TM 11-2621

WAR DEPARTMENT TECHNICAL MANUAL

REMOTE CONTROL EQUIPMENT AN/TRA-2

RESTRICTED. *DISSEMINATION OF RESTRICTED MATTER.* The information contained in restricted documents and the essential characteristics of restricted materiel may be given to any person known to be in the service of the United States and to persons of undoubted loyalty and discretion who are cooperating in Government work, but will not be communicated to the public or to the press except by authorized military public relations agencies. (See also par. 28, AR 380-5, 15 Mar 1944.)

WAR DEPARTMENT *24 AUGUST 1944*

ADDENDA SHEET
7 NOVEMBER 1944
TM 11-2621

ADDENDA SHEET
for
TECHNICAL MANUAL
Remote Control Equipment AN/TRA-2

24 AUGUST 1944

The following information corrects portions of TM 11-2621. Personnel using the equipment and having custody of the technical manual will attach this addenda sheet securely inside the front cover of the TM, and will enter suitable notations beside each changed portion in the TM to indicate the presence of this information.

Page 1, par. 2b, line 2. Change C-112/TRA-2 to C-113/TRA-2.

Page 6, par. 5b, line 3 from the bottom. Change terminals 3 and 4 to terminals 3 and 2.

Page 14, par. 8a (14). Change R2 to R3.

Page 21, par. 9c (5), line 8. Change relay RL101 to relay RL1.

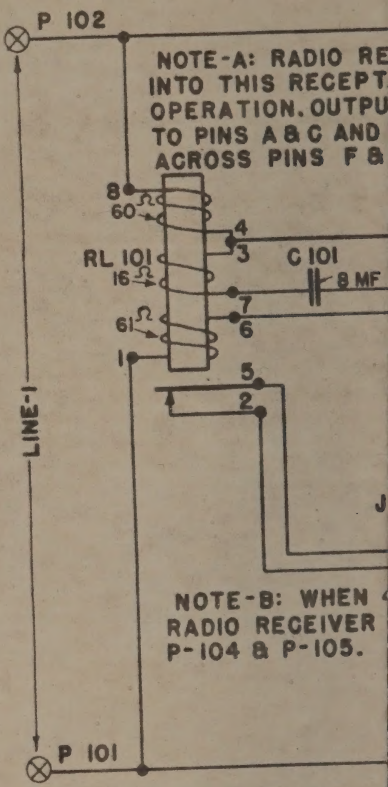
Page 30, par. 14, Signal Corps stock No. 3G1837-6.9. Change FTR-UP-12042 to FTR-UP-24042.

Page 31, par. 14, Ref symbol C2. Change No. 6187 to No. D-11166.

Page 31, par. 14, Ref symbol CH-1. Change 3-h to 4-h; 5-ma to 100-ma; 70-ohm to 130-ohm maximum; 1-9/16" to 2-1/2".

Page 32, par. 14, Ref symbol F1. Change Signal Corps stock No. 3Z2571-15.1 to 3Z2585. Change 150-ma to 125-ma. Delete slow blow. Change Bussman to Littlefuse No. 1044.





DESIGNATION	ITE
C 101	CAPACITOR 8
C 102	CAPACITOR 2
J 101	JACK, LOUD SPE
J 102-1	JACK, HEADSET
J 102-2	JACK, HEADSET
J 102-3	JACK, HEADSET
J 103-1	JACK, MICROPHO
J 103-2	JACK, MICROPHO
J 103-3	JACK, MICROPHO

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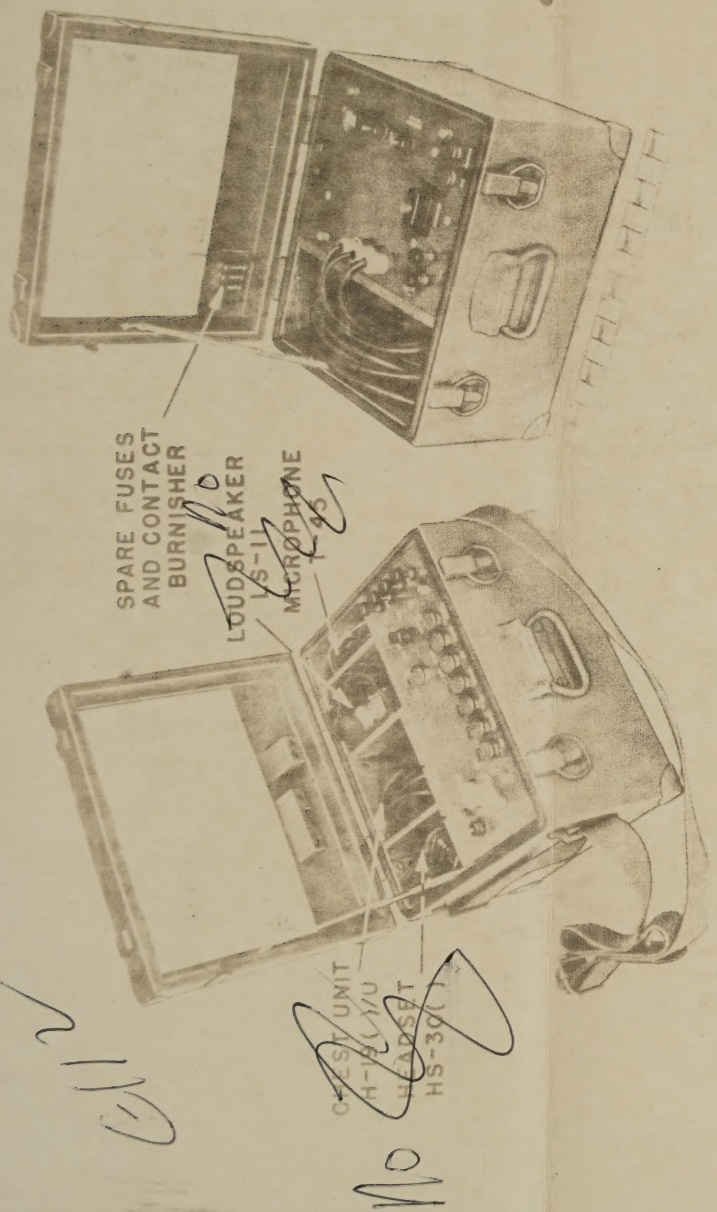
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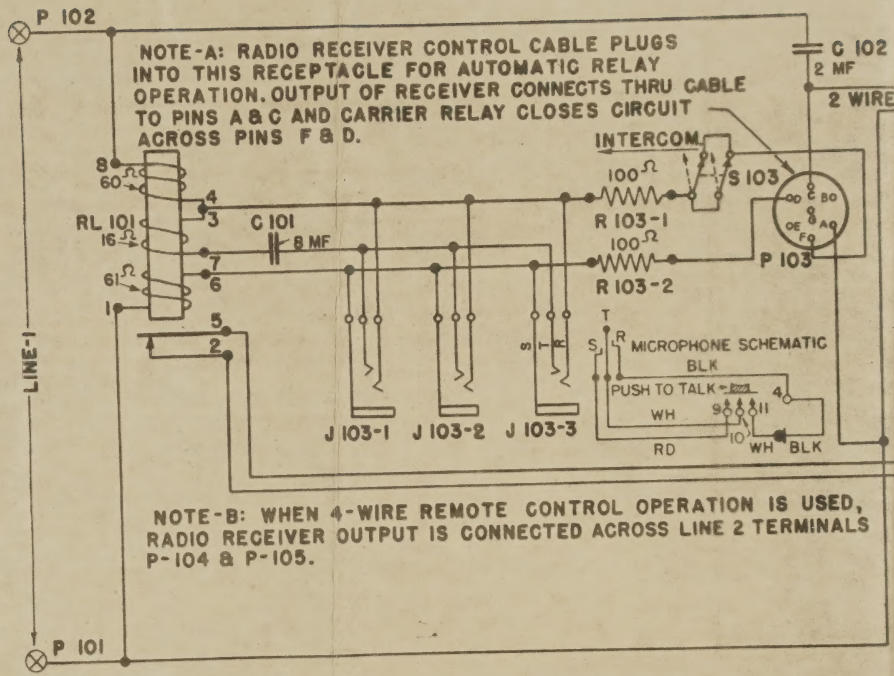
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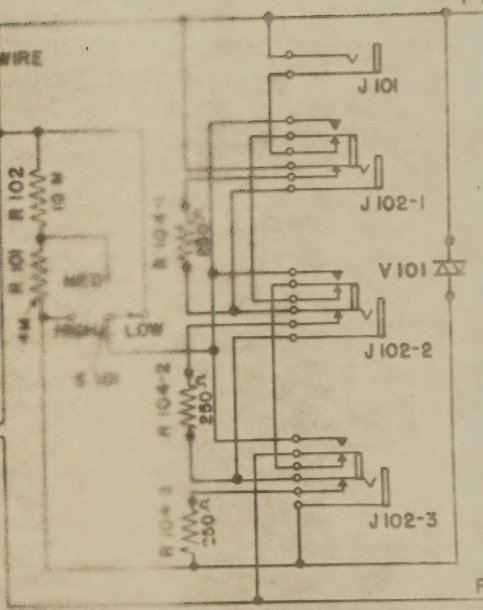
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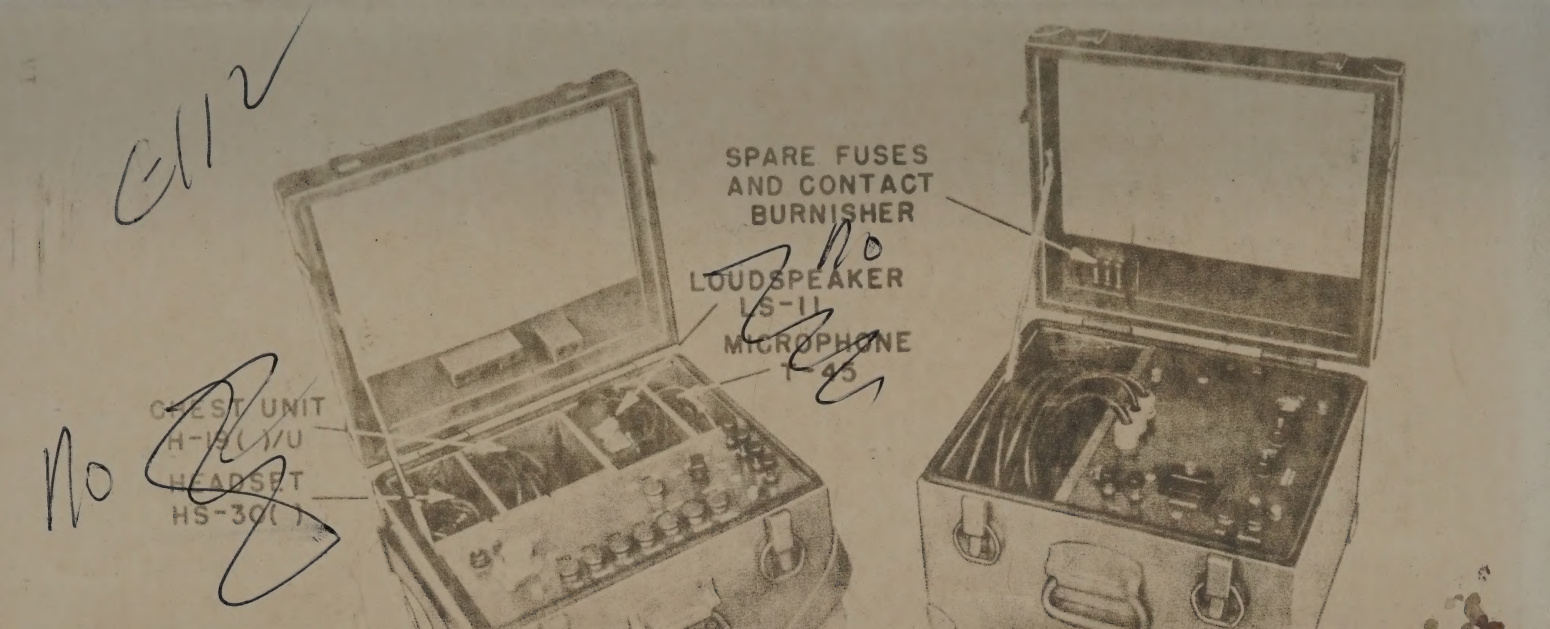


REMOTE CONTROL UNIT C-112/TRA-2

DESIGNATION	ITEM	DESIGNATION	ITEM
C 101	CAPACITOR 8 MF 200 V	P 101	LINE TERMINAL LINE 1
C 102	CAPACITOR 2 MF 200 V	P 102	LINE TERMINAL LINE 1
J 101	JACK, LOUD SPEAKER	P 103	CONTROL CABLE RECEPTACLE
J 102-1	JACK, HEADSET	P 104	LINE TERMINAL LINE 2
J 102-2	JACK, HEADSET	P 105	LINE TERMINAL LINE 2
J 102-3	JACK, HEADSET	R 101	RESISTOR 4000 OHM 1/2 W
J 103-1	JACK, MICROPHONE	R 102	RESISTOR 10,000 OHM 1/2 W
J 103-2	JACK, MICROPHONE	R 103-1	RESISTOR 100 OHM 2 W
J 103-3	JACK, MICROPHONE	R 103-2	RESISTOR 100 OHM 2 W

DESIGNATION	ITEM
R 104-1	RESISTOR 250 OHM
R 104-2	RESISTOR 250 OHM
R 104-3	RESISTOR 250 OHM
S 101	SWITCH, VOLUME
S 102	SWITCH, LINE (SCREW
S 103	SWITCH, INTERCOMMU
K 101	RELAY, CONTROL
V 101	VARISTOR

Fig. 10. Remote Control Unit C-112/TRA-2, schem[illegible] diagram.


SPARE FUSES
AND CONTACT
BURNISHER
LOUDSPEAKER
LS-11
MICROPHONE
CHEST UNIT
H-189( )/U
HEADSET
HS-30( )

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WAR DEPARTMENT,
WASHINGTON 25, D. C., 24 AUGUST, 1944.

TM 11-2621, Remote Control Equipment AN/TRA-2, is published for the information and guidance of all concerned.

[A. G. 300.7 (29 May 44).]

BY ORDER OF THE SECRETARY OF WAR:

G. C. MARSHALL,
Chief of Staff.

OFFICIAL:

J. A. ULIO,
Major General,
The Adjutant General.

DISTRIBUTION:

IC 11 (5); plus modified par. 9a.
(For explanation of symbols see FM 21-6.)

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DESTRUCTION NOTICE

WHY - To prevent the enemy from using or salvaging this equipment for his benefit.

WHEN- When ordered by your commander.

HOW - 1. Smash - Use sledges, axes, handaxes, pick-axes,hammers,crowbars,heavy tools.

2. Cut - Use axes, handaxes, machetes.

3. Burn - Use gasoline, kerosene, oil, flame throwers, incendiary grenades.

4. Explosives - Use firearms, grenades, TNT.

5. Disposal - Bury in slit trenches, fox holes, other holes. Throw in streams. Scatter.

USE ANYTHING IMMEDIATELY AVAILABLE FOR DESTRUCTION OF THIS EQUIPMENT.

WHAT- 1. Smash - Relays, jacks, capacitors, resistors, chokes, loudspeaker,headsets, microphones.

2. Cut - Cords, wiring, straps.

3. Burn - Cases, charts, technical manuals.

4. Bend - Panels.

5. Bury or scatter - Any or all the above items after destruction.

DESTROY EVERYTHING

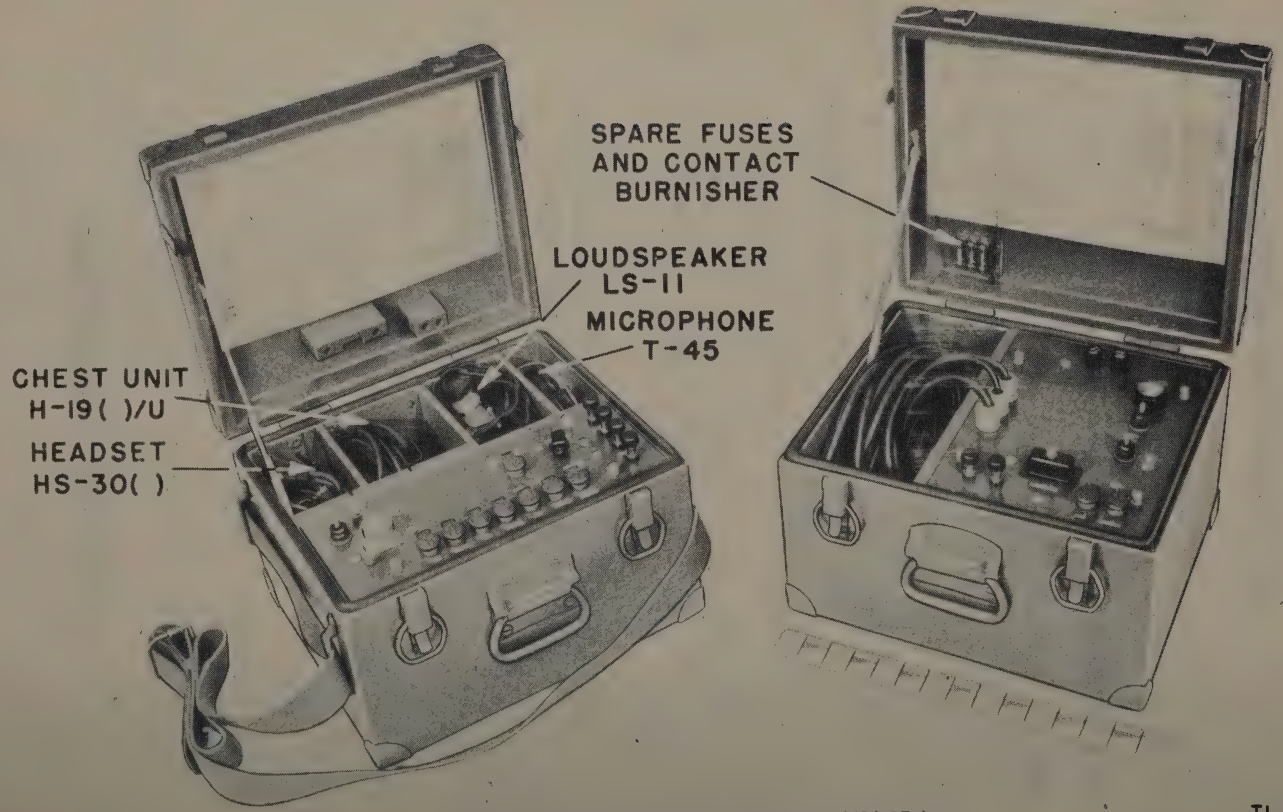


Fig. 1. Remote Control Equipment AN/TRA-2.

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SECTION I
DESCRIPTION

1. GENERAL.

This manual describes the installation, operation, and maintenance of Remote Control Equipment AN/TRA-2. The complete equipment consists of two separate man-transportable units in individual carrying cases and is shown in figure 1 with the accessories properly stored. Remote Control Equipment AN/TRA-2 provides for the remote control of Radio Set AN/TRC-1 or equivalent radio communication equipment. The two major components are Remote Control Unit C-112/TRA-2 (fig. 2) and Control Unit C-113/TRA-2 (fig. 3). Control Unit C-113/TRA-2 operates from a 115- or 230-volt, 50- to 60-cycle, a-c power source. Remote Control Unit C-112/TRA-2 operates from current supplied by Control Unit C-113/TRA-2.

2. COMPONENTS.

a. Remote Control Unit C-112/TRA-2. The carrying case of Remote Control Unit C-112/TRA-2 is part of the unit and is not considered a separate component. The other components, which are stored in the case, are:

1 Headset HS-30( ) equipped with Cord CD-874( ) and Plug PL-55.
1 Chest Unit H-19( )/U (chest unit D-173249) equipped with cord and Plug PL-68.
1 Microphone T-45 equipped with Cord CD-318 ( ) and Plug PL-68
1 Loudspeaker LS-11 with cord and Plug PL-55.

b. Control Unit C-113/TRA-2. The carrying case of Control Unit C-~~112~~/TRA-2 is also part of the unit and is not considered as a separate component. The three cords attached to the unit are stored in the case. Three spare fuses and a contact burnisher are attached to the cover.

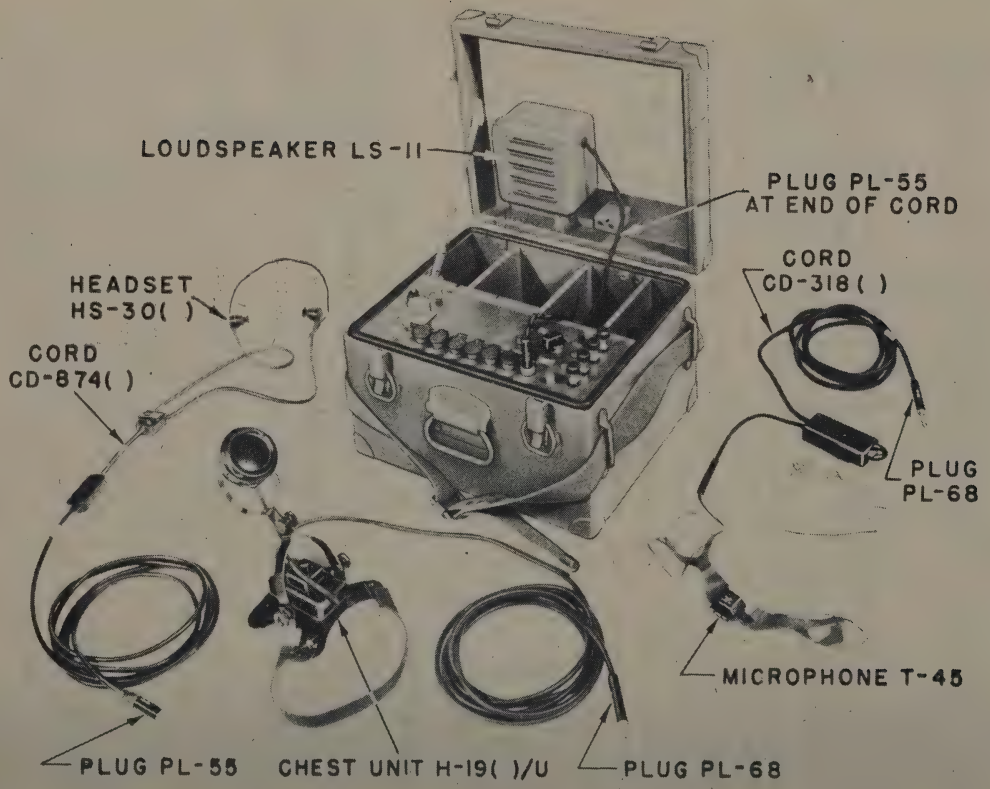


Fig. 2. Remote Control Unit C-112/TRA-2.

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3. DESCRIPTION.

a. Control Unit C-113/TRA-2. Control Unit C-113/TRA-2 is housed in a plywood case, painted olive drab, with metal corner reinforcements and a metal carrying handle. The hinged cover, when closed, is held in contact with a weatherproof strip by two trunk catches mounted on the case. When the cover is opened, it is held by a substantial stay brace equipped with a latch feature. A compartment is provided for storage of the cords and plugs for connection to the radio set and to the a-c line. Located on the panel are the microphone and headset jacks, the LINE binding posts, line protectors, power switch, pilot light, operating fuse, spare fuse, and the INTERCOM. switch.

b. Remote Control Unit C-112/TRA-2. Remote Control Unit C-112/TRA-2 is housed in a case similar to Control Unit C-113/TRA-2 but is equipped with a carrying strap. The two cases differ internally in compartments. Compartments are provided in the Remote Control Unit C-112/TRA-2 case for storage of the components listed in paragraph 2*a*. Located on the panel are three pairs of jacks for three sets of microphones and headsets, HEADSET VOLUME control, jack for loudspeaker, binding posts for LINE 1 and LINE 2, a seven-pin receptable for Cord CX-104/TRC-1, and the INTERCOM. switch.

c. Weights and Dimensions Packed for Shipping. Control Unit C-113/TRA-2 and Remote Control Unit C-112/TRA-2 are packed in separate outer corrugated board cartons. Each carton is labeled respectively, *One Control Unit C-113/TRA-2, Stock No. 2C681-113* and *One Remote Control Unit C-112/TRA-2, Stock No. 2C681-112*. Both cartons are shipped together in one wooden crate labeled, *One Remote Control Equipment AN/TRA-2, Stock No. 2S5006-2*. The over-all dimensions, weight and cubic volume of the wooden crate are as follows: Height 15 3/4", Width 31 3/4", Depth 17 1/4", Weight 98 pounds, Volume 5 cubic feet.

4. METHODS OF OPERATION.

Control Unit C-113/TRA-2 and Remote Control Unit C-112/TRA-2 are used with Radio Set AN/TRC-1 in three basic applications or methods of operation.

a. Automatic Relay Operation. This method of operation is used to increase the range of a transmitter by automatic relay to a distant receiver

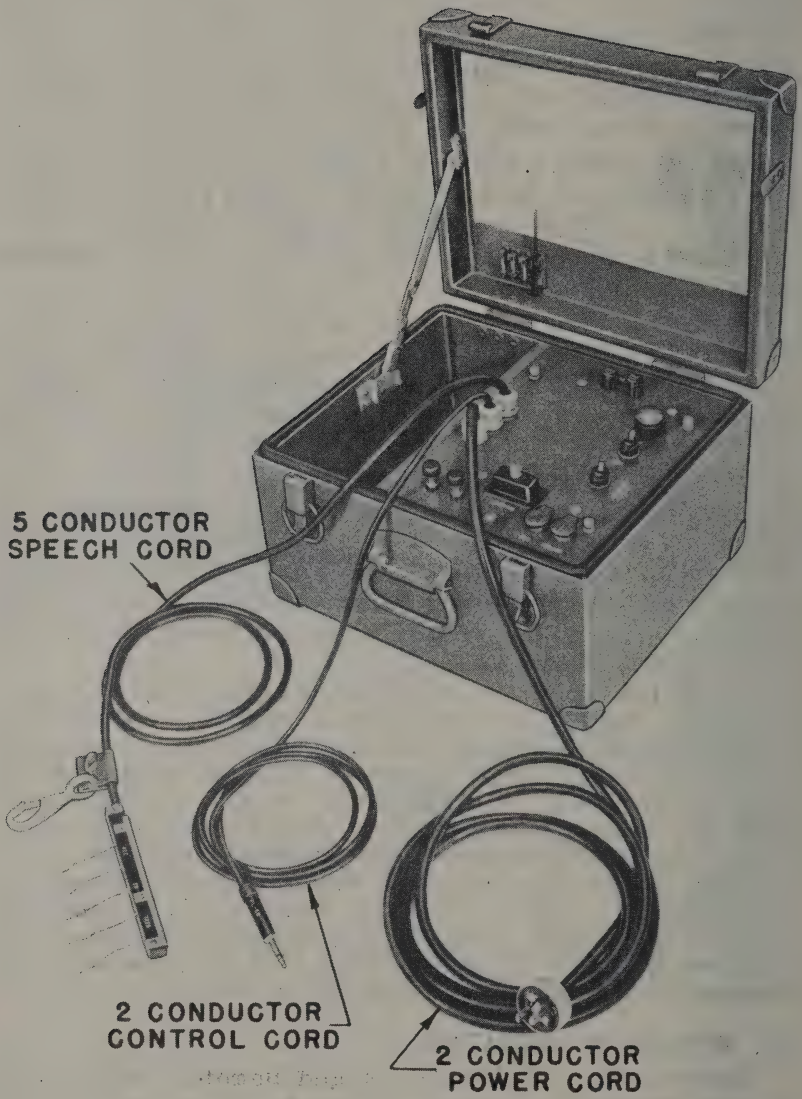


Fig. 3. Control Unit C-113/TRA-2. TL 15270

when the relay transmitter and receiver are separated by more than 10 feet. Control Unit C-113/TRA-2 is located at the relay transmitter and Remote Control Unit C-112/TRA-2 is located at the relay receiver. When the distance between the relay transmitter and receiver is 10 feet or less, Remote Control Equipment AN/TRA-2 is not required, as Cord CX-104/TRC-1 can then be used to interconnect the transmitter and receiver.

b. Radio Remote Control, Two-wire. This method of operation provides for the remote control of the radio transmitter at the communication center, with wired intercommunication without radio transmission between the two locations. The transmitter also may be operated from its location. Signals received on the radio receiver are transmitted simultaneously over the field-wire circuit to the remote point. Control Unit C-113/TRA-2 and Radio Set AN/TRC-1 are required at the communication center, and Remote Control Unit C-112/TRA-2 is required at the remote point.

c. Radio Remote Control, Four-wire. This method of operation permits the radio receiver and transmitter to be at separate locations, each location being wired to the communication center by a pair of field wires. The transmitter may be controlled at its location, or from the communication center. Signals received on the radio receiver are received at the communication center over field wire, but are not relayed to the operator at the transmitter. Remote Control Unit C-112/TRA-2 is required at the communication center. Radio Receiver R-19( )/TRC-1 is installed at one remote location, and Control Unit C-113/TRA-2 and Radio Transmitter T-14( )/TRC-1 are required at the other remote point.

NOTE: Control Unit C-113/TRA-2 may be used in conjunction with telegraph (teletype) operation of Radio Set AN/TRC-1. Remote Control Unit C-112/TRA-2 is not required in telegraph installations, but may be used to provide voice intercommunication over a field-wire line, not exceeding 2 miles, between a telegraph terminal and the radio station for cueing purposes.

SECTION II
INSTALLATION AND OPERATION

5. GENERAL.

The installation of the equipment is governed by the application, the service to be rendered, and the location. In all three basic methods of operation, automatic relay operation; radio remote control, two-wire; and radio remote control, four-wire, separation of the equipment is limited to 2 miles of field Wire W-110-B, or a maximum loop resistance of 400 ohms for any one pair.

a. A single pair of field wire is connected to LINE 1 terminals for automatic relay operation and for radio remote control, two-wire operation. Two pairs of field wire, one pair to LINE 1 terminals and one pair to LINE 2 terminals, are connected for radio remote control, four-wire operation.

b. Control Unit C-113/TRA-2 is provided with three fixed cords: a 6-foot, five-conductor *speech* cord; a 6-foot, two-conductor *control* cord; and a 10-foot, two-conductor *power* cord (fig. 3). The speech cord, terminating in a special five-pin connector, and the control cord, terminating in Plug PL-68, connect to Radio Transmitter T-14( )/TRC-1 in the three methods of operation. The power cord, terminating in a standard outlet plug, connects to the 115-volt a-c power source of the transmitter.

NOTE: To operate from a 230-volt, 50- to 60-cycle power source, remove the unit from the case and change the straps on power transformer T-3 as follows:

Remove strap between terminals 1 and 3;
Remove strap between terminals 2 and 4;
Strap terminals 3 and ~~4~~ 2

The pilot light is wired across one half of the transformer, therefore the wiring should

not be changed (fig. 9).

c. Remote Control Unit C-112/TRA-2 requires a single pair field wire to connect it to Control Unit C-113/TRA-2 for all three methods of operation.

6. INSTALLATION.

a. Automatic Relay Operation.

(1) Connect the equipment as shown in figure 4.

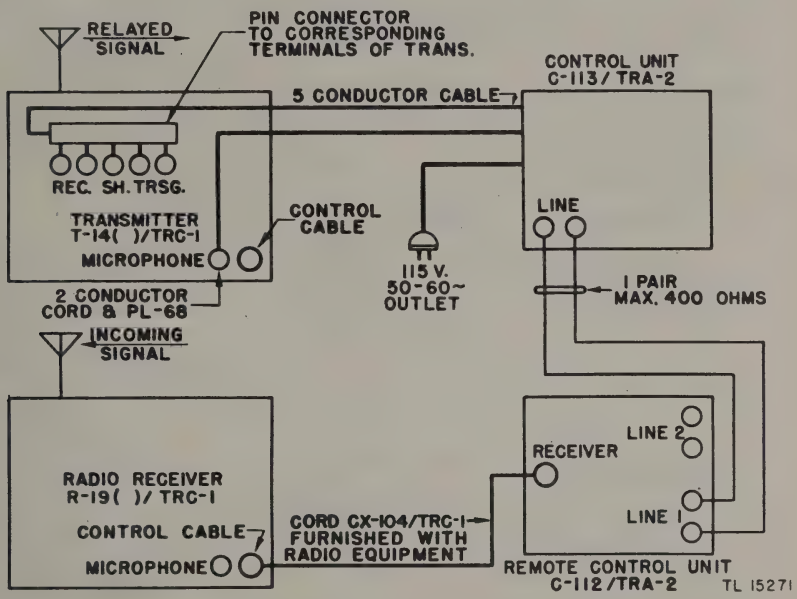


Fig. 4. Automatic relay operation, cording diagram.

Separate the transmitting and receiving antennas by a distance sufficient to prevent reception of spurious transmitter harmonics. This distance will depend upon the choice of crystal frequencies. Select the crystals according to the interference charts in TM 11-2601.

(2) Set LINE SWITCH of Remote Control Unit C-112/TRA-2 to TWO WIRE position.

(3) Set Radio Transmitter T-14( )/TRC-1 controls as follows:

(*a*) LINE switch to ON position.

(*b*) CABLE COMPENSATOR to position 8.

(*c*) CARRIER CONTROL switch to position 2.

(4) Set Radio Receiver R-19( )/TRC-1 controls as follows:

(*a*) LINE switch to ON position.

(*b*) SQUELCH switch to ON position and turn ADJUST

control for squelch operation.

(c) CHANNEL switch to SINGLE CHANNEL position.

(d) METER SWITCH to position 6.

(e) AUDIO GAIN control to register a reading of plus 1 dbm on the meter during average voice peaks when a voice-modulated signal is being received.

b. Radio Remote Control, Two-wire.

(1) Connect as shown in figure 5.

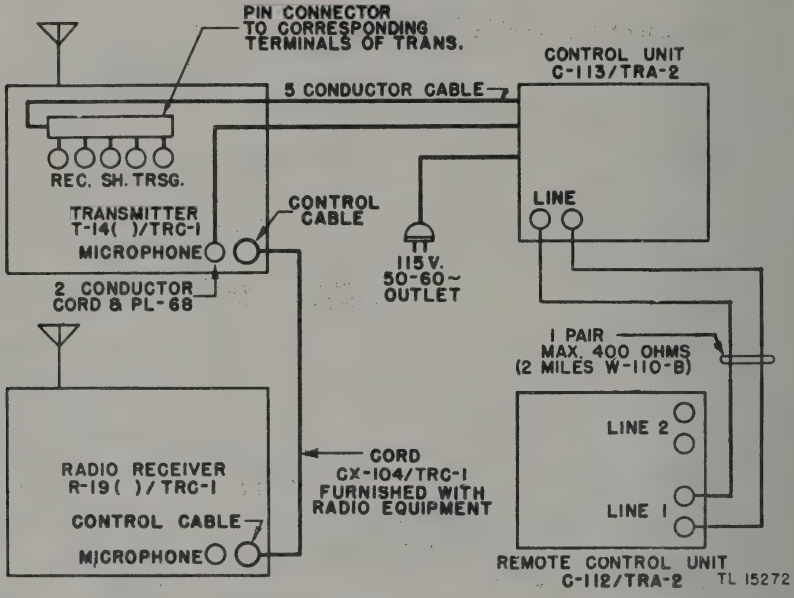


Fig. 5. Radio remote control, two-wire, cording diagram.

(2) Set LINE SWITCH of Remote Control Unit C-112/TRA-2 to TWO WIRE position.

(3) Set Radio Transmitter T-14( )/TRC-1 controls as follows:

(a) CABLE COMPENSATOR to maximum.

(b) CARRIER CONTROL switch to position 1.

(4) Set Radio Receiver R-19( )/TRC-1 controls as follows:

(a) AUDIO GAIN to obtain sufficient volume at Remote Control Unit C-112/TRA-2.

(b) METER SWITCH to position 6 only when output level does not exceed plus 6 dbm.

CAUTION: Greater output may result in injury to meter.

c. Radio Remote Control, Four-wire.

(1) Connect as shown in figure 6.

(2) Set LINE SWITCH of Remote Control Unit C-112/

TRA-2 to FOUR WIRE position.

(3) Set Radio Transmitter T-14( )/TRC-1 controls as follows:

(a) CABLE COMPENSATOR to maximum.

(b) CARRIER CONTROL switch to position 1.

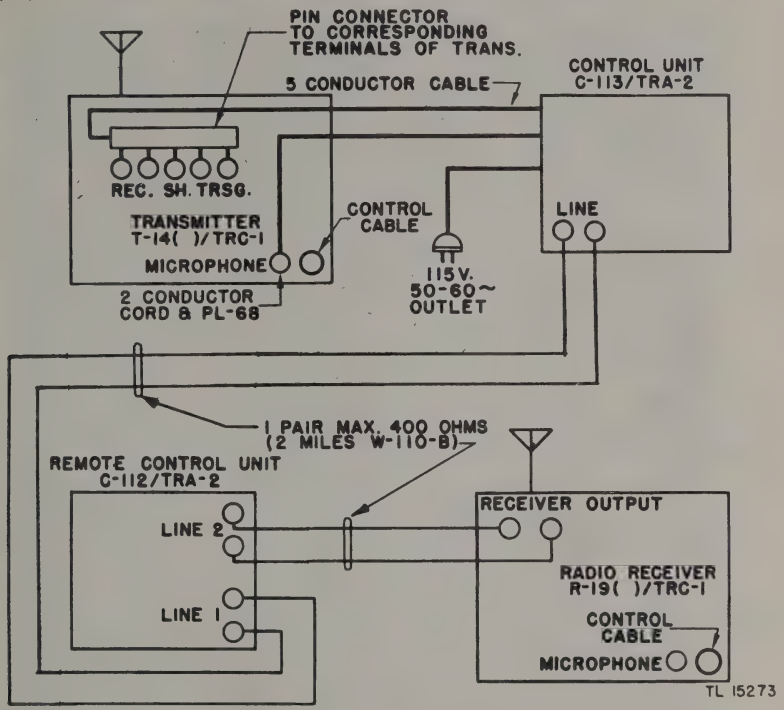


Fig. 6. Radio remote control, four-wire, cording diagram.

(4) Set Radio Receiver R-19( )/TRC-1 controls as follows:

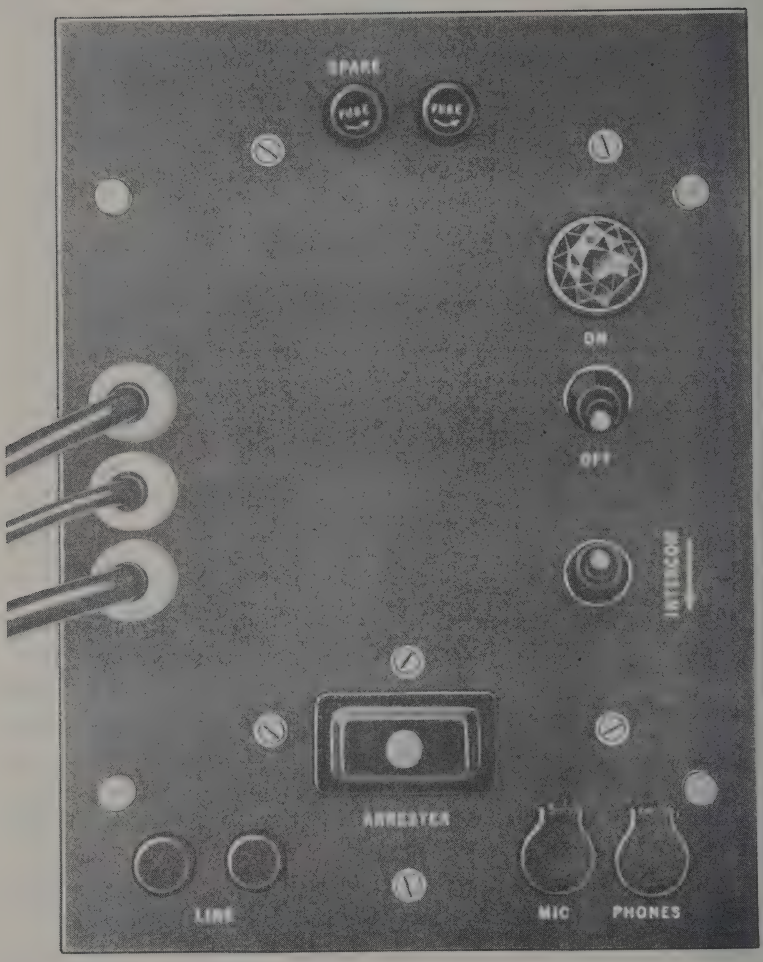
(a) AUDIO GAIN to obtain sufficient volume at Remote Control Unit C-112/TRA-2.

(b) METER SWITCH to position 6 only when output level does not exceed plus 6 dbm.

CAUTION: Greater output may result in injury to meter.

7. OPERATION.

a. General. For all applications set power switch to ON position; pilot lamp should light. Handset TS-15( ) or H-23( )/U furnished with Radio Transmitter T-14( )/TRC-1 is plugged into the jacks at the lower right-hand corner of Control Unit C-113/TRA-2 (fig. 7). Refer to figure 8 for front panel of Remote Control Unit C-112/TRA-2. Facilities are available for



TL 15274

Fig. 7. Control Unit C-113/TRA-2, front panel.

plugging in three sets of headsets and microphones. Either Chest Unit H-19( )/U or Lip Microphone T-45, or both may be used. Normally Loudspeaker LS-11 is plugged into the loudspeaker jack. Headsets may be used for radio remote control, two-wire (fig. 5) and radio remote control, four-wire (fig. 6). The loudspeaker is not generally used for automatic relay operation (fig.4). Plugging in a headset automatically disconnects the loudspeaker. Check position of LINE SWITCH for proper position to correspond to the particular method of operation. Rotate counterclockwise for installations corresponding to figures 4 and 5 (two-wire service) and clockwise for installations corresponding to figure 6 (four-wire service).

b. Operating Instructions for Control Unit C-113/TRA-2.

(1) RADIO TRANSMISSION. Operate switch on Handset TS-15( ) or H-23( )/U and hold while talking. The voice will modulate Radio Transmitter T-14( )/TRC-1 and will also be transmitted by field wire to Remote Control Unit C-112/TRA-2.

(2) INTERCOMMUNICATION (fig. 4 and 5). Operate INTERCOM. switch in the direction of the arrow on the panel and hold to prevent modulation of the transmitter. Operate thumb switch on handset and hold only while talking. *Release thumb switch when listening.*

NOTE: Intercommunication feature is not provided for installations corresponding to figure 6 (four-wire service). In an emergency, however, where intercommunication is essential without modulating the transmitter, rotate LINE SWITCH counterclockwise to the TWO WIRE position. Operate as outlined above. Restore LINE SWITCH to FOUR WIRE position when normal operation is resumed.

c. Operating Instructions for Remote Control Unit C-112/TRA-2.

(1) RADIO TRANSMISSION. Operate push-button switch on Chest Unit H-19( )/U (chest unit D-173249) or cord switch of Lip Microphone T-45, and hold while talking.

CAUTION: Restore switch of either type microphone to re-establish radio reception. Radio signals will not be received either at Control Unit C-113/TRA-2 or at Remote Control

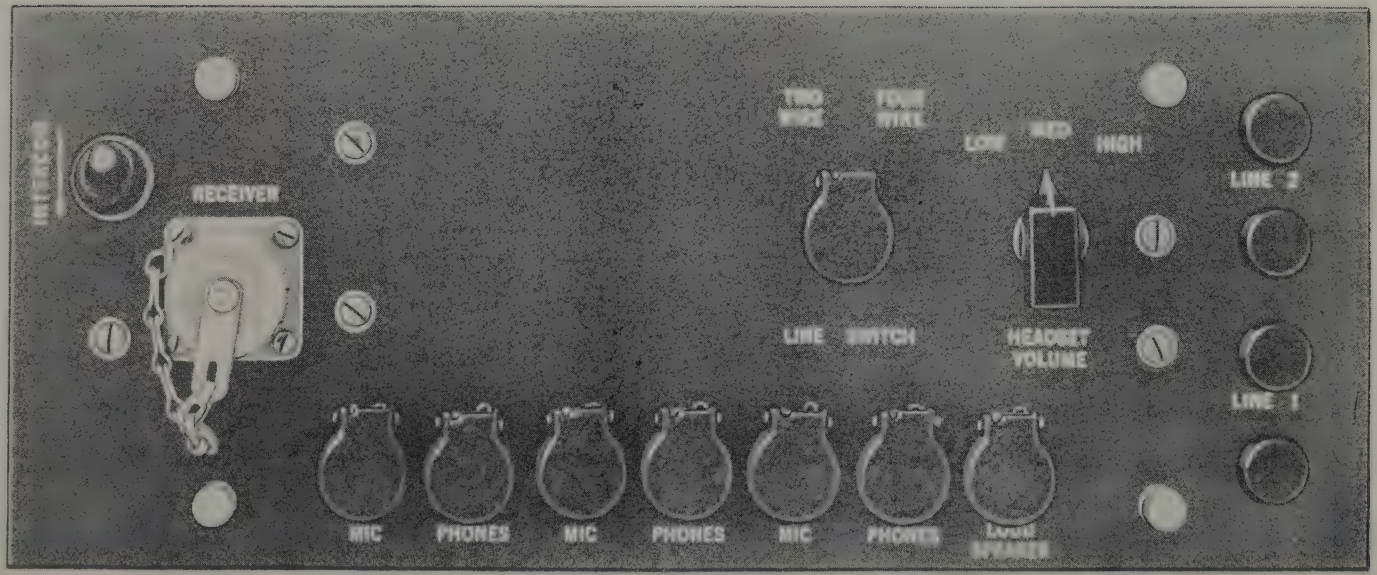


Fig. 8. Remote Control Unit C-112/TRA-2, front panel.

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Unit C-112/TRA-2 while microphone switches are held operated.

(2) INTERCOMMUNICATION (fig. 4). Operate INTERCOM. switch in the direction of the arrow on the panel and hold when necessary to increase listening level, but only if it *does not* interfere with operation of radio. This switch need not be used on installations corresponding to figure 5.

NOTE: Privacy of intercommunication feature is under the control of the operator at Control Unit C-113/TRA-2 only. If operator at Remote Control Unit C-112/TRA-2 desires that the communication does not modulate the transmitter, he should request the operator at Control Unit C-113/TRA-2 to operate the INTERCOM. switch.

SECTION III

FUNCTIONING OF PARTS

8. FUNCTIONING OF PARTS.

a. Control Unit C-113/TRA-2. The functions of the components will be described using the circuit designations appearing on the schematic diagram (fig. 9) and the tabulation.

(1) A1-1 and A1-2 are protector blocks to protect each side of the line from lightning, by providing a low-resistance path through a small gap to ground.

(2) A2-1 and A2-2 are carbon blocks used in protector blocks A1-1 and A1-2.

(3) C1-1 and C1-2 are 2-mf blocking capacitors to prevent direct current from flowing in phones, also line coupling capacitors.

(4) C2 and CH1 are filters to smooth ripple of rectified alternating current.

(5) Fuse F1 provides overload protection for rectifier.

(6) J1 and J2 are jacks for Plugs PL-68 and PL-55 of Handset TS-15( ) or H-23( )/U.

(7) P1 is a special five-pin connector for cable between Control Unit C-113/TRA-2 and Transmitter T-14( )/TRC-1.

(8) P7, control Plug PL-68, plugs into microphone input jack of Transmitter T-14( )/TRC-1 to operate antenna and plate-voltage relay.

(9) P6 is a power plug used to connect to the a-c line.

(10) P8 and P9 are line terminals for line termination.

(11) PL1 is the pilot lamp.

(12) R1 is a 2,000-ohm resistor, to reduce the volume of the adjacent receiver.

(13) R2 is a 4,700-ohm bleeder resistor across output of rectifier to improve regulation.

(14) R3 is a 20,000-ohm current limiting resistor for pilot light.

(15) RL1 is a control relay. Its primary function

is to break the radio receiver circuit and to establish a voice-modulation circuit to the radio transmitter.
(16) S1 is the power switch which controls the input to the unit.
(17) S2 is the intercommunication switch which opens voice-modulation input and control circuits to radio transmitter.
(18) Induction coil T1 is an autotransformer, microphone-to-line. It matches the input impedance of Remote Control Unit C-112/TRA-2 and is equipped with a winding for sidetone reduction.
(19) T2 and TH1 are the volume limiting transformer and thermistor. These two devices provide automatic level control of the input to the radio transmitter.
(20) T3 is a step-down power transformer for the rectifier.
(21) V1 is a varistor which absorbs clicks in the headset circuit.
(22) RE1 is a selenium rectifier of the dry-plate, full-wave, bridge type. It converts a-c power to d-c.

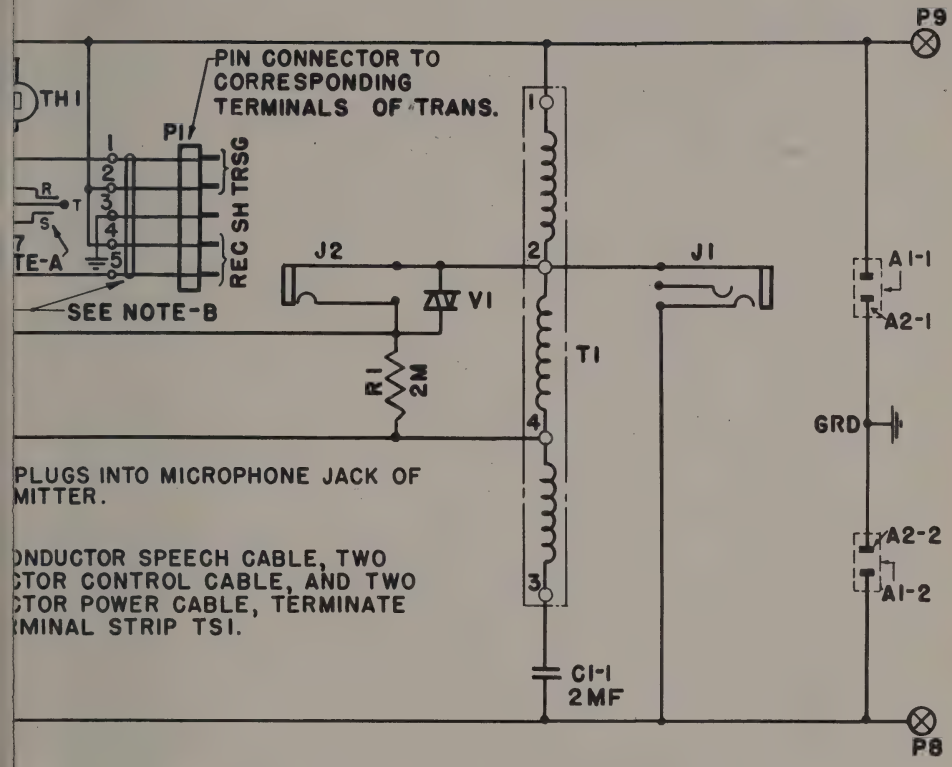
b. Remote Control Unit C-112/TRA-2. The functions of the components will be described using the circuit designations appearing on the schematic diagram (fig. 10) and the tabulation.
(1) C101 is an 8-mf capacitor used in series with one winding of control relay to block direct current from that winding.
(2) C102 is a 2-mf, line coupling capacitor.
(3) J101 is a jack for plug-in of loudspeaker.
(4) J102-1, J102-2, and J102-3 are jacks for plug-in of headsets.
(5) J103-1, J103-2, and J103-3 are jacks for plug-in of microphones.
(6) P101 and P102 are line terminals for termination of line 1.
(7) P103 is a seven-pin, female control cable receptable for connecting Cord CX-104/TRC-1 to Radio Receiver R-19( )/TRC-1.
(8) P104 and P105 are line terminals for termination of line 2.
(9) R101, a 4,000-ohm resistor, R102, a 10,000-ohm resistor, and S101 make up a three-position volume

control to control volume of headsets.
(10) R103-1 and R103-2, 100-ohm resistors, are for relay control, and are used only on automatic relay operation (fig. 4).
(11) R104-1, R104-2, and R104-3, 250-ohm resistors, compensate for insertion of one to three headsets.
(12) S102 is the line switch which separates line 1 from line 2 on remote control, four-wire operation.
(13) S103 is the intercommunication switch which increases INTERCOM. listening level on automatic relay operation.
(14) RL101 is a combination relay and autotransformer, microphone-to-line, and matches the input impedance of Control Unit C-113/TRA-2. The contacts control the sidetone reduction circuit, and disconnect the loudspeaker circuit.
(15) V101 is a varistor which absorbs clicks in the headset circuit.

9. FUNCTIONING OF CIRCUITS.

a. General. Refer to figure 17 showing figures 9 and 10 combined, or to figure 18 showing a simplified arrangement of figure 17. Control Unit C-113/TRA-2 and Remote Control Unit C-112/TRA-2 are shown connected by the single pair line required for all three methods of operation.
(1) Pins TRSG of the five-pin connector P1 connect to the voice-modulation input circuit of Radio Transmitter T-14( )/TRC-1. Pins REC connect to the audio output of Radio Receiver R-19( )/TRC-1. Plug P7 connects to MICROPHONE input jack of the transmitter and serves to control antenna and plate-voltage relay of the transmitter on the operation of relay RL1 of Control Unit C-113/TRA-2.
(2) Microphone and relay operating voltage for both units is obtained from the rectifier in Control Unit C-113/TRA-2.

b. Automatic Relay Operation. Both the radio transmitter and receiver are turned on and controls adjusted as outlined in paragraph 6. Control Cord CX-104/TRC-1 connects Remote Control Unit C-112/TRA-2 to Radio Receiver T-19( )/TRC-1.
(1) The carrier of the distant transmitter operates relay RL101 in the relaying receiver through the squelch circuit. The contacts of this relay trans-



UNIT C-113/TRA-2		
ITEM	DESIGNATION	ITEM
BLOCKS	RL I	RELAY, CONTROL
"	S I	SWITCH, POWER
L PLUG	S2	SWITCH, INTERCOMMUNICATION
WER PLUG	T I	INDUCTION COIL
RMINAL	T2	VOLUME LIMITING TRANSFORMER
RMINAL	T3	POWER TRANSFORMER
AMP, NEON 1/4 W	TH I	VOLUME LIMITING THERMISTOR
OR 2,000 OHM 1/2 W	V I	VARISTOR
OR 4,700 OHM 8 W	RE I	SELENIUM RECTIFIER
OR 20,000 OHM 1/2 W	TS I	TERMINAL STRIP

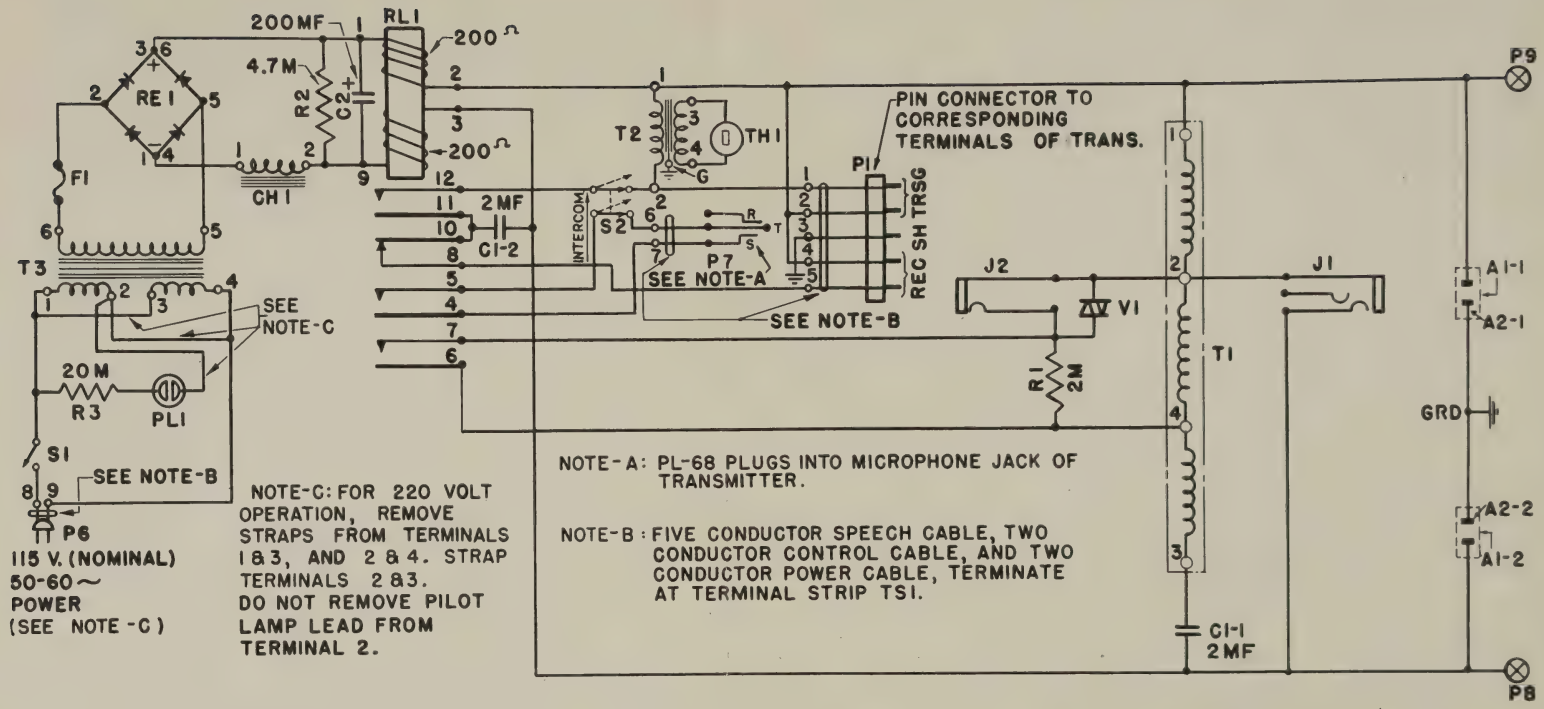
-113/TRA-2, schematic diagram. TL 15276

control to control volume of headsets.
(10) R103-1 and R103-2, 100-ohm resistors, are for relay control, and are used only on automatic relay operation (fig. 4).
(11) R104-1, R104-2, and R104-3, 250-ohm resistors, compensate for insertion of one to three headsets.
(12) S102 is the line switch which separates line 1 from line 2 on remote control, four-wire operation.
(13) S103 is the intercommunication switch which increases INTERCOM. listening level on automatic relay operation.
(14) RL101 is a combination relay and autotransformer, microphone-to-line, and matches the input impedance of Control Unit C-113/TRA-2. The contacts control the sidetone reduction circuit, and disconnect the loudspeaker circuit.
(15) V101 is a varistor which absorbs clicks in the headset circuit.

9. FUNCTIONING OF CIRCUITS.

a. General. Refer to figure 17 showing figures 9 and 10 combined, or to figure 18 showing a simplified arrangement of figure 17. Control Unit C-113/TRA-2 and Remote Control Unit C-112/TRA-2 are shown connected by the single pair line required for all three methods of operation.
(1) Pins TRSG of the five-pin connector P1 connect to the voice-modulation input circuit of Radio Transmitter T-14( )/TRC-1. Pins REC connect to the audio output of Radio Receiver R-19( )/TRC-1. Plug P7 connects to MICROPHONE input jack of the transmitter and serves to control antenna and plate-voltage relay of the transmitter on the operation of relay RL1 of Control Unit C-113/TRA-2.
(2) Microphone and relay operating voltage for both units is obtained from the rectifier in Control Unit C-113/TRA-2.

b. Automatic Relay Operation. Both the radio transmitter and receiver are turned on and controls adjusted as outlined in paragraph 6. Control Cord CX-104/TRC-1 connects Remote Control Unit C-112/TRA-2 to Radio Receiver T-19( )/TRC-1.
(1) The carrier of the distant transmitter operates relay RL101 in the relaying receiver through the squelch circuit. The contacts of this relay trans-

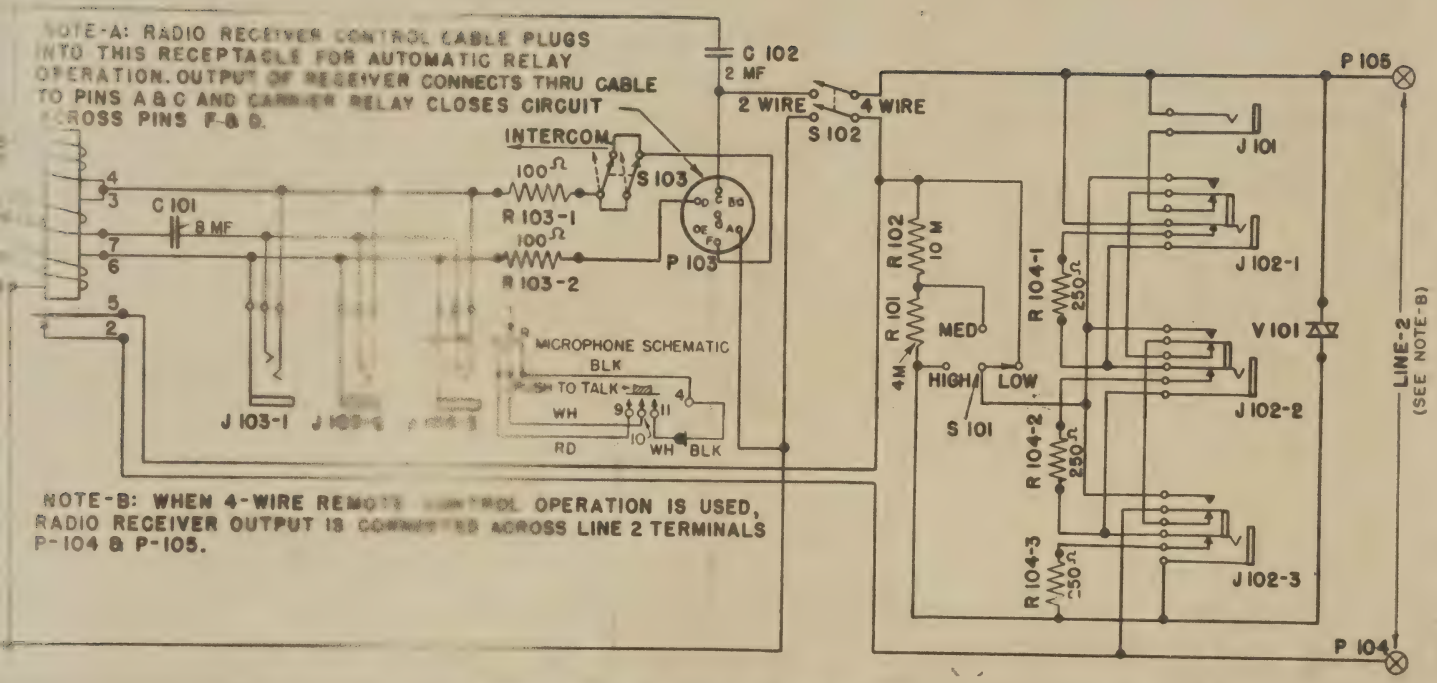


CONTROL UNIT C-113/TRA-2

DESIGNATION	ITEM	DESIGNATION	ITEM	DESIGNATION	ITEM
A1-1	PROTECTOR BLOCK	A2-1	CARBON BLOCKS	RL1	RELAY, CONTROL
A1-2	" "	A2-2	" "	S1	SWITCH, POWER
C1-1	CAPACITOR 2 MF 200 V	P7	CONTROL PLUG	S2	SWITCH, INTERCOMMUNICATION
C1-2	CAPACITOR 2MF 200 V	P6	A.C. POWER PLUG	T1	INDUCTION COIL
C2	CAPACITOR 200 MF 150 V	P8	LINE TERMINAL	T2	VOLUME LIMITING TRANSFORMER
CH1	CHOKE COIL 4 HY AT 100 MA	P9	LINE TERMINAL	T3	POWER TRANSFORMER
F1	FUSE 125 MA	PL1	PILOT LAMP, NEON 1/4 W	TH1	VOLUME LIMITING THERMISTOR
J1	JACK, MICROPHONE	R1	RESISTOR 2,000 OHM 1/2 W	V1	VARISTOR
J2	JACK, HEADSET	R2	RESISTOR 4,700 OHM 8 W	RE1	SELENIUM RECTIFIER
P1	PIN CONNECTOR, SPECIAL	R3	RESISTOR 20,000 OHM 1/2 W	TS1	TERMINAL STRIP

Fig. 9. Control Unit C-113/TRA-2, schematic diagram.

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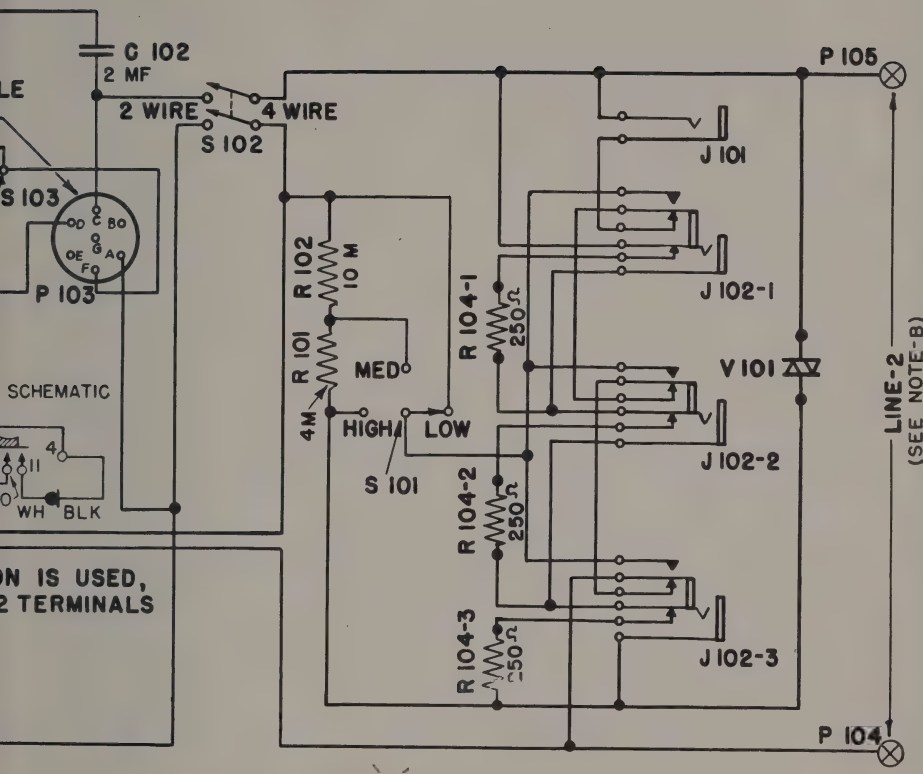


ITEM	
CAPACITOR	8 MF 200 V
CAPACITOR	2 MF 200 V
JACK, LOUD SPEAKER	
JACK, HEADSET	
JACK, HEADSET	
JACK, HEADSET	
JACK, MICROPHONE	
JACK, MICROPHONE	
JACK, MICROPHONE	

TE CONTROL UNIT C-112/TRA-2

ITEM	DESIGNATION	ITEM
LINE TERMINAL LINE 1	R 104-1	RESISTOR 250 OHM 1/2 W
LINE TERMINAL LINE 1	R 104-2	RESISTOR 250 OHM 1/2 W
CONTROL CABLE RECEPTACLE	R 104-3	RESISTOR 250 OHM 1/2 W
LINE TERMINAL LINE 2	S 101	SWITCH, VOLUME
LINE TERMINAL LINE 2	S 102	SWITCH, LINE (SCREW SLOT)
RESISTOR 4000 OHM 1/2 W	S 103	SWITCH, INTERCOMMUNICATION
RESISTOR 10,000 OHM 1/2 W	RL 101	RELAY, CONTROL
RESISTOR 100 OHM 2 W	V 101	VARISTOR
RESISTOR 100 OHM 2 W		

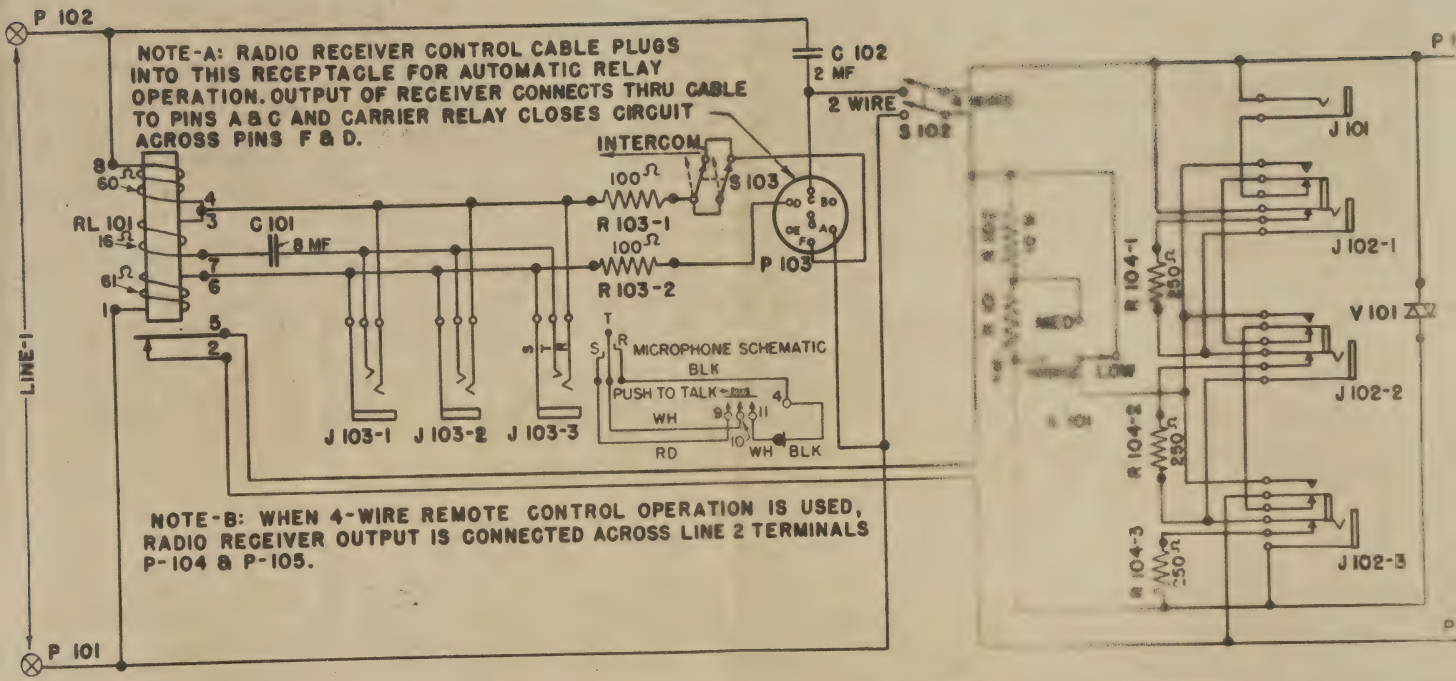
Fig. 11 Unit C-112/TRA-2, schematic diagram. TL 15277



ROL UNIT C-112/TRA-2			
ITEM	DESIGNATION	ITEM	
ERMINAL LINE 1	R 104-1	RESISTOR	250 OHM 1/2 W
ERMINAL LINE 1	R 104-2	RESISTOR	250 OHM 1/2 W
L CABLE RECEPTACLE	R 104-3	RESISTOR	250 OHM 1/2 W
RMINAL LINE 2	S 101	SWITCH, VOLUME	
RMINAL LINE 2	S 102	SWITCH, LINE (SCREW SLOT)	
R 4000 OHM 1/2 W	S 103	SWITCH, INTERCOMMUNICATION	
R 10,000 OHM 1/2 W	RL 101	RELAY, CONTROL	
R 100 OHM 2 W	V 101	VARISTOR	
R 100 OHM 2 W			

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t C-112/TRA-2, schematic diagram.



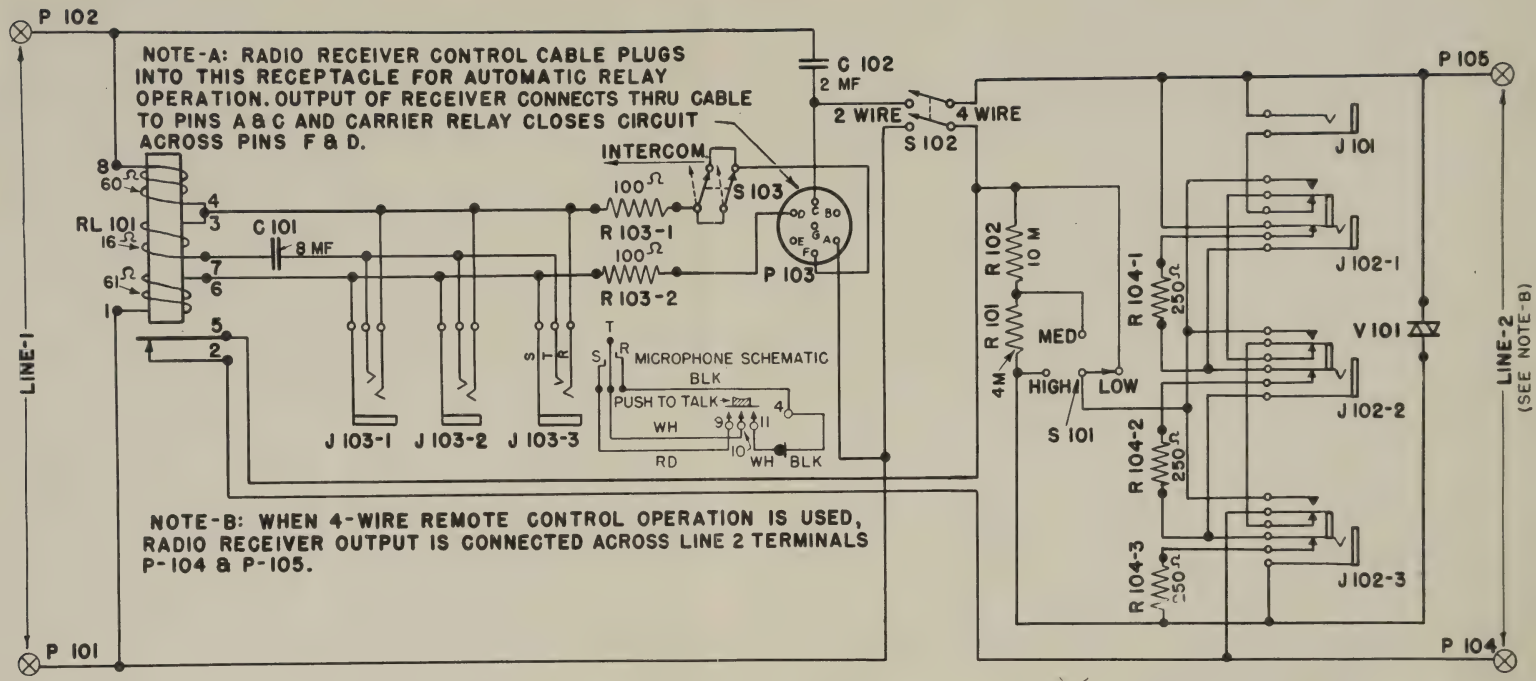
REMOTE CONTROL UNIT C-112/TRA-2

DESIGNATION	ITEM
C 101	CAPACITOR 8 MF 200 V
C 102	CAPACITOR 2 MF 200 V
J 101	JACK, LOUD SPEAKER
J 102-1	JACK, HEADSET
J 102-2	JACK, HEADSET
J 102-3	JACK, HEADSET
J 103-1	JACK, MICROPHONE
J 103-2	JACK, MICROPHONE
J 103-3	JACK, MICROPHONE

DESIGNATION	ITEM
P 101	LINE TERMINAL LINE 1
P 102	LINE TERMINAL LINE 1
P 103	CONTROL CABLE RECEPTACLE
P 104	LINE TERMINAL LINE 2
P 105	LINE TERMINAL LINE 2
R 101	RESISTOR 4000 OHM 1/2 W
R 102	RESISTOR 10,000 OHM 1/2 W
R 103-1	RESISTOR 100 OHM 2 W
R 103-2	RESISTOR 100 OHM 2 W

ITEM
RESISTOR 250 OHM
RESISTOR 250 OHM
RESISTOR 250 OHM
SWITCH, VOLUME
SWITCH, LINE (SCREW SLOT
SWITCH, INTERCOMMUNICATI
RELAY, CONTROL
VARISTOR

Fig. 10. Remote Control Unit C-112/TRA-2, schematic diagram.

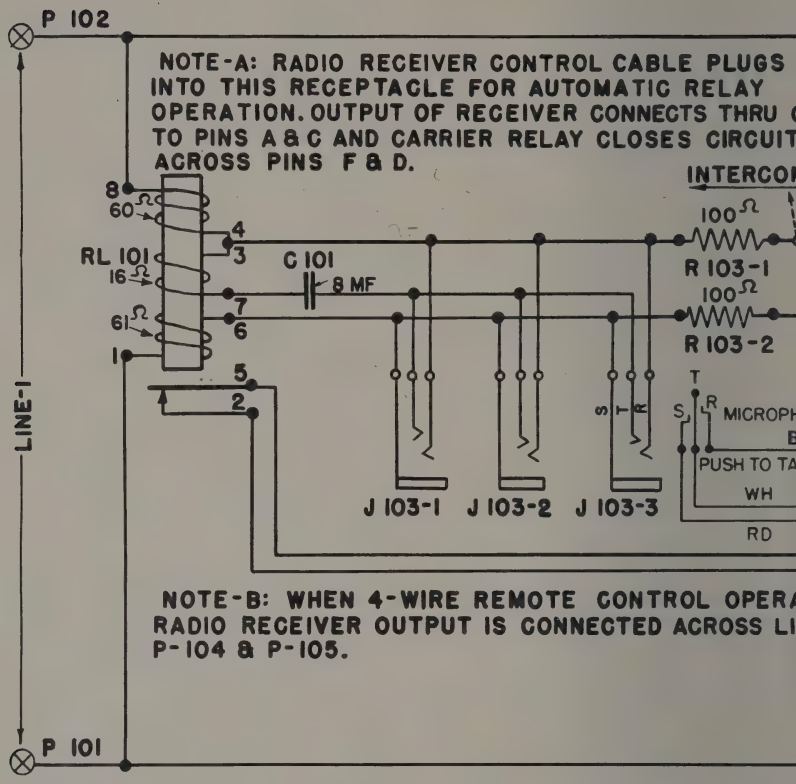


REMOTE CONTROL UNIT C-112/TRA-2

DESIGNATION	ITEM	DESIGNATION	ITEM	DESIGNATION	ITEM
C 101	CAPACITOR 8 MF 200 V	P 101	LINE TERMINAL LINE 1	R 104-1	RESISTOR 250 OHM 1/2 W
C 102	CAPACITOR 2 MF 200 V	P 102	LINE TERMINAL LINE 1	R 104-2	RESISTOR 250 OHM 1/2 W
J 101	JACK, LOUD SPEAKER	P 103	CONTROL CABLE RECEPTACLE	R 104-3	RESISTOR 250 OHM 1/2 W
J 102-1	JACK, HEADSET	P 104	LINE TERMINAL LINE 2	S 101	SWITCH, VOLUME
J 102-2	JACK, HEADSET	P 105	LINE TERMINAL LINE 2	S 102	SWITCH, LINE (SCREW SLOT)
J 102-3	JACK, HEADSET	R 101	RESISTOR 4000 OHM 1/2 W	S 103	SWITCH, INTERCOMMUNICATION
J 103-1	JACK, MICROPHONE	R 102	RESISTOR 10,000 OHM 1/2 W	RL 101	RELAY, CONTROL
J 103-2	JACK, MICROPHONE	R 103-1	RESISTOR 100 OHM 2 W	V 101	VARISTOR
J 103-3	JACK, MICROPHONE	R 103-2	RESISTOR 100 OHM 2 W		

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Fig. 10. Remote Control Unit C-112/TRA-2, schematic diagram.



		REMOTE C	
DESIGNATION	ITEM	DESIGNATION	
C 101	CAPACITOR 8 MF 200 V	P 101	LINE
C 102	CAPACITOR 2 MF 200 V	P 102	LINE
J 101	JACK, LOUD SPEAKER	P 103	CON
J 102-1	JACK, HEADSET	P 104	LINE
J 102-2	JACK, HEADSET	P 105	LINE
J 102-3	JACK, HEADSET	R 101	RES
J 103-1	JACK, MICROPHONE	R 102	RES
J 103-2	JACK, MICROPHONE	R 103-1	RES
J 103-3	JACK, MICROPHONE	R 103-2	RES

Fig. 10. Remote Control

fer to the *make* side applying ground to pin F of receptacle P103. Pin D is permanently grounded to the chassis of the receiver, so that the circuit is completed across pins F and D. Relay RL1 and RL101 of the remote control equipment energize in series, from the positive side of the rectifier, through the coil between terminals 1 and 2 of relay RL1 and one side of the field-wire pair, to relay RL101, through the coil between terminals 8 and 4, resistor R103-1, switch S103, pins F and D, resistor R103-2, and the coil between terminals 6 and 1, to the other side of the field-wire pair, through the coil between terminals 3 and 9, to the negative side of the rectifier.

(2) Contacts 4 and 5 of relay RL1 close a circuit from grounded sleeve of MICROPHONE jack, through sleeve and tip of plug P7 to operate antenna transfer and plate-voltage relay in the transmitter. Contacts 11 and 12, on closing, couple one side of the field-wire pair through capacitor C1-2 to the voice-modulation input of the transmitter.

(3) The output of the radio receiver is connected across pins A and C and is coupled to the field-wire pair through capacitor C102. The audio output of the receiver is therefore coupled by means of the field-wire pair to the audio-input side of the radio transmitter for radio relay of the signal.

(4) The output of the radio receiver is also in parallel (multiple) with the headset circuit of Remote Control Unit C-112/TRA-2 and with the handset circuit of Control Unit C-113/TRA-2. Radio signals are therefore received at both locations. The radio transmitter may be operated from either unit, as well as by the automatic relay circuit described. Also, intercommunication without modulating the transmitter is provided. Since the circuits involved in these features are those functioning directly for the other two methods, they will be described under their respective headings. Also circuits irrelevant to the specific method, automatic relay operation, have not been described.

(5) Control Unit C-113/TRA-2 is equipped with an automatic device to limit the audio-input level to the transmitter to prevent over-modulation. The components of this device are transformer T2 and

thermal element TH1. Thermal element TH1 has a negative coefficient of resistance. The functioning of this device is more important in automatic relay operation than in the other methods, since the input level may be high.

(6) The primary of the transformer is connected across the audio input to the transmitter. As the voltage across the primary increases, the sensitive thermal element across the secondary heats. The negative coefficient of resistance characteristic of the thermal element introduces a resistive shunt load across the input circuit through the reflected impedance to the primary. The increase in load reduces the input level.

(7) The volume limiting effectiveness of the device begins at approximately 0 dbm when connected across a 500 ohm line. Its regulation characteristics maintain a uniform input level to the transmitter within plus or minus 2 dbm, throughout the range of approximately 0 dbm to plus 15 dbm.

c. Radio Remote Control, Two-wire. The radio transmitter is controlled from Control Unit C-113/TRA-2 by the operation of the microphone push button. Relay RL1 energizes through the following circuit: from the positive side of the rectifier, through the coil between terminals 1 and 2 of relay RL1, primary winding between terminals 1 and 2 of induction coil T1, microphone switch, and through coil 3-9, to the negative side of the rectifier. Contacts 11 and 12, on *making*, closes the circuit to the audio input of the transmitter, and contacts 4 and 5 close antenna and plate-voltage control relay circuit as previously described.

(1) The direct current of the microphone circuit traced above is caused to fluctuate above and below the steady-state value by the varying resistance of the microphone when activated by a sound wave. The varying current produces an alternating magnetic field in the induction coil which induces an alternating voltage of voice frequencies across terminals 1 and 3, and through capacitor C1-1 to the field-wire pair. The alternating voltage is also applied thru capacitor C1-2 and contacts 11 and 12 to the voice-modulation input of the transmitter.

(2) The voltages induced in the windings between

terminals 1 and 2 and 3 and 4 are in opposition to a portion of the voltage induced in the winding between terminals 2 and 4, across which the phones are connected. The opposition voltage reduces the level of the speaker's voice in the receiver of the handset to provide the anti-sidetone feature.

(3) The headset circuit of Remote Control Unit C-112/TRA-2 is a series circuit from one side of the field-wire pair, through contacts 2 and 5, the volume control, sleeve and tip of three sets of jacks and coupling capacitor, to the other side. When no headsets are connected a series resistor replaces them. The loudspeaker circuit is similar except that it is in series with a set of transfer contacts on each of the three jacks. This circuit is broken when a headset is plugged in to automatically disconnect the loudspeaker.

(4) The volume control for the headsets consists of two resistors and a three-position switch. R101, 4,000 ohms, and R102, 10,000 ohms, are in series in the headset circuit for LOW volume setting; only R101, 4,000 ohms, is in series for MED setting. The volume control is shunted when set to HIGH position.

(5) The radio transmitter is also controlled from Control Unit C-112/TRA-2 by the operation of the microphone push button. Relays RL1 and RL101 energize in series through the same circuit previously traced for automatic relay operation (par. 9*b*), except that the circuit is completed through the microphone instead of across pins F and D. The contacts of relay RL101 connect the transmitter to the field-wire pair, and operate antenna and plate-voltage control relay. Contacts 2 and 5 of relay RL101 open and reduce the sidetone level of the speaker's voice in the headsets when used, by causing the circuit to follow the LOW setting path of the volume control. When the loudspeaker is being used, these contacts remove it from the circuit. The three coils of relay RL101 constitute an autotransformer similar in purpose and operation to the induction coil described previously. The winding between terminals 3 and 7 and capacitor C-101 match the impedance of the microphone to the input impedance of Control Unit C-113/TRA-2.

(6) The audio output of the radio receiver at pins

REC is coupled to the field-wire pair through capacitor C1-2 and is bridged to the induction coil of Control Unit C-113/TRA-2 and to the headset circuit of Remote Control Unit C-112/TRA-2, providing for the transmission of radio signals to both locations. Resistor R1, 2,000 ohms, is in series with jack J2 to reduce the volume in the receiver of the handset. This resistor is shunted by contacts 6-7 of relay RL1 for all other circuits.

(7) INTERCOM. switch S2 opens the audio-input circuit to the transmitter established by contacts 11 and 12 of relay RL1 and opens the control circuit to the antenna transfer and plate voltage relay established by contacts 4 and 5 to prevent operation of the transmitter when relay RL1 energizes on the push-to-talk circuit. The communication is thereby confined to the field wire between the two units.

d. Radio Remote Control, Four-wire. The operation of the circuits for this method of operation are identical to those previously described for radio remote control, two-wire, except for the circuit function of LINE SWITCH S102, and changes in circuiting involved in the connection of the radio receiver output to LINE 2 terminals. In this application the LINE SWITCH is set to FOUR WIRE position, opening both sides of the field-wire transmission circuit at the input to the headset circuit of Remote Control Unit C-112/TRA-2. Intercommunication through the field wire is therefore not possible since the circuit to the headset is open. Also, signals received by the radio receiver are not transmitted to Control Unit C-113/TRA-2 for the same reason. Remote control of the transmitter by the push-to-talk circuit remains the same as for other applications.

SECTION IV
MAINTENANCE

NOTE: Failure or unsatisfactory performance of equipmeht will be reported on W.D., A.G.O. Form No. 468. If this form is not available, see TM 38-250.

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10. GENERAL.

a. Figures 11 and 12 are internal views of Control Unit C-113/TRA-2; figures 13 and 14 are internal views of Remote Control Unit C-112/TRA-2. Figures 15 and 16 are wiring diagrams of Control Unit C-113/TRA-2 and Remote Control Unit C-112/TRA-2, respectively. Control Unit C-113/TRA-2 and Remote Control Unit C-112/TRA-2 have only a few moving parts which are frequently used. Therefore, they should require only a minimum of maintenance. All electrical equipment of this type, however, must be kept free of grit and dirt to prevent failure caused by improper contact. The units are well gasketed to prevent the entrance of foreign matter, but under severe field conditions, some dust may filter through. Routine maintenance should include the cleaning and dusting of the components, preferably by air hose.

b. Burnish contacts that are found corroded or dirty. Use burnisher sparingly and only when necessary, particularly on the contacts of the relays. Inspect the wiring and soldered connections for any signs of corrosion and correct as necessary. Contact pressure on jack springs need not be at any given value, but pressure in excess of 50 grams should exist to provide proper follow-up of the contacts. Relay contact pressures should, however, be kept close to the values given in this maintenance section and for that reason should be made only by personnel trained in adjusting telephone equipment. The relays are designed to withstand vibration, temperature changes, and long service. When ad-

justment is necessary, it should be made by trained personnel who have the proper tools and equipment.

11. CONTROL UNIT C-113/TRA-2.

Dust or foreign matter should not be allowed to accumulate on the disks of the rectifier stacks. Be careful not to chip the weatherproof enamel coating. The relay is to be maintained to the following adjustments:

a. Air gap between armature and core 0.018 inch minimum, 0.027 inch maximum.

b. Air gap between contacts 0.008 inch.

c. Contact pressure 20 grams.

d. Operating current 0.018 ampere.

e. Release current 0.008 ampere.

12. REMOTE CONTROL UNIT C-112/TRA-2.

The relay of this unit is to be maintained to the following adjustments:

a. Air gap between armature and core 0.023 inch minimum, 0.027 inch maximum.

b. Air gap between contacts 0.008 inch.

c. Contact pressure 20 grams.

d. Operating current 0.0285 ampere.

e. Nonoperating current 0.024 ampere.

f. Release current 0.012 ampere.

g. To check the winding between terminals 3 and 7, it should operate relay on a current of 0.084 ampere.

13. GENERAL DISCUSSION OF TROUBLE CONDITIONS.

The ability to locate and correct trouble in any electrical device must be developed by a thorough understanding of the functioning of the device. No manual can anticipate and point out all the combination of faults which may develop. There are, however, a few likely abnormal conditions which are pointed out below for guidance.

a. Relays do not energize on operation of push-to-talk microphone buttons.

(1) Check fuse on Control Unit C-113/TRA-2; at the same time note position of power switch. If fuse is blown, determine the cause before a new fuse is inserted. A few possible causes are as follows:

(a) Break-down of 200-mf electrolytic capacitor. Disconnect one side and check for short with ohmmeter.

(b) Check for a possible short between the two

windings of relay RL1. The windings between terminals 1 and 2, and 3 and 9 should measure approximately 200 ohms each. Disconnect one terminal of each winding to test.

(2) Check power transformer and rectifier circuit wiring. An ohmmeter test of the secondary of the transformer (terminal 5 and 6) should show a resistance value of approximately 60 ohms. The primary winding between terminals 1 and 2 is approximately 300 ohms, and approximately 325 ohms between 3 and 4. Output voltage of rectifier unit (across terminals 1 and 9 of relay RL1 is approximately 60 volts with a line voltage of 115 volts.

b. Relay RL1 operates through local circuit but relay RL101 does not energize at its local circuit:

(1) Open circuit in the field-wire pair.

(2) Check windings of relay RL101.

c. INTERCOM. feature not operating.

(1) Check position of LINE SWITCH of Remote Control Unit C-112/TRA-2 for proper position. Recall that for the intercommunication feature, LINE SWITCH should be set to TWO WIRE position.

(2) Check capacitors C1-1 and C-102 for opens.

d. Reverse operation (operation of microphone push button cuts in radio receiver instead of transmitter):

(1) Look for reversed five-conductor speech cable.

(2) Check to make sure that letters designating the pins on the block agree with, and are connected to, corresponding lettered terminals of the transmitter.

e. Relays functioning, radio equipment functioning, but voice transmission inoperative:

(1) Check connection of Cord CX-104/TRC-1 and five-conductor speech cable and associated pin connector. Check two-conductor control cable and connections into MICROPHONE jack of transmitter.

(2) Check all contacts of relay RL1 in Control Unit C-113/TRA-2.

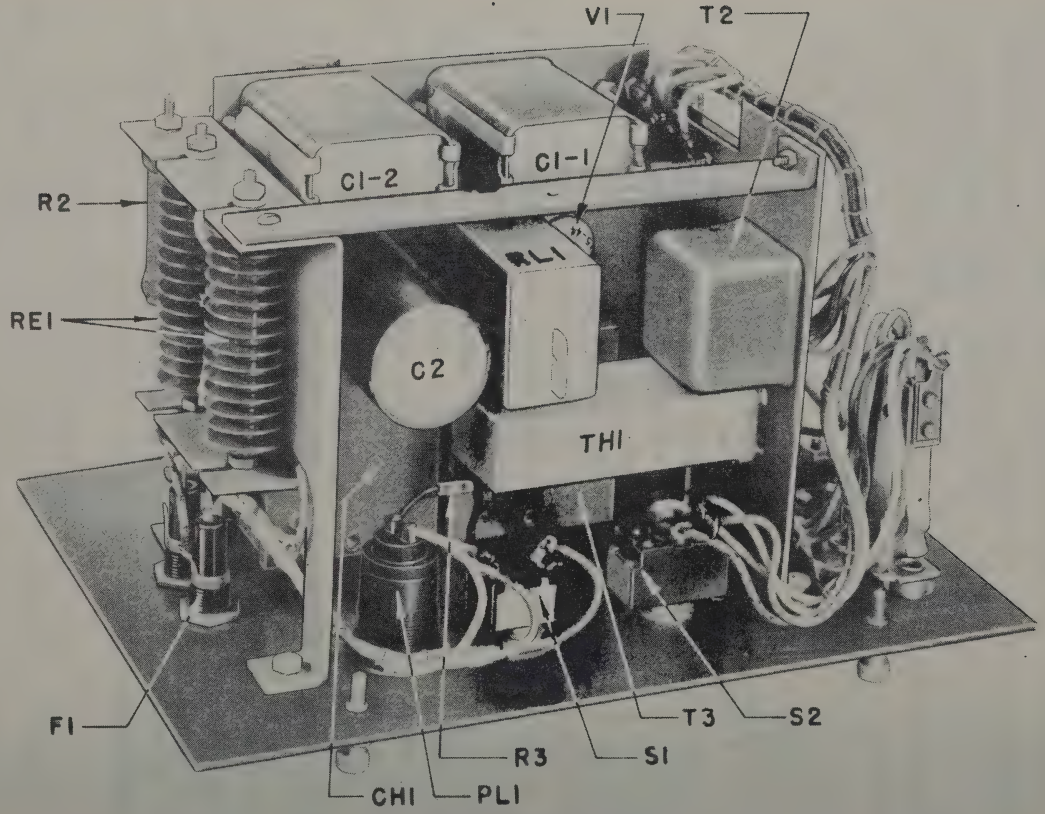


Fig. 11. Control Unit C-113/TRA-2, right rear view.

TL 15278

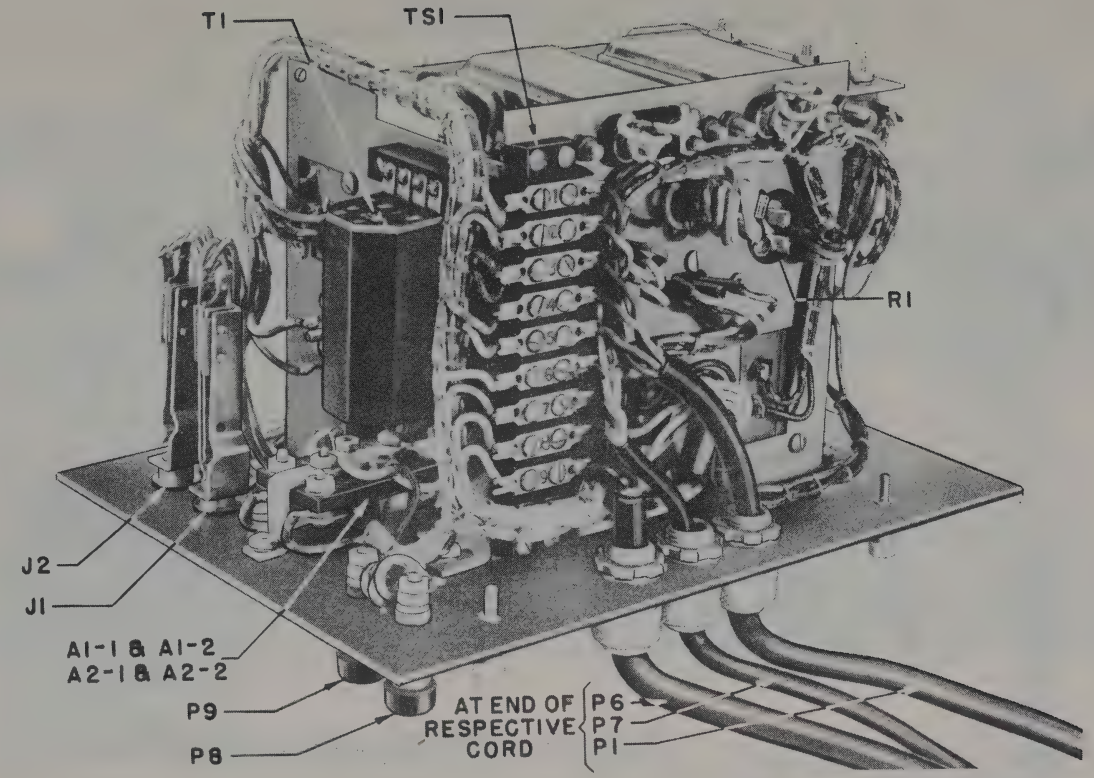


Fig. 12. Control Unit C-113/TRA-2, left rear view.

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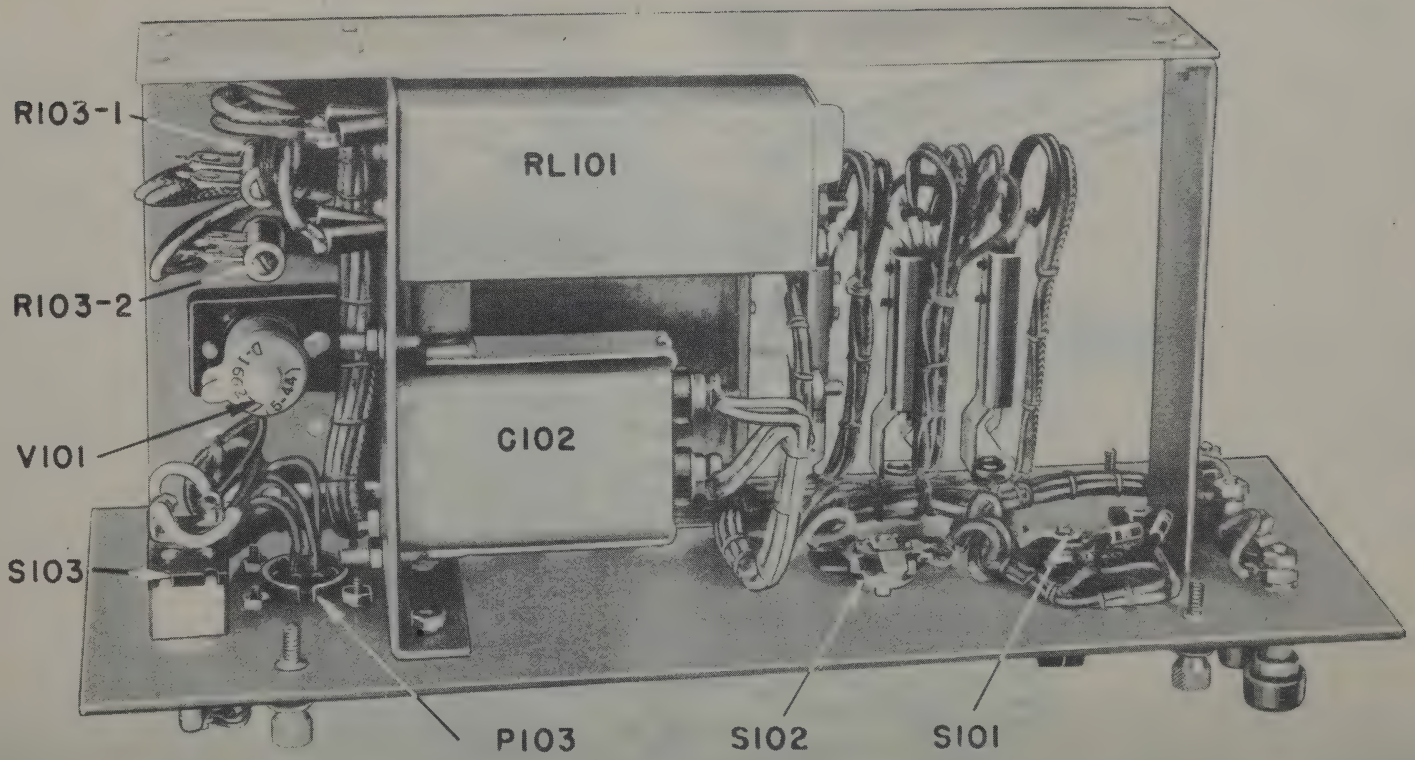


Fig. 13. Remote Control Unit C-112/TRA-2, top view.

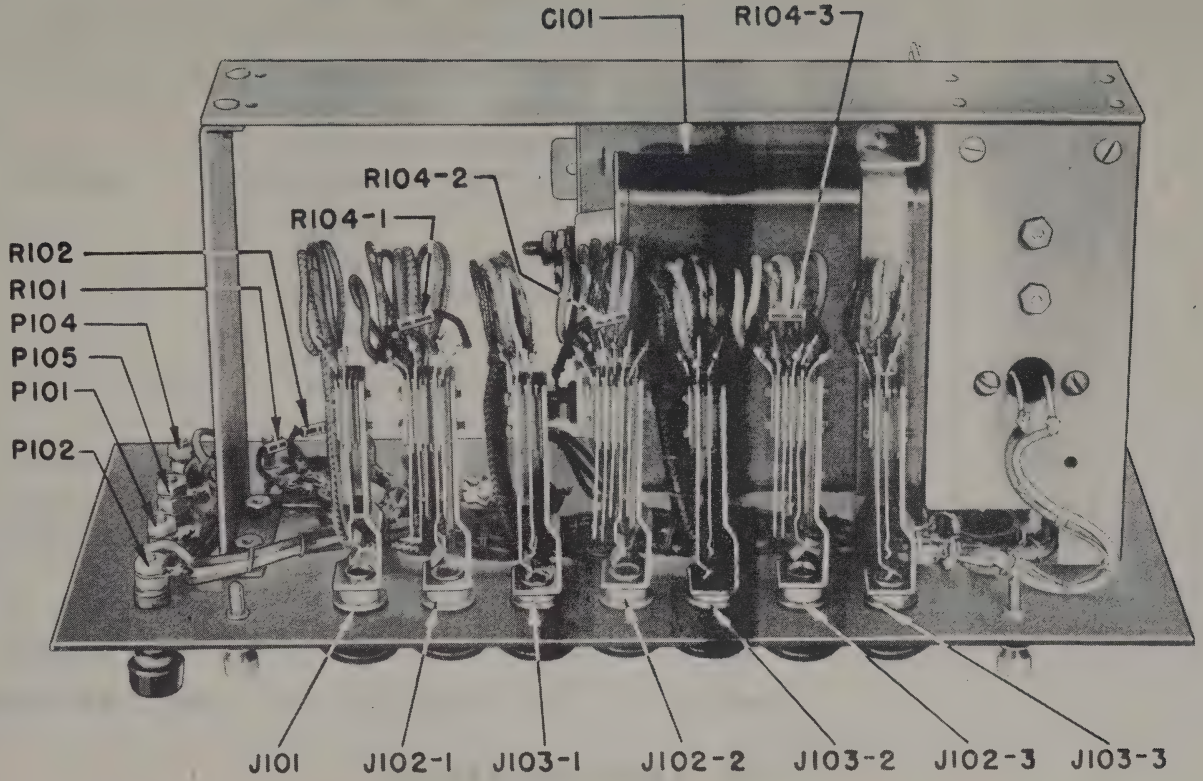


Fig. 14. Remote Control Unit C-112/TRA-2, bottom view.

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SECTION V

SUPPLEMENTARY DATA

14. MAINTENANCE PARTS LIST FOR CONTROL UNIT C-113/TRA-2.

Ref symbol	Signal Corps stock No.	Name of part and description	Quan per unit	Run-ning spares	Orgn stock	3d ech	4th ech	5th ech	Depot stock
P8,P9	3Z314	BINDING POST TM-214.	2			*	*		*
	3Z9849.39-1/B1	BOOT: rubber; Cutler-Hammer No.86971W6; assembled with nickel-plated brass washer, Cutler-Hammer No.816-132F1; special nut, Cutler-Hammer No.86971W5; neoprene washer, Cutler-Hammer No. 16-900-5; for weatherproofing of toggle switches, Cutler-Hammer No. 8803K5.	2			*	*		*
	6Q14561	BURNISHER: contact; steel with rubber insulated handle; 3-3/4" x 1/4" x 1/64"; for relay contacts; W. E. type 1A.	1		*	*	*		*
	3G1837-6.9	BUSHING: bakelite; 1/2" diam x 3/16" high with 3/16" hole thru center and 1/32" guide hole on outer surface; insulates binding post; FTR-UP-12042.	2			*	*		*

C2	3DB200-8	CAPACITOR: dry electrolytic; 200-mf -10, +55%; 150 v dc (working); temperature range -40 to +85° C1 encased in cylindrical can 4-1/4" x 1-1/8" diam; Sprague Mfg. No. 6187 special.	1							
C1-1 C1-2	3DB2.202H	CAPACITOR: fixed; paper; 2-mf ±10%; 200 v dc (working); rectangular can 1-3/4" x 2-5/8" x 1"; 2 porcelain insulated terminals 3/4" high, spaced 3/4" apart; Tobe Deutschman type TRS-202-H.	2				*	*		*
A2-1 A2-2	2ZK700-8	CARBON BLOCK: molded; 1-1/4" x 3/8" x 5/32"; line protection; W.E. type No. 26.	2				*	*		*
CH-1	2C684-113/C1	COIL: choke; filter; 3-h; 5-ma; approximately 70-ohm; steel shield case, 2 soldered lug terminals; over-all dimensions, 1-9/16" x 2-1/4" x 1-7/8"; 4 each 6-32 tapped mounting holes; 1-3/4" mounting centered on length, 1-3/8" mounting centered on width; FTR-UA-12001.	1				*	*		*
T1	3C315-58	COIL: induction; common battery telephone type; 3 winding antisidetone; 4 terminal lug connections; metal case; over-all dimensions, 3" x	1				*	*		*

* Indicates stock available.

14. MAINTENANCE PARTS LIST FOR CONTROL UNIT C-113/TRA-2 (contd).

Ref symbol	Signal Corps stock No.	Name of part and description	Quan per unit	Running spares	Orgn stock	3d ech	4th ech	5th ech	Depot stock
		1-1/2" x 1-3/4" with single mounting hole on one end; FTR-702-A.							
F1	3Z2571-15.1	FUSE: 150-ma; slow blow; glass body; 1-1/4" x 1/4" diam; Bussman type 3AG.	1	*	*	*	*	*	*
	3ZK3275.4	FUSE HOLDER: single-circuit; bakelite insulation; 17/32" hole mounting type; over-all dimensions, 2" x 5/8" diam; Bussman type HKM.	1			*	*		*
	6Z4847-3	GRIP: cord; complete with compression nut and grommet; fits cord size 0.375 to 0.437"; over-all dimensions, 1-5/16" x 1" diam; bore of body 7/16", 3/8" conduit; Pyle National Co. No. DB-4.	1			*	*		*
	6Z4847-4	GRIP: cord; complete with compression nut and grommet; fits cord size 0.312 to 0.375"; over-all dimensions, 1-5/16" x 1" diam; bore of body 7/16", 3/8" conduit; Pyle National Co. No. DB-438.	1			*	*		*

	6Z4847-5	GRIP: cord; complete with compression nut and grommet; fits cord size 0.250 to 0.312"; over-all dimensions, 1-5/16" x 1" diam; bore of body 7/16", 3/8" conduit; Pyle National Co. No. DB-4516.	1			*	*		*
J1	2Z5531.26	JACK: telephone; special; sleeve tip and ring, no contacts; over-all dimensions, 3-1/2" x 9/16" x 9/16"; 3/8"-32 thread on sleeve; single panel mounting; FTR-UA-12053.	1			*	*		*
J2	2Z5531.25	JACK: telephone; special; sleeve and tip, no contacts; over-all dimensions, 3-1/2" x 9/16" x 9/16";3/8"-32 thread on sleeve; single panel mounting; FTR-UA-12054.	1			*	*		*
	2C684-113/L1	LABEL: circuit; laminated vinylite; 9-1/8" x 6-1/8"; schematic wiring diagram; FTR-UP-24145.	1		*	*	*		*
PL-1	2Z5889-3	LAMP: pilot; neon; bayonet type; over-all dimensions, 1-1/2" long x 9/16" diam; W.E. JCG No. 991.	1		*	*	*		*

* Indicates stock available.

14. MAINTENANCE PARTS LIST FOR CONTROL UNIT C-113/TRA-2 (contd).

Ref symbol	Signal Corps stock No.	Name of part and description	Quan per unit	Run-ning spares	Orgn stock	3d ech	4th ech	5th ech	Depot stock
	2Z5885-12	LAMP MOUNTING ASSEMBLY: clear facet jewel 1" diam; metal housing; over-all dimensions, 2-1/2" x 1" diam; panel mounting;for neon lamp; Dial Light Co. type No. NE915.	1			*	*		*
P6	6Z1727	PLUG: male; 10 amp, 250 v; 15 amp, 125 v; 2 parallel blade prongs; metal body with cord clamps; 3/8" diam cord hole; over-all dimensions, 1-1/2" diam x 1-3/4" long; for power supply outlet; Hubbell 7057.	1			*	*		*
P1	2Z3025-5	PLUG: male; 5 pin prongs attached to insulated wire; mounted on black bakelite insulation strip with metal jacket; over-all dimensions, 6-1/4 x 3/8" x 5/8"; for connection to trans-mitter; FTR-UA-12056, special.	1			*	*		*
P7	2Z7168	PLUG PL-68.	1			*	*		*
A1-1	4E927	PROTECTOR BLOCK: ceramic with carbon	2		*	*	*		*

A1-2		insert; over-all dimensions, 1-1/4" x 3/8" x 1/4" with 3/16" wide x 3/16" high slot thru center to hold carbon block; for line protection; W.E. type No. 27.								
RE1	3H4956-60	RECTIFIER: selenium; half-wave; output, 56 v, 130 ma; ambient temp 50° C; 14 disks, 12 disks active; 18 v per disk max 75 ma; center-tapped for full-wave bridge circuit; over-all dimensions, 3" x 1" diam; bolt mounting at each end; FTR-UA-12005.	2			*	*		*	
RL1	2Z7598-26	RELAY: telephone; 4-pole, 3 make contacts and 1 break; 2 concentric coils, each 200 ohms; d-c operation; rectangular case with dust cover; over-all dimensions, 5" x 1-5/8" x 1-1/8"; FTR-UR-1145.	1			*	*		*	
R1	3RC20BE202J	RESISTOR: fixed; carbon; 2,000-ohm ±5%; 1/2-watt; bakelite insulation; 3/8" long x 1/8" diam; Allen-Bradley type EB.	1			*	*		*	

* Indicates stock available.

14. MAINTENANCE PARTS LIST FOR CONTROL UNIT C-113/TRA-2 (contd).

Ref symbol	Signal Corps stock No.	Name of part and description	Quan per unit	Running spares	Orgn stock	3d ech	4th ech	5th ech	Depot stock
R2	3Z6620-1	RESISTOR: fixed; carbon; 20,000-ohm ±5%; 1/2-watt; bakelite insulation; 3/8" long x 1/8" diam; Allen-Bradley type EB.	1						
R3	3Z6470-30	RESISTOR: fixed; wire-wound; 4,700-ohm ±5%; 8-watt; 2 terminal lug connections; over-all dimensions, 2" long x 5/8" diam; IRC type DG with C coating.	1			*	*		*
	6L20808-18K	SCREW: panel; special; knurled head; 3/8" long, 5/16" diam; threaded portion 8-32 x 3/8"; over-all length 1-1/8"; to secure control unit to case; FTR-UP-24048.	4		*	*	*		*
S2	3Z9849.113	SWITCH: toggle; on momentary off action; moulded bakelite body; over-all dimensions, exclusive of terminals and handle, 1-1/4" x 3/4" x 3/4"; bushing 1/2" long x 7/16" diam; 5/8" long handle; for intercommunication; Cutler-Hammer 8829K4.	1			*	*		*

S1	3Z9849.39-1	SWITCH: toggle;(SPST); moulded bakelite body with metal jacket; over-all dimensions, exclusive of terminals and handle, 1-1/8" x 5/8" x 5/8"; bushing 1/2" long x 7/16" diam; 5/8" long handle; for power supply control; Cutler-Hammer 8803K5.	1			*	*		*
TH1	4Z7440.1	THERMISTOR: over-all dimensions, 3-1/2" x 1-3/8" x 7/8"; 2 each 8-32 bolt mounting, 5/8" mounting centered; thermistor-type volume limiter with 2 solder lug terminals; W.E. -D167019.	1			*	*		*
T3	2Z9612.108	TRANSFORMER: power; primary, 115 or 230-v ac, 50-60-cycles; secondary, 78-v ac; over-all dimensions, 2-1/2" x 2-1/4" x 1-7/8"; 4 each 6-32 tapped mounting holes at each corner; 1-3/4" mounting centered on length, 1-3/8" mounting centered on width; with 6 terminal soldering lugs; FTR-UA-12000.	1			*	*		*

* Indicates stock available.

14. MAINTENANCE PARTS LIST FOR CONTROL UNIT C-113/TRA-2 (contd).

Ref symbol	Signal Corps stock No.	Name of part and description	Quan per unit	Run-ning spares	Orgn stock	3d ech	4th ech	5th ech	Depot stock
T2	2Z9614-92	TRANSFORMER: volume limiting; inductance of primary 0.58-h, 1 v at 300 cps; bridging loss of 2 db at no dbm level in a 600-ohm circuit at 1,000 cps with 5 megohms across secondary; over-all dimensions, 1-1/2" x 1-1/2" x 1-1/4"; 2 each 6-32 tapped mounting holes, 1-9/16" mounting centered diagonally across; with 5 terminal soldering lugs; for volume control; FTR-UA-12002.	1			*	*		*
VI	4Z9737	VARISTOR: thalium-copper-oxide rectifier; over-all dimensions, 1-1/2" long x 7/8" diam stack; mounted on moulded bakelite base 1-5/8" x 1" x 1/4"; click eliminator for phone circuit; W.E. D-166297.	1			*	*		*

15. MAINTENANCE PARTS LIST FOR REMOTE CONTROL UNIT C-112/TRA-2. (contd).

Ref symbol	Signal Corps stock No.	Name of part and description	Quan per Unit	Run-ning spares	Orgn stock	3d ech	4th ech	5th ech	Depot stock
P-101 P-102 P-104 P-105	3Z314	BINDING POST TM-214	4			*	*		*
	3Z9849.39-1/B1	BOOT: rubber; Cutler-Hammer No. 86971W6; assembled with nickel-plated brass washer, Cutler-Hammer No. 816-132F1; special nut, Cutler-Hammer No.86971W5; neoprene washer, Cutler-Hammer No. 16-900-5; for weatherproofing of toggle switches, Cutler-Hammer No. 8803K5.	1			*	*		*
	3G1837-4.4	BUSHING: special; bakelite; OD 5/8", ID 3/8", 1/8" thick; insulates jacks from panel; FTR-UP-24053.	7			*	*		*
	3G1837-6.9	BUSHING: bakelite; 1/2" diam x 3/16" high with 3/16" hole thru center and 1/32" guide hole on outer surface; insulates binding post; FTR-UP-12042.	4			*	*		*
	2Z1612.2	CAP AND CHAIN: aluminum; 1-1/8" diam x 7/16" H; chain 3-3/4"; cover for female receptacle AN3102-16S-IS; Amphenol No. 9760-16.	1		*	*			*

* Indicates stock available.

15. MAINTENANCE PARTS LIST FOR REMOTE CONTROL UNIT C-112/TRA-2. (contd).

Ref symbol	Signal Corps stock No.	Name of part and description	Quan per Unit	Running spares	Orgn stock	3d ech	4th ech	5th ech	Depot stock
C-102	3DB2.202H	CAPACITOR: fixed; paper; 2-mf ±10%; 200 v dc (working); rectangular can 1-3/4" x 2-5/8" x 1"; 2 porcelain insulated terminals 3/4" high, spaced 3/4" apart; Tobe Deutschman type TRS-202-H.	1			*	*		*
C-101	3DB8-121	CAPACITOR: fixed; paper; 8-mf ±10%;200 v dc (working); rectangular can 3-3/4" x 3-1/2" x 1-1/4"; 2 porcelain insulated terminals 1-3/8" high, spaced 1-7/8" apart; Tobe Deutschman type TRS-802-U.	1			*	*		*
	3E1318	CORD CD-318.	1		*	*	*		*
	3E1874	CORD CD-874: 10-ft.	1		*	*	*		*
	4B420-19	CHEST SET H-19( )/U.	1		*	*	*		*
	2C684-112/G1	GASKET: neoprene; 1-1/4" square with 3/4" diam hole, 1/32" thick; seals	1			*	*		*

		receptacle: FTR-UP-24157.							
	2B830	HEADSET HS-30( ).	1		*	*	*		*
	3C1838-14.5	INSULATOR: phenolic; 7/16" diam x 1/8" thick with 3/16" hole thru center; insulates binding post; FTR-UP-24055.	6			*	*		*
J102-1 J102-2 J102-3	2Z5531.24	JACK: telephone; special; 5 contacts, one break, one make and break; over-all dimensions, 3-1/2" x 9/16" x 9/16"; 3/8"-32 thread on sleeve; single panel mounting; FTR-UA-12052.	3			*	*		*
J103-1 J103-2 J103-3	2Z5531.26	JACK: telephone; special; sleeve tip and ring, no contacts; over-all dimensions, 3-1/2" x 9/16" x 9/16"; 3/8"-32 thread on sleeve; single panel mounting; FTR-UA-12053.	3			*	*		*
J101	2Z5531.25	JACK: telephone; special; sleeve and tip, no contacts; over-all dimensions, 3-1/2" x 9/16" x 9/16"; 3/8"-32 thread on sleeve; single panel mounting; FTR-UA-12054.	1			*	*		*
	2Z3352.51	JACK COVER ASSEMBLY: olive drab, wrinkle-finish; over-all dimensions,	8			*	*		*

* Indicates stock available.

15. MAINTENANCE PARTS FOR REMOTE CONTROL UNIT C-112/TRA-2-(contd).

Ref symbol	Signal Corps stock No.	Name of part and description	Quan per unit	Run-ning spares	Orgn stock	3d ech	4th ech	5th ech	Depot stock
		1" long x 7/8" wide x 1/2" deep; FTR-UA-12043.							
	2ZK5822-22	KNOB: bar; pointer; black bakelite; white line engraved; 1/4" shaft diam; over-all dimensions, 1-1/4" long x 7/16" wide x 5/8" deep; center circular section 3/4" diam; Eby No. UA-12045.	1		*	*	*		*
	2C684-112/L1	LABEL: circuit; laminated vinylite; 12" x 4-1/2"; FTR-UP-24139.	1		*	*	*		*
	2C684-112/L2	LABEL: hook-up; laminated vinylite; 12" x 8-1/4"; block diagram and oper. inst.; FTR-UP-24140.	1		*	*	*		*
	6C51	LOUDSPEAKER LS-11.	1		*	*	*		*
	2B1645	MICROPHONE T-45.	1		*	*	*		*
	6L3506-32-1	NUT: steel; 3/8"-32; 5/8" diam counterbored ring, 5/8" across flats, 1/4" high; holds jack cover to jacks	8			*	*		*

		and switch; FTR-UP-24037 special.								
	2ZK3096-31	RECEPTACLE: female; 7-contact; molded black bakelite; 1" x 5/8" diam; in aluminum shell; flush chassis mounting with 4 mounting holes; 1-1/4" square base; body dimensions 29/32" x 1" diam; Amphenol No. AN3102-16S-1S.	1			*	*		*
RL-101	2Z7598-25	RELAY: telephone; single-pole, break-contact; 3 concentric coils, 16, 60, and 61 ohms; d-c operation; rectangular case with dust cover; over-all dimensions, 5" x 1-5/8" x 1-1/8"; FTR-UR-1146.	1			*	*		*
R-104-1 R-104-2 R-104-3	3Z6025-55	RESISTOR: fixed; carbon; 250-ohm ±5%; 1/2-watt; Allen-Bradley type EB.	3			*	*		*
R-101	3Z6400-55	RESISTOR: fixed; carbon; 4,000-ohm ±5%; 1/2-watt; bakelite insulation; 3/8" long x 1/8" diam; Allen-Bradley type EB.	1			*	*		*
R-102	3Z6610-10	RESISTOR: fixed; carbon; 10,000-ohm ±5%; 1/2-watt; bakelite insulation;	1			*	*		*

* Indicates stock available.

15. MAINTENANCE PARTS LIST FOR REMOTE CONTROL UNIT C-112/TRA-2 (contd).

Ref symbol	Signal Corps stock No.	Name of part and description	Quan per unit	Run-ning spares	Orgn stock	3d ech	4th ech	5th ech	Depot stock
		3/8" long x 1/8" diam; Allen-Bradley type EB.							
R-103-1 R-103-2	3Z6010-146	RESISTOR: fixed; wire-wound; 100-ohm ±5%; 2-watt; IRC type AA with C coating.	2			*	*		*
	6L20808-18K	SCREW: panel; special; knurled head; 3/8" long x 5/16" diam; threaded portion 8-32 x 3/8"; over-all length 1-1/8"; to secure control unit to case; FTR-UP-24048.	4		*	*	*		*
	2Z9049.14	STRAP: carrying; webbing type 3, olive drab; 9" long x 1-1/2" wide, with metal buckle and metal tip on end; per US spec. 6-185C with amend.No.1; FTR-UA-12046.	1		*	*	*		*
S102	3Z9825-62.120	SWITCH: rotary; (DPST); single wafer; 3/8" diam hole mounting; bakelite insulation; special type 22 for screwdriver actuation; 1" x 5/8"; 1/4" diam shaft; line switch; Oak Mfg.No. UA-12031.	1			*	*		*

S101	3Z9825-62.121	SWITCH: rotary; 1-pole, 3-position; bakelite insulation; single wafer; type 27; 3/8" diam hole mounting; 1-1/4" x 1-1/4"; 1/4" shaft 3/8" long; Oak Mfg. No. UA-12030.	1			*	*		*
V101	4Z9737	VARISTOR: thalium-copper-oxide rectifier; over-all dimensions, 1-1/2" long x 7/8" diam stack; mounted on moulded bakelite base 1-5/8" x 1" x 1/4"; click eliminator for phone circuit; W. E. D-166297.	2			*	*		*

* Indicates stock available.

16. MAINTENANCE PARTS LIST FOR CHEST UNIT H-19 ( )/U.

Ref symbol	Signal Corps stock No.	Name of part and description	Quan per unit	Run-ning spares	Orgn stock	3d ech	4th ech	5th ech	Depot stock
	481109F/19	CAP: transmitter; W.E. Co. No. P456235.	1		*		*		
	3E4036-9-1	CORD: 9"; 2-conductor; W.E. Co. No. D166789; (connects transmitter to switch).	1		*		*		
	3E4036-120-12	CORD: 10'; 3-conductor; W.E. Co. No. D167013; complete with Plug PL-68.	1		*		*		
	4B420-19/G1	GASKET: 1.875" x 3.312" x 1/64"; Garlock 7021; compressed asbestos fiber sheet packing per W.E. Co. HES671310-5; (seals switchblock).	1		*		*		
	6L6632-8-1.7B	SCREW: machine; brass; fillister-head; No. 6-32 x 17/32"; black nickel finish; (mounts switchblock).	4		*		*		
	4B1357/4	STRAP ASSEMBLY: consists of adjustable strip of black cotton webbing 3/4" wide and 19" long; with snap clip on each end; per W.E. Co. ES673136-2.	1		*		*		

	3Z9819-4	SWITCHBLOCK ASSEMBLY: W.E. Co. HES671275-5, complete with button; spring contacts, and screws; per W.E. Co. HES671310-6.	1		*		*		
	4B1356/2	TRANSMITTER CASE: W.E. Co. HES671417-2; complete with cord, stud, capacitor, spring contacts, and screws; per W.E. Co. HES671418-1.	1		*		*		
	4B1109F/3	TRANSMITTER UNIT: W.E. Co. No. D141914.	1		*		*		

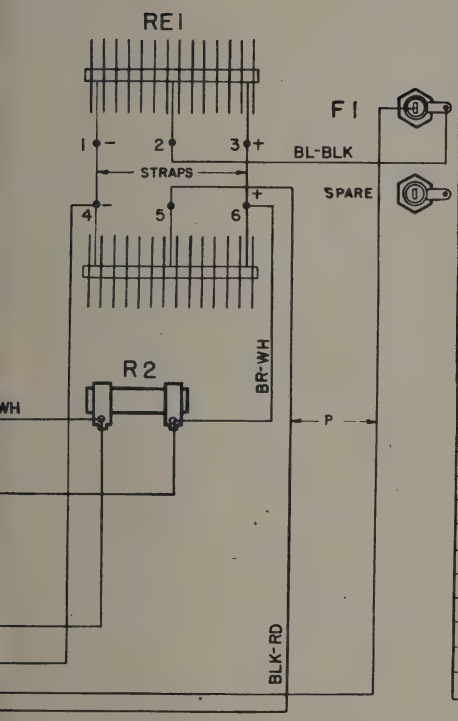
* Indicates stock available.

17. MAINTENANCE PARTS LIST FOR HEADSET HS-30( ).

Ref symbol	Signal Corps stock No.	Name of part and description	Quan per unit	Run-ning spares	Orgn stock	3d ech	4th ech	5th ech	Depot stock
	2B1300	INSERT M-300.	2				*	*	*
	3Z10161	TERMINAL TM-161: ring; tip-solderless.	4				*	*	*
	3Z10163	TERMINAL TM-163: spade; tip-solderless.	2				*	*	*

* Indicates stock available.

NOTE:- P DESIGNATES TWISTED PAIR



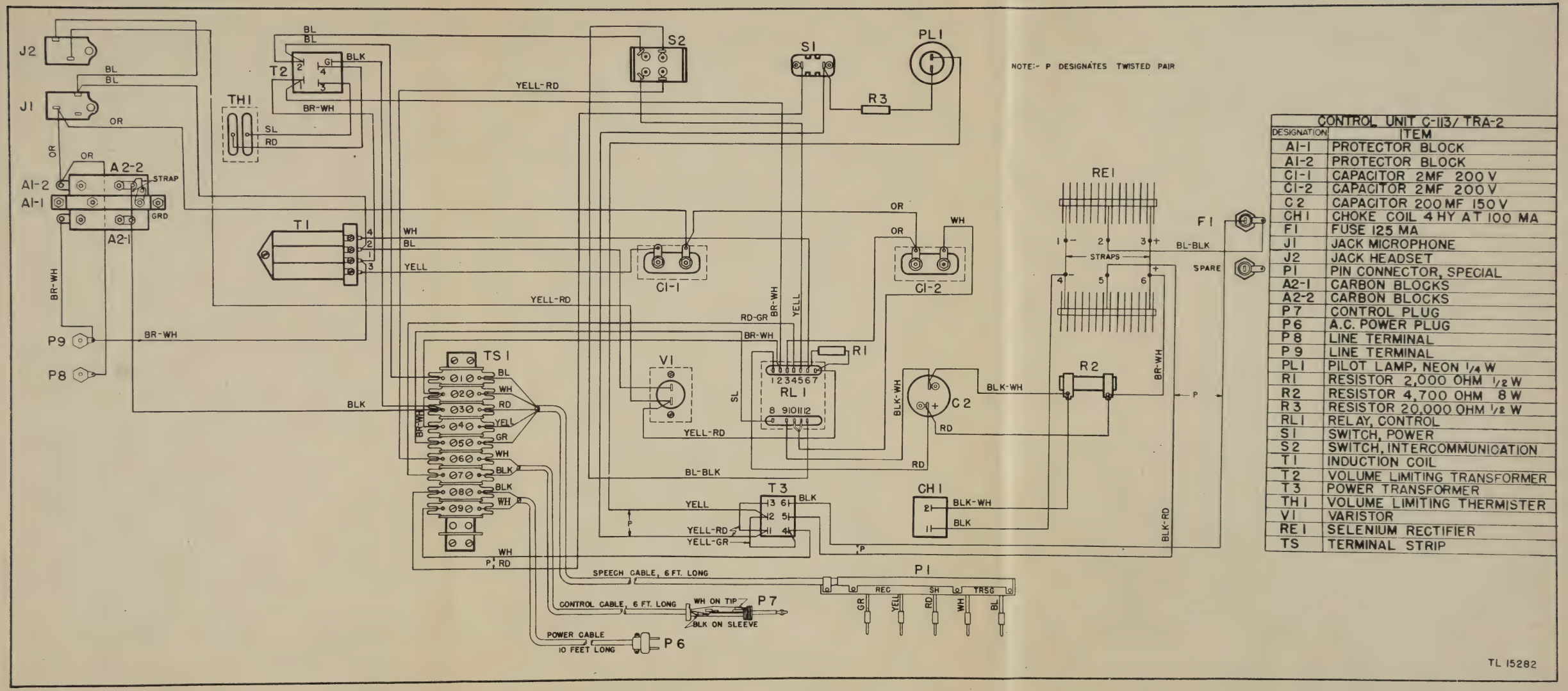
CONTROL UNIT C-113/TRA-2	
DESIGNATION	ITEM
A1-1	PROTECTOR BLOCK
A1-2	PROTECTOR BLOCK
C1-1	CAPACITOR 2MF 200 V
C1-2	CAPACITOR 2MF 200 V
C 2	CAPACITOR 200 MF 150 V
CH 1	CHOKE COIL 4 HY AT 100 MA
F 1	FUSE 125 MA
J 1	JACK MICROPHONE
J 2	JACK HEADSET
P 1	PIN CONNECTOR, SPECIAL
A2-1	CARBON BLOCKS
A2-2	CARBON BLOCKS
P 7	CONTROL PLUG
P 6	A.C. POWER PLUG
P 8	LINE TERMINAL
P 9	LINE TERMINAL
PL 1	PILOT LAMP, NEON 1/4 W
R 1	RESISTOR 2,000 OHM 1/2 W
R 2	RESISTOR 4,700 OHM 8 W
R 3	RESISTOR 20,000 OHM 1/2 W
RL 1	RELAY, CONTROL
S 1	SWITCH, POWER
S 2	SWITCH, INTERCOMMUNICATION
T 1	INDUCTION COIL
T 2	VOLUME LIMITING TRANSFORMER
T 3	POWER TRANSFORMER
TH 1	VOLUME LIMITING THERMISTER
V 1	VARISTOR
RE 1	SELENIUM RECTIFIER
TS	TERMINAL STRIP

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17. MAINTENANCE PARTS LIST FOR HEADSET HS-30( ).

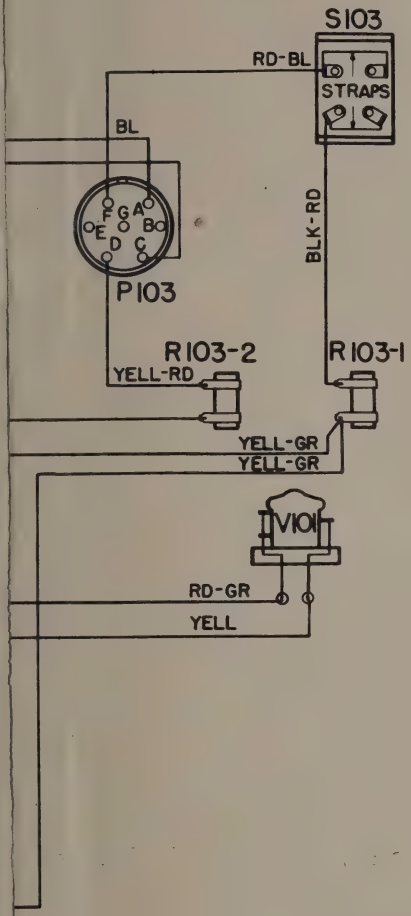
Ref symbol	Signal Corps stock No.	Name of part and description	Quan per unit	Run-ning spares	Orgn stock	3d ech	4th ech	5th ech	Depot stock
	2B1300	INSERT M-300.	2				*	*	*
	3Z10161	TERMINAL TM-161: ring; tip-solderless.	4				*	*	*
	3Z10163	TERMINAL TM-163: spade; tip-solderless.	2				*	*	*

* Indicates stock available.



CONTROL UNIT C-113/TRA-2	
DESIGNATION	ITEM
A1-1	PROTECTOR BLOCK
A1-2	PROTECTOR BLOCK
C1-1	CAPACITOR 2MF 200 V
C1-2	CAPACITOR 2MF 200 V
C 2	CAPACITOR 200 MF 150 V
CH 1	CHOKE COIL 4 HY AT 100 MA
F 1	FUSE 125 MA
J 1	JACK MICROPHONE
J 2	JACK HEADSET
P 1	PIN CONNECTOR, SPECIAL
A2-1	CARBON BLOCKS
A2-2	CARBON BLOCKS
P 7	CONTROL PLUG
P 6	A.C. POWER PLUG
P 8	LINE TERMINAL
P 9	LINE TERMINAL
PL 1	PILOT LAMP, NEON 1/4 W
R 1	RESISTOR 2,000 OHM 1/2 W
R 2	RESISTOR 4,700 OHM 8 W
R 3	RESISTOR 20,000 OHM 1/2 W
RL 1	RELAY, CONTROL
S 1	SWITCH, POWER
S 2	SWITCH, INTERCOMMUNICATION
T 1	INDUCTION COIL
T 2	VOLUME LIMITING TRANSFORMER
T 3	POWER TRANSFORMER
TH 1	VOLUME LIMITING THERMISTER
V 1	VARISTOR
RE 1	SELENIUM RECTIFIER
TS	TERMINAL STRIP

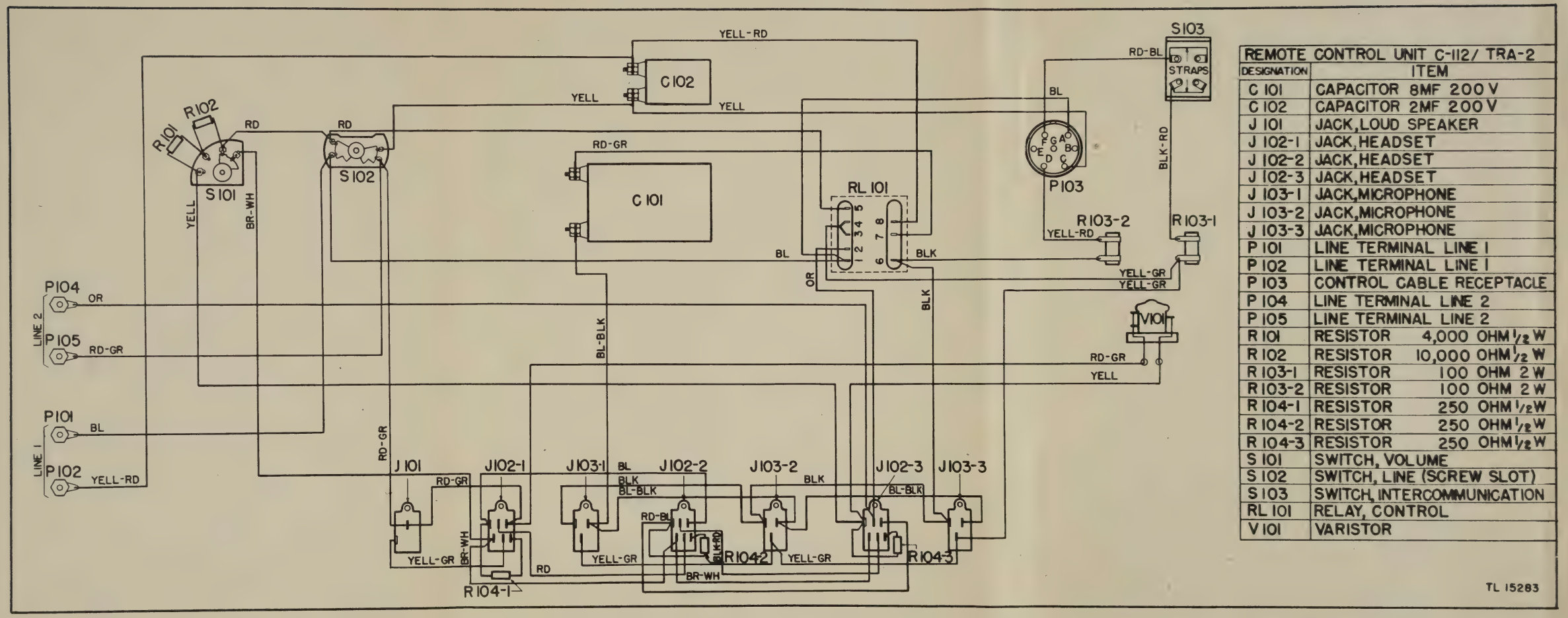
Fig. 15. Control Unit C-113/TRA-2, wiring diagram.



REMOTE CONTROL UNIT C-112/ TRA-2	
DESIGNATION	ITEM
C 101	CAPACITOR 8MF 200 V
C 102	CAPACITOR 2MF 200 V
J 101	JACK, LOUD SPEAKER
J 102-1	JACK, HEADSET
J 102-2	JACK, HEADSET
J 102-3	JACK, HEADSET
J 103-1	JACK, MICROPHONE
J 103-2	JACK, MICROPHONE
J 103-3	JACK, MICROPHONE
P 101	LINE TERMINAL LINE 1
P 102	LINE TERMINAL LINE 1
P 103	CONTROL CABLE RECEPTACLE
P 104	LINE TERMINAL LINE 2
P 105	LINE TERMINAL LINE 2
R 101	RESISTOR 4,000 OHM 1/2 W
R 102	RESISTOR 10,000 OHM 1/2 W
R 103-1	RESISTOR 100 OHM 2 W
R 103-2	RESISTOR 100 OHM 2 W
R 104-1	RESISTOR 250 OHM 1/2 W
R 104-2	RESISTOR 250 OHM 1/2 W
R 104-3	RESISTOR 250 OHM 1/2 W
S 101	SWITCH, VOLUME
S 102	SWITCH, LINE (SCREW SLOT)
S 103	SWITCH, INTERCOMMUNICATION
RL 101	RELAY, CONTROL
V 101	VARISTOR

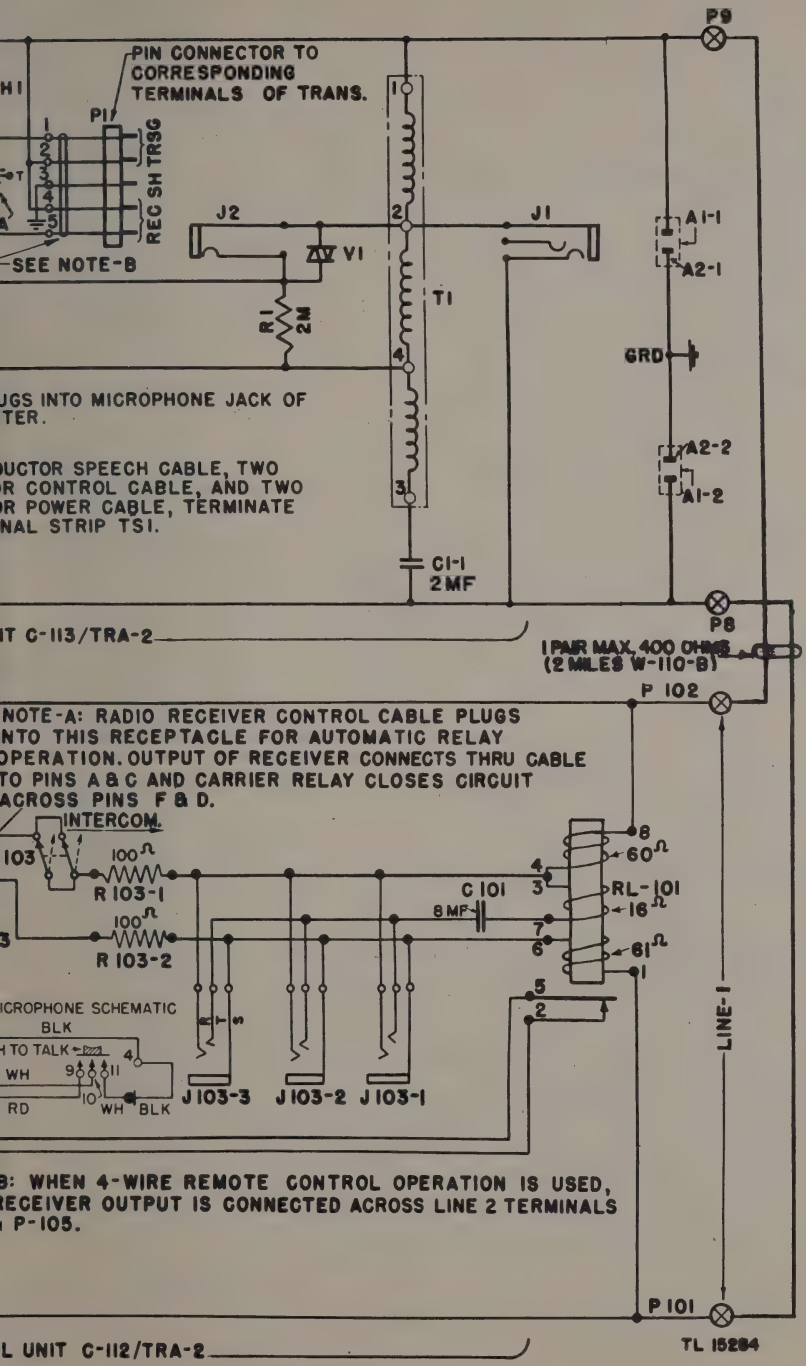
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ram.



REMOTE CONTROL UNIT C-112/ TRA-2	
DESIGNATION	ITEM
C 101	CAPACITOR 8MF 200 V
C 102	CAPACITOR 2MF 200 V
J 101	JACK, LOUD SPEAKER
J 102-1	JACK, HEADSET
J 102-2	JACK, HEADSET
J 102-3	JACK, HEADSET
J 103-1	JACK, MICROPHONE
J 103-2	JACK, MICROPHONE
J 103-3	JACK, MICROPHONE
P 101	LINE TERMINAL LINE 1
P 102	LINE TERMINAL LINE 1
P 103	CONTROL CABLE RECEPTACLE
P 104	LINE TERMINAL LINE 2
P 105	LINE TERMINAL LINE 2
R 101	RESISTOR 4,000 OHM 1/2 W
R 102	RESISTOR 10,000 OHM 1/2 W
R 103-1	RESISTOR 100 OHM 2 W
R 103-2	RESISTOR 100 OHM 2 W
R 104-1	RESISTOR 250 OHM 1/2 W
R 104-2	RESISTOR 250 OHM 1/2 W
R 104-3	RESISTOR 250 OHM 1/2 W
S 101	SWITCH, VOLUME
S 102	SWITCH, LINE (SCREW SLOT)
S 103	SWITCH, INTERCOMMUNICATION
RL 101	RELAY, CONTROL
V 101	VARISTOR

Fig. 16. Remote Control Unit C-112/TRA-2, wiring diagram.



l schematic diagram.

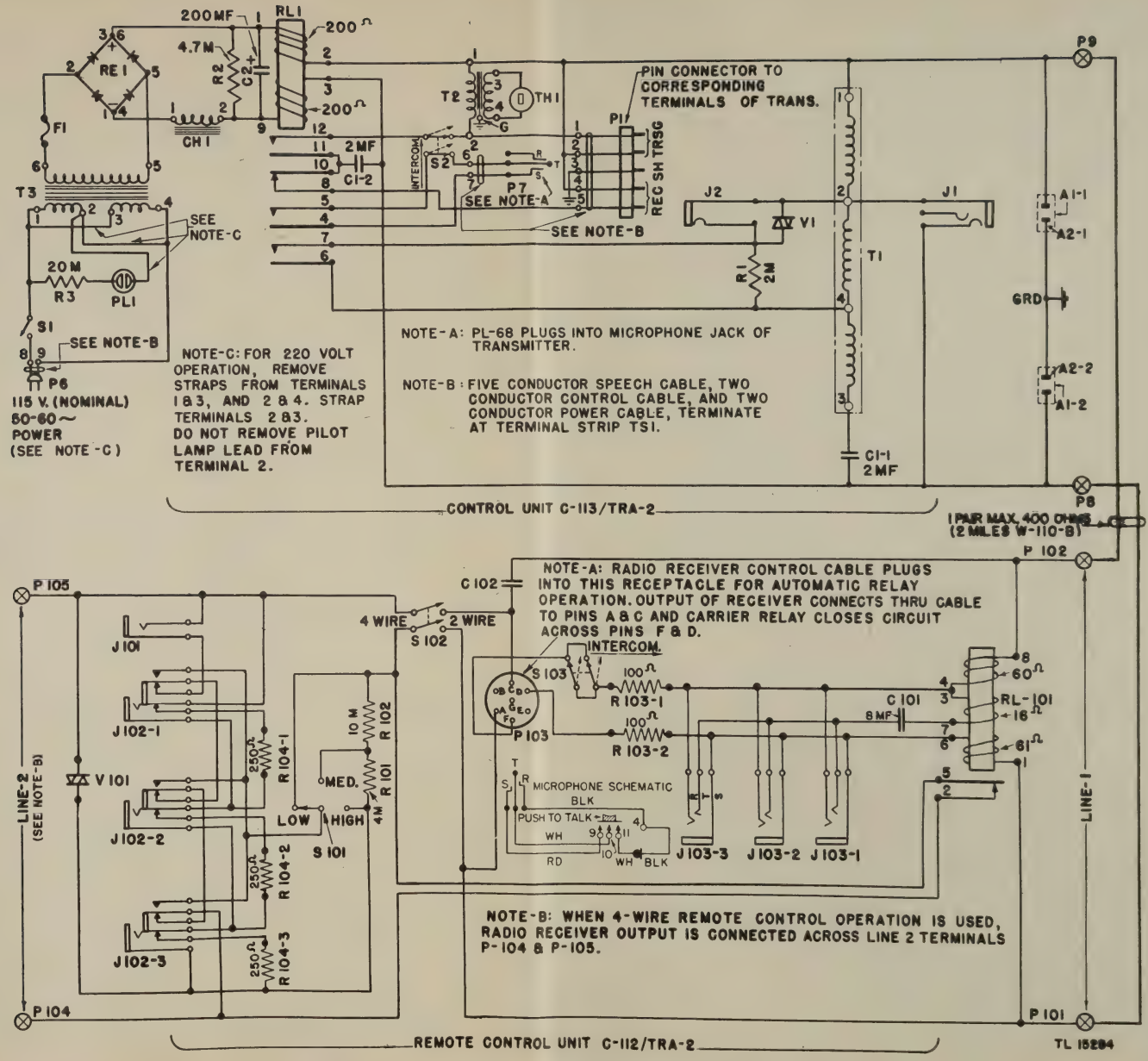
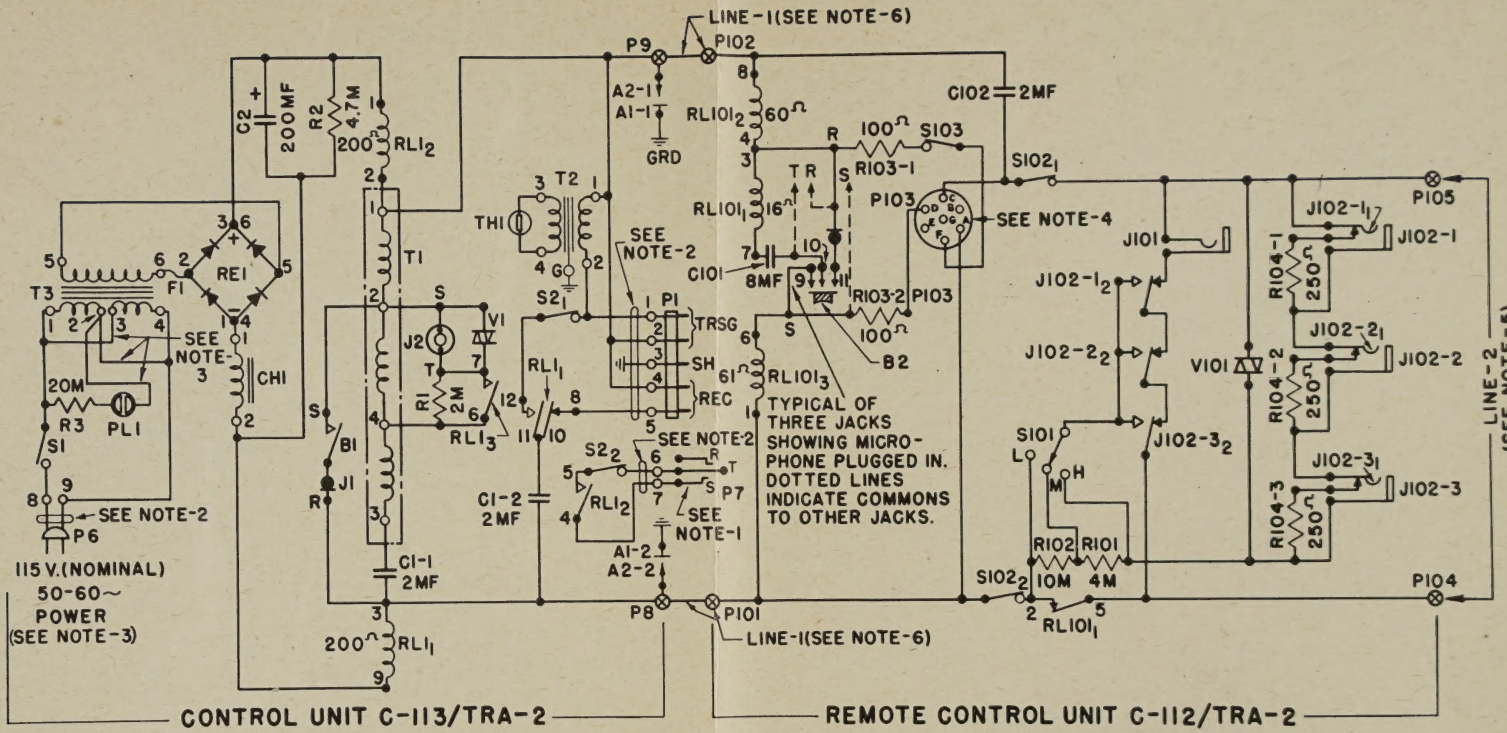


Fig. 17. Over-all schematic diagram.

Order No. 2200–MPD–44; 7,000 copies, August 1944.



NOTES

1: PLUG PL-68 PLUGS INTO MICROPHONE JACK OF TRANSMITTER.

2: FIVE CONDUCTOR SPEECH CABLE, TWO CONDUCTOR CONTROL CABLE, AND TWO CONDUCTOR POWER CABLE, TERMINATE AT TERMINAL STRIP TS1.

3: FOR 220 VOLT OPERATION, REMOVE STRAPS FROM TERMINALS 1 & 3, AND 2 & 4. STRAP TERMINALS 2 & 3. DO NOT REMOVE PILOT LAMP LEAD FROM TERMINAL 2.

4: RADIO RECEIVER CONTROL CABLE PLUGS INTO THIS RECEPTACLE FOR AUTOMATIC RELAY OPERATION. OUTPUT OF RECEIVER CONNECTS THRU CABLE TO PINS A & C AND CARRIER RELAY CLOSES CIRCUIT ACROSS PINS F & D.

5: WHEN 4-WIRE REMOTE CONTROL OPERATION IS USED, RADIO RECEIVER OUTPUT IS CONNECTED ACROSS LINE 2 TERMINALS, P104 AND P105.

6: WIRING BETWEEN UNITS CONSISTS OF 1 PAIR MAX. 400 OHMS (2 MILES W-110-B).

7: COILS $RL1_1$, $RL1_2$, AND $RL1_3$ ARE THREE CONCENTRIC WINDINGS OF RELAY RL1; AND SIMILARLY COILS $RL101_1$, $RL101_2$, AND $RL101_3$ ARE THREE CONCENTRIC WINDINGS OF RELAY RL101.

8: ASSOCIATED CONTACT SPRINGS OF RELAYS, JACKS, AND SWITCHES ARE DESIGNATED BY THE RESPECTIVE COMPONENT DESIGNATION AND A SUBSCRIPT NUMERAL INDICATING THE NUMBER OF CONTACT SETS OPERATED BY THE SAME COMPONENT.

9: BACK CONTACTS OF RELAYS AND JACKS (CONTACTS CLOSED WHEN COMPONENT IS IN NON-OPERATED CONDITION) ARE SHOWN BLACK, AND FRONT CONTACTS (CONTACTS CLOSED WHEN COMPONENT IS IN OPERATED CONDITION) ARE SHOWN WHITE.

10: S, T, AND R REPRESENT SLEEVE, TIP AND RING OF JACKS AND PLUGS REPLACED BY THE SCHEMATIC SYMBOL OF THE DEVICE CONNECTED BY SUCH MEANS, FOR SIMPLIFICATION OF THE CIRCUIT DIAGRAM.

11: B1 AND B2 ARE PUSH-TO-TALK BUTTONS OF RESPECTIVE MICROPHONES.

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Fig. 18. Simplified over-all schematic diagram.

Order No. 2200–MPD–44; 7,000 copies, August 1944.