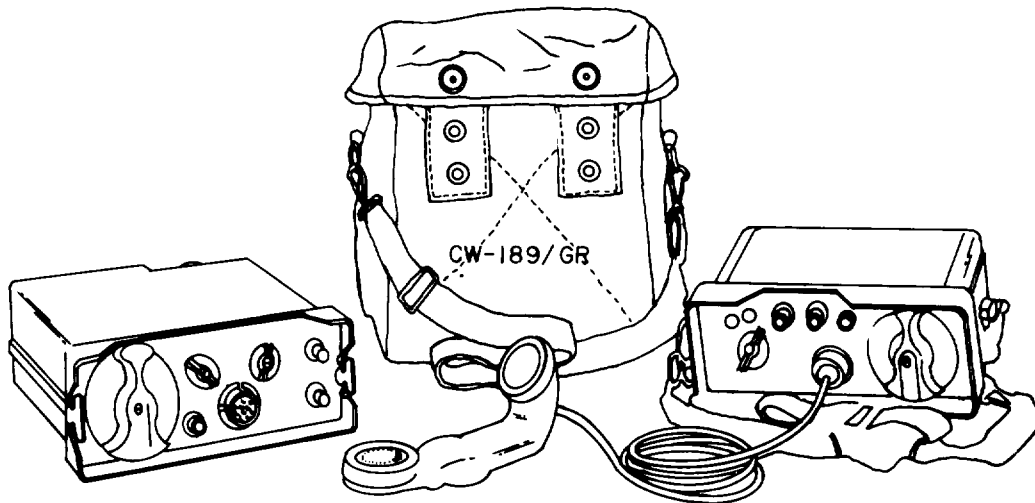


**TM 11-5820-489-34
TO 31R4-2GRA6-42**

TECHNICAL MANUAL

**DIRECT SUPPORT AND GENERAL SUPPORT
MAINTENANCE MANUAL**



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PROCEDURE
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**CONTROL GROUP
AN/GRA-6
(NSN 5820-00-644-4554)**

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DEPARTMENTS OF THE ARMY AND THE AIR FORCE

1 JANUARY 1987

**WARNING**

Adequate ventilation should be provided while using TRICHLORO-TRIFLUOROETHANE. Prolonged breathing of vapor should be avoided. The solvent should not be used near heat or open flame, the products of decomposition are toxic and irritating. Since TRICHLOROTRIFLUOROETHANE dissolves natural oils, prolonged contact with the skin should be avoided. When necessary, use gloves which the solvent cannot penetrate. If the solvent is taken internally, consult a physician immediately.

Compressed air shall not be used for cleaning purposes except where reduced to less than 29 pounds per square inch (psi) and then only with effective chip guarding and personnel protective equipment. Do not use compressed air to dry parts when TRICHLOROTRIFLUOROETHANE has been used. Compressed air is dangerous and can cause serious bodily harm if protective means or methods are not observed to prevent chip or particle (of whatever size) from being blown into the eyes or unbroken skin of the operator or other personnel.



5

SAFETY STEPS TO FOLLOW IF SOMEONE IS THE VICTIM OF ELECTRICAL SHOCK

1

DO NOT TRY TO PULL OR GRAB THE INDIVIDUAL

2

IF POSSIBLE , TURN OFF THE ELECTRICAL POWER

3

IF YOU CANNOT TURN OFF THE ELECTRICAL POWER, PULL, PUSH, OR LIFT THE PERSON TO SAFETY USING A WOODEN POLE OR A ROPE OR SOME OTHER INSULATING MATERIAL

4

SEND FOR HELP AS SOON AS POSSIBLE

5

AFTER THE INJURED PERSON IS FREE OF CONTACT WITH THE SOURCE OF ELECTRICAL SHOCK, MOVE THE PERSON A SHORT DISTANCE AWAY AND IMMEDIATELY START ARTIFICIAL RESUSCITATION

Technical Manual
No. 11-5820-489-34
Technical Order
No. 31R4-2GRA6-42

DEPARTMENTS OF THE ARMY,
AND THE AIR FORCE

Washington, DC, 1 January 1987

**DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE MANUAL
CONTROL GROUP AN/GRA-6
(NSN 5820-00-644-4554)**

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this manual. If you find any mistakes or if you know of a way to improve the procedures, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms), or DA Form 2028-2 located in back of this manual direct to: Commander, US Army Communications-Electronics Command and Fort Monmouth, ATTN: AMSEL-ME-MP, Fort Monmouth, New Jersey 07703 -5000. For Air Force, submit AFTO Form 22 (Technical Order System Publication Improvement Report and Reply) in accordance with paragraph 6-5, Section VI, T.O. 00-5-1. Forward direct to prime ALC/MST. A reply will be furnished direct to you.

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*This manual supersedes TM 11-5038 dated April 1951.

**CHAPTER 1
INTRODUCTION**

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Section I. GENERAL INFORMATION

1-1. SCOPE

This manual describes Control Group AN/GRA-6 and covers Direct and General Support maintenance.

1-2. CONSOLIDATED INDEX OF ARMY PUBLICATIONS AND BLANK FORMS

Refer to the latest issue of DA Pam 310-1 to determine whether there are new editions, changes or additional publications pertaining to the equipment.

1-3. MAINTENANCE FORMS, RECORDS, AND REPORTS

a. Reports of Maintenance and Unsatisfactory Equipment. Department of the Army forms and procedures used for equipment maintenance will be those prescribed by DA Pam 738-750 Maintenance Management Update. Air Force personnel will use AFR 66-1 for maintenance reporting and TO-00-35D54 for unsatisfactory equipment reporting.

b. Report of Packaging and Handling Deficiencies. Fill out and forward SF 364 (Report of Discrepancy (ROD)) as prescribed in AR 735-11-2/DLAR 4140.55/NAVMATINST 4355.73B/AFR 400-54/MCO 4430.3H.

c. Discrepancy in Shipment Report (DISREP) (SF 361). Fill out and forward Discrepancy in Shipment Report (DISREP) (SF 361) as prescribed in AR 55-38/NAVSUPINST 4610.33C/AFR 75-18/MCO P4610.19D/DLAR 4500.15.

1-4. DESTRUCTION OF ARMY ELECTRONICS MATERIEL

Destruction of Army electronics materiel to prevent enemy use shall be in accordance with TM 750-244-2.

1-5. OFFICIAL NOMENCLATURE, NAMES, AND DESIGNATIONS

Refer to TM 11-5820-489-10.

1-6. REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIR)

a. If your equipment needs improvement, let us know. Send us an EIR. You, the user, are the only one who can tell us what you don't like the design. Put it on an SF 368 (Quality Deficiency Report). Mail it to Commander, US Army Communications-Electronics Command and Fort Monmouth, ATTN: AMSEL-PA-MA-D, Fort Monmouth, New Jersey 07703-5000. We'll send you a reply.

b. Air Force personnel are encouraged to submit EIR's in accordance with AFR 900-4.

Section II EQUIPMENT DESCRIPTION AND DATA

1-7. TABULATED DATA

Refer to TM 11-5820-489-10.

1-8. LOCATION AND DESCRIPTION OF MAJOR COMPONENTS

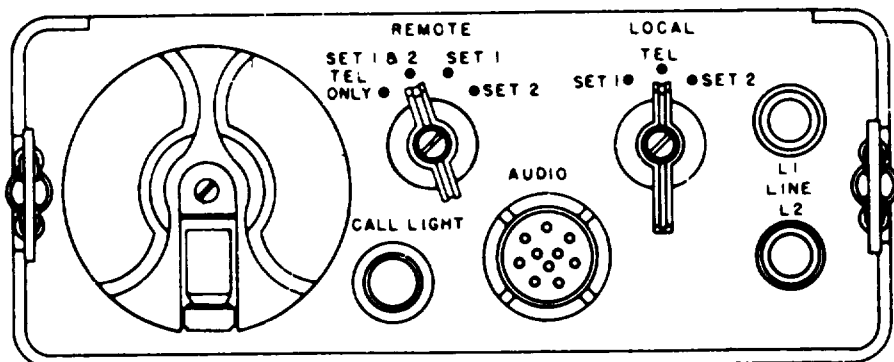
Refer to TM 11-5820-489-10.

1-9. EQUIPMENT CONFIGURATION

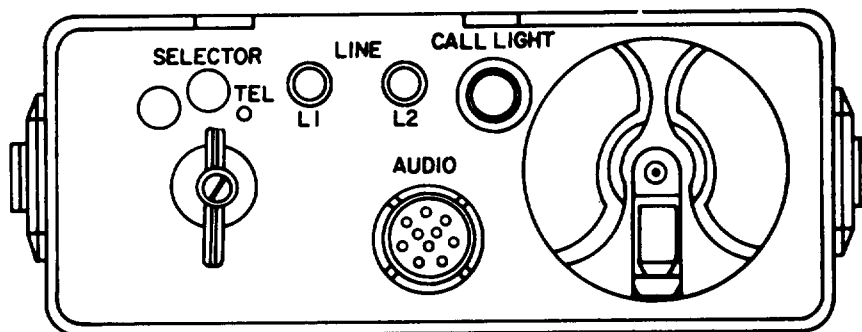
Refer to TM 11-5820-489-10.

1-10. SAFETY, CARE, AND HANDLING

Observe all WARNINGS, CAUTIONS and NOTES contained in this manual.



LOCAL CONTROL
C-434/GRC



REMOTE CONTROL
C-433/GRC

1-11. NOMENCLATURE CROSS-REFERENCE LIST

REMOTE	C-433/GRC
LOCAL	C-434/GRC
HS	Handset H-33(*)/PT

Section III. TECHNICAL PRINCIPLES OF OPERATION

1-12. FUNCTIONAL ANALYSIS

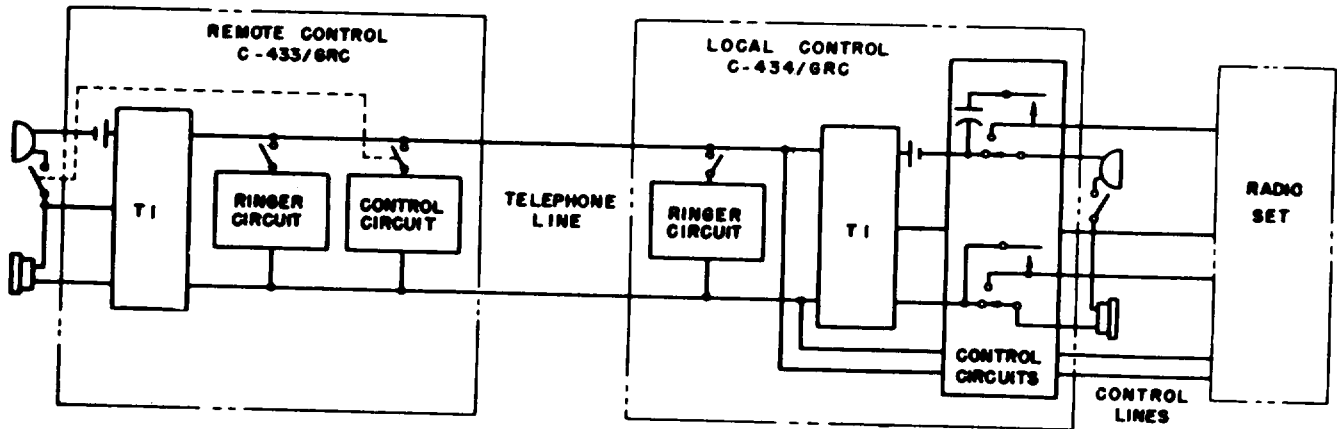
a. Control Group AN/GRA-6 provides:

- Talking and listening capabilities for one or two receiver-transmitters to a remote position.
- Telephone communications and ringing between remote and local control positions.
- Power control of radio set from remote position.

b. Control Group AN/GRA-6 consists of these basic circuit elements:

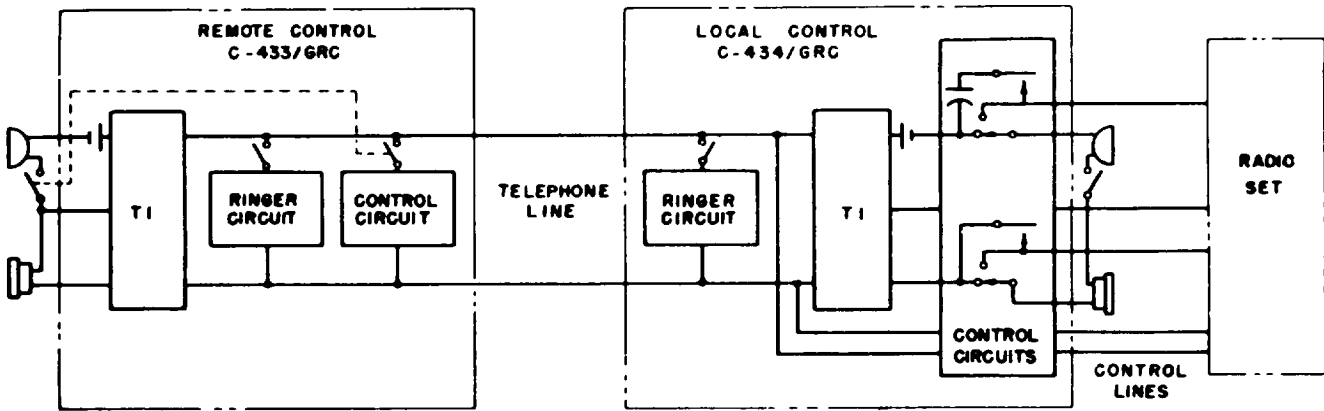
- Telephone circuit
- Ringing circuit
- Control circuit

Telephone Circuit



- Each control unit provides a line transformer (T1) with a microphone input, receiver output and balanced 600-ohm line windings.
- Both transformers (T1) joined by telephone line form the basic telephone circuit.
- Microphone voltage is provided by flashlight dry cells (BA-30; two in Remote Control Unit and two in Local Control Unit) connected in series with the microphone windings of the line transformer.

Ringing Circuit



The ringing circuit consists of:

- Hand cranked 90 volts/20 Hz ringing generator/signal transmitting device.
- Bell and lamp/signal receiving devices.
- Signal switch to select audible or visual signal.

Ringing, sending and receiving devices are connected across the telephone line.

Control Circuits

Remote Control C-433/GRC

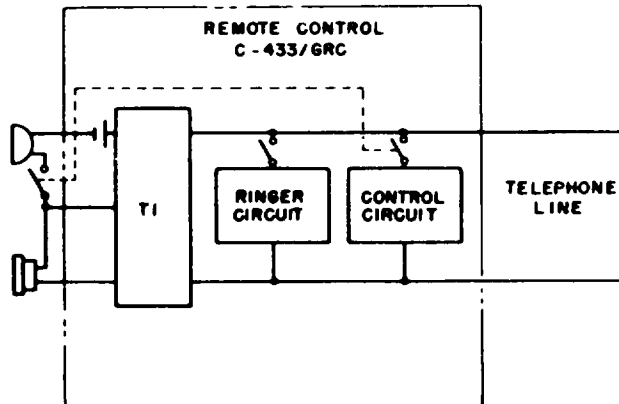
Remote Control Circuit consists of:

- Control Voltage
- Selector Switch/three position which provides three functions:

LEFT-HAND WRITE-IN POSITION - battery connected across line/binding post L1 positive/L2 negative.

MIDDLE WRITE-IN POSITION - battery connected across line/binding post L1 negative/L2 positive.

TEL - battery disconnected from line.



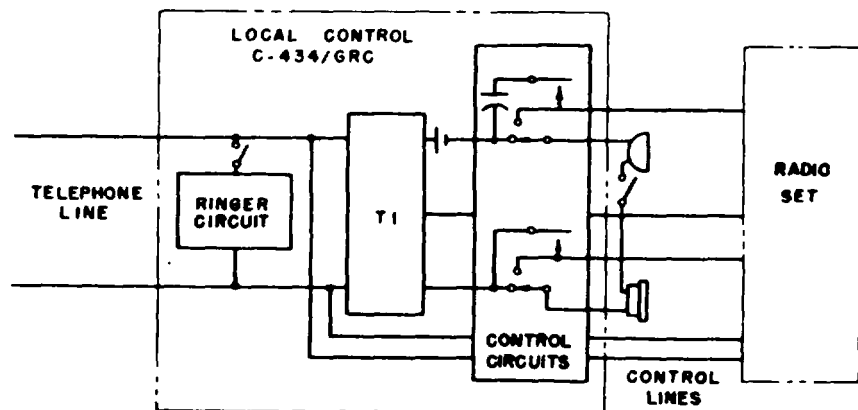
Local Control C-434/GRC

Local Control circuit consists of:

- Four position Remote Switch.
- Three position Local Switch.
- Three relays 01, 02, and 03.

REMOTE SWITCH (SET 1, SET 2, or SET 1 and SET 2) connects relays 01, 02 and 03 across the line to respond to the particular control voltage polarity determined by the setting of the Remote Control SELECTOR switch. In the TEL ONLY position, the switch removes control of radio from remote operator and allows the local operator control.

LOCAL SWITCH - with Remote Switch (Local Control Unit) in TEL ONLY position, control of SET 1 or SET 2 is available to local operator.



Relays 01, 02, 03

01- Nonpolarized, nonlocking type; controls switching of microphone and headphone leads,

02- Polarized, with magnetic latch; controls switching ground return connection to receiver-transmitter control relays.

03- Polarized, with magnetic latch; controls switching power supply energizing lead for the radio set. (Refer to FO-7.)

CHAPTER 2
DIRECT SUPPORT MAINTENANCE

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Section I. REPAIR PARTS, SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT

2-1. SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT

NOMENCLATURE	NATIONAL STOCK NO.	REMARKS
Battery, BA-30	6135-00-120-1020	4 Required
Battery, BA-414/U	6135-00-125-5256	1 Required
Handset, H-33/PT	5965-00-163-9947	2 Required
Multimeter, TS-352B/U	6625-00-242-5023	
Tool Kit, Electronic Equipment TK-105/G	5180-00-610-8177	
Voltmeter, Electronic ME-30B/U	6625-00-649-4537	

2-2. REPAIR PARTS

Refer to TM 11-5820-489-34P.

Section II. TROUBLESHOOTING PROCEDURES

2-3. GENERAL INSTRUCTIONS

a. Maintenance personnel should conduct a visual inspection of the equipment before starting detailed troubleshooting steps. Many troubles can be discovered by looking over the equipment and noting an obviously damaged, dirty or corroded part, or defective wiring.

b. Maintenance personnel at the Direct Support level should take advantage of steps made at lower levels by:

- debriefing operator who discovered fault if possible or applicable.
- debriefing organizational personnel who attempted repair prior to receipt of equipment at the Direct Support facility.

c. The following troubleshooting chart can be used only if both components of Control Group AN/GRA-6 are available and installed properly. For installation procedures see TM 11-5820-489-20. If only one component of Control Group AN/GRA-6 is available at the direct support maintenance level proceed to the localized testing procedure starting in para. 2-4 and do short circuit checks, operational checks, voltage and resistance measurements to isolate faulty components.

d. Batteries must be installed If no other power source is provided.

Using the Troubleshooting Chart

- 1 KEY
- 2 ADDITIONAL INFORMATION
- 3 PROCEDURAL STEP

MALFUNCTION/SYMP TOM	PROBABLE CAUSE		
	INDICATION	YES	NO
(1) REMOTE does not transmit visual signal.	LOCAL - Lamp (E3), Resistor (R1), Signal Selector Switch (S1) defective. REMOTE - Transformer (T1) or Generator (G1) defective.		
Preliminary			
REMOTE - Set SELECTOR to TEL.			
LOCAL - Set REMOTE switch to TEL ONLY, LOCAL switch to TEL, SIGNAL SELECTOR switch S1 to LAMP.			
1. Crank REMOTE ringing generator.	Ringing signal at HS of REMOTE.	Go to 2.	G1, T1 of REMOTE defective. (Refer to para 2-7.)
2. Crank REMOTE ringing generator.	LAMP (E3) lights at LOCAL.		Change LAMP E3. (Refer to para 2-19.) Repeat step 2. If NO, check S1, R1. (Refer to para 2-13.)
(2) LOCAL does not transmit visual signal.	REMOTE - Lamp (E3) Resistor (R1), Signal Selector Switch (S1), Transformer (T1) defective. LOCAL - Transformer (T1) or Generator (G1) defective.		
Preliminary			
REMOTE - Set SELECTOR to TEL, SIGNAL SELECTOR switch (S1) to LAMP.			
LOCAL - Set REMOTE switch to TEL ONLY, LOCAL switch to TEL, Switch S1 to BELL.			
1. Crank LOCAL ringing generator.	Ringing signal at HS of LOCAL.	Go to 2.	G1, T1 of LOCAL defective. (Refer to para 2-8.)

NOTE

To remove unit from case, refer to paragraph 2-17.


- 1 Going from MALFUNCTION/SYMP TOM column to PROBABLE CAUSE column will zero in on the problem area.
- 2 WARNINGS, CAUTIONS and NOTES appear when applicable.
- 3 Flows logically, taking technician from most probable to least likely cause of malfunction.
- 4 Illustrated aids speed procedure and increase accuracy.

MALFUNCTION/SYMP TOM	PROBABLE CAUSE		
	TEST PROCEDURE	INDICATION	YES NO
(1) REMOTE does not transmit visual signal.	LOCAL - Lamp (E3), Resistor (R1), Signal Selector Switch (S1) defective. REMOTE - Transformer (T1) or Generator (G1) defective.		
Preliminary			
REMOTE - Set SELECTOR to TEL.			
LOCAL - Set REMOTE switch to TEL ONLY, LOCAL switch to TEL, SIGNAL SELECTOR switch S1 to LAMP.			
1. Crank REMOTE ringing generator.	Ringing signal at HS of REMOTE.	Go to 2.	G1, T1 of REMOTE defective. (Refer to para 2-7.)
2. Crank REMOTE ringing generator.	LAMP (E3) lights at LOCAL.	.....	Change LAMP E3. (Refer to para 2-19.) Repeat step 2 If NO, check S1, R1. (Refer to para 2-13.)
(2) LOCAL does not transmit visual signal.	REMOTE - Lamp (E3) Resistor (R1), Signal Selector Switch (S1), Transformer (T1) defective. LOCAL - Transformer (T1) or Generator (G1) defective.		
Preliminary			
REMOTE - Set SELECTOR to TEL, SIGNAL SELECTOR switch (S1) to LAMP.			
LOCAL - Set REMOTE switch to TEL ONLY, LOCAL switch to TEL, Switch S1 to BELL.			
1. Crank LOCAL ringing generator.	Ringing signal at HS of LOCAL.	Go to 2.	G1, T1 of LOCAL defective. (Refer to para 2-8.)

MALFUNCTION/SYMPTOM	PROBABLE CAUSE		
	TEST PROCEDURE	INDICATION	YES NO
2. Crank LOCAL ringing generator.	Call light (E3) lights at REMOTE.		Change call light (E3). (Refer to para 2-19.) Repeat step 2. If NO, check S1, R1. (Refer to para 2-14.)
(3) REMOTE does not transmit audible signal.		LOCAL - Bell, Signal Selector Switch (S1), Capacitor (C1) or Transformer (T1) defective. REMOTE - Transformer (T1) or Generator (G1) defective.	
Preliminary			
REMOTE - Set SELECTOR to TEL, switch S1 to BELL.			
LOCAL - Set REMOTE switch to TEL ONLY, LOCAL switch to TEL and switch S1 to BELL.			
1. Crank REMOTE ringing generator.	Ringling signal at HS of REMOTE.	Go to 2.	T1, G1 of REMOTE defective. (Refer to para 2-7.)
2. Crank REMOTE ringing generator.	Bell rings at LOCAL.	Go to 3.	Bell, C1, S1 in LOCAL defective. (Refer to para 2-8.)
3. Crank REMOTE ringing generator.	Ringling signal at HS of LOCAL.	Go to (4).	T1 of LOCAL defective. (Refer to para 2-14.)
(4) LOCAL does not transmit audible signal.		LOCAL - G1 or T1 defective. REMOTE - Bell, S1, C1 or T1 defective.	
Preliminary			
REMOTE - Set SELECTOR to TEL, switch S1 to BELL.			

MALFUNCTION/SYMPTOM	PROBABLE CAUSE		
TEST PROCEDURE	INDICATION	YES	NO
LOCAL - Set REMOTE switch to TEL ONLY, LOCAL switch to TEL and switch S1 to BELL.			
1. Crank LOCAL ringing generator.	Ringing signal at HS of LOCAL.	Go to 2.	T1, G1 of LOCAL defective. (Refer to para 2-8.)
2. Crank LOCAL ringing generator.	Bell rings at REMOTE.	Go to 3.	Bell, C1 S1 in REMOTE defective. (Refer to para 2-7.)
3. Crank LOCAL ringing generator.	Ringing signal at HS of REMOTE.		T1 of REMOTE defective. (Refer to para 2-8.)
(5) LOCAL does not transmit speech. REMOTE does not transmit speech.	LOCAL - Transformer (T1), Capacitor (C1), Batteries BT1 and BT2 defective. REMOTE - Transformer (T1), Capacitor (C1), Batteries BT1 and BT2 defective.		
1. At LOCAL, press push-to-talk switch and talk into microphone.	Speech heard at HS of REMOTE.	Go to 4.	LOCAL-BT1/BT2 improperly installed or defective.
			Check installation or install new BT1, BT2 if defective.
			Go to 2.

MALFUNCTION/SYMPTOM	PROBABLE CAUSE		
TEST PROCEDURE	INDICATION	YES	NO
<p>2. At LOCAL, press push-to-talk switch and talk into microphone.</p>	<p>Speech heard at HS of REMOTE.</p>	<p>Go to 4.</p>	<p>T1 or C1 defective in LOCAL or REMOTE. To check go to 3.</p>
<p>3. At LOCAL, connect a headphone equipped with wire connectors to L1 and L2. Press push-to-talk switch on HS and talk into microphone.</p>	<p>Speech heard at headphone connected to L1 and L2 of LOCAL.</p>	<p>T1 or C1 in REMOTE defective. Make voltage and continuity checks of above. (Refer to para 2-9.)</p>	<p>T1 or C1 in LOCAL defective. Make voltage and continuity checks of above. (Refer to para 2-10.)</p>
<p>4. At REMOTE, press push-to-talk switch on HS and talk into microphone.</p>	<p>Speech heard at HS of LOCAL.</p>	<p>Go to (6).</p>	<p>REMOTE BT1/BT2 improperly installed or defective. Check installation or install new BT1/BT2 if defective. Go to 5.</p>
<p>5. At REMOTE, press push-to-talk switch of HS and talk into microphone.</p>	<p>Speech heard at HS of LOCAL.</p>	<p>Go to (6).</p>	<p>T1 or C1 in LOCAL or REMOTE defective. To check go to 6.</p>

MALFUNCTION/SYMPTOM	PROBABLE CAUSE		
TEST PROCEDURE	INDICATION	YES	NO
<p>(6) LOCAL does not control SET 1.</p> <p>Preliminary</p> <p>REMOTE - Set SELECTOR switch to TEL position.</p> <p>LOCAL - Set REMOTE switch to SET 1 and hold LOCAL switch to SET 1</p>	<p>DEFECTIVE: S2, S3, Relay Control Wiring, SET 1 LOCAL Microphone Circuit or LOCAL Phone Circuit to SET 1.</p>		
			
<p>Before making continuity checks, remove voltages from points being measured.</p>			
<p>NOTE</p>			
<p>Use Multimeter TS-352B/U for measurements.</p>			
<p>1. At LOCAL, measure continuity: Between M of J2 and chassis.</p>	<p>Zero ohms</p>	<p>Go to 2.</p>	<p>S2 or power control wiring defective. Check continuity of above.</p>
<p>2. Between C of J2 and chassis.</p>	<p>Zero ohms</p>	<p>Go to 3.</p>	<p>S3 or relay control circuit wiring for SET 1 defective. Check continuity of above.</p>

MALFUNCTION/SYMPTOM	PROBABLE CAUSE		
TEST PROCEDURE	INDICATION	YES	NO
3. Between T of J2 and C of J1.	Zero ohms	Go to 4.	S2 or S3 or SET 1 LOCAL microphone circuit defective. (Refer to para 2-14 to check S2 and S3 continuity (Refer to FO-7, FO-8 microphone circuit.)
4. Between b of J2 and A or L of J1.	Infinity	Go to (7).	LOCAL phone circuit to SET 1 defective. Check S2 and LOCAL phone circuit continuity. (Refer to para 2-14 and FO-7.)
(7) LOCAL does not control SET 2.	DEFECTIVE: S2, S3 Relay Control Wiring for SET 2, LOCAL Microphone Circuit or LOCAL Phone Circuit to SET 2.		
<p>Preliminary</p> <p>REMOTE - Set SELECTOR switch to TEL.</p> <p>LOCAL - Set REMOTE switch to SET 1 and LOCAL switch to SET 2.</p>			

MALFUNCTION/SYMPTOM	PROBABLE CAUSE		
TEST PROCEDURE	INDICATION	YES	NO
<p>1. At LOCAL, measure continuity between N of J2 and chassis.</p>	<p>Zero ohms</p>	<p>Go to 2.</p>	<p>S3 or relay control circuit wiring for SET 2. Check S3 continuity. (Refer to FO-7.) Check control circuit wiring. (Refer to FO-7.)</p>
<p>2. At LOCAL, measure continuity between pin a of J2 and C of J1.</p>	<p>Zero ohms</p>		<p>S2, S3 or wiring defective. Check S2 and S3 continuity. (Refer to FO-7.) Check local microphone circuit to SET 2. (Refer to FO-7.)</p>

MALFUNCTION/SYMPOM	PROBABLE CAUSE		
TEST PROCEDURE	INDICATION	YES	NO
<p>8) REMOTE does not control SET 1.</p> <p>Preliminary</p> <p>REMOTE - Put SELECTOR switch in LH write-in position.</p> <p>LOCAL - Put REMOTE switch in SET 1 and LOCAL switch in TEL position.</p> <p>1. At REMOTE, press push-to-talk switch. Talk into microphone. Measure voltage between binding posts L1 and L2 of REMOTE.</p> <p>2. At REMOTE, press push-to-talk switch. Talk into microphone. Measure voltage between binding posts L1 and L2 at LOCAL.</p> <p>3. At REMOTE, press push-to-talk switch and talk into microphone. At LOCAL, measure resistance between C of J2 and chassis.</p> <p>4. At REMOTE, press push-to-talk switch and talk into microphone. At LOCAL, measure resistance between N of J2 and chassis.</p>	<p>DEFECTIVE: Battery (BT3), S2, Line Wires too long or reversed, Microphone circuit to SET 1, Relay circuit, 01, 02, or 03 Relay.</p> <p>At least 24 volts; L1 positive, L2 negative.</p> <p>At least 24 volts; L1 positive, L2 negative.</p> <p>Infinity</p> <p>Infinity</p>	<p>Go to 2.</p> <p>Go to 3.</p> <p>Go to 4.</p> <p>Go to 5.</p>	<p>BT3, S2 or control voltage circuit defective. Replace BT3. (Refer to para 2-19.) Check control circuit continuity. (Refer to FO-6, FO-7.)</p> <p>Line wires too long or reversed. Reverse line connections.</p> <p>02 relay or SET 1 relay control circuit defective. Check continuity of above. (Refer to FO-6, FO-7.)</p> <p>02 relay or SET 2 relay control circuit defective.</p>

MALFUNCTION/SYMP TOM	PROBABLE CAUSE		
TEST PROCEDURE	INDICATION	YES	NO
4. At REMOTE (cont.)			Check con- tinuity of above. (Refer to FO-6, FO-7.)
5. At REMOTE, press push-to-talk switch and talk into microphone. At LOCAL, measure resistance between M of J2 and chassis.	Zero ohms	Go to 6.	03 relay or S2 defective. Check con- tinuity of 03 relay and S2. (Refer to FO-6, FO-7.)
6. At REMOTE, release push-to-talk switch. At LOCAL, measure the resistance between M of J2 and chassis.	Zero ohms	Go to 7.	03 relay defec- tive. Replace 03 relay. (Refer to para 2-19.)
7. At REMOTE, set SELECTOR switch to RH write-in position. Press then release push-to-talk switch. At LOCAL, measure the resistance between M of J2 and chassis.	Zero ohms	Go to (9).	03 relay defective. Check 03 relay continuity. (Refer to FO-7.)
(9) REMOTE does not control SET 2.	DEFECTIVE: S2, Line Wires too long or reversed, Control Voltage Circuit, Microphone Circuit to SET 1 or 2, 01, 02, or 03 Relay or Microphone Push-to-Talk Switch.		
Preliminary			
REMOTE - Put SELECTOR switch in MIDDLE Write-in position.			
LOCAL - Put REMOTE switch in SET 1 position and hold LOCAL switch in SET 1 position.			
1. At REMOTE, press push-to-talk switch. Talk into microphone. At REMOTE, measure voltage between L1 and L2.	At least 24 volts; L1 posi- tive, L2 negative.	Go to 2.	BT3, S2 de- fective or control cir- cuit. Check continuity. (Refer to FO-6, FO-7.)

MALFUNCTION/SYMPTOM	PROBABLE CAUSE		
TEST PROCEDURE	INDICATION	YES	NO
2. At REMOTE, press push-to-talk switch. Talk into microphone. At LOCAL, measure voltage between L1 and L2.	At least 24 volts; L1 negative, L2 positive.	Go to 3.	Line wires too long or reversed. Reverse line connections.
3. At REMOTE, press push-to-talk switch, Talk into microphone. At LOCAL, measure resistance between C of J2 and chassis.	Infinity	Go to 4.	O2 relay or SET 1 relay control circuit defective. Check continuity of above (Refer to FO-7.)
4. At REMOTE, press push-to-talk switch. Talk into microphone. At LOCAL, measure resistance between N of J2 and chassis.	Zero ohms	Go to 5.	SET 2 relay control circuit defective. Check continuity of S2, O2 relay and SET 2 relay control circuit (Refer to FO-7.)
5. At REMOTE, release push-to-talk switch. At LOCAL, measure resistance between C and J2 and chassis.	Infinity	Go to 6.	Microphone Push-to-talk switch or O2 relay, defective. Check continuity of above. (Refer to FO-8.)

MALFUNCTION/SYMPTOM	PROBABLE CAUSE		
TEST PROCEDURE	INDICATION	YES	NO
6. At REMOTE, release push-to-talk switch. At LOCAL, measure resistance between A of J1 chassis.	Infinity	Go to 7.	01 relay defective Check 01 relay continuity (Refer to FO-7.)
7. At LOCAL, put REMOTE switch in SET 2 position. At REMOTE, put SELECTOR switch in LH Write-in position. At REMOTE, press push-to-talk switch. Talk into microphone. At LOCAL, measure resistance between M of J2 and chassis.	Zero ohms	Go to 8.	03 relay or S2 defective Check 03 relay and S2 continuity. (Refer to FO-6, FO-7 and FO-8.)
8. At REMOTE, release push-to-talk switch. At LOCAL, measure resistance between M of J2 and chassis.	Zero ohms	Go to 9.	03 relay defective Replace 03 relay. (Refer to para 2-19.)
9. At REMOTE, put SELECTOR switch in MIDDLE Write-in position. Push, then release push-to-talk switch. At LOCAL, measure resistance between M of J2 and chassis.	Infinity	. . . . .	03 relay defective Check 03 relay continuity (Refer to FO-6, FO-7 and FO-8.)

2-4. SHORT CIRCUIT CHECKS - REMOTE CONTROL UNIT

Before proceeding to isolate faults within any component, key circuits should be check for shorts.

Preliminary Test Setup

- Remove outer case cover releasing two snap catches (refer to para 2-17).
- Remove dry cell batteries (refer to para 2-17).
- Disconnect AUDIO accessories.
- Use Multimeter TS-352B/U.

CAUTION

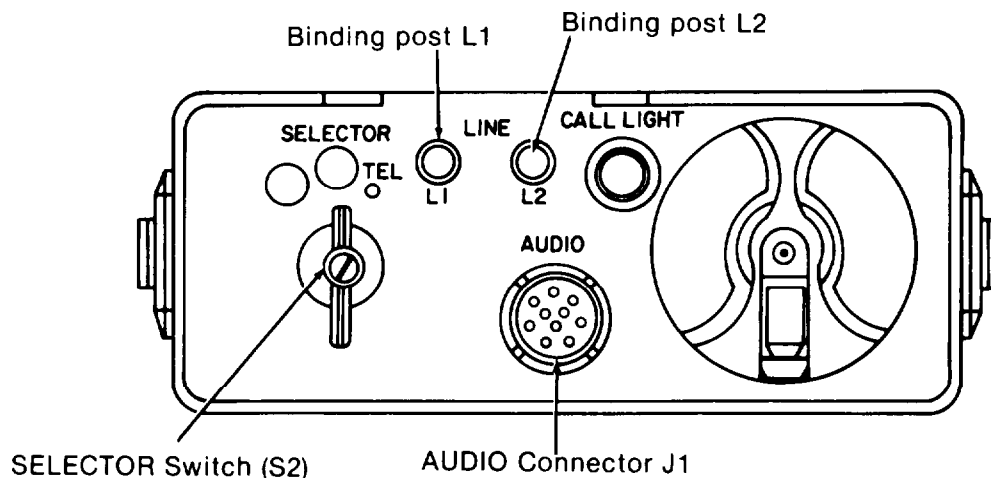
Do not install batteries in this unit until any faults found in the following tests have been repaired.

NOTE

If an incorrect reading is obtained during initial short circuit checks, visually check wires, lugs, and parts involved and repair as needed, before proceeding to troubleshooting procedures.

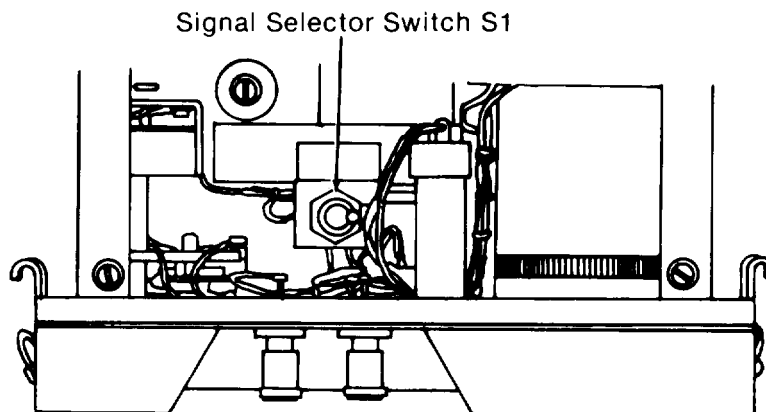
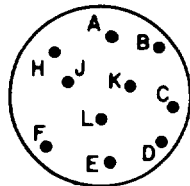
Test Setup for Remote Control Unit

- Use the following illustrations to locate test points.



FROM	TO	REQUIRED READING
Terminal C of AUDIO connector J1.	Chassis	Infinity
Terminal E of AUDIO connector J1.	Chassis	Infinity
Terminal F of AUDIO connector J1.	Chassis	Infinity
Binding post L1 for each of the positions of S1 (Signal Selector) switch and S2 (SELECTOR) switch	Chassis	Infinity
Terminal H of AUDIO connector J1 for each of the positions of S2 (SELECTOR) switch.	Chassis	Infinity
Binding post L2 for each of the positions of S1 (Signal Selector) switch and S2 (SELECTOR) switch.	Chassis	Infinity

Pin locations
AUDIO connector J1



2-5. SHORT CIRCUIT CHECKS - LOCAL CONTROL UNIT

Before proceeding to isolate faults within any component, key circuits should be checked for shorts.

Preliminary Test Setup

- Remove outer case cover releasing two snap catches (refer to para 2-17).
- Remove dry cell batteries (refer to para 2-17).
- Disconnect AUDIO accessories.
- Use Multimeter TS-352B/U.

CAUTION

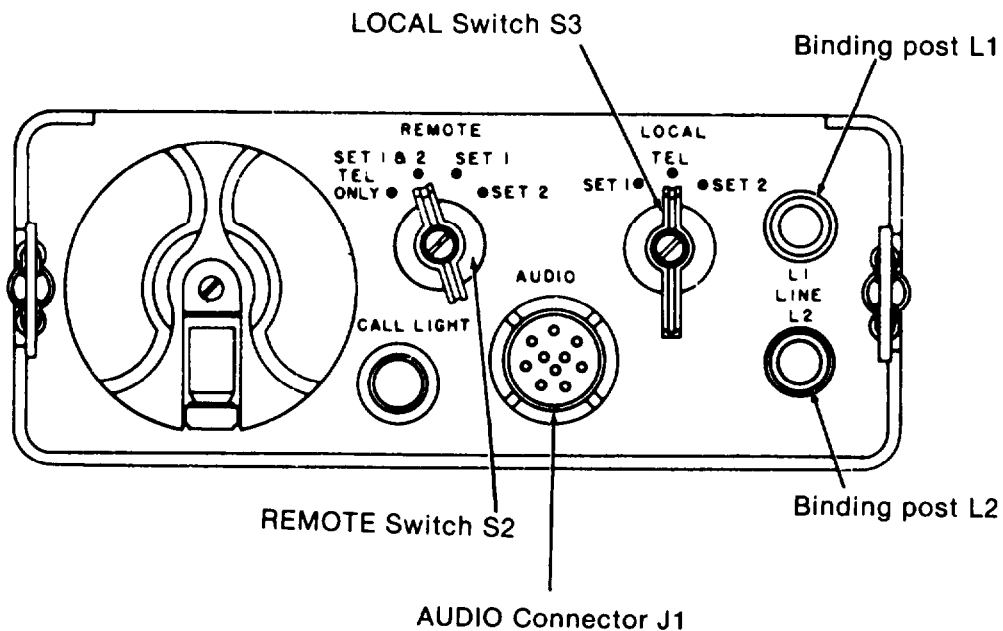
Do not install batteries in this unit until any faults found in the following tests have been repaired.

NOTE

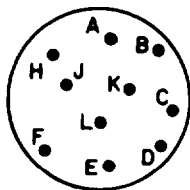
If an incorrect reading is obtained during initial short circuit checks, visually check wires, lugs, and parts involved and repair as needed, before proceeding to troubleshooting procedures.

Test Setup for Local Control Unit

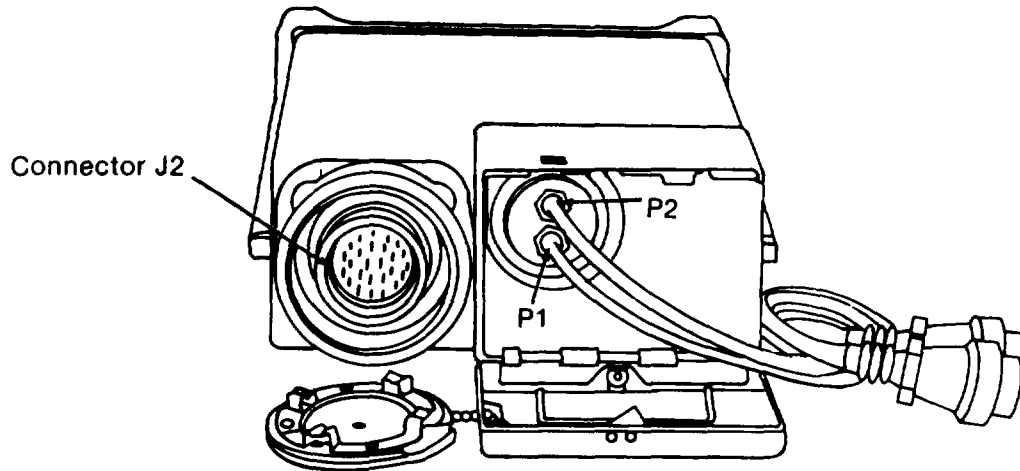
- Use the following illustrations to locate test points.



FROM	TO	REQUIRED READING
Binding post L1 for each position of REMOTE switch S2.	Chassis	Infinity
Binding post L2 for each position of REMOTE switch S2.	Chassis	Infinity
Terminal C of AUDIO connector J1 for each position of LOCAL switch S3.	Chassis	Infinity



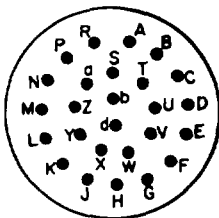
Pin locations for AUDIO connector J1



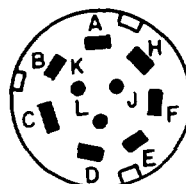
NOTE

Hold both plugs in hand and check.

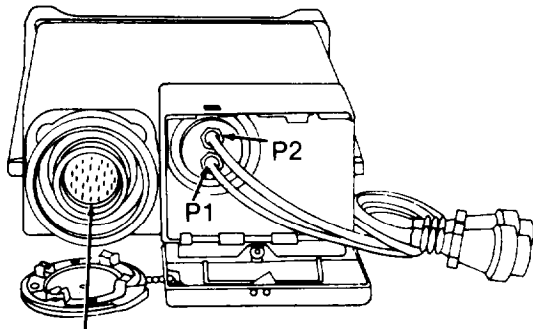
FROM	TO	REQUIRED READING
Terminal C of Connector Plug P2 for each position of REMOTE switch S2 and LOCAL switch S3.	Chassis	infinity
Terminal T of connector J2 for each position of REMOTE switch S2 and LOCAL switch S3.	Chassis	Infinity
Terminal F of connector plug P2 with LOCAL switch S3 in TEL or SET 1.	Chassis	Infinity
LOCAL switch S3 in SET 2.	Chassis	Zero
Terminal F of connector plug P1 with LOCAL switch S3 in TEL or SET 2.	Chassis	Infinity
LOCAL switch S3 in SET 1.	Chassis	Zero
Terminal M of connector J2 with REMOTE switch S2 in TEL ONLY.	Chassis	Infinity
REMOTE switch S2 in SET 1 & 2.	Chassis	Zero
REMOTE switch S2 in SET 1 or SET 2.	Chassis	Zero or Infinity depending on the last voltage applied to line terminals.



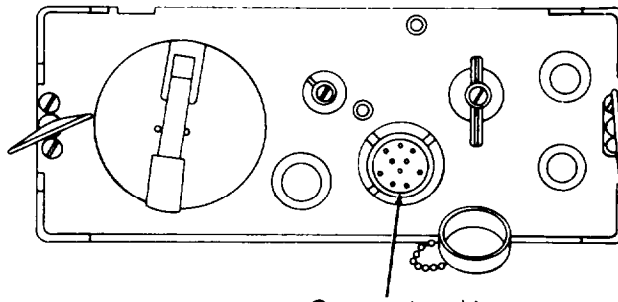
Pin locations for Connector J2



Pin locations for Connector Plugs P1 and P2

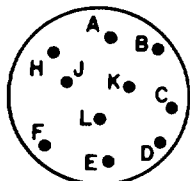


Connector J2

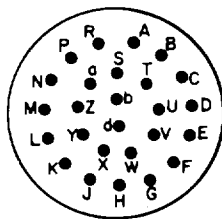


Connector J1

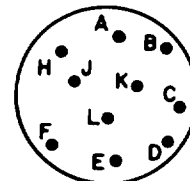
FROM	TO	REQUIRED READING
Terminal B of J1	Chassis	Zero
Terminal E of J1	Chassis	Zero
Terminal H of J1	Chassis	Zero
Terminal B of P2	Chassis	Zero
Terminal B of P1	Chassis	Zero
Terminal d of J2	Chassis	Zero
Terminal b of J2	Chassis	Zero
Terminal A of J1	Terminal L of J1	Zero
Terminal C of P2	Terminal a of J2	Zero
Terminal A of P2	Terminal A of P1	Zero
Terminal J of P2	Terminal J of P1	Zero
Terminal F of P2	Terminal N of J2	Zero
Terminal A of P1	Terminal S of J2	Zero
Terminal J of P1	Terminal M of J2	Zero
Terminal C of P1	Terminal T of J2	Zero
Terminal F of P1	Terminal C of J2	Zero



Pin locations J1



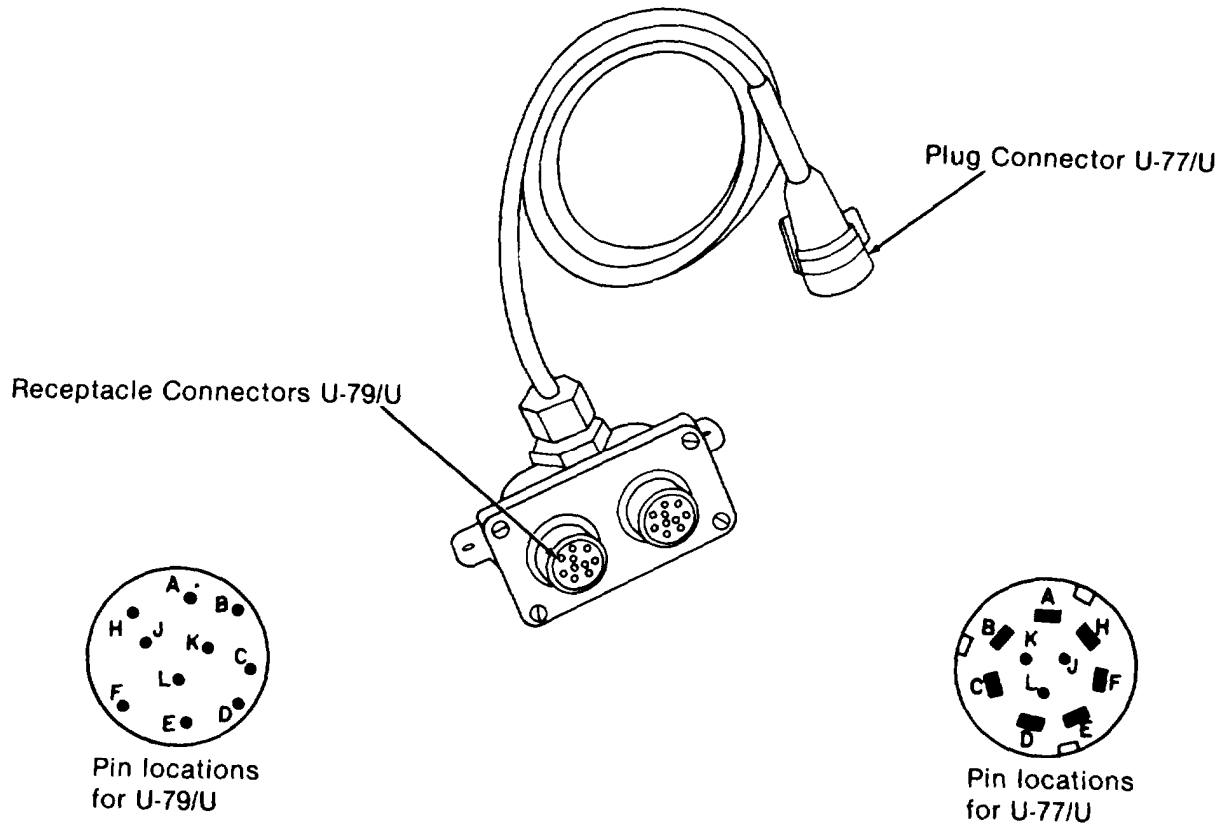
Pin locations J2



Pin locations P1 & P2

2-6. SHORT CIRCUIT CHECKS - INTERCONNECTING BOX J-654/G

- Disconnect plug connector U-77/U from REMOTE CONTROL UNIT AUDIO connector.
- Remove HS and LOUDSPEAKER from receptacle connectors U-79/U.
- Use Multimeter TS-352B/U.
- Use the following illustrations to locate test points.



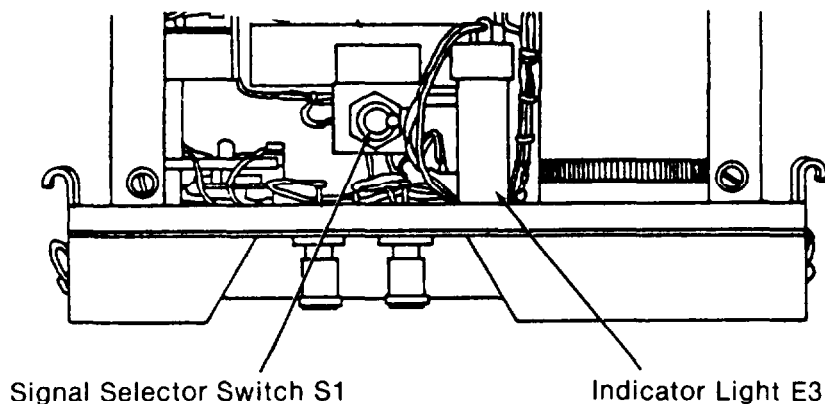
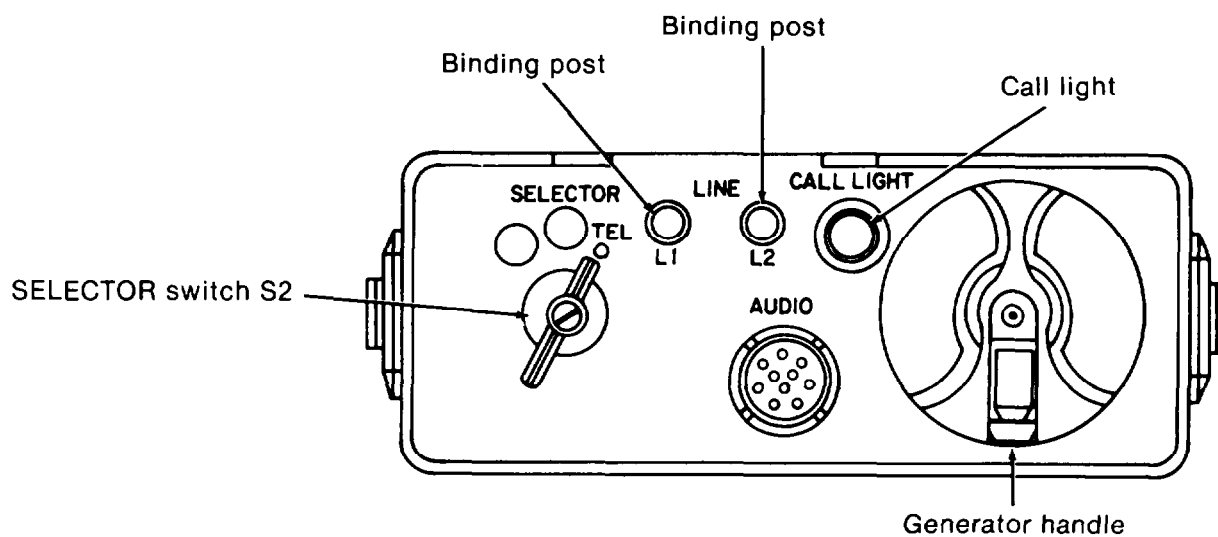
- Measure continuity between letters of the same designation on receptacle connectors U-79/U and plug connector U-77/U. Reading should be zero.
- Measure continuity between pin A of connector U-77/U and all other pins. Reading should be infinity.
- Pins J, K, and L are not connected.

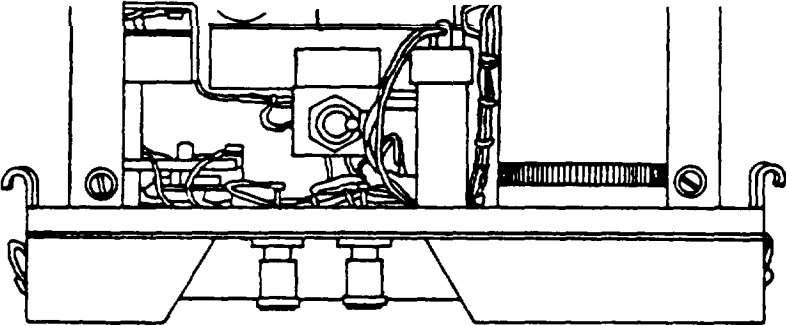
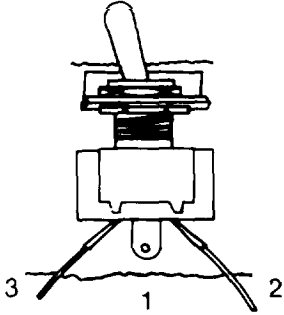
2-7. OPERATIONAL CHECKS FOR REMOTE CONTROL UNIT

It is necessary to use a HS known to be in good operating condition to properly conduct the following operational checks. Refer to TM 11-5820-489-20.

Test Setup

- Remove outer case cover by loosening two thumbscrews (refer to para 2-17).
- Install batteries (refer to para 2-20).
- Connect good HS to AUDIO connector.
- Set SELECTOR switch to TEL position.
- Set SIGNAL SELECTOR switch to BELL position.
- Use the following illustrations to locate test points.



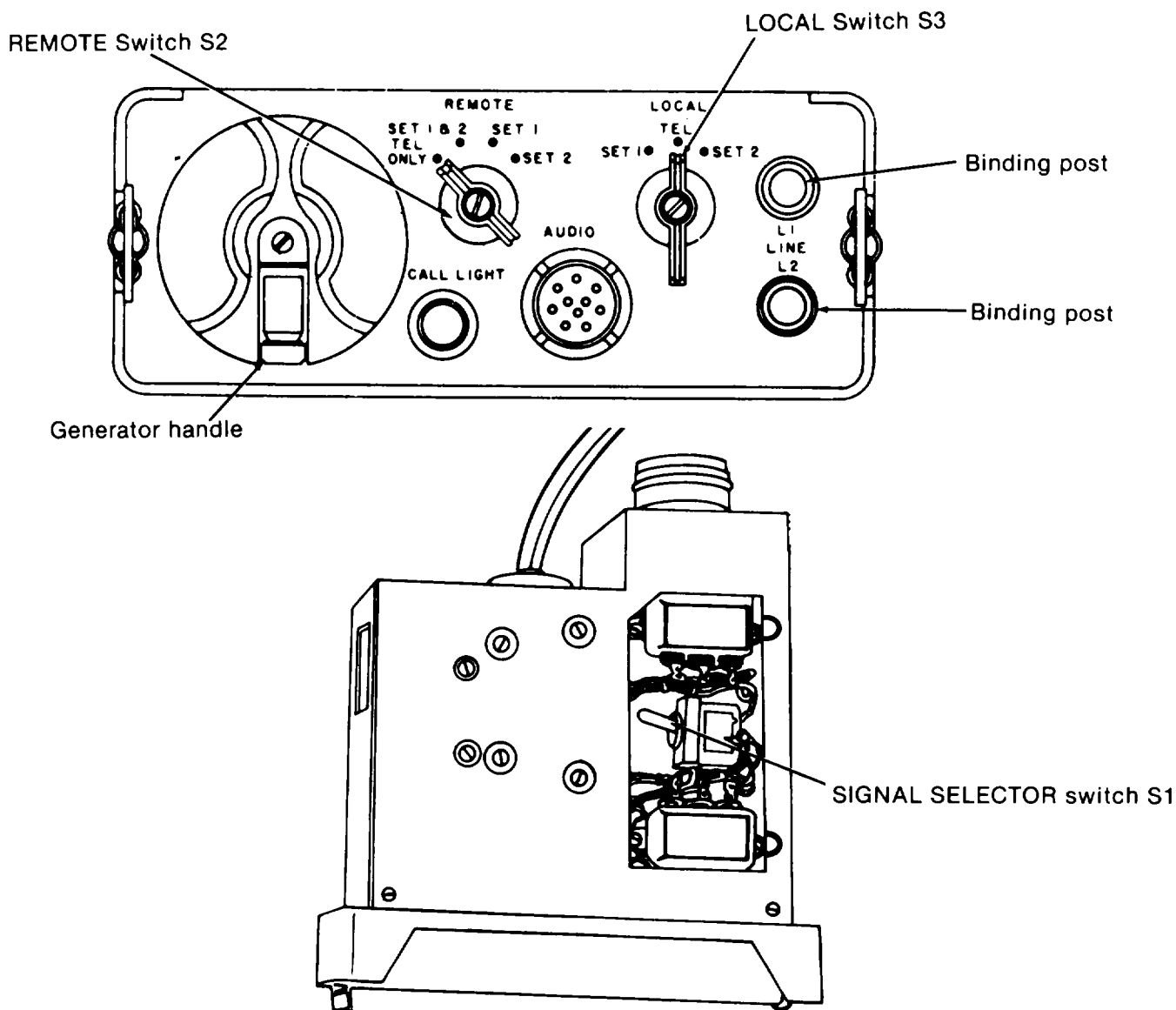
OPERATIONAL CHECKS			
TEST PROCEDURE	INDICATION	YES	NO
(1) RINGING CHECKS			
1. Crank generator handle.	Bell does not ring.	Go to 2.	Replace Generator. (Refer to para 2-19.)
2. Connect a jumper between binding post L1 and terminal #2 of Signal Selector switch and crank generator handle.	Lamp lights	Go to 3.	Replace Lamp. (Refer to para 2-19.) Repeat step 2. If NO, remove jumper and check resistance of transformer or capacitor. (Refer to para 2-15.)
			
3. Move jumper from terminal #2 to #3 of switch and crank generator handle.	Bell rings	Remove jumper and Go to (2).	Replace BELL. (Refer to para 2-19.) Repeat step 3.
(2) SPEECH CHECKS			
Preliminary			
Connect headphones with wire terminals at the end between binding posts.			
Press push-to-talk switch on HS and talk into microphone.	Speech heard in headphones.		Check resistance of transformer. (Refer to para 2-15.)

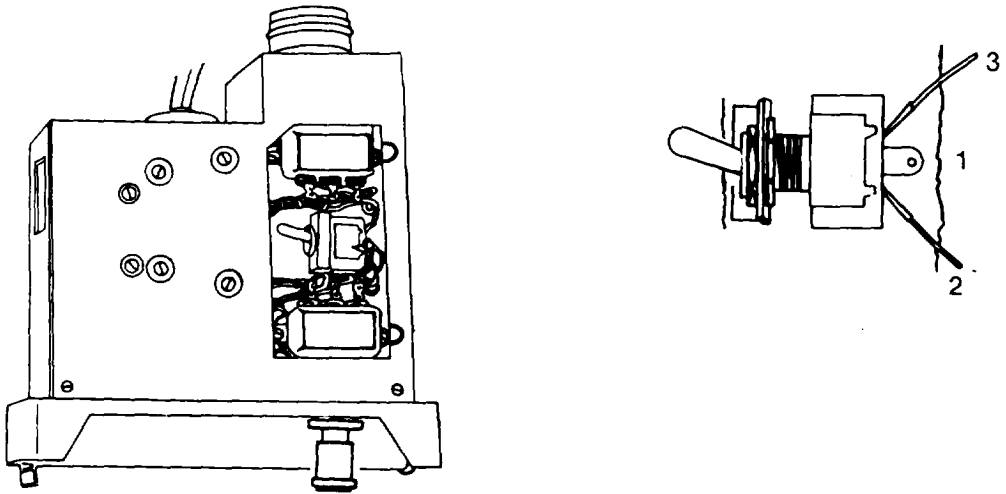
2-8. OPERATIONAL CHECKS FOR LOCAL CONTROL UNIT

It is necessary to use a HS known to be in good operating condition to properly conduct the following operational checks. Refer to TM 11-5820-489-20.

Test Setup

- Remove outer case cover by loosening two thumb screws (refer to para 2-17).
- Install batteries (refer to para 2-20).
- Connect good HS to AUDIO connector.
- Set SIGNAL SELECTOR switch to BELL position.
- Set REMOTE switch to TEL ONLY.
- Set LOCAL switch to TEL position.
- Use the following illustrations to locate test points.



OPERATIONAL CHECKS			
TEST PROCEDURE	INDICATION	YES	NO
(1) RINGING CHECKS			
1. Crank generator handle.	Bell rings	Go to 2.	Replace Generator. (Refer to para 2-19.)
2. Connect a jumper between binding post L1 and terminal #2 of Signal Selector switch and crank generator handle.	Lamp lights	Go to 3.	Replace Lamp. (Refer to para 2-19.) Repeat step 2. If NO, remove jumper and check resistance of transformer or capacitor. (Refer to para 2- 16.)
			
3. Move jumper from terminal #2 and #3 of switch and crank generator handle.	Bell rings	Remove jumper and Go to (2).	Replace BELL (Refer to para 2-19.) Repeat step 3.

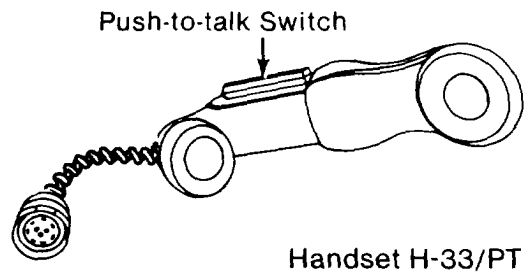
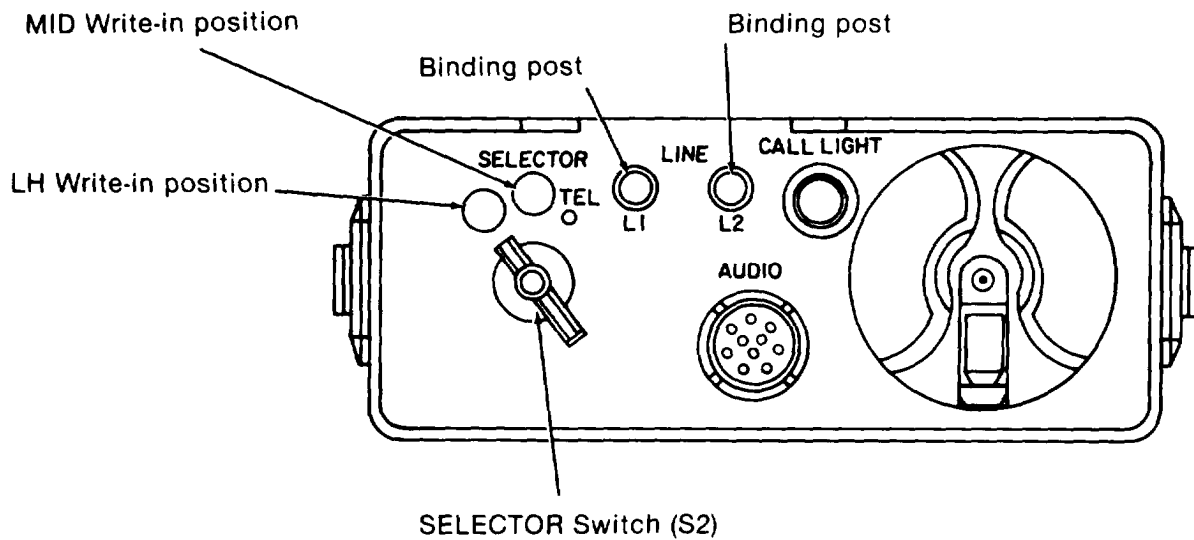
OPERATIONAL CHECKS			
TEST PROCEDURE	INDICATION	YES	NO
(2) SPEECH CHECKS			
Preliminary			
Connect headphones with wire terminals at the end between binding posts.			
1. Press push-to-talk switch on HS and talk into microphone.	Speech heard in headphones	Go to 2.	Check resistance of transformer. (Refer to para 2-16.)
2. Set LOCAL switch to SET 1 position, press push-to-talk switch on HS and talk into microphone.	No speech heard in headphones	Go to 3.	Check continuity of LOCAL switch S3.
3. Set REMOTE switch to SET 1. Connect headphones between terminals S and d of J2. Press push-to-talk switch on HS and talk into microphone.	Speech heard in headphones	.....	Check continuity of REMOTE switch S2.

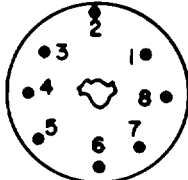
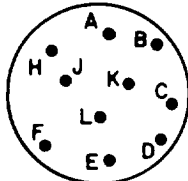
2-9. VOLTAGE MEASUREMENTS FOR REMOTE CONTROL UNIT

Test Setup

It is necessary to use a HS known to be in good operating condition to properly conduct the following voltage measurements. Refer to TM 11-5820-489-20.

- Remove outer case cover releasing two snap catches (refer to para 2-17).
- Install batteries (refer to para 2-20).
- Connect good HS to AUDIO connector.
- Set SELECTOR switch to LH write-in position.
- Use Multi meter TS-352B/U.



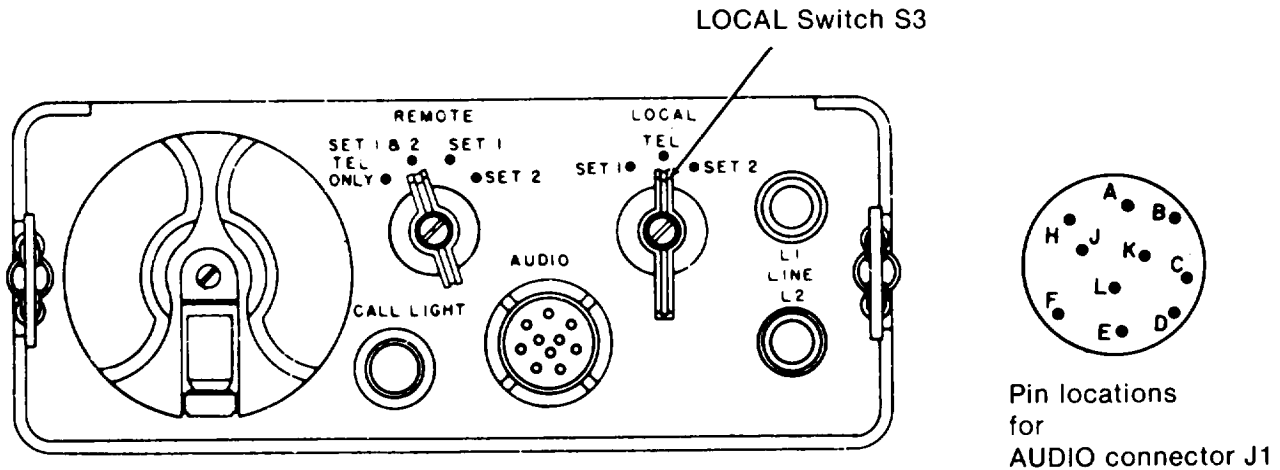
VOLTAGE CHECK			
TEST PROCEDURE	INDICATION	YES	NO
(1)			
1. Connect TS-352B/U between binding posts. Depress HS push-to-talk switch.	24 Vdc L1-positive L2-negative	Go to 2.	Less than 24 Vdc. Replace BT3. (Refer to para 2-17.) No voltage, check continuity of battery plug and wires, SELECTOR switch, transformer and generator.
 <p>Pin locations battery plug pin 1-negative pin 3-positive</p>			
2. Release push-to-talk switch.	Zero Vdc	Go to 3.	Check continuity of SELECTOR switch.
3. Set SELECTOR switch to TEL position. Press HS push-to-talk switch.	Zero Vdc	Go to 4.	Check continuity of SELECTOR switch.
4. Set SELECTOR switch to MID Write-in position. Press HS push-to-talk switch.	24 Vdc L1-negative L2-positive	Go to (2).	Check continuity of SELECTOR switch.
(2) Disconnect HS from AUDIO connector			
1. Connect TS-352B/U between terminals C and E of J1.	2 to 3 Vdc E-positive C-negative	Go to 2.	Replace batteries. (Refer to para 2-17.) Repeat step 1 If NO check continuity of wires to transformer and transformers.
 <p>Pin locations AUDIO connector J1</p>			

VOLTAGE CHECK			
TEST PROCEDURE	INDICATION	YES	NO
2. Set SELECTOR switch to LH Write-in position. Connect TS-352B/U between terminal H of J1 and binding post L2.	30 to 45 Vdc H-positive L2-negative	Go to 3.	Check voltage at pin 1 and 3 of battery plug. Replace if below 30 Vdc. Repeat step 2. If NO check continuity of SELECTOR switch windings of transformer and resistance of R2.
3. Set SELECTOR switch to MID Write-in position. Connect TS-352 B/U between terminal H of J1 and binding post L2.	30 to 45 Vdc H-negative L2-positive	Go to 4.	Check continuity of SELECTOR switch.
4. Connect TS-352B/U between L2 and terminal 2 of generator. Connect a jumper between H and F of J1.	30 to 45 Vdc L2-positive G1-2-negative	Go to 5.	Replace C1. (Refer to para 2-19.)
5. Connect TS-352B/U between L2 and terminal 3 of generator.	30 to 45 Vdc L2-positive G1-3-negative	Go to 6.	Replace generator. (Refer to para 2-19.)
6. Connect TS-352B/U between L1 and L2.	30 to 45 Vdc L2-positive L1-negative		Replace transformer. (Refer to para 2-19.)
NOTE			
Remove jumper from terminals H and F of J1.			

2-10. VOLTAGE MEASUREMENTS FOR LOCAL CONTROL UNIT

Test Setup

- Remove outer case cover by loosening two thumbscrews (refer to para 2-17).
- Install batteries (refer to para 2-20).
- Set LOCAL switch to TEL position.
- Use Multimeter TS-352B/U.
- Use the following illustrations to locate test points.

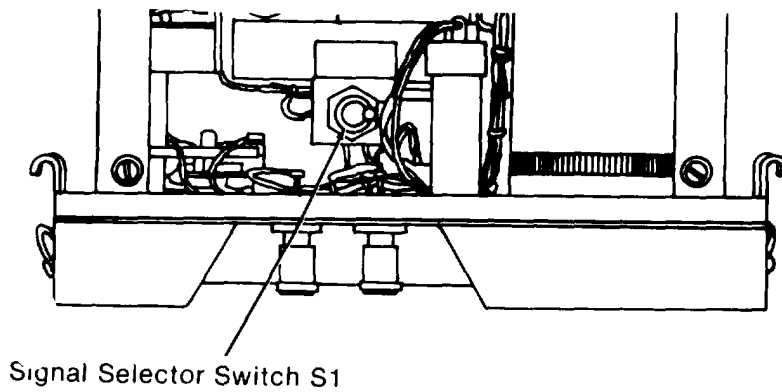
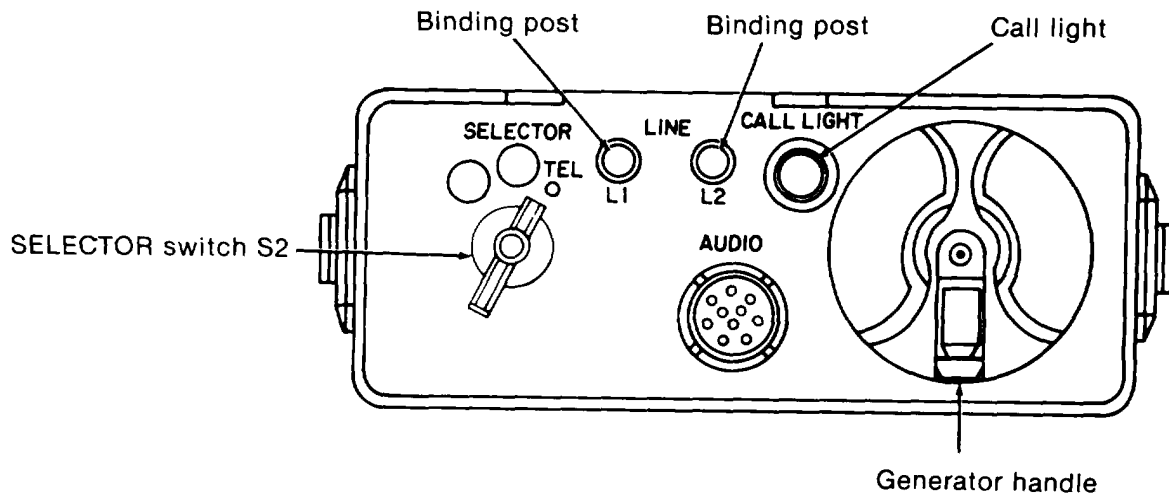


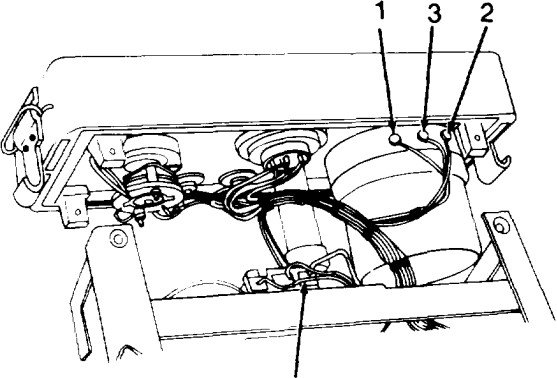
VOLTAGE MEASUREMENTS			
TEST PROCEDURE	INDICATION	YES	NO
1. Connect TS-352B/U between terminals C & E of J1.	2 to 3 Vdc E positive C negative	.....	Replace batteries. Repeat Step 1. If NO, check continuity of LOCAL switch and transformer.

2-11. REMOTE UNIT GENERATOR G-25/PT OR G-42A/PT CONTINUITY AND VOLTAGE CHECKS

Test Setup

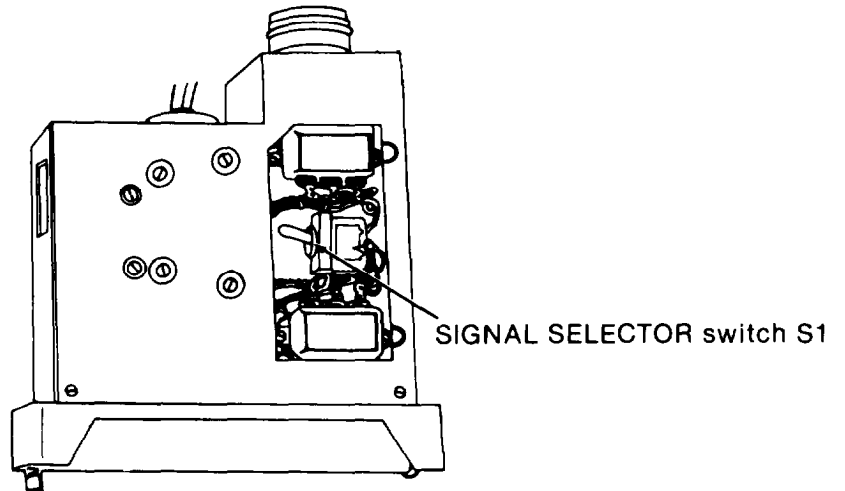
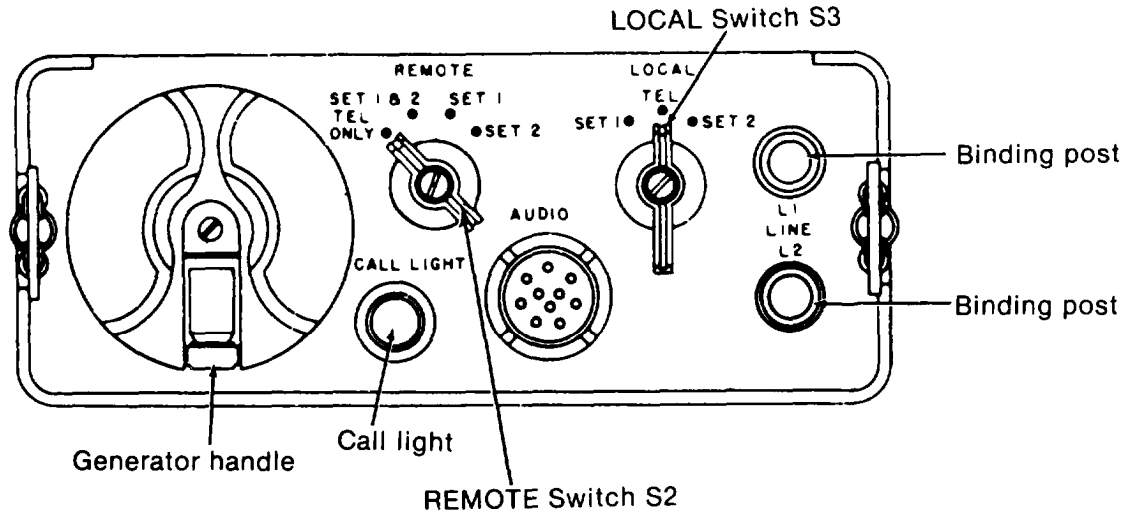
- Remove outer case cover releasing two snap catches (refer to para 2-17).
- Set SELECTOR switch to TEL position.
- Set SIGNAL SELECTOR switch to BELL position.
- Use Multi meter TS-352B/U.
- Position unit so that rear and numbered terminals of generator are visible.

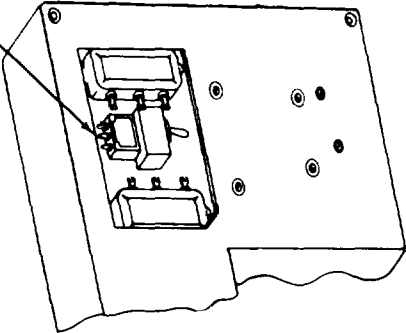
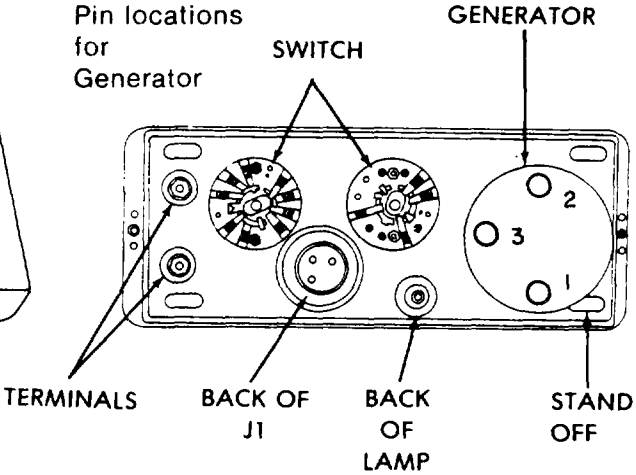


GENERATOR			
TEST PROCEDURE	INDICATION	YES	NO
(1) CONTINUITY CHECK			
1. Connect TS-352B/U between terminal 2 and 3 of generator.	Zero	Go to 2.	Replace generator. (Refer to para 2-19.)
2. Crank generator.	Infinity	Go to (2).	Replace generator. (Refer to para 2-19.)
 <p style="text-align: center;">Signal Selector Switch Term. #3</p>			
Pin locations for generator			
(2) VOLTAGE CHECK			
Connect a jumper between L1 and terminal 3 of the SIGNAL SELECTOR switch. Connect TS-352B/U between terminals 1 and 3 of the generator and crank generator handle.	Bell rings. 50 Vac reading.	Remove jumper.	Replace generator. (Refer to para 2-19.)
NOTE			
A generator producing 45 volts can be tolerated in service.			

**2-12. LOCAL UNIT GENERATOR G-25/PT OR G-42A/PT CONTINUITY
Test Setup**

- Remove outer case cover by loosening two thumbscrews (refer to para 2-17).
- Set LOCAL switch to TEL position.
- Set REMOTE switch to TEL ONLY.
- Set SIGNAL SELECTOR switch to BELL position.
- Use Multi meter TS-352B/U.
- Position unit so that rear of generator and terminals are visible.

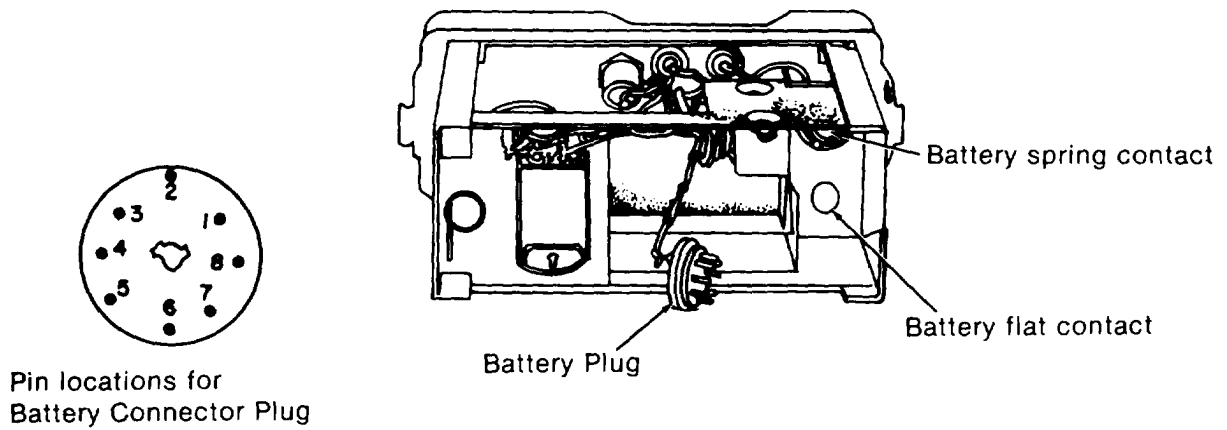
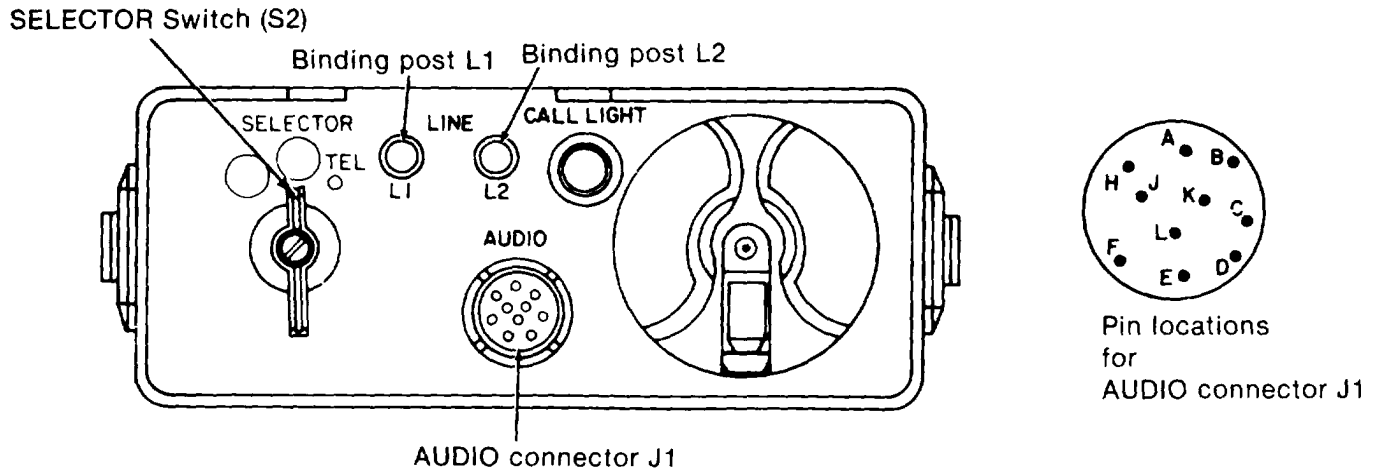


GENERATOR			
TEST PROCEDURE	INDICATION	YES	NO
(1) CONTINUITY CHECK			
1. Connect TS-352B/U between terminal 2 and 3 of generator.	Zero	Go to 2.	Replace generator. (Refer to para 2-19.)
2. Crank generator.	Infinity	Go to (2).	Replace generator. (Refer to para 2-19.)
<div style="display: flex; justify-content: space-around; align-items: flex-start;"> <div style="text-align: center;"> <p>SWITCH SIGNAL SELECTOR TERM 3</p>  </div> <div style="text-align: center;"> <p>Pin locations for Generator</p>  </div> </div>			
(2) VOLTAGE CHECK			
Connect a jumper between L1 and terminal 3 of the SIGNAL SELECTOR switch. Connect TS-352B/U between terminals 1 and 3 of the generator and crank generator handle.	Bell rings. 50 Vac reading.	Remove jumper.	Replace generator. (Refer to para 2-19.)
NOTE			
A generator producing 45 volts can be tolerated in service.			

2-13. REMOTE UNIT RESISTANCE CHECKS

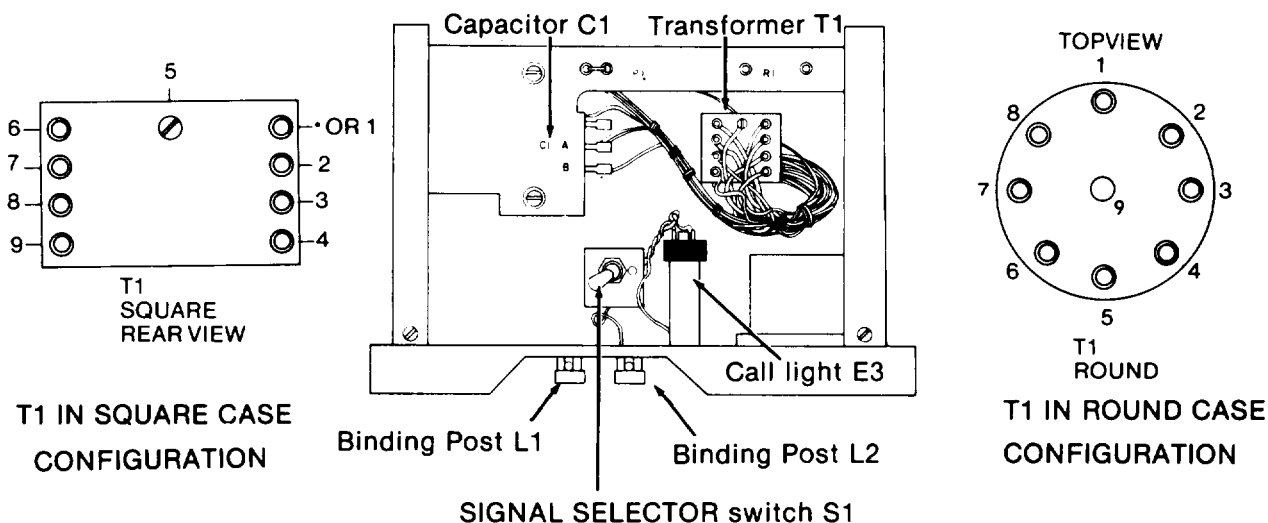
Test Setup

- Remove outer case cover releasing two snap catches (refer to para 2-17).
- Disconnect HS.
- Remove batteries (refer to para 2-17).
- Use Multimeter TS-352B/U.
- Use the following illustrations to locate test points.



NOTE

T1 case configuration may be either round or square.



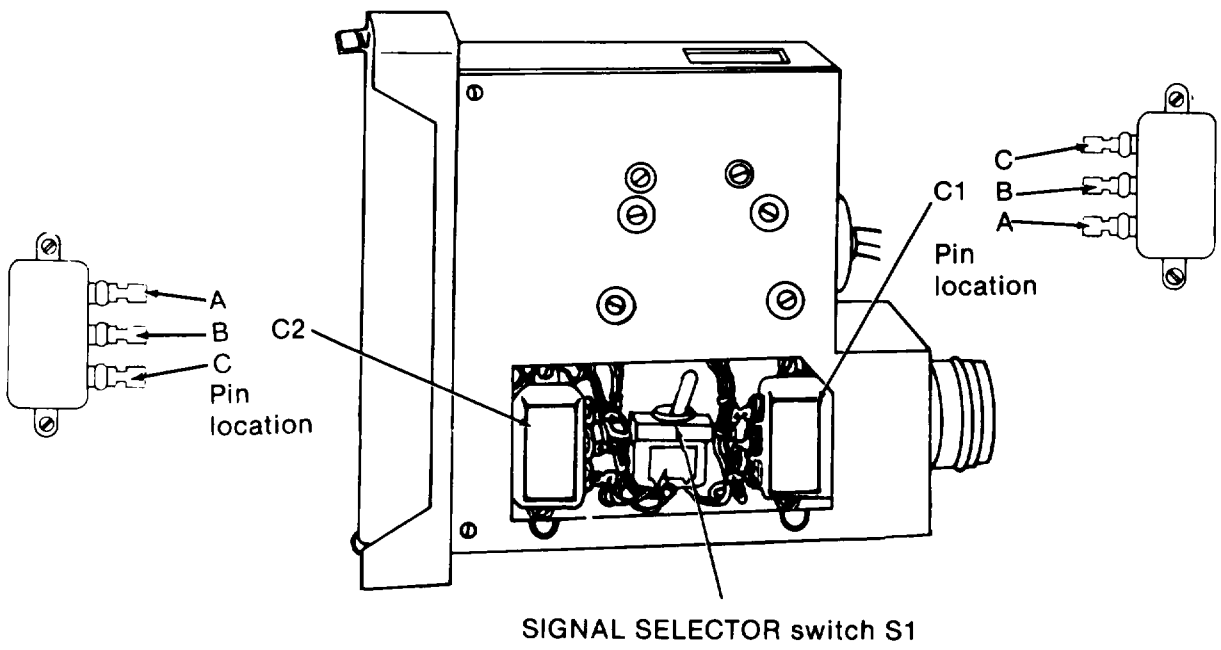
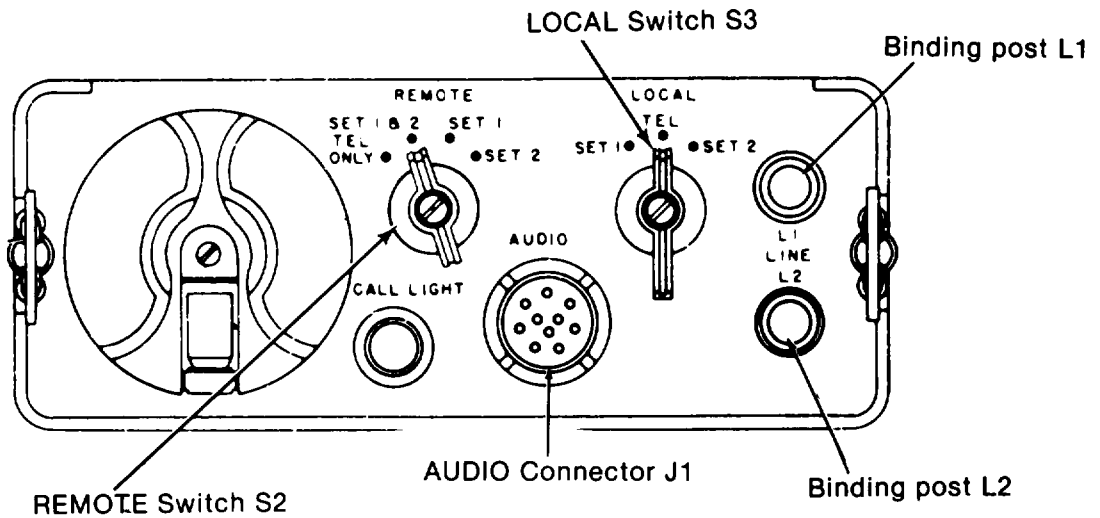
RESISTANCE CHECK			
TEST PROCEDURE	INDICATION	YES	NO
Connect TS-352B/U between:			
1. C of AUDIO connector J1 and battery spring contact.	10 ohms	Go to 2.	Defective wiring, spring contact or transformer.
2. E of AUDIO connector J1 and battery flat contact.	Zero ohms	Go to 3.	Defective wiring or contact.
3. A and B of AUDIO connector J1.	61 ohms	Go to 4.	Defective wiring or transformer.
4. Binding post L1 and terminal 2 of transformer.	25 ohms	Go to 5.	Defective wiring or transformer.
5. F of AUDIO connector J1 and terminal 2 of transformer.	Zero ohms	Go to 6.	Defective wiring or generator.
6. H of AUDIO connector J1 and pin 1 of battery plug. Set SELECTOR to MIDDLE Write-in position.	680 ohms	Go to 7.	Defective wiring, resistor R2 or SELECTOR switch.

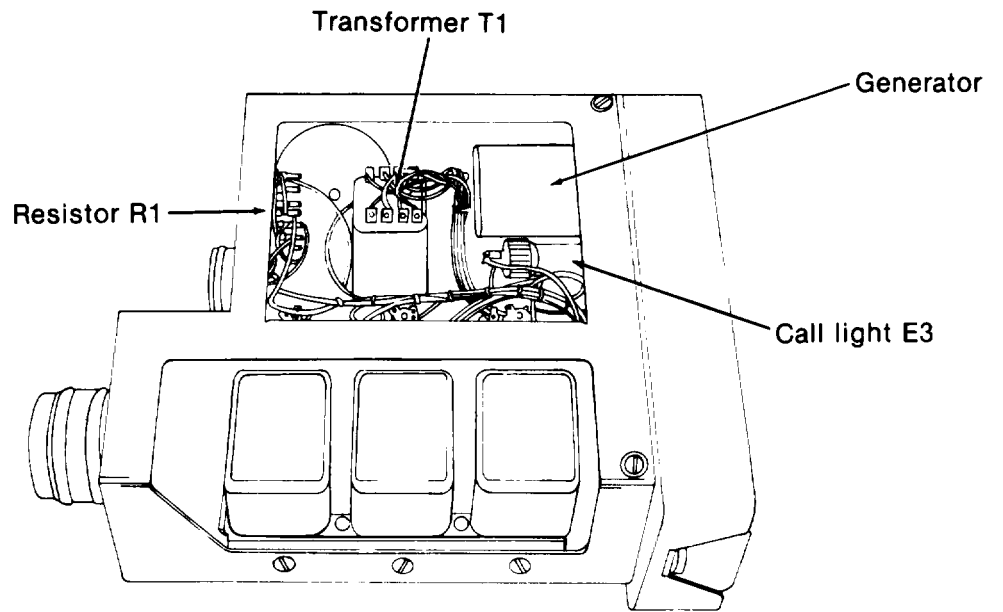
RESISTANCE CHECK			
TEST PROCEDURE	INDICATION	YES	NO
7. Pin 3 of battery plug and terminal 3 of transformer.	Zero ohms	Go to 8.	Defective wiring or SELECTOR switch.
8. H of AUDIO connector J1 and pin 3 of battery plug. Set SELECTOR switch to LH Write-in position.	Zero ohms	Go to 9.	Defective SELECTOR switch.
9. Pin 1 of battery plug and terminal 3 of transformer.	680 ohms	Go to 10.	Defective wiring, resistor R2 or SELECTOR switch.
10. Pin 3 of transformer and binding post L2	27 ohms	Go to 11.	Defective transformer.
11. Negative terminal of call light E3 and pin 1 of generator.	680 ohms	Go to 12.	Defective resistor R2.
12. Pin 2 of generator and pin C of capacitor C1. Set SIGNAL SELECTOR switch to BELL position.	2,550 ohms	Go to 13.	Defective bell, SIGNAL SELECTOR switch and capacitor C1.
13. Pin 2 of generator and the positive terminal of call light E3. Set SIGNAL SELECTOR switch to LAMP position.	Zero ohms	Go to 14.	Defective wiring, or SIGNAL SELECTOR switch.
14. Pin 3 of generator and pin B of capacitor C1.	Zero ohms		Defective wiring.

2-14. LOCAL UNIT RESISTANCE CHECKS

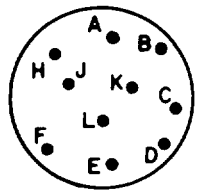
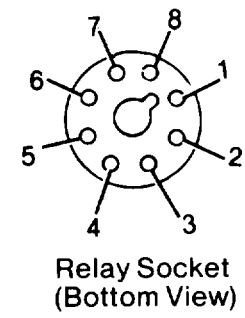
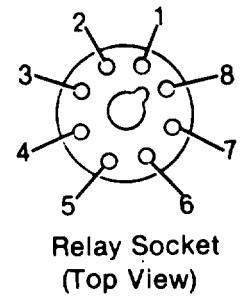
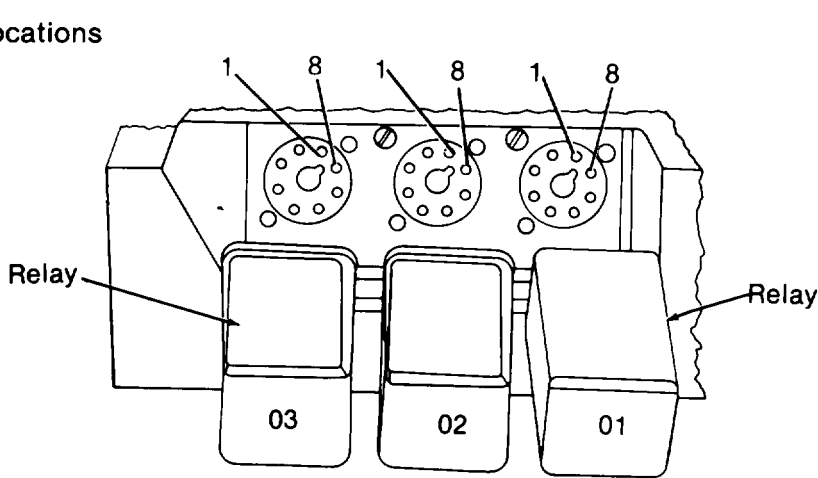
Test Setup

- Remove outer case cover loosening two thumbscrews (refer to para 2-17).
- Disconnect HS.
- Remove batteries (refer to para 2-17).
- Use Multi meter TS-352B/U.
- Use the following illustrations to locate test points.

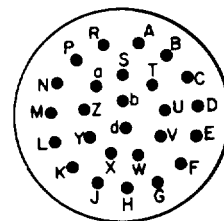




Pin locations



Pin locations J1



Pin locations J2

RESISTANCE CHECK			
TEST PROCEDURE	INDICATION	YES	NO
Connect TS-352B/U between:			
1. Binding posts L1 and L2. Set REMOTE switch to SET 1.	26,000 ohms	Go to 2.	Defective relay 01, 02 or 03, REMOTE switch, capacitor or generator.
2. Set REMOTE switch to TEL ONLY position.	Infinity	Go to 3.	Defective call light, capacitor C1 or generator.
3. L1 and terminal 2 of generator.	25 ohms	Go to 4.	Defective transformer or generator.
4. L1 and terminal B of capacitor C1.	27 ohms	Go to 5.	Defective transformer.
5. Terminal A and B of capacitor C1. Set SIGNAL SELECTOR switch in BELL position.	2,550 ohms	Go to 6.	Defective bell or SIGNAL SELECTOR switch.
6. Terminal 2 of generator and positive terminal of call light. Set SIGNAL SELECTOR switch to LAMP position.	Zero ohms	Go to 7.	Defective SIGNAL SELECTOR switch.
7. C of capacitor C1 and negative terminal of call light.	680 ohms	Go to 8.	Defective resistor R1.
Preliminary			
Remove relays 01, 02 and 03 (refer to para 2-19).			
8. Terminals 2 and 3 of Relay 01.	16,000 ohms	Go to 9.	Defective relay.
9. Terminals 2 and 3 of Relay 02.	5,000 ohms	Go to 10.	Defective relay

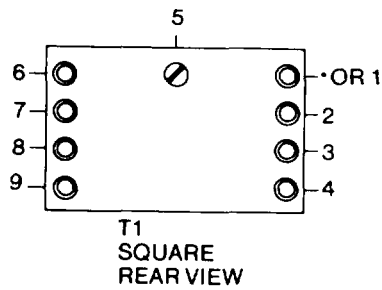
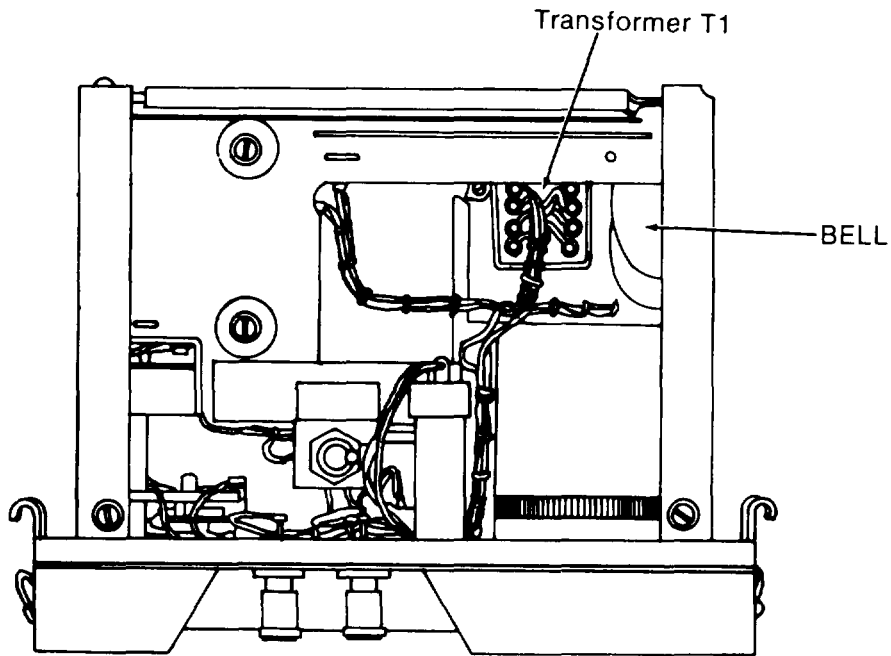
RESISTANCE CHECK			
TEST PROCEDURE	INDICATION	Y E S	N O
10. Pins 2 and 3 of Relay 03	5000 ohms	Go to 11.	Replace relay. (Refer to para 2-19.)
11. A of J1 to pin S of J2. Set REMOTE to TEL ONLY.	Infinity	. . . . .	Replace REMOTE switch. (Refer to para 2-19.)
Set REMOTE switch to SET 1.	Zero ohms	Go to 12.	Replace REMOTE switch. (Refer to para 2-19.)
12. Terminal 7 of Relay 02 Socket and N of J2.	Zero ohms	Go to 13.	Defective wiring.
13. Terminal 6 of Relay 02 Socket and Terminal 7 of Relay 01 Socket.	Zero ohms	Go to 14.	Defective wiring.
14. C of J2 and Terminal 4 of Relay 02.	Zero ohms	Go to 15.	Defective wiring.
15. a of J2 and pin A of capacitor C2.			
Set REMOTE switch to SET 2.	Zero ohms	. . . . .	Replace REMOTE switch. (Refer to para 2-19.)
Set REMOTE switch to SET 2.	Infinity	Go to 16.	Replace REMOTE switch. (Refer to para 2-19.)
16. a of J2 and C of J1. Set LOCAL to SET 2.	Zero ohms	. . . . .	Replace LOCAL switch. (Refer to para 2-19.)
Set LOCAL switch to SET 1.	Infinity	Go to 17.	Replace LOCAL switch. (Refer to para 2-19.)
17. C of J1 and battery spring contact.	Zero ohms	Go to 18	Defective wiring.
18. Battery spring contact and flat contact.	Infinity	Go to 19.	Defective wiring.

RESISTANCE CHECK			
TEST PROCEDURE	INDICATION	YES	NO
19. Battery flat contact to chassis.	10 ohms	Go to 20.	Replace transformer. (Refer to para 2-19.)
20. Pin 5 of transformer and pin C of capacitor C2.	Infinity	Go to 21.	Replace relay 01. (Refer to para 2-19.)
21. Terminal 5 of transformer and Terminal 8 of Relay 01.	Zero ohms	Go to 22.	Defective wiring.
22. Terminal 5 of Relay 01 and pin C of capacitor C2.	Zero ohms	Go to 23.	Defective wiring.
23. T of J2 and C of J1.	Zero ohms		
Set LOCAL switch to SET 1.		.....	Defective wiring or LOCAL switch.
Set LOCAL switch to SET 2.	Infinity	Go to 24.	Defective wiring or LOCAL switch.
24. T of J2 and pin B of capacitor C2.			
Set REMOTE switch to SET 1.	Zero ohms	.....	Replace REMOTE switch. (Refer to para 2-19.)
Set REMOTE switch to SET 2.	Infinity	Go to 25	Defective wiring or REMOTE switch.
25. Terminal a of J2 to pin C of capacitor C2.	* Infinity	Go to 26.	Replace capacitor. (Refer to para 2-19.)
Set REMOTE switch to SET 1 & 2.			
26. Terminal T of J2 and pin C of capacitor C2.	* Infinity	.....	Replace capacitor. (Refer to para 2-19.)
NOTE			
* May indicate capacitor charge.			

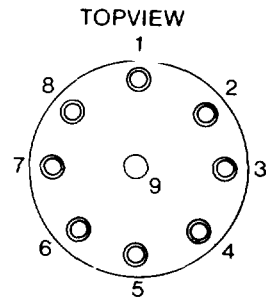
2-15. REMOTE UNIT SUBASSEMBLY RESISTANCE CHECKS

Test Setup

- Remove outer case cover by releasing two snap catches (refer to para 2-17).
- Disconnect HS.
- Remove batteries (refer to para 2-17).
- Use Multi meter TS-352B/U.
- Use the following illustrations to locate test points.



T1 IN SQUARE CASE
CONFIGURATION



T1 IN ROUND CASE
CONFIGURATION

SUBASSEMBLY			
TEST PROCEDURE	INDICATION	YES	NO
<p>(1) TRANSFORMER T1</p> <p>Connect TS-352B/U between:</p> <p>1. Pin 1 and 2</p> <p>2. Pin 3 and 4</p> <p>3. Pin 5 and 6</p> <p>4. Pin 7 and 9</p>	<p>25 ohms</p> <p>27 ohms</p> <p>10 ohms</p> <p>61 ohms</p>	<p>Go to 2.</p> <p>Go to 3.</p> <p>Go to 4.</p> <p>.....</p>	<p>Replace transformer. (Refer to para 2-19.)</p> <p>Replace transformer. (Refer to para 2-19.)</p> <p>Replace transformer. (Refer to para 2-19.)</p> <p>Replace transformer. (Refer to para 2-19.)</p>
<p>(2) BELL</p> <p>Connect TS-352B/U between terminals of bell.</p>	<p>2550 ohms</p>	<p>.....</p>	<p>Replace bell. (Refer to para 2-19.)</p>

NOTE

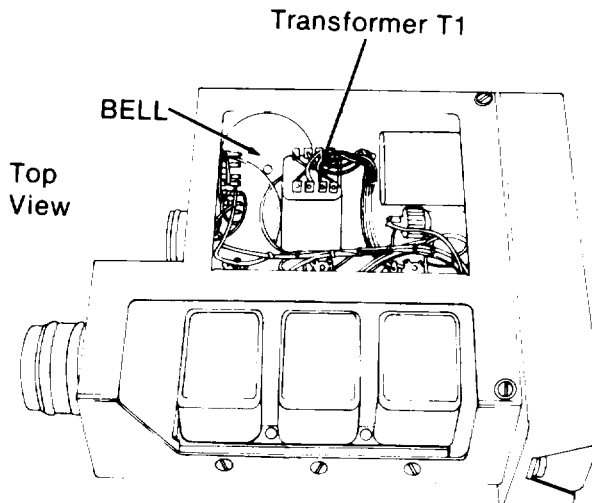
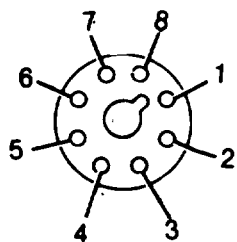
T1 case configuration may be either square or round.

2-16. LOCAL UNIT SUBASSEMBLY RESISTANCE CHECKS

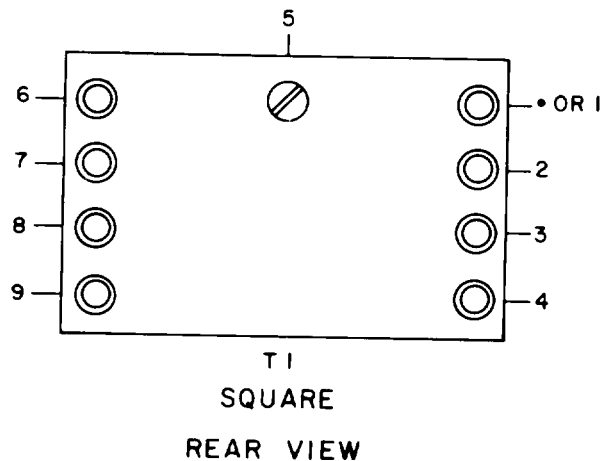
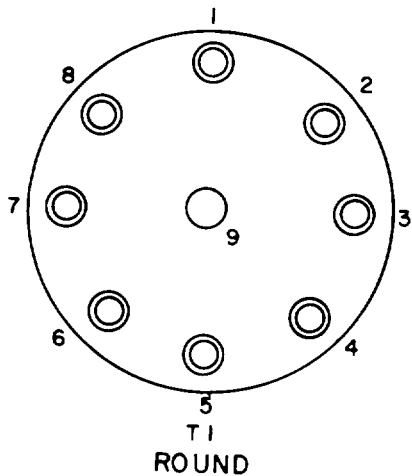
Test Setup

- Remove outer case cover loosening two thumbscrews (refer to para 2-17).
- Disconnect HS.
- Remove batteries (refer to para 2-17).
- Use Multimeter TS-352B/U.
- Use the following illustrations to locate test points.

Pin locations
Relays 01, 02 and 03



TOPVIEW



SUBASSEMBLY			
TEST PROCEDURE	INDICATION	YES	NO
(1) TRANSFORMER T1			
Connect TS-352B/U between:			
1. Pin 1 and 2	25 ohms	Go to 2.	Replace transformer. (Refer to para 2-19.)
2. Pin 3 and 4	27 ohms	Go to 3.	Replace transformer. (Refer to para 2-19.)
3. Pin 5 and 6	10 ohms	Go to 4.	Replace transformer. (Refer to para 2-19.)
4. Pin 7 and 9	61 ohms	.....	Replace transformer. (Refer to para 2-19.)
(2) BELL			
Connect TS-352B/U between terminals of bell.	2550 ohms	.....	Replace bell. (Refer to para 2-19.)
(3) RELAY 01 (Remove)			
Connect TS-352B/U between:			
1. Pin 2 and 3	16,000 ohms	Go to 2.	Replace relay. (Refer to para 2-19.)
2. Pin 4 and 6	Zero ohms	Go to 3.	Replace relay. (Refer to para 2-19.)
3. Pin 6 and 7	Infinity	Go to 4.	Replace relay. (Refer to para 2-19.)

SUBASSEMBLY			
TEST PROCEDURE	INDICATION	YES	NO
(3) RELAY 01 contd			
4. Pin 5 and 8	Infinity	.....	Replace relay. (Refer to para 2-19.)
(4) RELAY 02 or 03			
Connect TS-352B/U between:			
1. Pin 2 and 3	5000 ohms	Go to 2.	Replace relay. (Refer to para 2-19.)
NOTE			
One pair of contacts should read zero ohms; the other should read infinity.			
2. Pin 4 and 6	Zero or infinity	.....	Replace relay. (Refer to para 2-19.)
3. Pin 6 and 7	Zero or infinity	.....	Replace relay. (Refer to para 2-19.)

Section III. MAINTENANCE INSTRUCTIONS

This section will describe the following procedures for Control Group AN/GRA-6:

- Disassembly.
- Cleaning.
- Repair and replacement of parts identified as defective during Troubleshooting procedure.
- Reassembly.

After repairs or replacement have been made to components of Control Group AN/GRA-6 it should be ready for return to service. To verify its condition conduct the operational checks described in TM 11-5820-489-20.

2-17. DISASSEMBLY

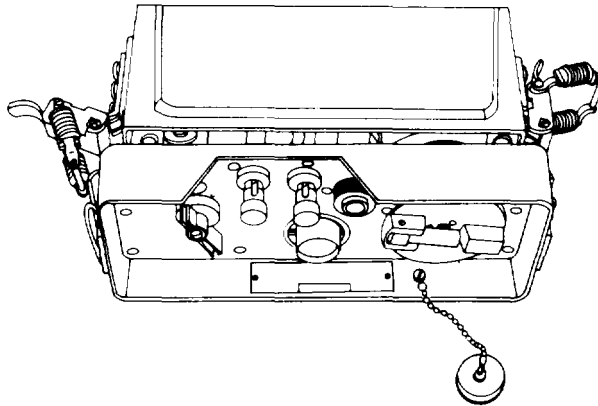
CAUTION

Always read over and be sure you understand the instructions before attempting disassembly. Use the following illustrations to locate parts and subassemblies of the unit to be disassembled. Careful removal of parts is important to avoid damage to the equipment. Small parts such as screws and washers should be stored in small containers and marked to aid in reassembly.

Remote Control C-433/GRC

- Use these illustrations for disassembly.

a. **Outer Case** - To remove outer case, loosen the two snap catches on the side of the case and slide the unit out of the case.

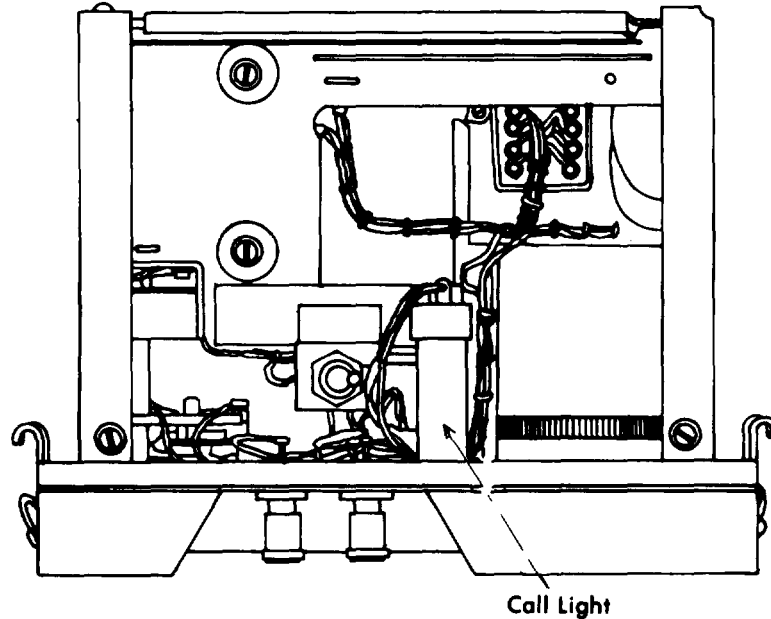


b. **Batteries** - Remove the battery compartment cover and batteries in the following manner:

- Place Remote Control with the panel down on a table with the left side of the unit facing away from you.
- Grasp the unit with both hands so that your thumbs rest on the two holes in the battery cover.
- Place your fingers on the side of the chassis where the smaller dry cell batteries (BT1 and BT2) are visible to prevent them from slipping.
- Press down on the cover and slide it back enough to allow the cover to pop up slightly.
- Now slide the cover forward until it is released.
- Remove the cover.
- Remove the small dry cell batteries BT1 and BT2.
- Remove battery connector plug P1 and remove BT3.

c. **Call Light** - Remove the call light holder in the following manner:

- Grasp the call light socket cap and pull it straight back out of the panel.
- Be careful not to break any wires or damage parts.

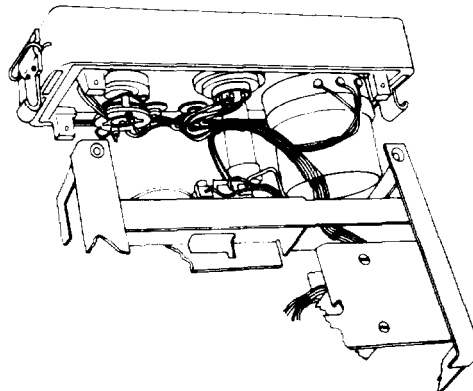


CAUTION

Be careful when removing the panel from the chassis to avoid damage to the connecting cable.

d. **Panel** - The panel should be removed only when it is necessary to repair a part on the panel. Remove the panel in the following manner:

- Locate the four machine screws, one at each corner of the chassis, which hold the panel in place.
- Remove these four screws and save for reassembly.
- Pull the panel gently away from the chassis frame.

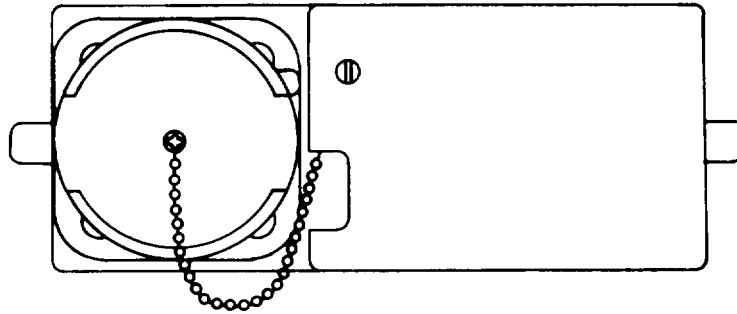


Local Control

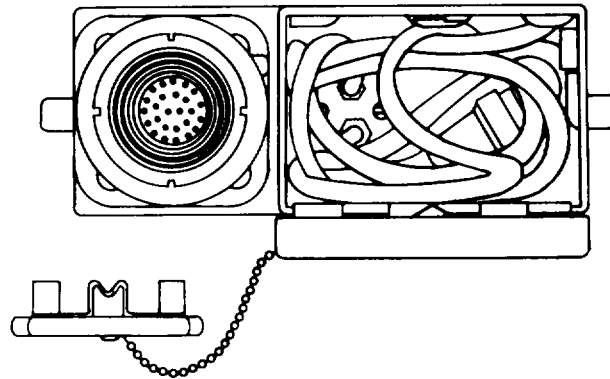
- Use these illustrations for disassembly.

a. **Outer Case** - Remove the outer case in the following manner:

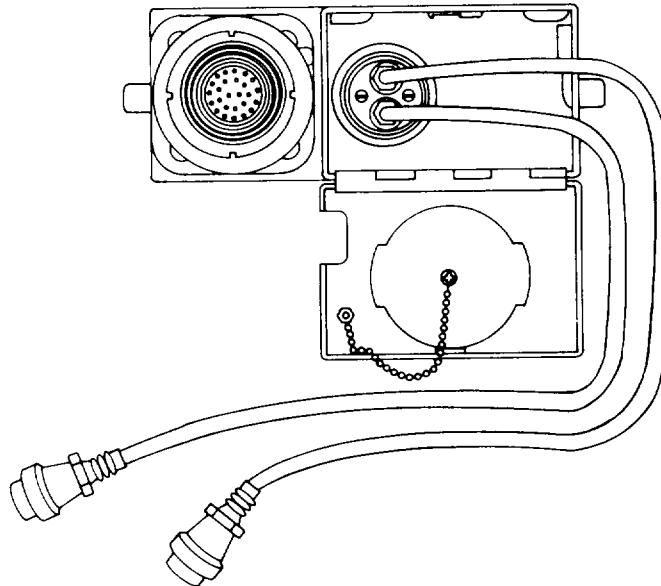
- Remove the cap covering connector J2 at the rear of the unit.



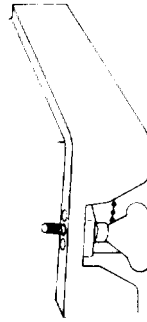
- Press down the snap latch at the top rear of the unit and open the cable compartment cover.



- Mount the J2 cover cap on the brackets inside the cable compartment cover.



- Release the two thumbscrews on the front panel to disengage the panel from the outer case.



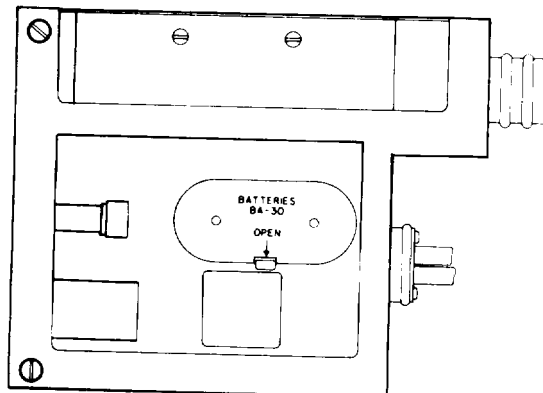
- Place Local Control panel down, on a table and lift off the cover.
- Feed the cables and the cable connectors through the hole in the cable compartment.

NOTE

It may be difficult sliding connector J2 through the hole in the case. This usually happens when the two O-rings on connector J2 are swollen. Apply a small amount of vaseline or PC-4 grease to the O-rings. Connector J2 should slide through the hole easily.

b. Batteries - Remove the battery compartment cover and batteries in the following manner:

- Locate the plastic battery container in the battery compartment.
- Press the snap catch which holds the battery container cover in place and remove the cover.
- Remove dry cell batteries BT1 and BT2.



c. Call Light - Remove the call light holder in the following manner:

- Grasp the call light socket and pull it straight back out of the panel.
- Be careful not to break any wires or damage parts.

CAUTION

Be careful when removing the panel from the chassis to avoid damage to the connecting cable.

d. **Panel** - The panel should be removed only when it is necessary to repair a part on the panel. Remove the panel in the following manner:

- Locate the four machine screws, one at each corner of the chassis, which hold the panel in place.
- Remove these four screws and save for reassembly.
- Pull the panel gently away from the chassis frame.

Visual Inspection

With Remote Control or Local Control disassembled it is simple to inspect all parts and wiring for any abnormal conditions. The causes of any abnormal conditions should be isolated and repaired. Specific repair and replacement procedures are covered in para 2-19. Now conduct the following visual checks:

- Inspect all parts for rust, corrosion, dirt, breakage or other damage.
- Inspect wiring for loose connections and frayed or burnt insulation.
- Inspect mounting hardware for mechanical defect, i.e., stripped threads, etc.
- Inspect transformer T1, ringing generator and switches for loose or broken lugs.
- Inspect all mounting hardware for looseness or defects.
- Inspect all battery contacts (flat and spring type) within the battery compartment and battery compartment cover for corrosion or broken, loose or damaged springs or contacts.
- Inspect the plug-in socket of BT3 for defects.
- Inspect battery plug P1 for pin or wire damage.

2-18. CLEANING

Dirt and corrosion interfere with electrical continuity and mechanical operation of equipment. All parts of the panel and chassis should be cleaned carefully. Use a lint-free cloth and dampen if necessary for most cleaning tasks. Always use a dry, lint-free cloth to wipe off the part or area that was cleaned.

Only use a cleaning solvent when absolutely necessary. Make sure that the cleaning compound is approved and that the following warnings are followed:



Adequate ventilation should be provided while using TRICHLOROTRI-FLUOROETHANE. Prolonged breathing of vapor should be avoided. The solvent should not be used near heat or open flame; the products of decomposition are toxic and irritating. Since TRICHLOROTRI-FLUOROETHANE dissolves natural oils, prolonged contact with skin should be avoided. When necessary, use gloves which the solvent cannot penetrate. If the solvent is taken internally, consult a physician immediately.

2-19. REPLACEMENT OF PARTS

Replacement of parts or subassemblies for Control Group AN/GRA-6 should be based on one or more of the following:

- Visual inspection reveals an obvious defect.
- Operation checks reveal a possible fault.
- Troubleshooting procedure reveals a possible fault.
- Test results reveal a fault.

CAUTION

Perform operational checks after every repair or replacement. Refer to paragraph 2-7 or 2-8.

NOTE

When operation checks or troubleshooting procedures reveal a possible fault, an actual voltage or resistance measurement test should be performed to verify the fault. Make sure that all the TEST SETUP steps are followed and the correct points of measurement are used. Except for an obviously broken, burnt or corroded part, no part or subassembly should be replaced without using every possible means to verify the fault.

NOTE

When repairing or replacing parts or subassemblies of Control Group AN/GRA-6 remember the following:

- Tag leads or wires to ensure correct rewiring.
- Clean the unit thoroughly to remove all solder drops, metal chips or foreign matter after completing repairs or replacement.
- Support the unit or subassembly properly to avoid straining or breaking wire connections between parts or subassemblies.
- Use a heat sink when soldering and unsoldering.

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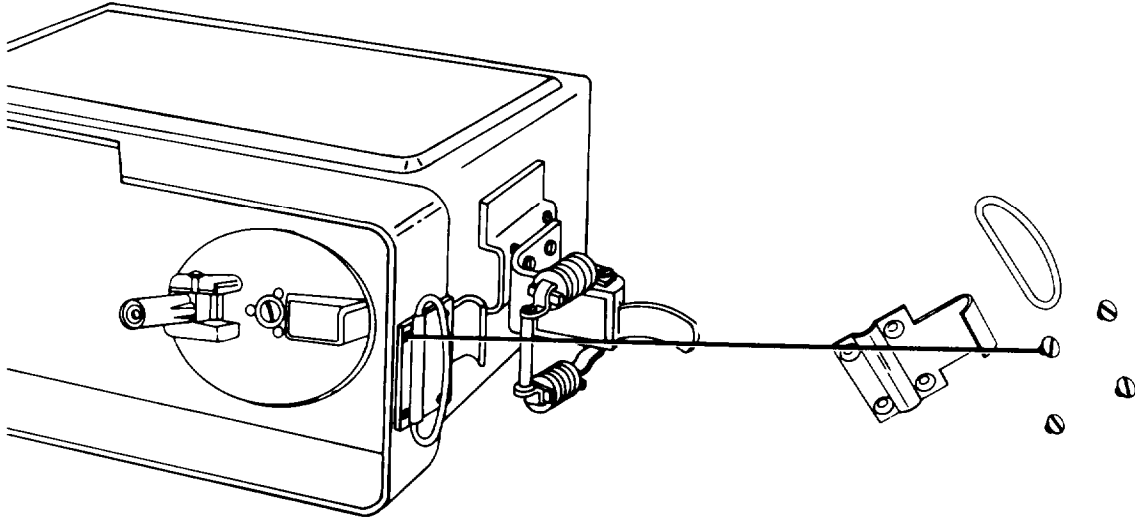
Replacement of many parts in Remote Control requires disassembly of the unit as described in para 2-17. Disassembly will divide the unit into three subassemblies:

- Panel Group
- Chassis Group
- Battery Cover Group.

Panel Group
Disassembly Not Required/Outer Cover Removed

a. **Luggage Catch/D-Ring.** The luggage catch also serves as a mounting point for the D-Ring.

- Remove the four screws mounting the luggage catch to panel.



- Remove luggage catch and D-ring.
- Install replacement luggage catch and/or D-ring using four mounting screws.
- Tighten four mounting screws.

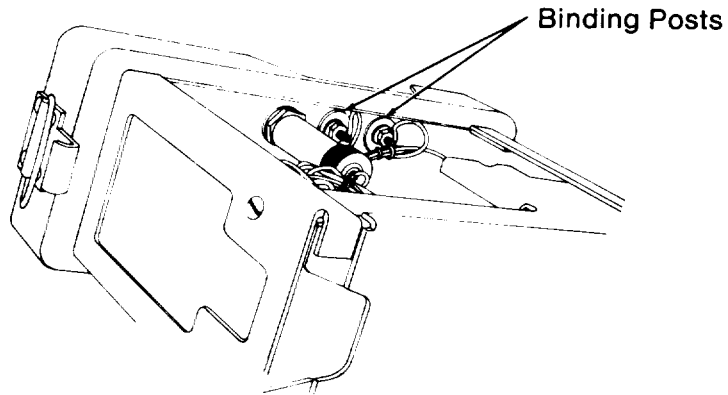
b. **Selector Switch Marker Disc**

- If marker disc is broken remove any pieces still mounted on the panel.
- Clean out the mounting area on the panel.
- Install the replacement disc using a suitable glue.

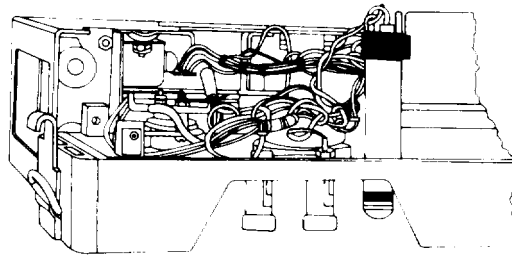
c. **Call Light Socket**

- Grasp the indicator light and pull it straight back out of the panel socket and remove bulb.
- Unsolder and tag the wires from the back of the call light socket.
- Solder the wires to the replacement call light socket.
- Carefully replace the call light socket.

d. Binding Posts (Includes Insulator and Extruded Washers)



- Locate the binding post at the rear of the panel and unsolder the wire from the stud. Tag the wire.
- Remove the nut which holds the binding post in place. It is at the rear of the binding post.



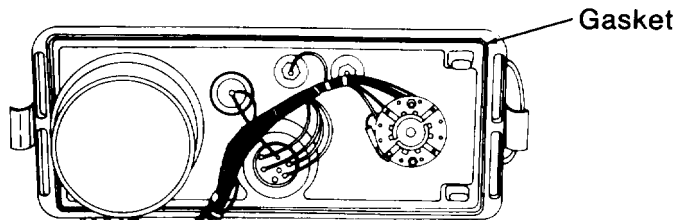
- Pull the binding post out from the front of the panel and save the extruded washer and insulator washer unless they are to be replaced. Note the order of the washers.
- Install the replacement binding post, extruded washer and insulator washer into the panel from the front.
- Install the binding post attaching nut to the binding post from the rear of the panel. Do not strip the threads.
- Solder the tagged wire to the binding post stud.

Disassembly Required

Replacement of the following parts in the panel group requires disassembly. See paragraph 2-9 for disassembly procedures for Remote Control.

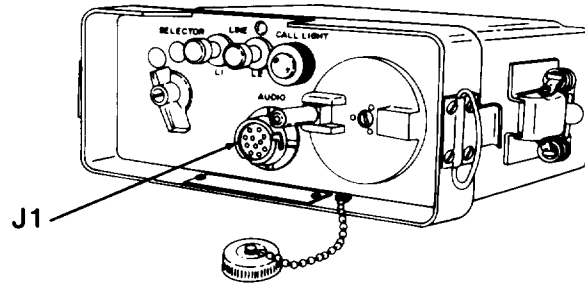
e. Gasket

- Remove the gasket from the groove on the rear of the panel.
- Clean out the groove, removing all old gasket material and dirt.
- Apply DC-4 grease or an approved sealing compound to the new gasket.
- Install the new gasket in the groove, be sure it fits properly.

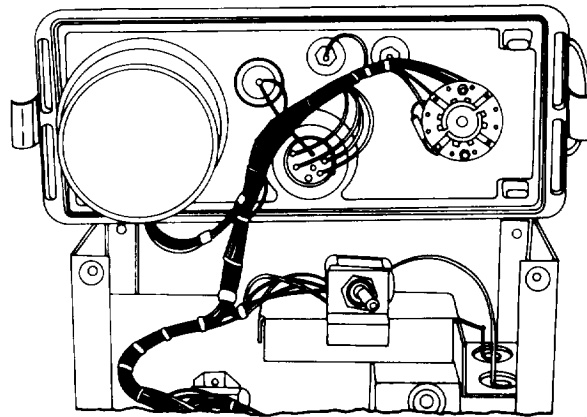


f. Audio Connector J1

- Insert a spanner wrench in the notches of the nut which secures J1 to the front of the panel.



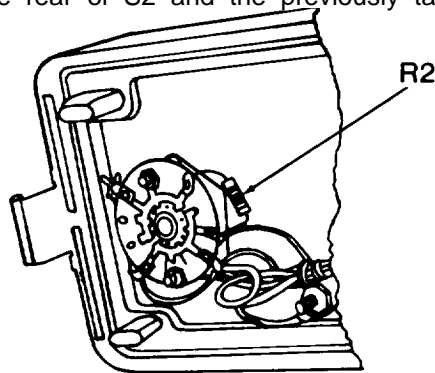
- Turn the wrench counterclockwise until the nut is completely loose.
- Remove the nut and lock washer.
- Unsolder and tag all wires.
- Remove J1 from the rear of the panel.



- Make sure the replacement J1 has a rubber gasket.
- Resolder the wires to the new J1.
- Remove all solder drops.
- Insert the replacement J1 in the panel from the rear.
- Attach the lock washer and nut onto the threaded portion of J1. Do not strip the threads.
- Tighten the nut finger tight and then tighten securely with the spanner wrench.

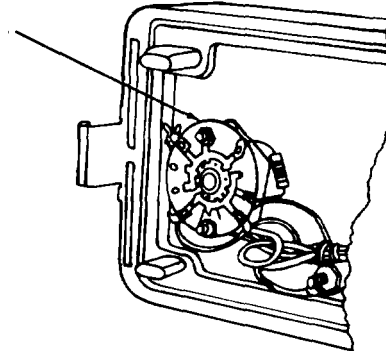
g. Resistor R2

- Resistor R2 is attached to the rear of SELECTOR switch S2.
- Carefully unsolder R2 and tag the wire which is attached with R2 to S2.
- Solder the replacement R2 to the rear of S2 and the previously tagged wire.

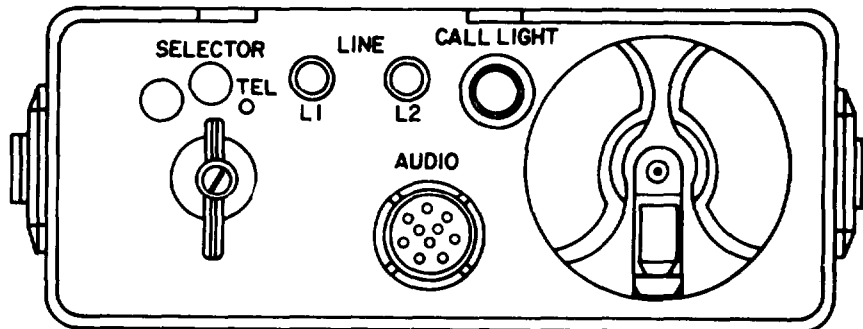


h. SELECTOR Switch S2

- Unsolder and tag all wires from the switch.



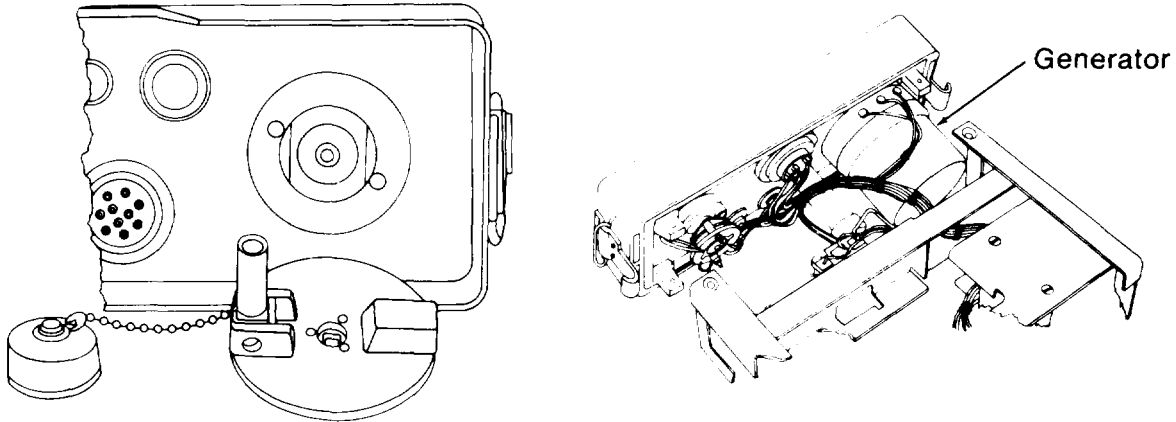
- Remove the switch knob retaining screw and knob from the front of the panel.
- Remove the castellated retaining nut from the front of the panel using a spanner wrench.



- Remove the switch from the rear of the panel.
- Insert the replacement switch into the panel from the rear. Make sure the key on the switch fits into the slot in the panel.
- Handle the switch carefully to avoid breaking the wafer.
- Restore the castellated retaining nut using a spanner wrench and tighten. Do not strip the threads.
- Restore the switch knob and retaining screw and tighten.
- Check the operation of the switch in each operating position.
- Resolder the wires to the switch.
- Remove all solder drops.

i. Generator

- The generator is replaced as a unit assembly.
- remove the screw and lock washer which hold the generator crank handle.
- Slide the crank off the shaft.



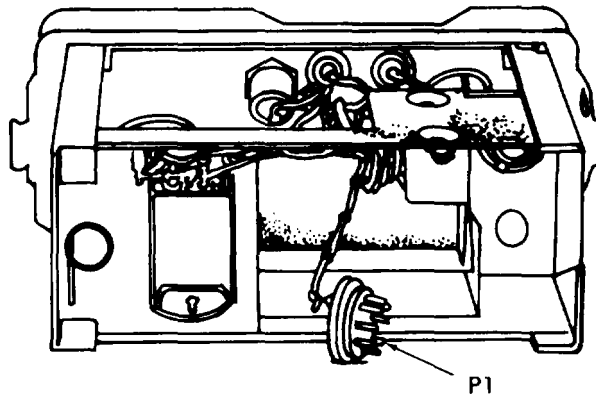
- Disconnect the wires attached to the rear of the generator and tag.
- Use a spanner wrench and remove the nut which holds the generator to the panel.
- Pull the generator out from the rear of the panel.
- Install the replacement generator into the panel.
- Restore the nut which holds the generator to the panel and tighten it. Do not strip the threads.
- Reattach the wires to the rear of the generator.
- Install the generator crank handle on the shaft.
- Install the lock washer and screw which hold the crank handle and tighten.

Chassis Group

Replacement of most parts in the chassis group can be made without disassembly. Remove the battery cover before proceeding.

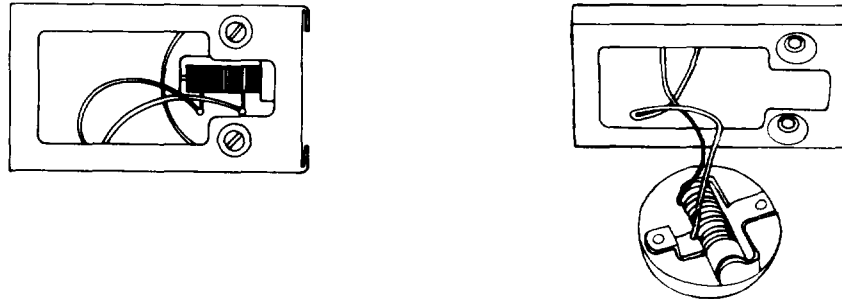
a. Battery Connector Plug P1

- Heat pins 1 and 3 with soldering iron to remove wires and tag them.
- Solder the wires to the replacement battery plug.



b. Telephone Ringer (Bell)

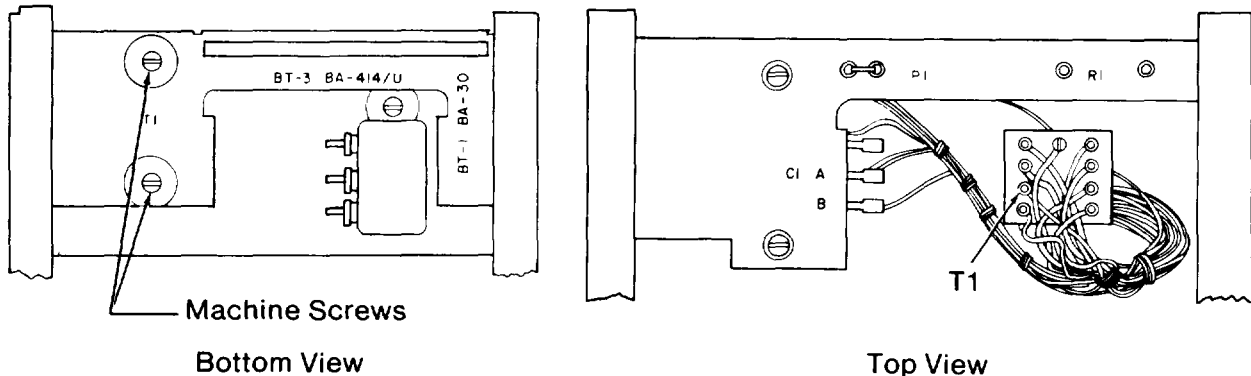
- Remove the two machine screws which mount the ringer to the chassis.
- Lift the ringer out of the compartment being careful not to strain or break wires or connections.



- At the terminal board unsolder the wires connecting to the ringer.
- Resolder the wires from the replacement bell to the terminal board.
- Restore the bell in its compartment in the chassis.
- Install the two mounting screws and tighten.

c. Transformer T1

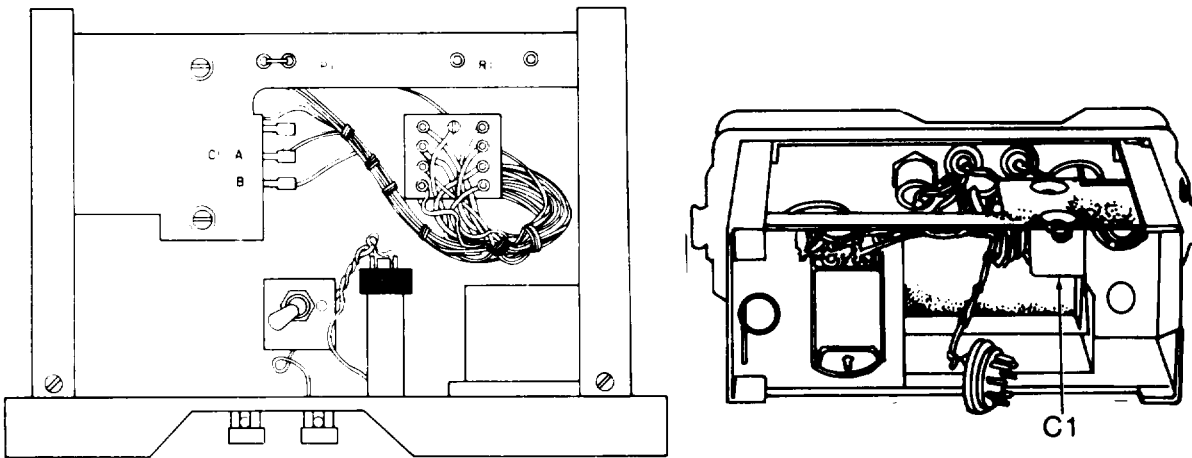
- Remove the two machine screws which mount the transformer to the chassis.



- Carefully lift the transformer straight-up out of the chassis. Be careful not to strain or break any wires or connections.
- Unsolder and tag the wires connected to the transformer.
- Resolder the wires to the replacement transformer.
- Put the transformer back into its place in the chassis.
- Install the two machine screws mounting the transformer to the chassis and tighten.

d. Capacitor C1

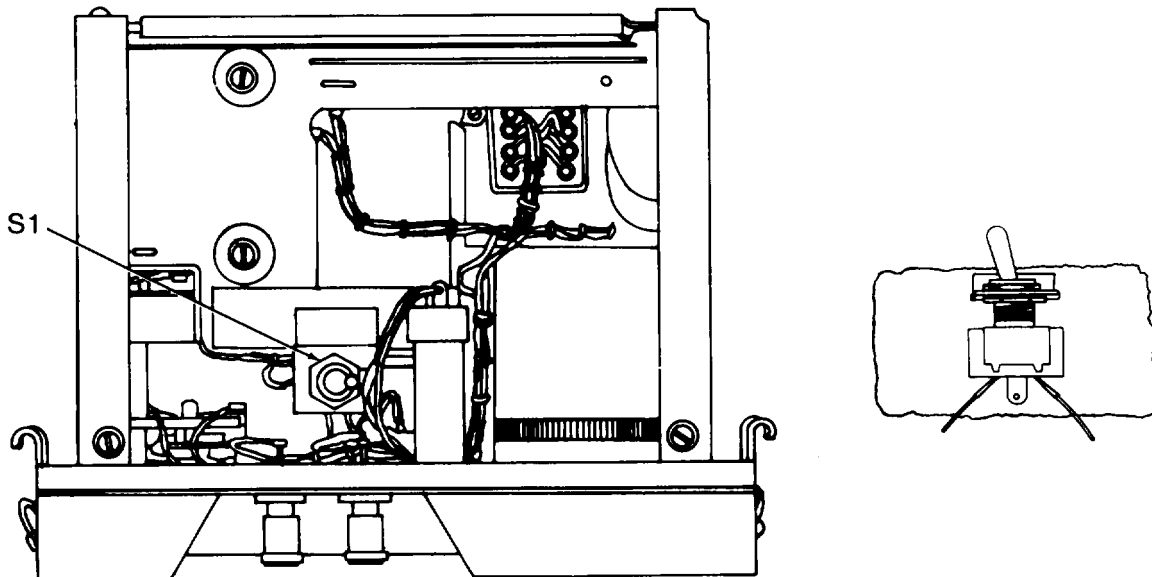
- Remove the two machine screws, lock washers and nuts mounting the capacitor to the chassis.



- Carefully lift the capacitor out of the chassis being careful not to strain or break any wires or connections.
- Unsolder and tag the wires connected to the capacitor.
- Resolder the wires to the replacement capacitor.
- Put the capacitor into its compartment in the chassis.
- Install the two mounting screws and tighten.

e. Toggle Switch S1

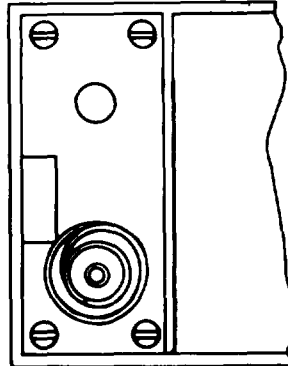
- Use a wrench to remove the nut which mounts the switch to its mounting plate.
- Pull the switch out of the mounting plate.
- Unsolder and tag the wires connected to the switch.



- Resolder the wires to the replacement switch.
- Restore the switch to the mounting plate.
- Install the mounting nut and tighten.

f. **Battery Contacts.** If either contact of the battery contact assembly is damaged or corroded replace the entire assembly in the following manner:

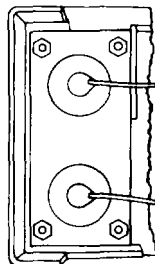
- Drill out the four rivets which mount the contact assembly to the chassis.



NOTE

If the contact assembly has been replaced before, it may be attached with machine bolts, lock washers, and nuts instead of rivets.

- Lift the contact assembly out of its compartment being careful not to break any wires or connections.
- Unsolder the wires connected to the contact assembly.
- Resolder the wires to the replacement contact assembly.



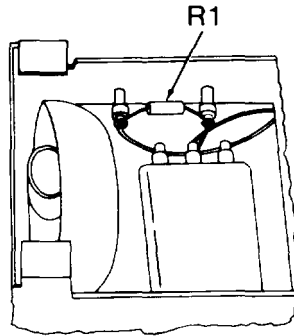
- Install the contact assembly in its proper location in the chassis.
- Fasten the contact assembly to the chassis using machine bolts, lock washers and nuts.

NOTE

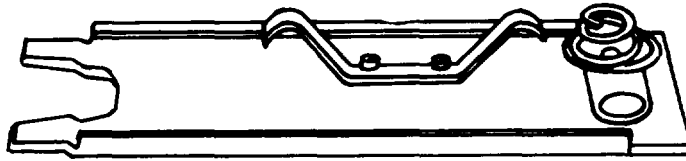
Clean corroded contacts before replacing the contact assembly.

g. Resistor R1

- Resistor R1 is located on two standoffs close to the telephone ringer and transformer T1.
- Carefully unsolder R1.
- Solder the replacement R1 in position.



Battery Cover Group



a. Battery Contacts

- Drill out the four rivets which mount the contact assembly to the battery cover.
- Lift the assembly off the cover.
- Put the replacement contact assembly on the cover.
- Using machine bolts, lock washers and nuts, mount the contact assembly to the cover and tighten.

b. Spring Holder (Battery)

- Drill and remove the rivets or remove the machine bolts and nuts which mount the spring holder to the battery cover.
- Remove the spring holder.
- Install the replacement spring holder.
- Restore the nuts and tighten.

Local Control C-434/GRC

Replacement of many parts in Local Control requires disassembly of the unit as described in paragraph 2-17. Disassembly will divide the unit into these subassemblies:

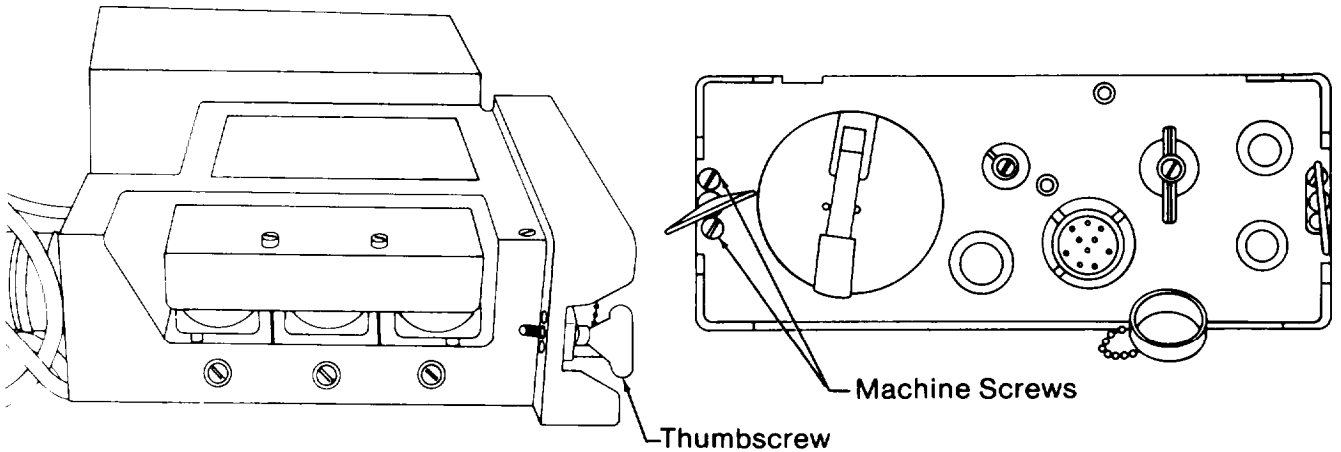
- Panel Group
- Chassis Group
- Cable Compartment Group

The part to be repaired or replaced will be located in one of these three subassemblies of Local Control. Use the following illustrations to locate the part and proceed to the following subparagraph dealing with repair or replacement of parts in that subassembly.

Panel Group

Disassembly Not Required

a. Thumbscrew



- Remove outer case.
- Turn thumbscrew to a horizontal position.
- Remove the two machine screws which secure thumbscrew to panel.
- Pull the thumbscrew assembly away from the panel.
- Install the replacement thumbscrew assembly on the panel.
- Install the two mounting screws and tighten.

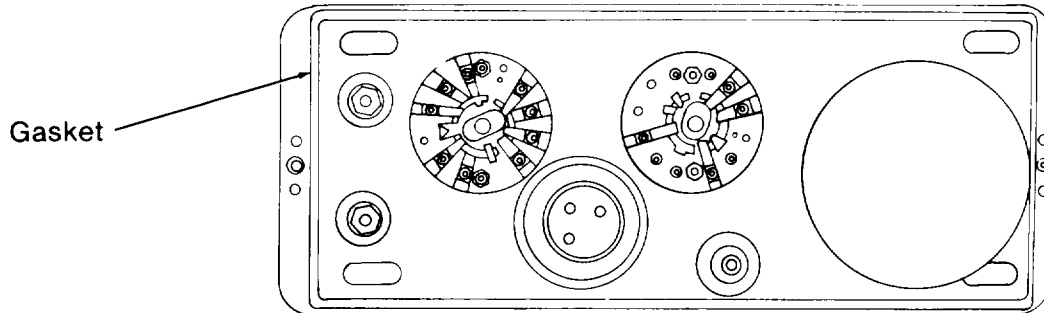
b. Indicator Light

- Remove battery cover for BT1 and BT2.
- Remove BT1 and BT2.
- Grasp the indicator light and pull it straight back out of the panel socket.
- Be careful not to break any wires or damage any parts.
- Unsolder and tag the wires from the back of the indicator light.
- Solder the wires to the replacement indicator lamp.
- Carefully replace the indicator light in the panel socket.
- Install BT1 and BT2.
- Install the battery cover.

Disassembly Required

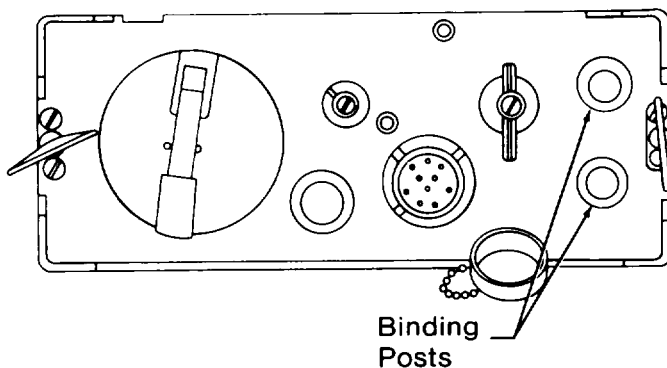
Replacement of the following parts in the panel group requires disassembly. See paragraph 2-17 for disassembly procedures for Local Control.

c. Gasket

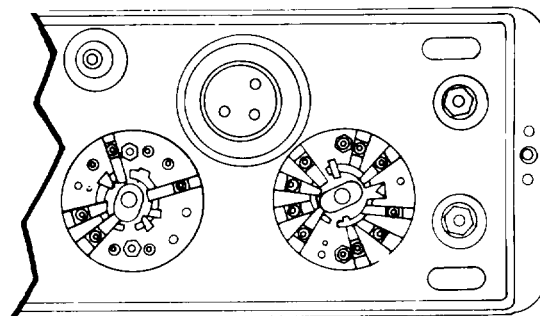


- Remove the gasket from the groove around the back of the panel.
- Clean out the groove, removing all old gasket material and dirt.
- Apply DC-4 grease or an approved sealing compound to the new gasket.
- Install the new gasket in the groove ensuring proper fit.

d. Binding Post (Includes Insulator and Extruded Washers)



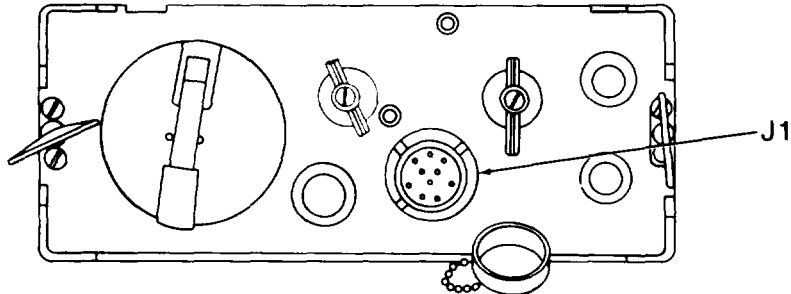
Rear View



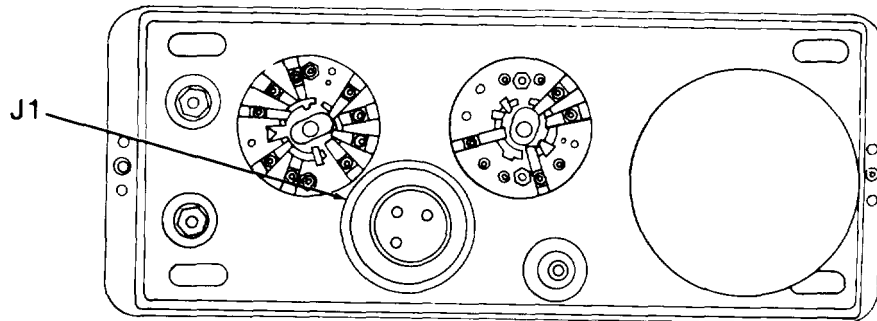
- Unsolder and tag the wire from the rear of the binding post.
- Remove the nut which holds the binding post in place at the rear of the panel.
- Pull the binding post out from the front of the panel and save the extruded washer and insulator washer unless they are to be replaced. Note the order of the washers.
- Install the replacement binding post, extruded washer and insulator washer in the panel from the front.
- Fasten the binding post attaching nut to the binding post from the rear of the panel. Do not strip the threads.
- Solder the tagged wire to the binding post stud.

e. Audio Connector J1

- Insert a spanner wrench in the notches of the nut which secures J1 to the panel.



- Turn the wrench counterclockwise until the nut is completely loose.
- Remove the nut and lock washer.
- Unsolder and tag all wires.

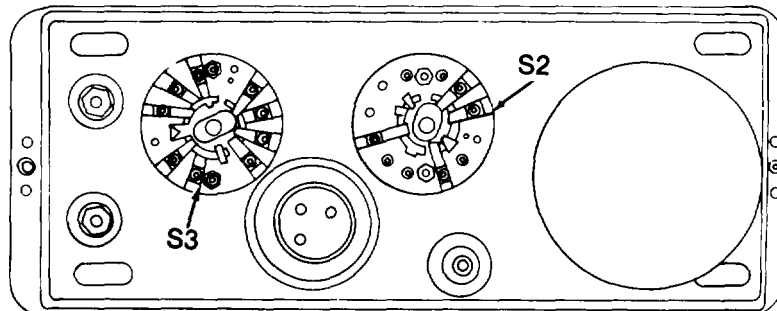


- Remove J1 from the rear of the panel.
- Make sure the replacement J1 has a rubber gasket.
- Resolder the wires to the new J1.
- Remove all solder drops.
- Insert the replacement J1 into the panel from the rear.
- Attach the lock washer and nut onto the threaded portion of J1 from the front of the panel.
- Tighten the nut finger tight and then tighten securely with the spanner wrench.

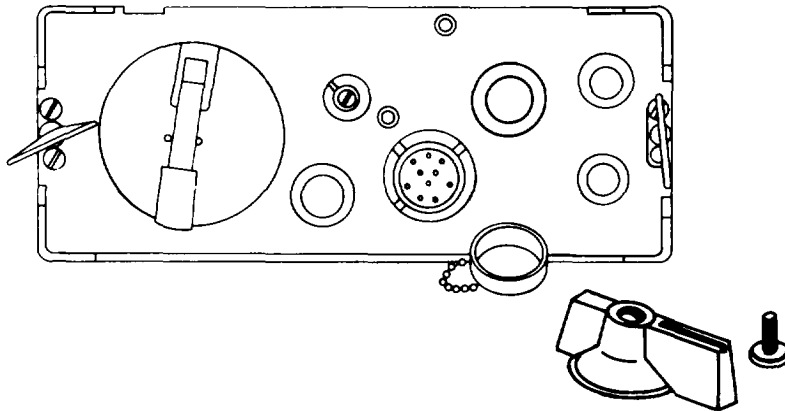
f. Rotary Switches S2 and S3

For replacement of REMOTE Switch (S2) and LOCAL Switch (S3) use the following procedure:

- Unsolder and tag all wires from the switch.

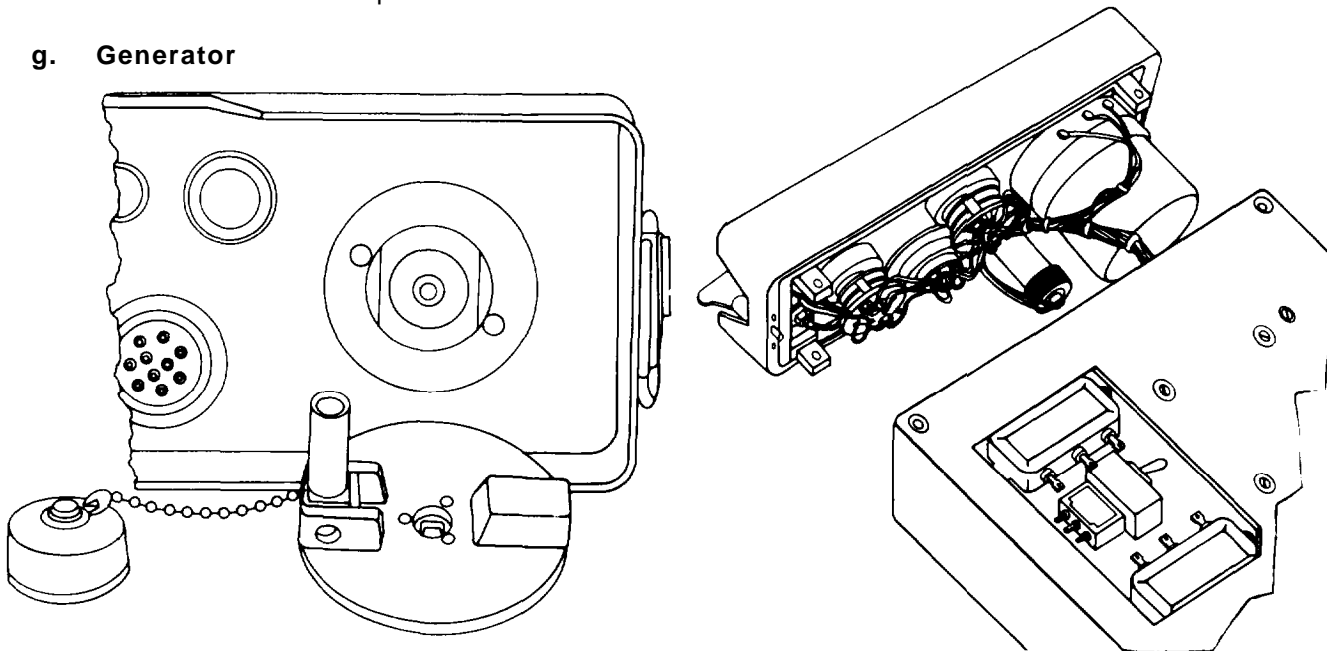


- Remove the switch knob retaining screw and knob from the front of the panel.



- Remove the castellated retaining nut from the front of the panel using a spanner wrench.
- Remove the switch from the rear of the panel.
- Insert the replacement switch into the panel from the rear. Make sure the key on the switch fits into the slot in the panel.
- Handle the switch carefully to avoid damaging the wafer.
- Replace the castellated retaining nut using a spanner wrench.
- Replace the knob and retaining screw and tighten.
- Check the operation of the switch in each operating position.
- Resolder the wires to the switch and remove tags.
- Remove all solder drops.

g. Generator



- The generator is replaced as a unit assembly.
- Remove the screw and lock washer which hold the generator crank to the front panel.
- Slide the crank off the shaft.
- Tag and disconnect the wires attached to the rear of the generator.
- Use a spanner wrench and remove the nut which holds the generator to the panel.
- Pull the generator out from the rear of the panel.
- Install the replacement generator into the panel.

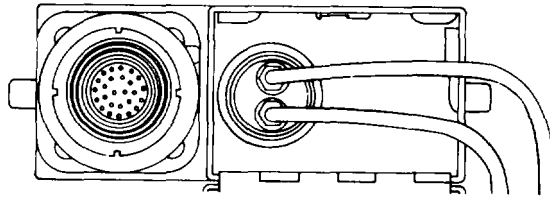
- Restore the nut which holds the generator to the panel and tighten it. Do not strip the threads.
- Reattach the wires to rear of the generator and remove tags.
- Install the generator crank handle on the shaft.
- Install the lock washer and screw which hold the crank to the front panel and tighten.

Chassis Group

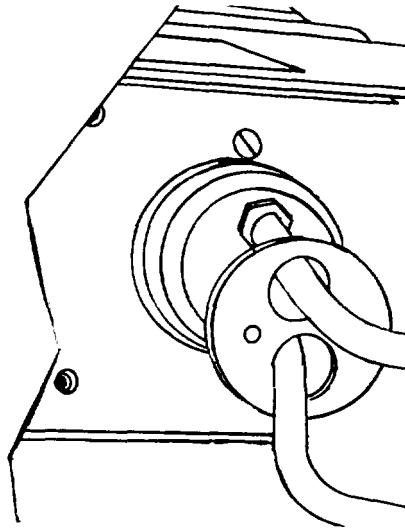
Disassembly Not Required

a. Cable Assembly

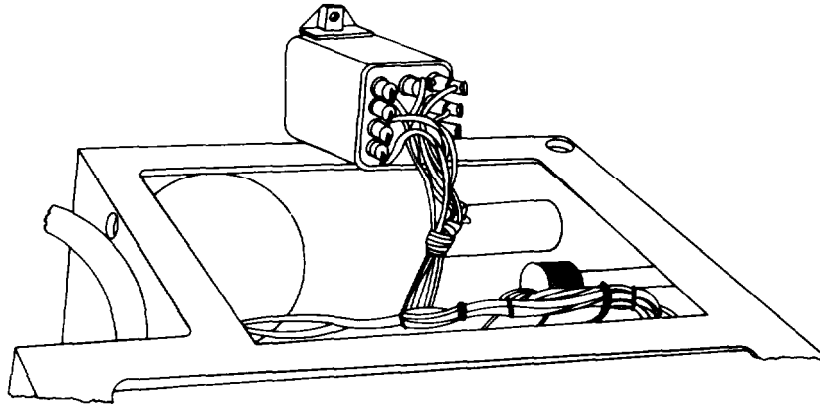
- Remove two machine screws which secure the cover over the packing nuts.



- Remove the cover.
- Use a wrench and loosen the packing nuts which fasten the cable assembly to the mounting points on the chassis.

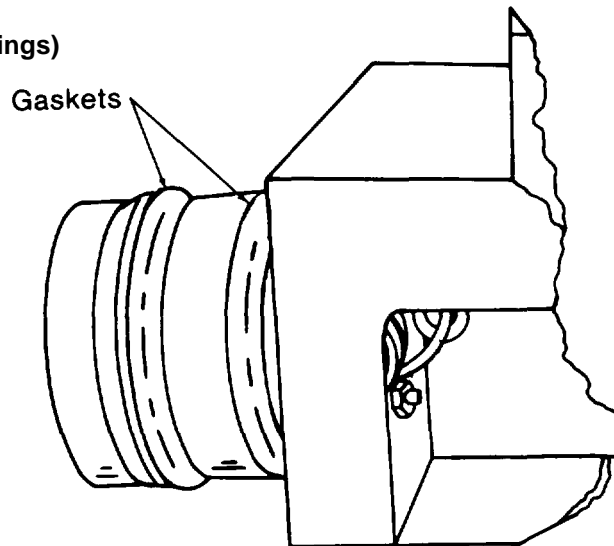


- Remove battery cover, BT1, BT2 and battery holder.
- Remove transformer T1 mounting screws.
- Pull T1 up and out of the chassis being careful not to break any wires or connections.
(See steps in d. below)
- Remove two machine screws mounting terminals board to chassis.
- Pull terminal board out of chassis carefully.
- Tilt terminal board for access, unsolder and tag all connections from cable assembly.
- Remove the cable assembly, packing nuts and washers.



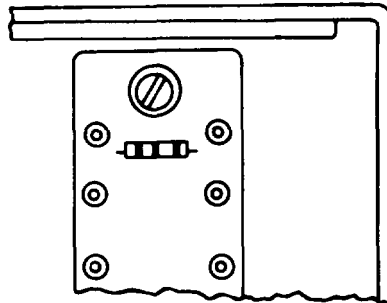
- Install replacement cable assembly.
- Solder all wires and connections to terminal board from replacement cable assembly.
- Install terminal board in chassis with two mounting screws and tighten.
- Replace T1 and mounting screws in chassis and tighten.
- Replace battery holder with four mounting screws.
- Replace BT1 and BT2 if equipment will be used or tested in the near future.
- Replace battery cover.
- Replace the packing nuts, washers and replacement cable assembly to the mounting points on the chassis.
 - Handtighten the packing nuts. Do not strip the threads.
 - Use a wrench and tighten the packing nuts.
 - Replace the cover over the packing nuts.
 - Replace the two mounting screws and tighten.

b. Gaskets (O-rings)



- Remove the O-ring from the groove around receptacle connector J2.
- Clean out the groove, removing all old gasket material and dirt.
- Apply DC-4 grease or an approved sealing compound to the new O-ring.
- Install the new O-ring in the groove ensuring proper fit.

c. Resistor R1



- Resistor R1 is attached to the terminal board located near the telephone ringer and transformer T1.
- Carefully unsolder R1 from the terminal board and tag the leads.

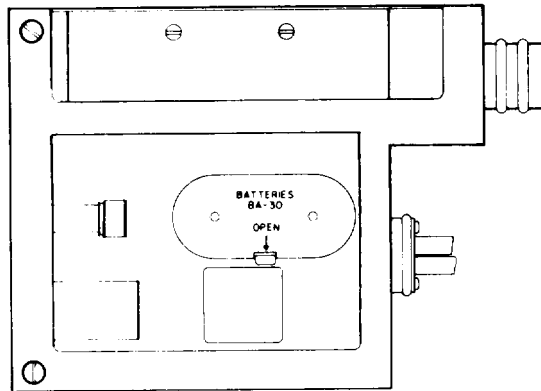
NOTE

If difficulty is encountered unsoldering R1 remove the two machine screws mounting transformer T1 and pull T1 up out of the chassis.

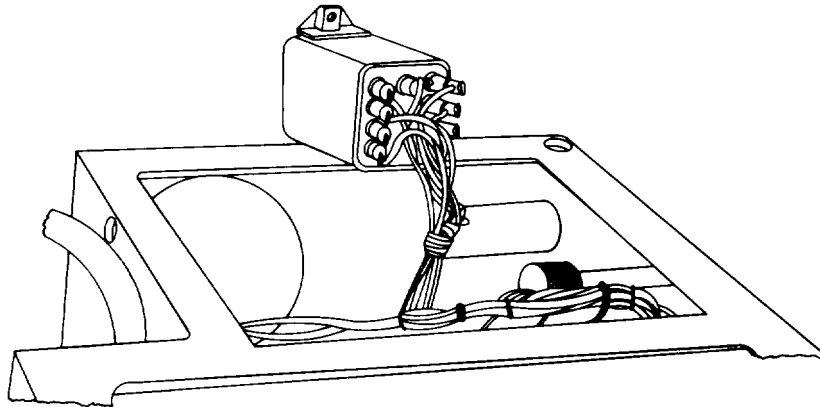
- Solder the replacement R1 to the terminal board.
- If T1 was removed install it in the chassis.
- Restore the two mounting screws and tighten.

d. Transformer T1

- Remove battery cover and BT1 and BT2.



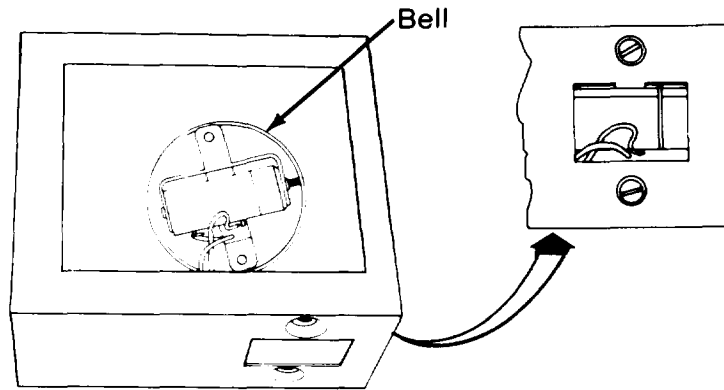
- Remove the four battery holder mounting screws.
- Remove the battery holder.



- Remove the two T1 mounting screws.
- Lift T1 out of the chassis being careful not to break any wires or connections.
- Unsolder and tag the wires connected to T1.
- Resolder the wires to the replacement T1.
- Replace T1 in the chassis.
- Install the two T1 mounting screws and tighten.
- Install BT1 and BT2 if equipment will be used or tested in the near future.
- Replace battery cover.

e. Telephone Ringer (Bell)

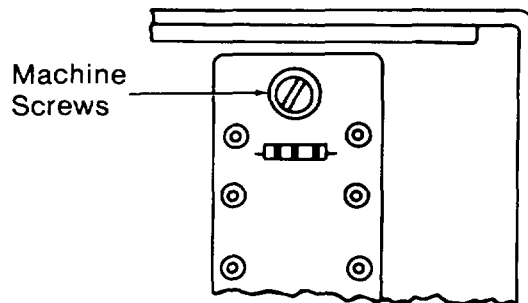
- Remove battery cover, BT1, BT2.
- Remove transformer T1 mounting screws.
- Move T1 away from the ringer.
- Remove the two ringer mounting screws.
- Pull ringer out of chassis carefully.



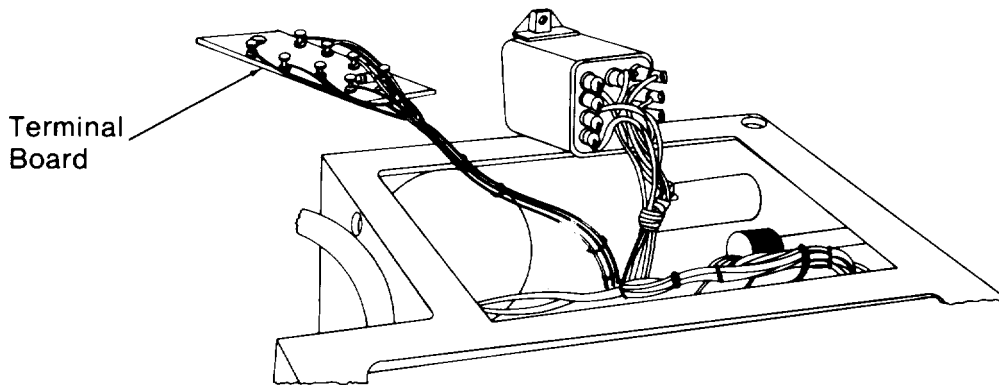
- Unsolder and tag the wires.
- Solder the wires to replacement ringer.
- Replace ringer in chassis.
- Install two mounting screws and tighten.
- Replace T1 and two mounting screws and tighten.
- install BT1 and BT2 if equipment will be used or tested in the near future.
- Install battery cover.

f. Terminal Board

- Remove battery cover, BT1, BT2 and battery holder.
- Remove transformer T1 mounting screws.
- Pull T1 up and out of the chassis being careful not to break any wires or connections.
(See steps in d. on page 2-70.)
- Remove two machine screws mounting terminal board to chassis.



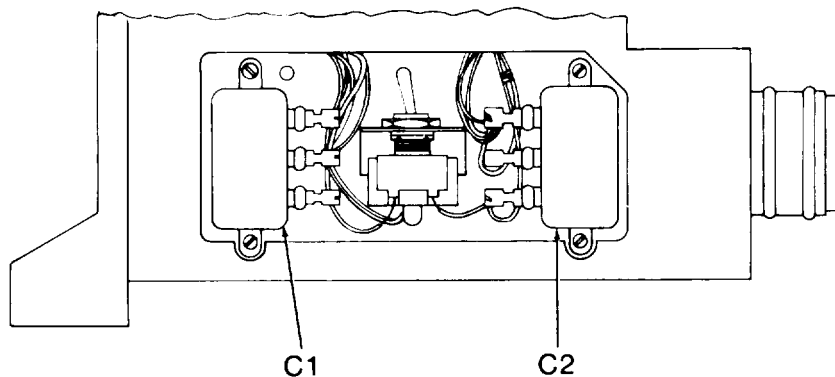
- Pull terminal board out of chassis carefully.
- Tilt terminal board for access and unsolder and tag all wires and connections.



- Solder all wires and connections to replacement terminal board and remove tags.
- Install terminal board in chassis with two mounting screws and tighten.
- Replace T1 and mounting screws in chassis and tighten.
- Replace battery holder with four mounting screws.
- Replace BT1 and BT2 if equipment will be used or tested in the near future.
- Replace battery cover.

g. Capacitors C1 and C2

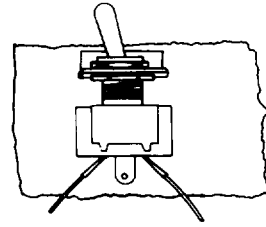
- Procedure is identical for replacement of capacitor C1 and C2.
- Remove the machine screws which mount the capacitor to the chassis.
- Remove the capacitor from its compartment.



- Unsolder and tag the wires attached to the capacitor terminals.
- Resolder the wires to the replacement capacitor.
- Install the replacement capacitor in the compartment and remove tags.
- Install the machine screws and tighten.

h. Toggle Switch S1

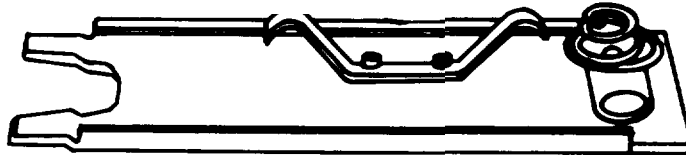
- Unsolder and tag the wires attached to the toggle switch.



- With a wrench, remove the nut which mounts the switch to its mounting plate.
- Pull the switch out of the mounting plate.
- Install the replacement switch on the mounting plate.
- Restore the mounting nut and tighten.
- Resolder the wires to the replacement switch and remove tags.

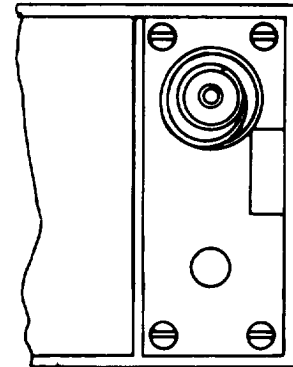
i. Battery Contacts

Cover - If either or both of the battery contacts on the battery cover are badly corroded or damaged replace the entire cover.

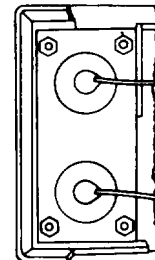


Chassis - If either or both of the battery contacts on the chassis mounted contact strip are badly corroded or damaged replace the entire strip in the following manner:

- Remove battery cover, BT1, BT2 and battery holder. See steps in 4. above
- Drill out the four rivets mounting the contact strip to the chassis.



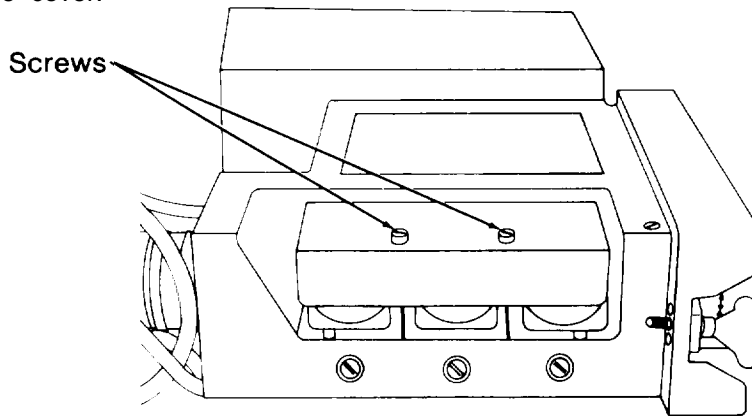
- Remove the contact strip.
- Unsolder the wires connected to the contact strip.
- Remove all metal chips and solder drops from the chassis.
- Solder the wires to the replacement contact strip.



- Install the contact strip in the chassis.
- Using machine bolts, lock washers and nuts, mount the contact strip to the chassis.
- Install battery holder and four machine screws and tighten.
- Install BT1 and BT2 if equipment will be used or tested in the near future.
- Install battery cover.

j. Relays 01, 02, 03

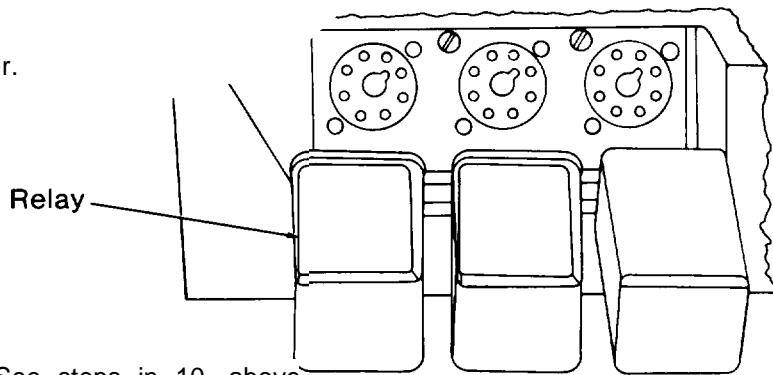
- Loosen and remove the two screws which hold the relay compartment cover in place.
- Remove the cover.



CAUTION

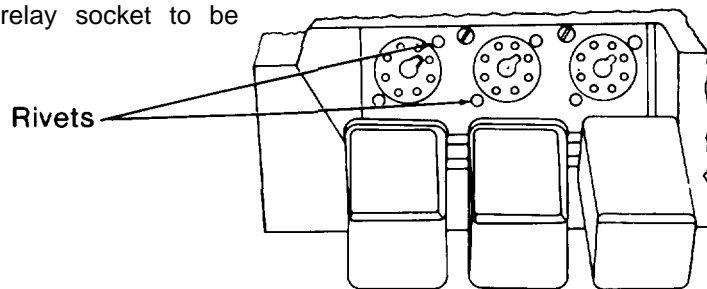
Relay pins are easily damaged. Use extreme care when removing relays.

- Carefully pull the relay to be replaced out of the socket. Rock relay back and forth if necessary.
- Install the replacement relay.
- Install the relay compartment cover.
- Tighten the mounting screws.

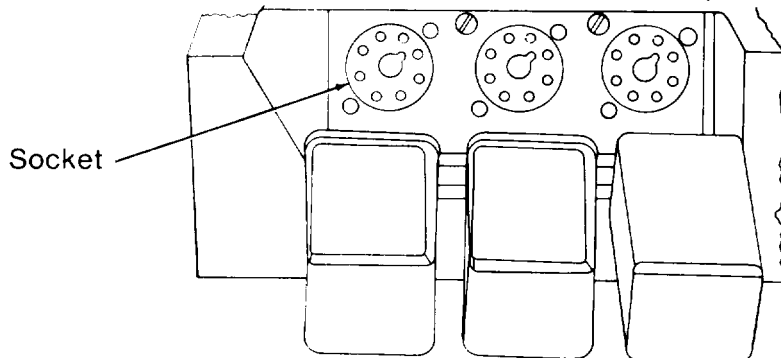


k. Relay Tube Sockets

- Remove relay cover and relays. See steps in 10. above.
- Remove battery cover, BT1, BT2 and battery holder. See steps in d. above.
- Drill out rivets which mount the relay socket to be replaced.



- Pull the socket and turn it to gain access to the solder points.

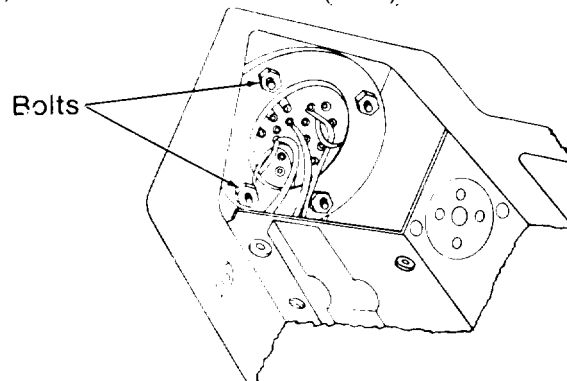


- Unsolder and tag the wires attached to the socket.
- Solder the wires to the replacement socket and remove tags.
- Replace the socket in the chassis recess.
- Using bolts, lock washers and nuts mount the relay socket to the chassis.
- Replace battery holder, BT1, BT2 and battery cover.
- Replace relays 01, 02, 03 and relay cover.

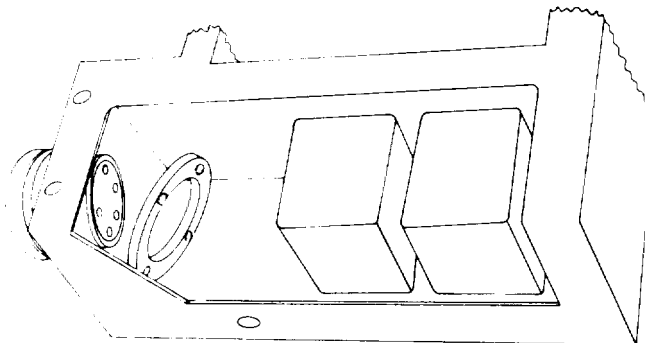
Disassembly Required

I. Receptacle Connector J2

- Remove relay cover and relays. See step j. on page 2-74
- Remove bolts, lock washers and nuts (4 ea) which mount J2 to chassis.



- Remove flange. Do not break any wires or connections.
- Remove five machine screws which secure the relay subassembly to the chassis.
- Move the relay subassembly away from J2 within the chassis.
- Remove O-rings.
- Pull the flange and J2 assembly in through the hole in the chassis.



- Unsolder and tag the wires attached to J2.
- Solder wires to replacement J2 and remove tags.
- Insert J2 back out through the hole in the chassis.
- Install the flange and align it with the holes in the chassis and J2.
- Install bolts, lock washers and nuts (4 ea) through the holes securing J2 to the chassis.
- Tighten four bolts.
- Replace relay subassembly using five machine screws and tighten.
- Replace panel.
- Replace relays 01, 02, 03 and relay cover.

2-20. REASSEMBLY

If disassembly was necessary to repair either component of Control Group AN/GRA-6 follow these instructions for reassembly:

Remote Control

a. Call Light Socket

- Install the call light socket in the panel before installing the panel assembly to the chassis assembly.
- Install the call light socket into its mounting hole on the panel assembly.

b. Panel

- Install the panel on the chassis lining up the holes on the panel and chassis.
- Make sure that no wires will be pinched between the panel and chassis.
- Install the four machine screws which mount the panel to the chassis and tighten.

c. Batteries

- If the equipment is to be used again soon, install batteries BT1, BT2 and BT3.

d. Battery Compartment Cover

- Place Remote Control with the panel down and the left side of the unit facing away from you.
- Place the compartment cover on the back of the unit with the projections aiming towards you and lined up with the chassis bracket angles.
- Depress the cover slightly and slide the cover projections under the chassis bracket angles.
- Depress the other end of the cover and slide it under the tab on the chassis securing the cover.

e. Outer Case

- Slide the unit into the outer case.
- Fasten the snap catches and secure the outer case to the unit.

CHAPTER 3

GENERAL SUPPORT MAINTENANCE

	PAGE
Control Circuits Test	3-2
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General instructions, Troubleshooting Procedures	3-1
Physical Tests and Inspection	3-2
Repair Parts,	3-1
Signaling and Interphone Test, interconnecting Box J-654/6	3-7
Special Tools, TMDE, and Support Equipment	3-1

Section I. REPAIR PARTS, SPECIAL TOOLS, TMDE AND SUPPORT EQUIPMENT

3-1. SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT

NOMENCLATURE	NATIONAL STOCK NO.	REMARKS
Power Supply PP-4763()/GRC	5820-00-113-9769	
Radio Set AN/GRC-106()	5820-00-402-2263	
Multimeter TS-352()/U	6625-00-242-5023	
Dummy Load, Electrical DA-75/U		
Decade Resistor ZM-16()/U	6625-00-669-0266	2 required
Handset H-33()/PT	5965-00-163-9947	In addition to handset supplied with AN/GRA-6.
Battery BA-30/U, 1.5V	6135-00-120-1020	4 required
Battery BA-414/U, 45V	6135-00-125-5256	
Hookup wire #22 AWG, 4 feet	6145-00-548-2434	Black
Hookup wire #22 AWG, 4 feet	6145-00-548-2344	

3-2. REPAIR PARTS

Refer to TM 11-5820-489-34P.

Section II. TROUBLESHOOTING PROCEDURES

3-3. GENERAL Instructions

Use the troubleshooting procedures covered in Chapter 2 of this manual to isolate and correct troubles in Control Group AN/GRA-6.

Section III. TESTING PROCEDURE

3-4. GENERAL INSTRUCTIONS

The following testing procedures are necessary to verify the performance standards for Control Group AN/GRA-6 for general support level maintenance and overhaul as authorized by the Maintenance Allocation Chart. If a part, subassembly, component, etc., does not meet the performance standard, the fault should be isolated and corrected using the troubleshooting, disassemble and repair sections of Chapter 2 of this manual. The Source, Maintenance and Recoverability (SMR) code of the affected part should be determined by consulting TM 11-5820-489-34P.

3-5. PHYSICAL TESTS AND INSPECTION

Test Setup

- Disconnect all connections to Control Group AN/GRA-6.
- Controls may be in any position.
- Test applies to both C-433/GRC and C-434/GRC.
- No test equipment needed.

TEST	INDICATION
Check SELECTOR, REMOTE, LOCAL and BELL-LAMP switches for correct operation. Check Generator for proper operation. Check cable assemblies for cuts and breaks in insulation. Inspect all connectors, lamps, and cover plates for damage and missing parts. Inspect both components for physical damage such as dents, punctures, and bent areas. Inspect both components for condition of finish and panel markings.	All switches should operate freely without binding. Generator should crank without binding. Wires and cables should have no deep cuts in insulation. Connectors, lamps, and cover plates should not have missing parts or be damaged so as to prevent proper operation. There should be no physical damage serious enough to prevent proper operation. Surfaces originally painted should not show bare metal. Panel markings should be legible.

3-6. CONTROL CIRCUITS TEST

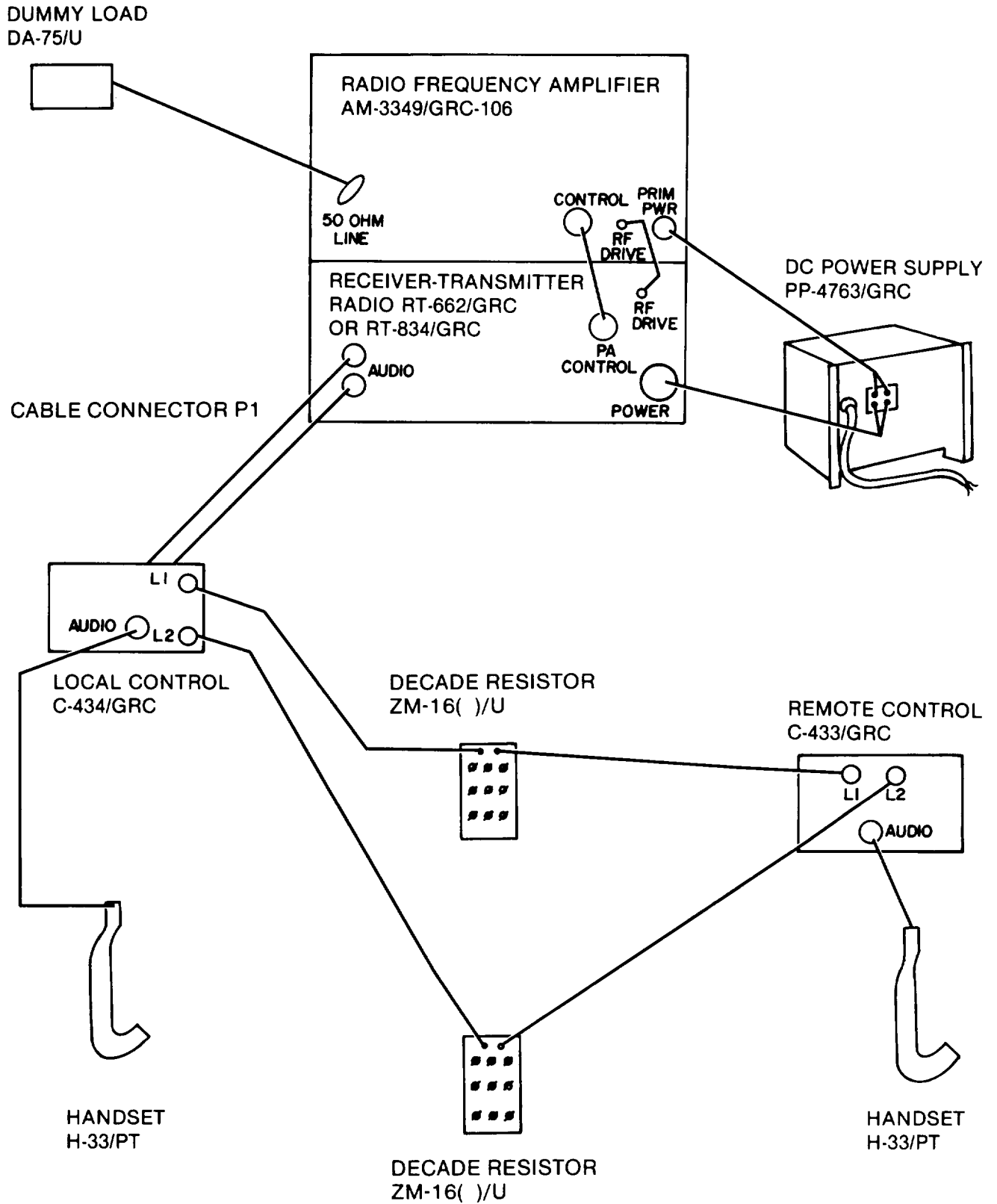
Test Equipment and Material

- | | |
|-----------------------------|---------------------------------|
| Power Supply PP-4763()/GRC | Dummy Load, Electrical DA-75/U |
| Radio Set AN/GRC-106 | Handset H-33()/PT |
| Multimeter TS-352()/U | Decade Resistors ZM-16()/U (2) |

Test Setup

- Install batteries in C-433/GRC and C-434/GRC.
- Use Multi meter TS-352()/U when applicable.
- Hook up equipment as shown in illustration.

RADIO SET AN/GRC-106()



STEP NO.	TEST EQUIPMENT CONTROL SETTINGS	EQUIPMENT TO BE TESTED CONTROL SETTINGS	TEST PROCEDURE	PERFORMANCE STANDARD
1	PP-4763()/GRC: AC ON Switch: ON AN/GRC-106. Follow tuning procedures in TM 11-5820-520-10 ZM-16()/U X-100 Switch: 2 X-10 Switch: 5 All other switches: 0	C-434/GRC: LOCAL switch: SET 1 REMOTE switch: Any position except TEL ONLY C-433/GRC: SELECTOR switch: any position	a. C-434/GRC - press push-to-talk switch on H-33()/PT and speak into mouthpiece. b. C-434/GRC - release push-to-talk switch on H-33()/PT. c. C-434/GRC - turn LOCAL switch to TEL position and REMOTE switch to SET 1. C-433/GRC - turn SELECTOR switch to left-hand write-in position. Press push-to-talk switches on H-33()/PT at C-433/GRC and speak into mouthpiece.	a. DA-75/U meter indicates operation of transmitter. Local operator's voice can be heard at both C-434/GRC and C-433/GRC. b. Receiver noise can be heard at both C-434/GRC and C-433/GRC. c. DA-75/U meter indicates operation of transmitter. REMOTE operator's voice can be heard at both C-434/GRC and C-433/GRC.

STEP NO.	TEST EQUIPMENT CONTROL SETTINGS	EQUIPMENT TO BE TESTED CONTROL SETTINGS	TEST PROCEDURE	PERFORMANCE STANDARD
1 (cont)			d. C-433/GRC -release push-to-hold switch on H-33()/PT. Turn REMOTE switch C-434/GRC to SET 1 & 2. Press push-to-talk switch on H-33()/PT at C-433/GRC and speak into mouthpiece.	d. Same as above.
2	Same as for step 1 above. Disconnect P1 from AUDIO connector on RT-662/GRC or RT-834/GRC and connect P2 in its place.	C-434/GRC: LOCAL switch: SET 2. REMOTE switch: any position except TEL ONLY C-433/GRC SELECTOR switch: any position	a. C-434/GRC - press push-to-talk switch on H-33()\PT and speak into mouthpiece. b. C-434/GRC - release push-to-talk switch on H-33()/PT. c. C-434/GRC - turn LOCAL switch to TEL and REMOTE switch to SET 2. C-433/GRC - turn SELECTOR switch to left-hand write-in position. Press push-to-talk switch on H-33()/PT at C-433/GRC and speak into mouthpiece.	a. DA-75/U meter indicates operation of transmitter. Local operator's voice can be heard at both local and remote control units. b. Receiver noise can be heard at both C-434/GRC and C-433/GRC. c. DA-75/U meter indicates operation of transmitter. Remote operator's voice can be heard at both C-434/GRC and C-433/GRC.

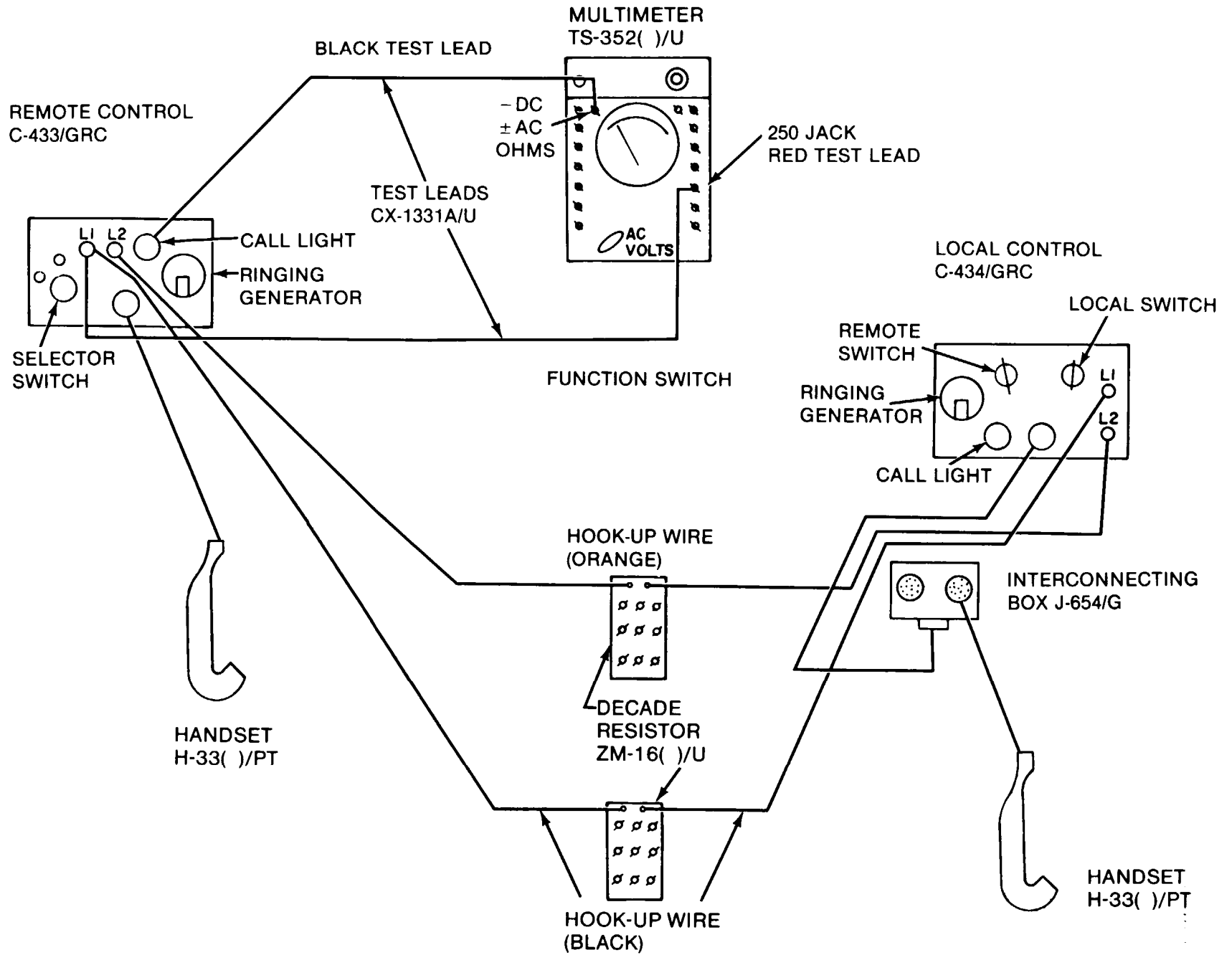
STEP NO.	TEST EQUIPMENT CONTROL SETTINGS	EQUIPMENT TO BE TESTED CONTROL SETTINGS	TEST PROCEDURE	PERFORMANCE STANDARD
2 (cont)			<p>d. C-433/GRC - release push-to-talk switch on H-33()/PT. Turn REMOTE switch to SET 1 & 2. Press push-to-talk switch on H-33()/PT on C-433/GRC and speak into mouthpiece.</p> <p>e. C-433/GRC - release push-to-talk switch on H-33()/PT. Turn SELECTOR switch to right-hand write-in position. Press push-to-talk switch on H-33()/PT</p>	<p>d. Same as above.</p> <p>e. Same as c. above.</p>
3	<p>TS-352()/U FUNCTION switch: OHMS</p> <p>RANGE switch: RX1</p>	<p>C-434/GRC: REMOTE switch: TEL ONLY</p> <p>LOCAL switch: Set 1</p>	<p>a. Turn off and disconnect all equipments. Remove all equipment except C-434/GRC. Disconnect all connectors and field wire from the binding posts.</p> <p>b. Place black test lead of TS-352()/U on pin M of J2. Briefly touch red test lead to all other pins of J2 except pins a and b.</p> <p>c. Touch red test lead to pin J of P1.</p> <p>d. Touch red test lead to pin A, C and F of P1.</p> <p>e. Touch red test lead to pin J of P2.</p>	<p>a. None.</p> <p>b. TS-352()/U should indicate infinity.</p> <p>c. TS-352()/U should indicate 0 ohm.</p> <p>d. Same as b.</p> <p>e. Same as c.</p>

STEP NO.	TEST EQUIPMENT CONTROL SETTINGS	EQUIPMENT TO BE TESTED CONTROL SETTINGS	TEST PROCEDURE	PERFORMANCE STANDARD
3 (cont)			f. Touch red test lead to pins A, C and F of P2. g. Coil up cable assemblies W1 and W2 and replace in cable compartment of C-434/GRC.	f. Same as b. g. None.

**Interconnecting Box J-654/G
Signaling and Interphone Test**

Test Setup

- Install batteries in C-433/GRC and C-434/GRC.
- Use Multimeter TS-352()/U.
- Connect all equipment as shown in the following illustration.
- Leave outer case cover off C-433/GRC and C-434/GRC.



TEST EQUIPMENT CONTROL SETTINGS	EQUIPMENT TO BE TESTED CONTROL SETTINGS	TEST PROCEDURE	PERFORMANCE STANDARD
		<p>b. Turn BELL-LAMP switch at C-434/GRC to BELL. Connect test leads CX-1331A/U of TS-352()/U between binding posts L1 and L2 of C-434/GRC.</p> <p>c. Crank ringing generator on C-433/GRC. Note meter indication on TS-353()/U and perform the following:</p> <p>(1) Listen with H-33()/PT at C-433/GRC.</p> <p>(2) Listen for ringing signal of C-433/GRC.</p> <p>(3) Listen with H-33()/PT at C-434/GRC.</p> <p>(4) Turn BELL-LAMP switch of C-433/GRC to LAMP. Open dimmer control on CALL LIGHT at top of C-433/GRC.</p> <p>d. Depress push-to-talk switch on H-33()/PT at C-434/GRC and J-654/G. Speak into mouthpiece.</p> <p>e. Release push-to-talk switch on H-33()/PT.</p>	<p>b. None.</p> <p>c. TS-352()/U should indicate at least 45 volts AC (0.45 on top AC scale).</p> <p>(1) Ringing signal should be heard in H-33()/PT.</p> <p>(2) Bell should ring at C-433/GRC.</p> <p>(3) Ringing signal should be heard in H-33()/PT.</p> <p>(4) TS-352()/U should indicate at least 50 volts AC (0.5 on top AC scale). CALL LIGHT lamp on C-433/GRC should light.</p> <p>d. Local operator's voice should be heard at both C-434/GRC and C-4331GRC.</p> <p>e. None.</p>

TEST EQUIPMENT CONTROL SETTINGS	EQUIPMENT TO BE TESTED CONTROL SETTINGS	TEST PROCEDURE	PERFORMANCE STANDARD
		<p>f. Disconnect H-33()/PT from left receptacle of J-654/G and connect it to right receptacle. Repeat d. above.</p> <p>g. Repeat e. above.</p> <p>h. Press push-to-talk switch on H-33()/PT at C-433/GRC. Speak into mouthpiece.</p> <p>i. Release push-to-talk switch on H-33()/PT and replace covers on C-434/GRC and C-433/GRC.</p>	<p>f. Same as d above.</p> <p>g. None.</p> <p>h. Remote operator's voice should be heard at both C-434/GRC and C-433/GRC.</p> <p>i. None.</p>

APPENDIX A

REFERENCES

A-1. INTRODUCTION

Following is a list of all forms and technical manuals referenced in this manual.

Quality Deficiency Report Form SF 368
Recommended Changes to Equipment Technical Manuals DA Form 2028-2
Recommended Changes to Publications and Blank Form. DA Form 2028

A-2. TECHNICAL MANUALS

Direct Support and General Support Maintenance Repair Parts and
Special Tools List (Including Depot Maintenance Repair Parts and Special
Tools): Control Group AN/GRA-6 TM 11-5820-489-34P
Operator's Manual: Control Group AN/GRA-6 TM 11-5820-489-10
Organizational Maintenance Manual: Control Group AN/GRA-6 TM 11-5820-489-20
Procedures for Destruction of Electronic Materiel to Prevent Enemy Use
(Electronics Command) TM 750-244-2

A-3. MISCELLANEOUS PUBLICATIONS

The Army Maintenance Management System (TAMMS) DA Pam 738-750
Consolidated Index of Army Publications and Blank Forms DA Pam 310-1

APPENDIX B

EXPENDABLE SUPPLIES AND MATERIALS LIST

B-1. INTRODUCTION

This appendix lists expendable supplies and materials you will need to operate and maintain AN/GRA-6. These items are authorized to you by CTA 50-970, Expendable Items.

B-2. EXPLANATION OF COLUMNS

a. ITEM NO. This number is referenced in the narrative instructions to identify the material (for example, "Use cleaning compound, Item 1, Appx B").

b. LEVEL. Shows the lowest level of maintenance that needs the listed item.

C - Crew/Operator

c. NATIONAL STOCK NUMBER. Shows the National Stock Number assigned to each item and used to requisition that item.

d. DESCRIPTION. Shows the National Item Name and (if required) a short description to identify and locate the item. The last line for each item shows the Federal Supply Code for Manufacturers (FSCM) in parentheses, followed by the part number.

e. UNIT OF MEASURE (U/M). Shows the measure of the item needed to perform the actual operational/maintenance function. This measure is shown by a two-letter abbreviation (for example, EA, OZ, IN).

ITEM NO.	LEVEL	NATIONAL STOCK NUMBER	DESCRIPTION	U/M
1	C	6850-00-105-3084	Trichlorotrifluoroethane (80244)	QT
2	C	8305-00-267-3015	Cleaning cloth	YD

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RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL PUBLICATIONS



THEN... JOT DOWN THE DOPE ABOUT IT ON THIS FORM. CAREFULLY TEAR IT OUT. FOLD IT AND DROP IT IN THE MAIL!

SOMETHING WRONG WITH THIS PUBLICATION?

FROM (PRINT YOUR UNIT'S COMPLETE ADDRESS)
 Commander
 Stateside Army Depot
 ATTN: AMSTA-US
 Stateside, N.J. 07703-5007

DATE SENT
 10 July 1975

PUBLICATION NUMBER
 TM 11-5840-340-12

PUBLICATION DATE
 23 Jan 74

PUBLICATION TITLE
 Radar Set AN/PRC-76

BE EXACT PIN-POINT WHERE IT IS

PAGE NO	PARA-GRAPH	FIGURE NO	TABLE NO
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IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:

Recommend that the installation antenna alignment procedure be changed throughout to specify a 2° IFF antenna lag rather than 1°.

REASON: Experience has shown that with only a 1° lag, the antenna servo system is too sensitive to wind gusting in excess of 25 knots, and has a tendency to rapidly accelerate and decelerate as it hunts, causing strain to the drive train. Hunting is minimized by adjusting the lag to 2° without degradation of operation.

Item 5, Function column. Change "2 db" to "3db."

REASON: The adjustment procedure for the TRANS POWER FAULT indicator calls for a 3 db (500 watts) adjustment to light the TRANS POWER FAULT indicator.

Add new step f.1 to read, "Replace cover plate removed in step e.1, above."

REASON: To replace the cover plate.

Zone C 3. On J1-2, change "+24 VDC to "+5 VDC."

REASON: This is the output line of the 5 VDC power supply. +24 VDC is the input voltage.

FO3



PRINTED NAME GRADE OR TITLE AND TELEPHONE NUMBER
 SSG I. M. DeSpiritof 999-1776

SIGN HERE

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DISTRIBUTION:

To be distributed in accordance with DA Form literature requirements for AN/GRA-6.

CAPACITOR COLOR CODE TABLES

TABLE I - For use with Group I, Styles CM, CN, CY, and CB

COLOR	MIL ID	1st SIG FIG	2nd SIG FIG	MULTIPLIER ¹	CAPACITANCE TOLERANCE				CHARACTERISTIC ²	DC WORKING VOLTAGE		OPERATING TEMP RANGE	VIBRATION GRADE
					CM	CN	CY	CB		CM	CN		
BLACK	CM, CN, CY, CB	0	0	1							85° to +70°C	10 - 88 gpa	
BROWN		1	1	10					B	A			
RED		2	2	100	±2%	±5%	±10%		C	D	-55° to +85°C		
ORANGE		3	3	1,000	±5%				E	F			
YELLOW		4	4	10,000					G	H	-55° to +125°C	18 - 200 gpa	
GREEN		5	5						I	J			
BLUE		6	6						K	L			
PURPLE (VIOLET)		7	7						M	N	-55° to +150°C		
GREY		8	8										
WHITE		9	9										
GOLD				0.1	±5%	±10%	±25%						
SILVER				10	±10%	±15%	±30%						

TABLE II - For use with Group II, General Purpose, Style CE

COLOR	TEMP RANGE AND VOLTAGE-TEMP LIMIT ³	1st SIG FIG	2nd SIG FIG	MULTIPLIER ¹	CAPACITANCE TOLERANCE		MIL ID
					CAPACITANCE OVER 10µuf	CAPACITANCE 10µuf OR LESS	
BLACK		0	0	1			
BROWN	AW	1	1	10	±10%		
RED	AX	2	2	100			
ORANGE	BE	3	3	1,000			
YELLOW	AV	4	4	10,000			CK
GREEN	CE	5	5				
BLUE	BY	6	6				
PURPLE (VIOLET)		7	7				
GREY		8	8				
WHITE		9	9				
GOLD							
SILVER							

TABLE III - For use with Group III, Temperature Compensating, Style CC

COLOR	TEMPERATURE COEFFICIENT ⁴	1st SIG FIG	2nd SIG FIG	MULTIPLIER ¹	CAPACITANCE TOLERANCE		MIL ID
					CAPACITANCE OVER 10µuf	CAPACITANCE 10µuf OR LESS	
BLACK	0	0	0	1			
BROWN	-20	1	1	10	±1%		DC
RED	-25	2	2	100	±2%		
ORANGE	-50	3	3	1,000			
YELLOW	-75	4	4				
GREEN	-100	5	5				
BLUE	-150	6	6				
PURPLE (VIOLET)	-180	7	7	0.01			
GREY		8	8	0.1	±10%		
WHITE		9	9				
GOLD							
SILVER							

- The multiplier is the number by which the two significant (SIG) figures are multiplied to obtain the capacitance in µuf.
- Letter indicates the Characteristics designated in applicable specification: MIL-C-5, MIL-C-91, MIL-C-11272, and MIL-C-10950 respectively.
- Letters indicate the temperature range and voltage-temperature limits designated in MIL-C-11015.
- Temperature coefficient in parts per million per degree centigrade.

COLOR CODE MARKING FOR MILITARY STANDARD CAPACITORS

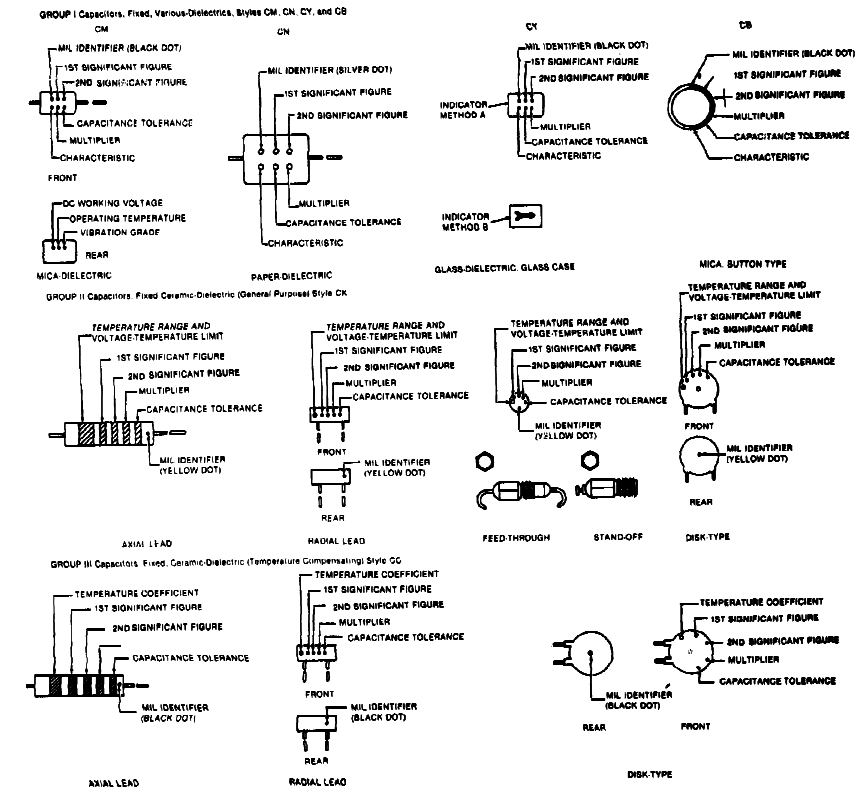
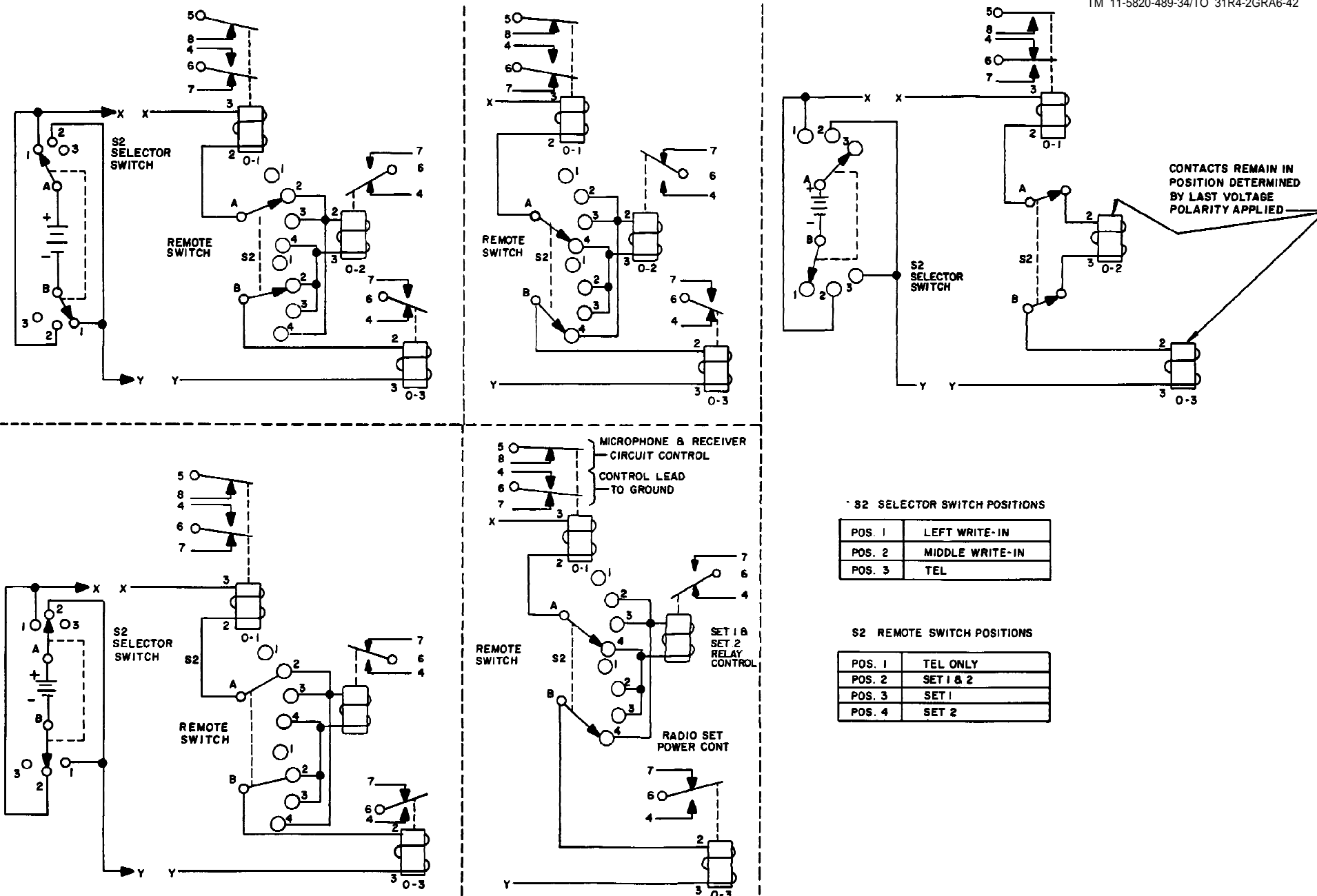


Figure FO-1. Color Code Marking



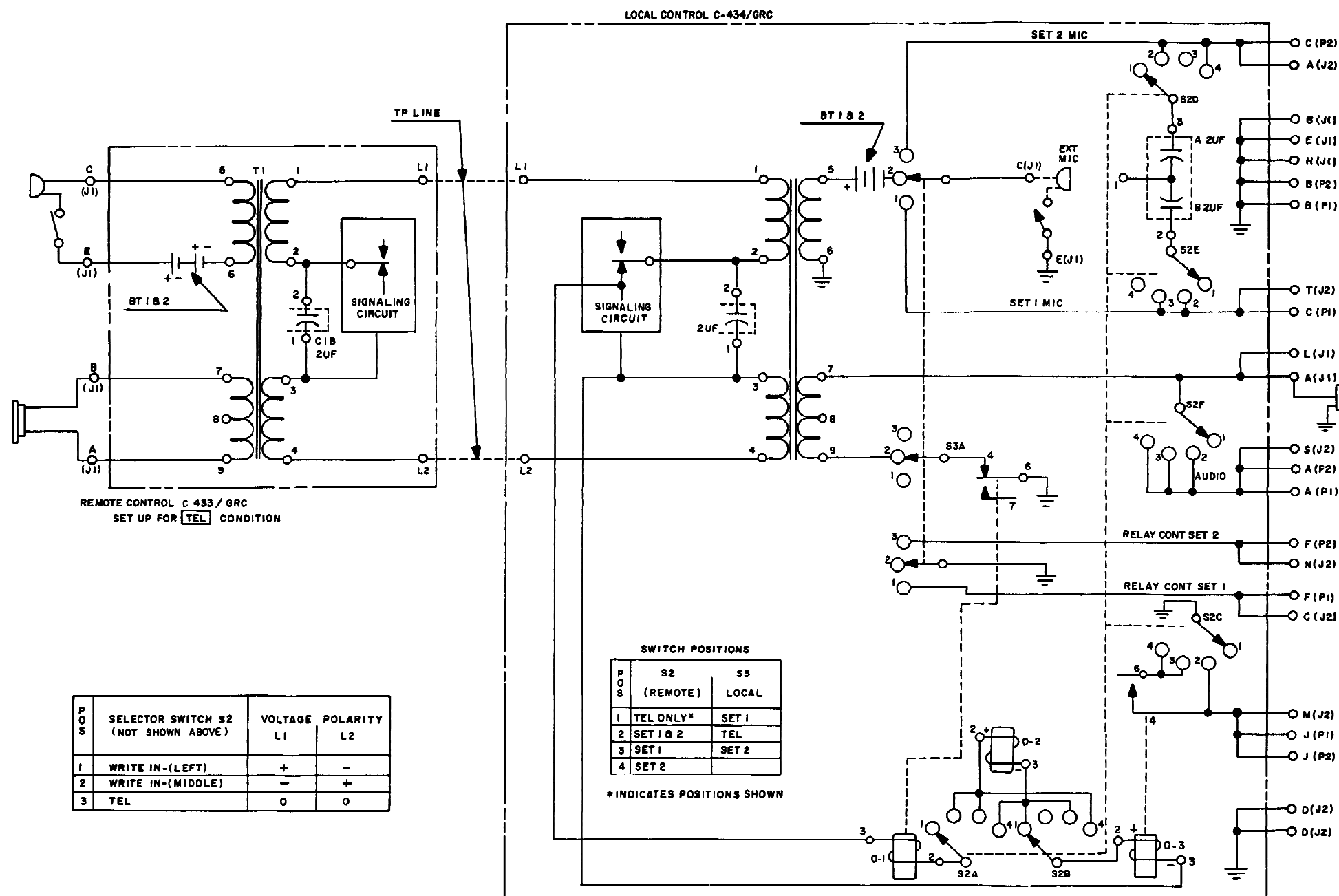
S2 SELECTOR SWITCH POSITIONS

POS. 1	LEFT WRITE-IN
POS. 2	MIDDLE WRITE-IN
POS. 3	TEL

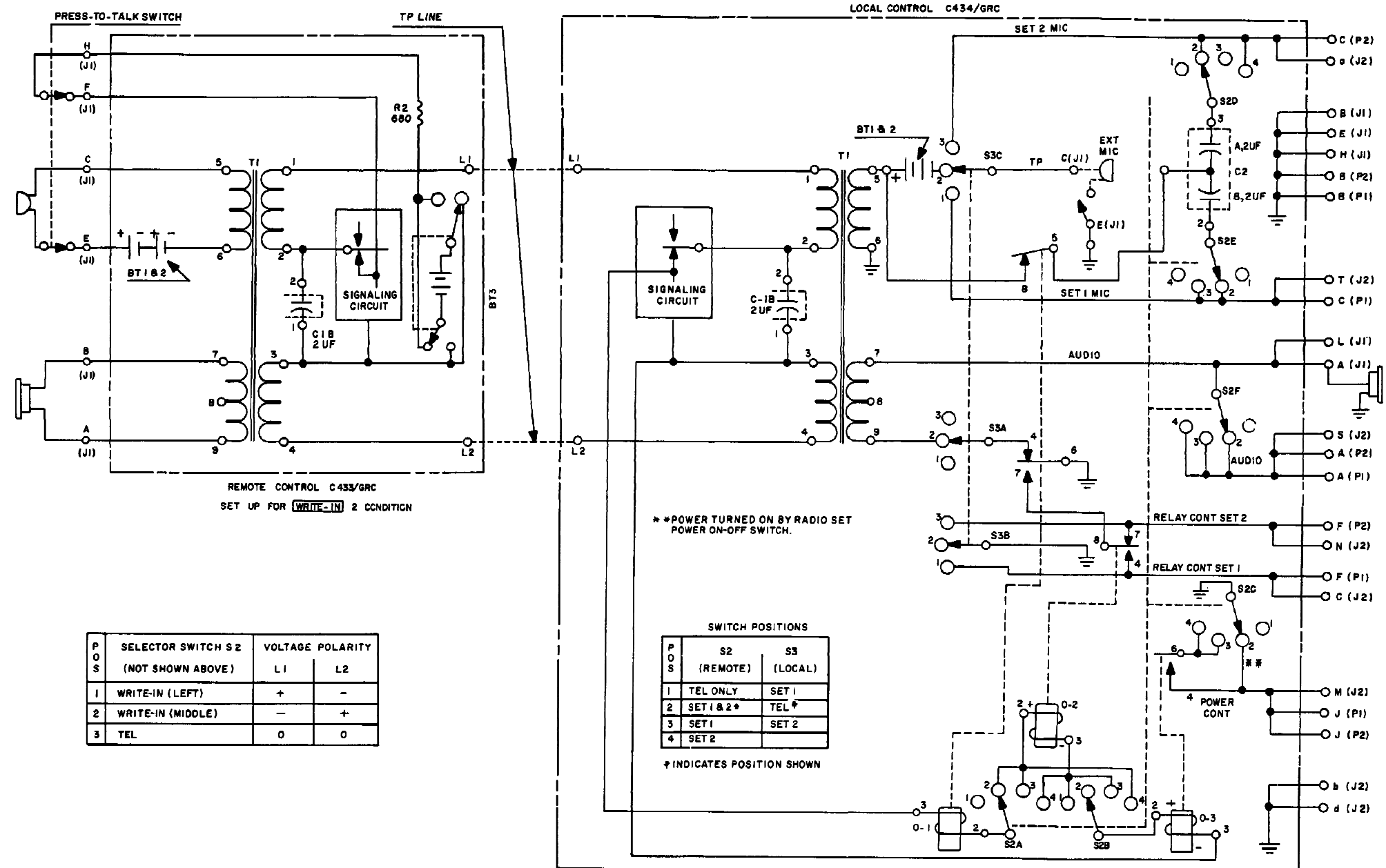
S2 REMOTE SWITCH POSITIONS

POS. 1	TEL ONLY
POS. 2	SET 1 & 2
POS. 3	SET 1
POS. 4	SET 2

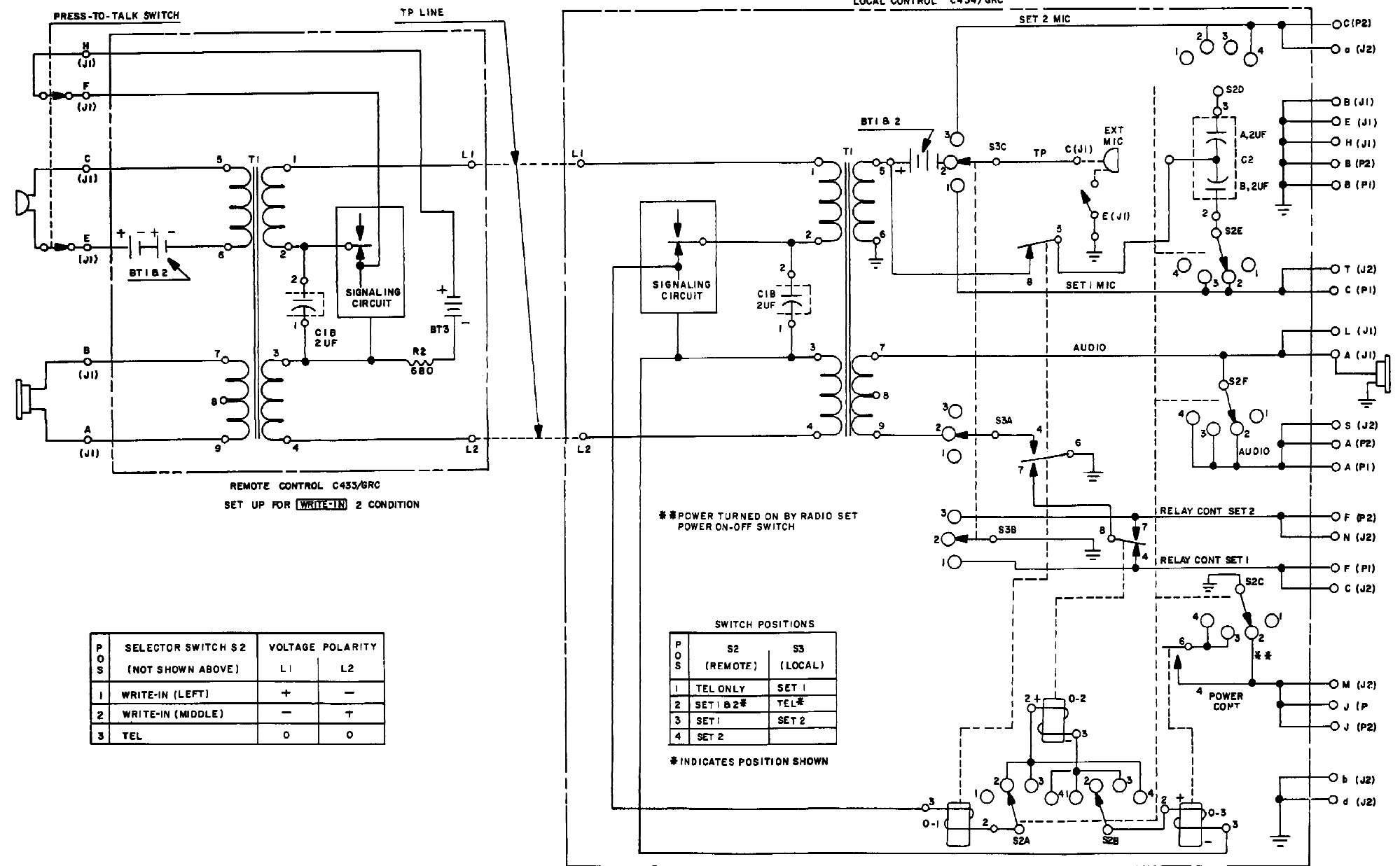
FO-2. CONTROL VOLTAGE POLARITIES AND RELAY CONTACT ARRANGEMENTS



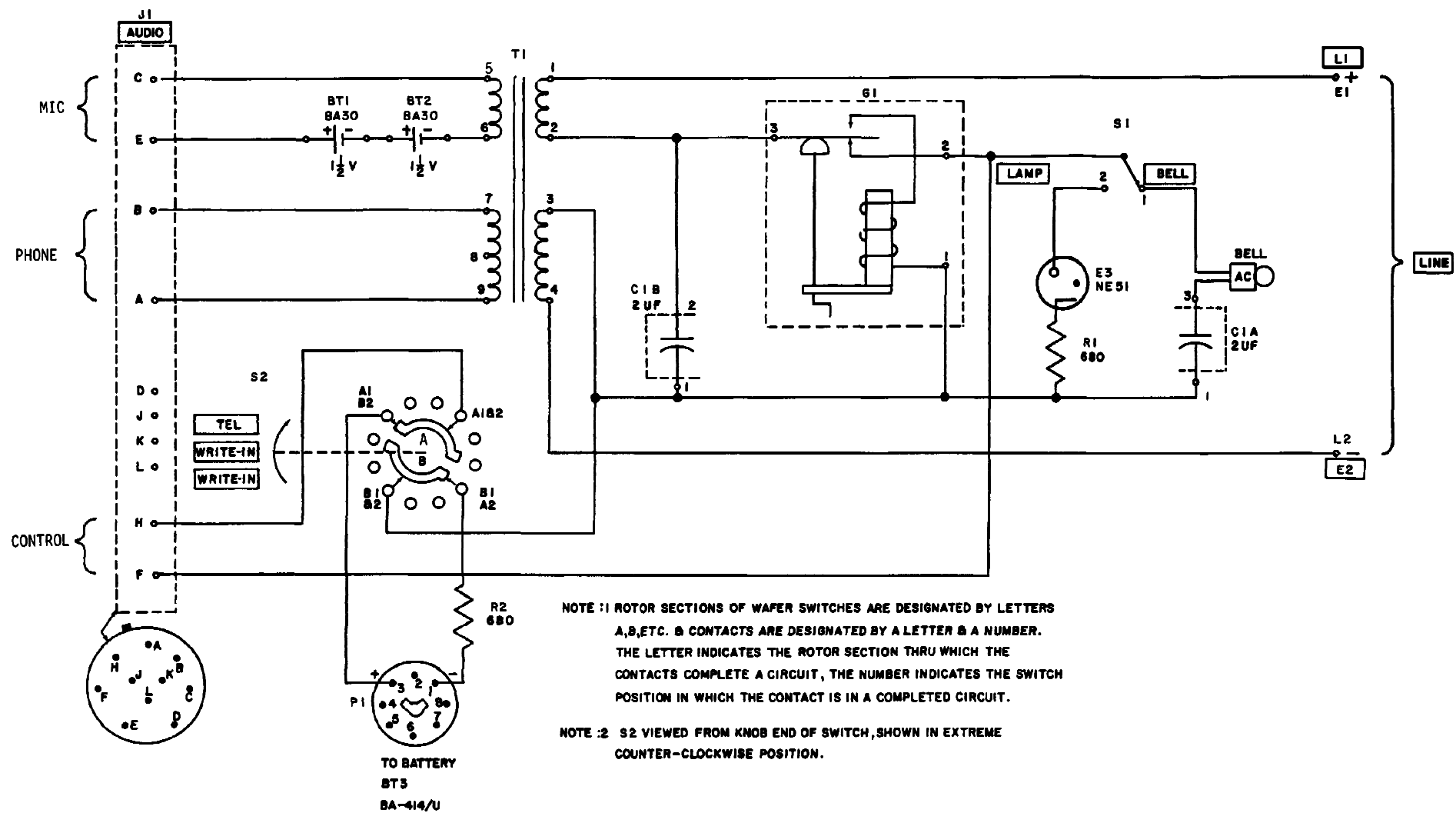
FO-3. CONTROL AN/GRA-6 OPERATION AS FIELD TELEPHONE SET, FUNCTIONAL DIAGRAM.



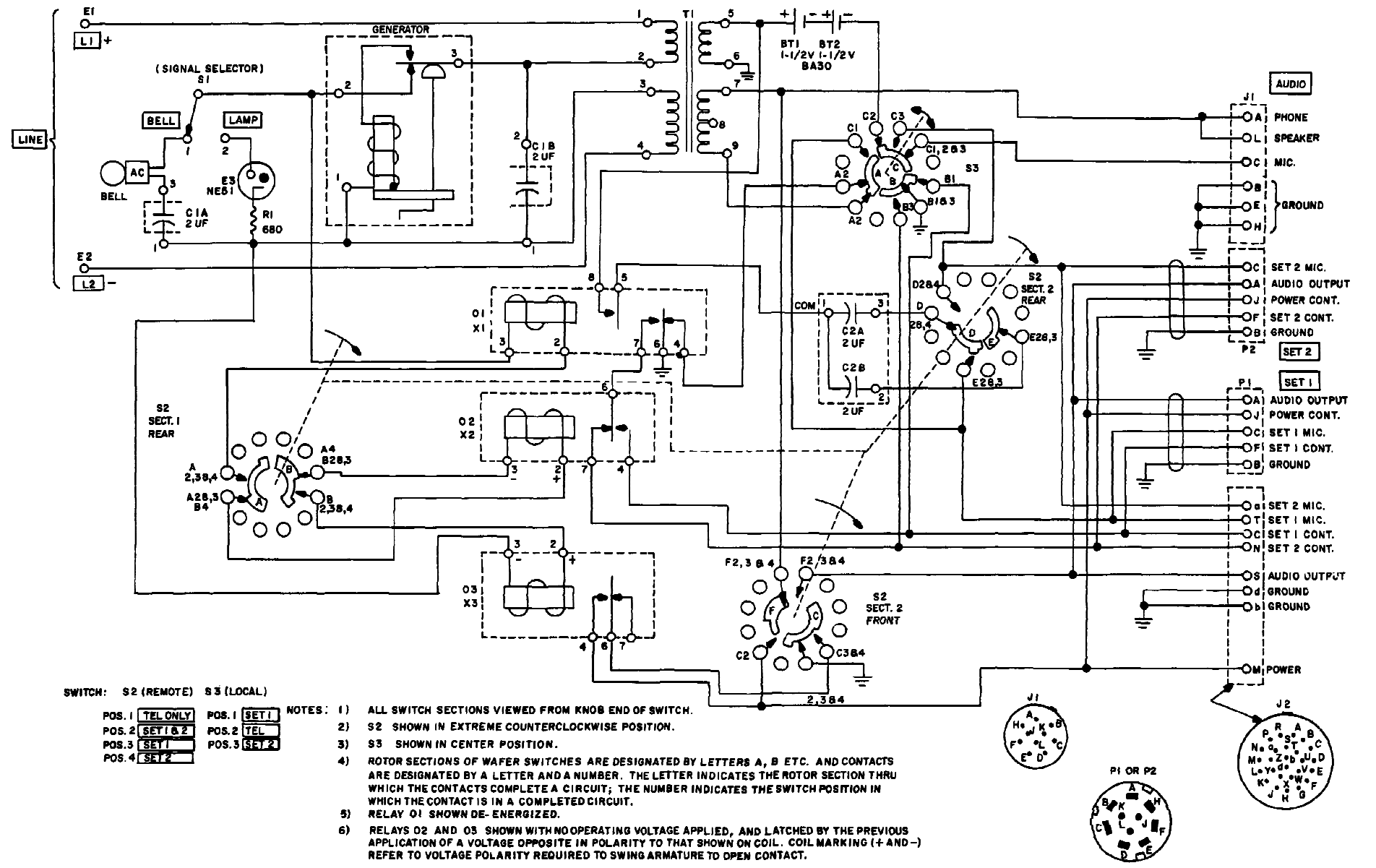
FO-4. CONTROL GROUP AN/GRA-6, REMOTE CONTROL OF SET 2 WITH LOCAL CONTROL OF POWER, FUNCTIONAL DIAGRAM.



FO-5. CONTROL GROUP AN/GRA-6, REMOTE CONTROL OF SET 1 WITH REMOTE CONTROL OF POWER, FUNCTIONAL DIAGRAM.



FO-6. REMOTE CONTROL C-433/GRC, SCHEMATIC DIAGRAM

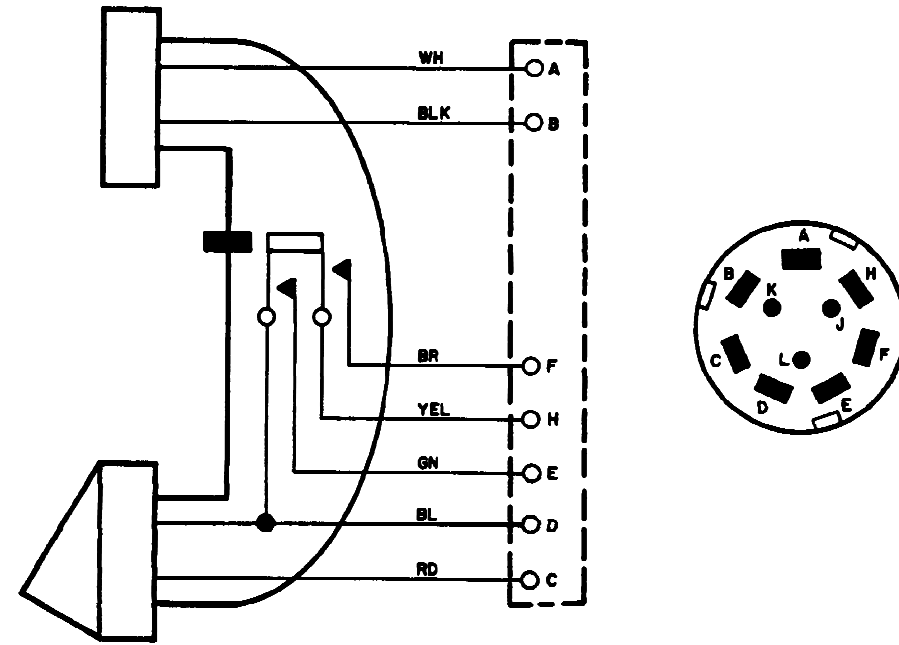


SWITCH: S2 (REMOTE) S3 (LOCAL)

POS. 1	TEL ONLY	POS. 1	SET 1
POS. 2	SET 1 & 2	POS. 2	TEL
POS. 3	SET 1	POS. 3	SET 2
POS. 4	SET 2		

- NOTES:
- 1) ALL SWITCH SECTIONS VIEWED FROM KNOB END OF SWITCH.
 - 2) S2 SHOWN IN EXTREME COUNTERCLOCKWISE POSITION.
 - 3) S3 SHOWN IN CENTER POSITION.
 - 4) ROTOR SECTIONS OF WAFER SWITCHES ARE DESIGNATED BY LETTERS A, B ETC. AND CONTACTS ARE DESIGNATED BY A LETTER AND A NUMBER. THE LETTER INDICATES THE ROTOR SECTION THRU WHICH THE CONTACTS COMPLETE A CIRCUIT; THE NUMBER INDICATES THE SWITCH POSITION IN WHICH THE CONTACT IS IN A COMPLETED CIRCUIT.
 - 5) RELAY O1 SHOWN DE-ENERGIZED.
 - 6) RELAYS O2 AND O3 SHOWN WITH NOOPERATING VOLTAGE APPLIED, AND LATCHED BY THE PREVIOUS APPLICATION OF A VOLTAGE OPPOSITE IN POLARITY TO THAT SHOWN ON COIL. COIL MARKING (+ AND -) REFER TO VOLTAGE POLARITY REQUIRED TO SWING ARMATURE TO OPEN CONTACT.

FO-7. LOCAL CONTROL C-434/GRC, SCHEMATIC DIAGRAM



FO-8. HANDSET H-33/PT, SCHEMATIC DIAGRAM.

