

ARMY TM 11-5820-489-20 AIR FORCE TO 31R4-2GRA6-32

ORGANIZATIONAL MAINTENANCE MANUAL

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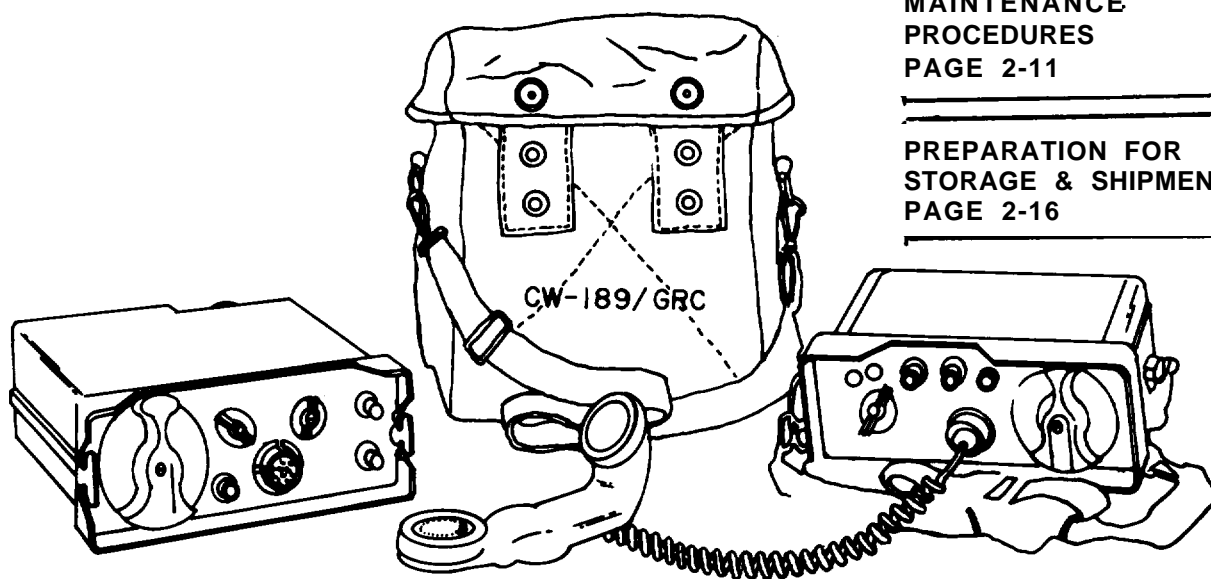
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CONTROL GROUP AN/GRA-6 **(NSN 5820-00-644-4554)**

DEPARTMENTS OF THE ARMY AND THE AIR FORCE
23 NOVEMBER 1983



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

WARNING

Adequate ventilation should be provided while using TRICHLOROTRIFLUOROETHANE, 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 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.

Technical Manual
No. 11-5820-489-20
Technical Order
No. 31R4-2GRA6-32

DEPARTMENTS OF THE ARMY
AND THE AIR FORCE
Washington, DC, 23 November 1983

ORGANIZATIONAL 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: DRSEL-ME-MP, Fort Monmouth, New Jersey 07703.

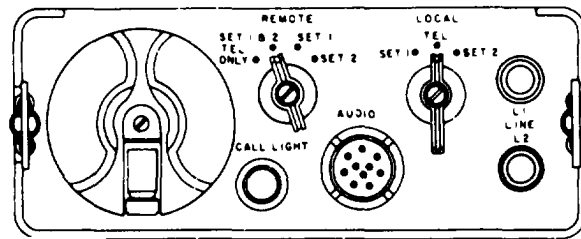
For Air Force, submit AFTO Form 22 (Technical Order System Publication Improvement Report and Reply) in accordance with paragraph 6-5, Section VI, T.O. 00-5-1. Forward direct to prime ALC/MST.

In either case a reply will be furnished direct to you.

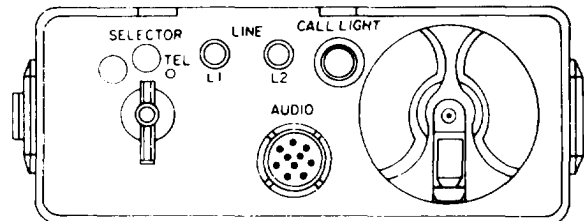
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*This manual supersedes so much of TM 11-5038, 18 April 1951, including all changes, as pertains to organizational maintenance.



LOCAL CONTROL
C-434/GRC



REMOTE CONTROL
C-433/GRC

HOW TO USE THIS MANUAL

- THIS MANUAL TELLS ABOUT THE TYPICAL ARRANGEMENTS OF THE LOCAL CONTROL C-434/GRC AND THE REMOTE CONTROL C-433/GRC.
- ALL THE PROCEDURES IN THIS MANUAL MUST BE EXAMINED BEFORE YOU BEGIN ANY TASK.
- THROUGHOUT THIS MANUAL COLOR CODED MARGIN TABS WILL GUIDE YOU TO THE SECTION THAT CONTAINS THE SPECIFIC INFORMATION YOU NEED.
- THIS MANUAL IS ORGANIZED INTO CHAPTERS, SECTIONS, PARAGRAPHS AND ILLUSTRATIONS, WHICH ARE NUMBERED TO HELP YOU FIND INFORMATION ABOUT YOUR EQUIPMENT QUICKLY AND EASILY.
- COLOR IS USED TO EMPHASIZE KEY POINTS.
- THE SUBJECT INDEX IN THE BACK OF THE MANUAL WILL HELP YOU FIND INFORMATION QUICKLY.

CHAPTER 1

INTRODUCTION

Section L GENERAL INFORMATION

Type of Manual: Organizational Maintenance.

Model Number and Equipment Name: Control Group AN/GRA-6.

Purpose of Equipment: Provides means for controlling and operating a radio set using one or two receiver-transmitters or amplifiers of the push-to-talk type. Also provides means for local control of a radio set through a continuous dc circuit.

The Control Group can also be used for two-way telephone communication and ringing between remote and local control operators.

NOTE

Information in this manual about the radio sets used with the Control Group is general. For more specific information refer to the technical manual for the particular set used.

1-2. MAINTENANCE FORMS, RECORDS, AND REPORTS

Department of the Army forms and procedures used for equipment maintenance will be those prescribed by TM 38-750, The Army Maintenance Management System (TAMMS). Air Force personnel will use AFR 66-1 for maintenance reporting and TO-00-35D54 for unsatisfactory equipment reporting.

1-3. DESTRUCTION OF ARMY MATERIEL TO PREVENT ENEMY USE

Refer to TM 750-244-2.

1-4. PREPARATION FOR STORAGE OR SHIPMENT

Procedures for storage and shipment are described in Chapter 2, Section VI of this manual.

1-5. NOMENCLATURE CROSS-REFERENCE LIST

NOTE

Official nomenclature must be used when filling out report forms or looking up technical manuals. Common names will be used when the major components of the Control Group are mentioned in this manual.

COMMON NAME	NOMENCLATURE
Battery	Battery, Dry BA-30 Battery, Dry BA-414/U(used with Remote Control)
Bag,	Bag CW-189/GRC
Control Group	Control Group AN/GRA-6
Handset	Handset H-33(*)/PT
Interconnecting Box	Box, interconnecting J-654/G
Local Control	Local Control C-434/GRC
Loudspeaker	Loudspeaker, Dynamic LS-166/U
Remote Control	Remote Control C-433/GRC

1-6. REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIR's)

- a. Army. If your Control Group AN/GRA-6 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 about your equipment. Let us know why you don't like the design. Put it on SF 368 (Quality Deficiency Report). Mail it to Commander, US Army Communications-Electronics Command and Fort Monmouth, ATTN: DRSEL-ME-MP, Fort Monmouth, New Jersey 07703. We'll send you a reply.
- b. Air Force. Air Force personnel are encouraged to submit EIR's in accordance with AFR 900-4.

Section II. EQUIPMENT DESCRIPTION AND DATA

1-7. EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES

See Operator's Manual TM 11-5820-489-10.

1-8. LOCATION AND DESCRIPTION OF MAJOR COMPONENTS

See Operator's Manual TM 11-5820-489-10.

1-9. DIFFERENCES BETWEEN MODELS

See Operator's Manual TM 11-5820-489-10.

1-10. EQUIPMENT DATA

See Operator's Manual TM 11-5820-489-10.

1-11. SAFETY, CARE, AND HANDLING

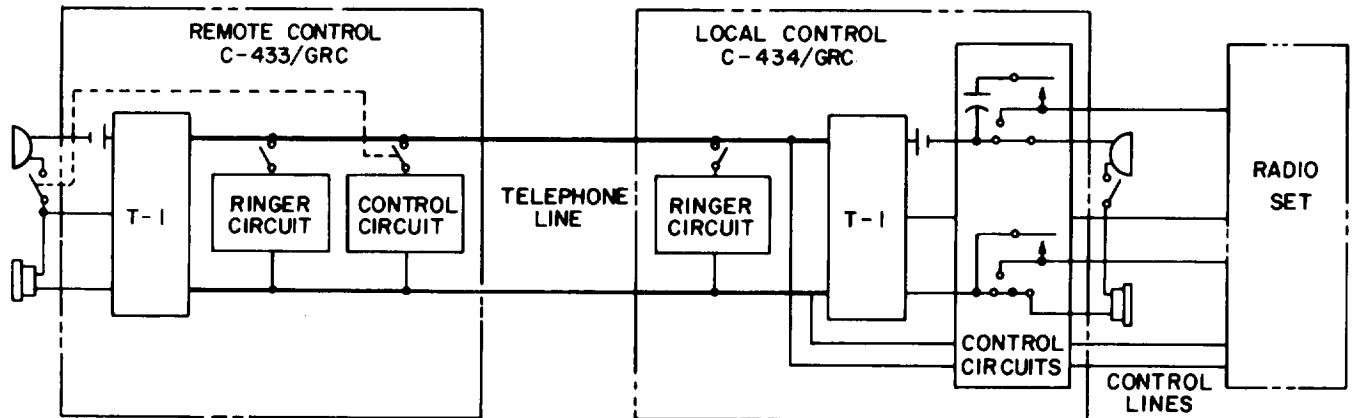
Observe all WARNINGS, CAUTIONS, and NOTES in this manual. This equipment can be dangerous if these instructions are not followed.

Section III. TECHNICAL PRINCIPLES OF OPERATION

1-12. GENERAL

The following information is for your use in understanding the technical principles of operation of Control Group AN/GRA-6.

Simplified block diagrams and a general description of the Control Group circuits are used to show the interrelation of the Control Group and radio set operation. This information will also be helpful when troubleshooting the equipment.



A. Ringing Circuit.

- A hand-cranked, 20-cycle ringing generator is used as the ringing signal transmitting device.
- The ringing signal is transmitted over a two-wire telephone line between the local and remote units. A bell and lamp are used as ringing signal receivers.
- A signal switch is used to select the type of ringing signal to be received (audible or visual).
- The operator of either the local or remote unit can send a ringing signal to the distant operator.
- The ringing signal has no relationship with the radio set connected to the local control unit.

B. Telephone Circuit.

- Each of the two control units provides a line transformer with microphone input, receiver output, and balanced 600-ohm line windings.
- When the transformers are connected by a two-wire telephone line (WD-1/TT), they make up the basic telephone circuit.
- Installation of two dry cell batteries (BA-30) in each unit, and connection of a Handset (H-33(*)/PT) to the AUDIO connector of each unit, allows two-way telephone communication between the local and remote operations.

C. Control Circuit.

- Used to operate push-to-talk capabilities of one or two radio sets (SET 1 and/or SET 2) from a local or remote position.
- Type of radio set control and mode of operation depend upon the settings of the control switches at each of the two units. See Operator's Manual TM 11-5820-489-10.
- In some instances, the control circuit is used to control ON/OFF power of the radio set.

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MAINTENANCE INSTRUCTIONS

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

2-1. TOOLS AND TEST EQUIPMENT

Tools and test equipment used for Operational Maintenance of Control Group AN/GRA-6 are listed in the Maintenance Allocation Chart (MAC) in Appendix B of this manual.

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

There are no special tools or TMDE required for Organizational Maintenance of this equipment.

2-3. REPAIR PARTS

Repair parts are listed and illustrated in the Repair Parts and Special Tools List (RPSTL) TM 11-5820-489-20P covering Organizational Maintenance for this equipment.

Section II. SERVICE UPON RECEIPT

2-4. UNPACKING EQUIPMENT

The following section includes:

- a chart of packaging data
- an Item by item description of how to unpack equipment
- two illustrations of equipment and packing material



Prevent personal injury when removing steel strapping. Wear heavy gloves and protective eyewear. Do not handle the shipping container by the steel strapping.

CAUTION

Be careful when unpacking the equipment. Do not push tools inside the shipping container. The equipment could be damaged as a result.

NOTE

Be careful not to damage packing material. Store for reuse.

Packaging Data

BOX NO. OR NAME	CONTENTS OF BOX	WEIGHT (LB)	VOLUME (CU FT)	QTY EACH BOX
1	Remote Control Unit C-433/GRC	8 3/4	0.24	1
2	Local Control Unit C-434/GRC	12 1/2	0.32	1
3	Handset H-33(*)/PT	23/4	0.12	1
4	Bag CW-189/GRC	4 1/*	0.18	1
	Spare parts			1 set
	Technical Manual TM 11-5820-489-20			2
Inter- mediate Carton	Boxes No. 1 through No. 4	29 1/2	1.32	1
Shipping Container	Intermediate Cartons	61	3.32	2

ITEM	ACTION	REMARKS
1. Shipping container	<ul style="list-style-type: none"> ● Pick a location that is as free from dust, dirt, and moisture as possible. ● Remove and save packing slip. ● Use cutters to cut steel strapping, or pliers to twist straps until they break. ● Use a nailpuller to remove nails from top and/or sides of container. Remove top and sides. 	
2. Intermediate cartons (2)	<ul style="list-style-type: none"> ● Remove from shipping container. ● Slit waterproof barriers and remove. 	

ITEM	ACTION	REMARKS
3. Unit packages (8)	<ul style="list-style-type: none"> ● Open cartons and remove silica gel. ● Remove board cells and pads. ● Remove from intermediate cartons. ● Slit waterproof barriers and remove. ● Open unit packages and remove equipment. 	
4. Control Group AN/GRA-6	<ul style="list-style-type: none"> ● Remove technical manuals from waterproof envelopes. ● Remove and store spare lamps from unit package containing Bag CW-189/GRC. ● Inspect for damage during shipment. ● Check packing list to be sure the shipment is complete. ● Check for modifications. ● Apply all URGENT MWO's. Schedule all NORMAL MWO's. 	<p>One technical manual is packed with each local control unit and one with each remote control unit.</p> <p>Report any damage on SF 364 (Report of Discrepancy (ROD)).</p> <p>Report any discrepancies according to instructions in TM 38-750.</p> <p>Check nameplates on equipment for changed numbers. Check DA PAM 310-1 for Modification Work Orders (MWO's) applying to your equipment.</p>

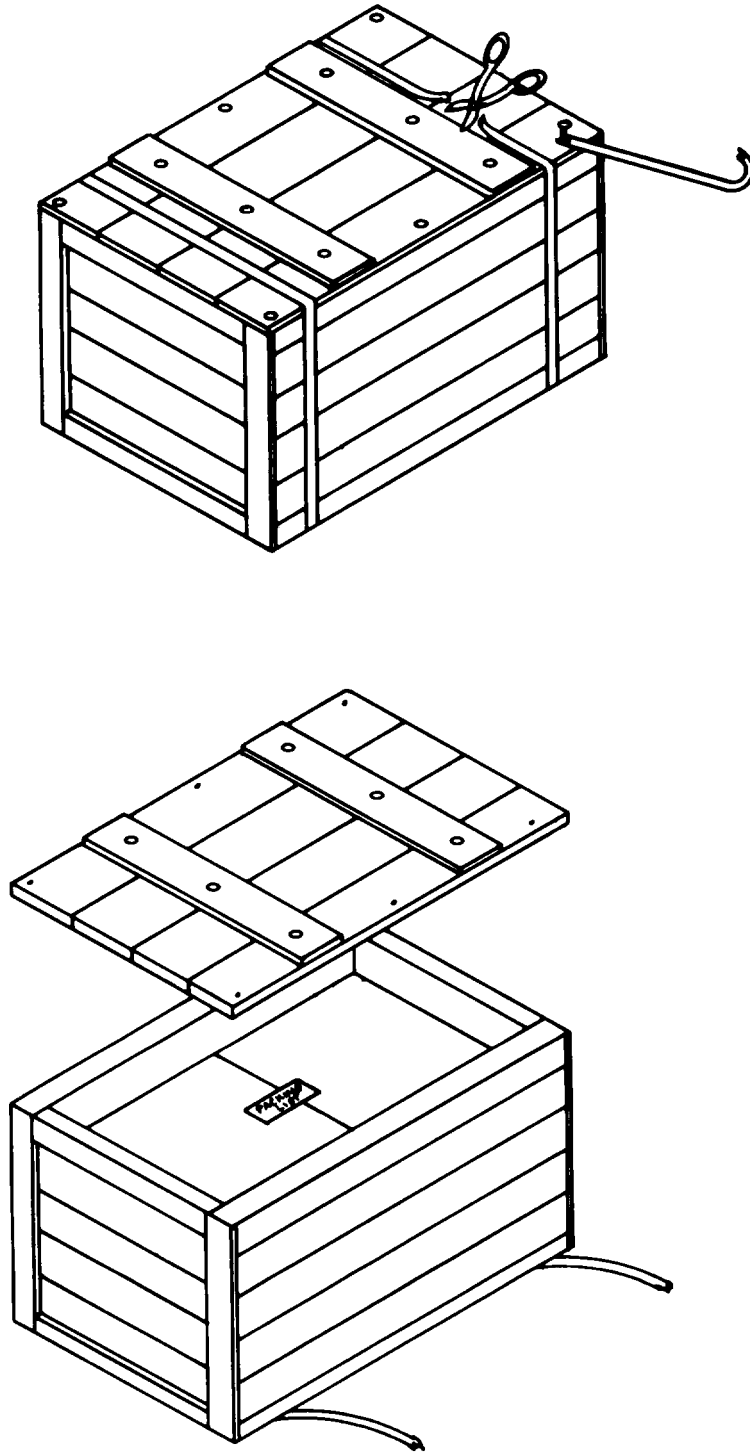


Figure 2-1. REMOVING TOP OF SHIPPING CARTON

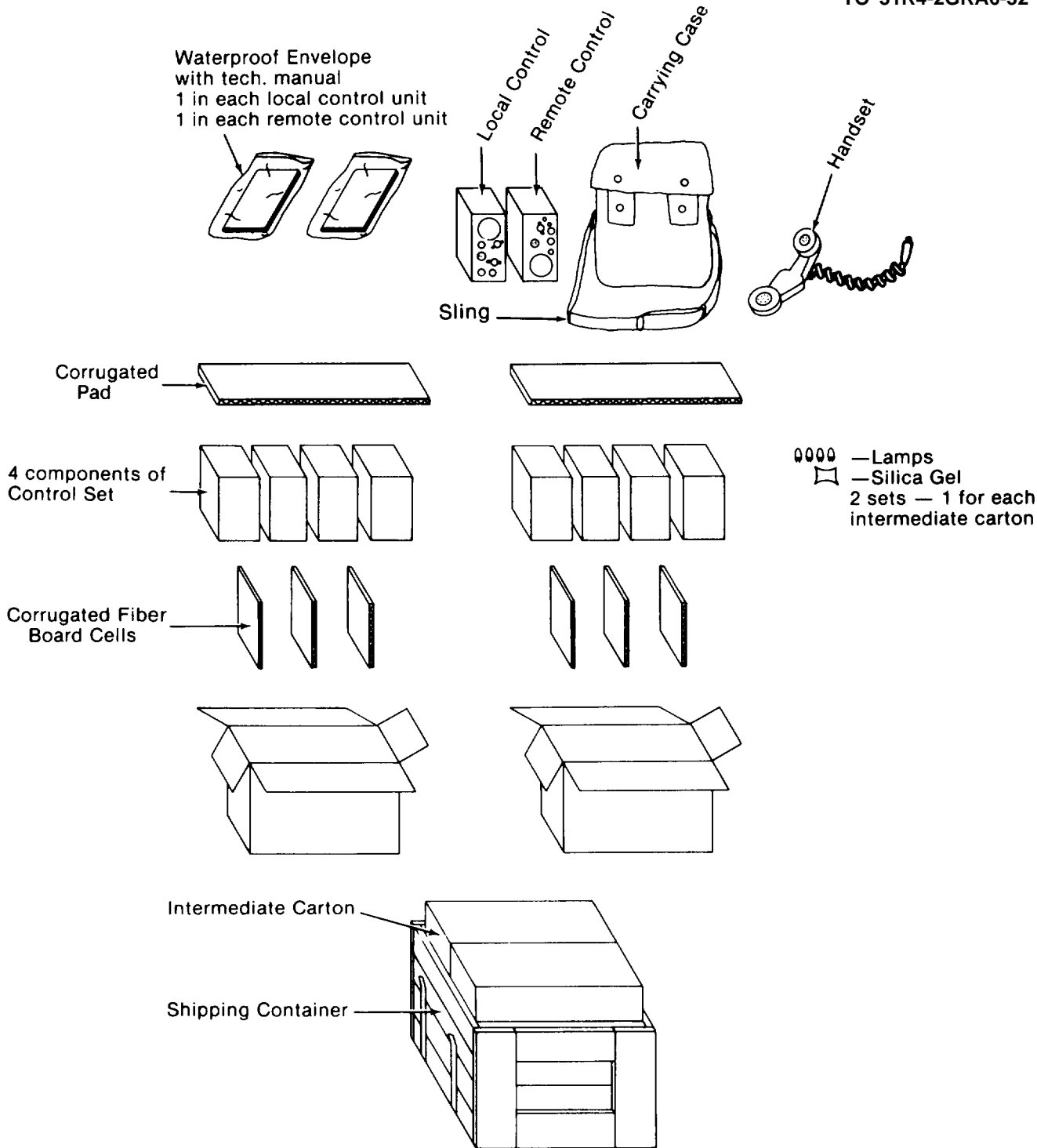


Figure 2-2. UNPACKING AN/GRA-6

2-5. INSTALLATION INSTRUCTIONS

See Operator's Manual TM 11-5820-489-10.

Section III. PREVENTIVE MAINTENANCE CHECKS AND SERVICES

2-6. GENERAL

The following information is for QUARTERLY PMCS (Preventive Maintenance Checks and Services) of any AN/GRA-6. This should be performed after 90 eight-hour days of operation. Maintenance forms and records used and maintained on this equipment are specified in TM 38-750. Perform all checks and services in sequence as listed in TABLE 2-1.

TOOLS AND MATERIAL

- Tool Kit, Electronic Equipment TK101/G (SC 5180-91-CL-R13).
- Cleaning compound
- Cleaning cloth

2-7. ROUTINE SERVICES

Routine services are a series of checks and services performed by organizational maintenance. These services are not listed in the QUARTERLY PMCS TABLE in order to separate the nonoperational from the operational services, Organizational maintenance personnel are not required to perform operator ROUTINE SERVICES.

Perform the following as necessary:

- Clean
- Dust
- Wash
- Check for frayed or cut cables
- Check for dented, bent, or broken components
- Check for rusting
- Check controls for smooth operation
- Check for loose nuts, bolts, and connectors
- Check ground connections
- Check for completeness of equipment
- Cover unused receptacles

Service the following items:

- Chassis
- Battery compartment
- Jacks
- Gaskets

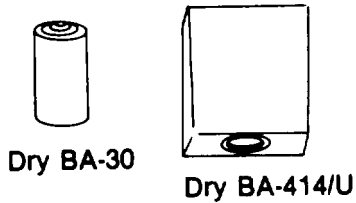
NOTE

If you find any damage during ROUTINE SERVICES refer to paragraph 2-10 (TROUBLESHOOTING TABLE) or Section V (MAINTENANCE PROCEDURES) in this manual for instructions on how to correct it. If the instructions are not there, notify your supervisor. A higher category of maintenance may be required.

TABLE 2-1. QUARTERLY PMCS TABLE

The procedure column in this table tells you how to perform the required checks and services. Carefully follow these instructions.

ITEM TO BE INSPECTED	PROCEDURES
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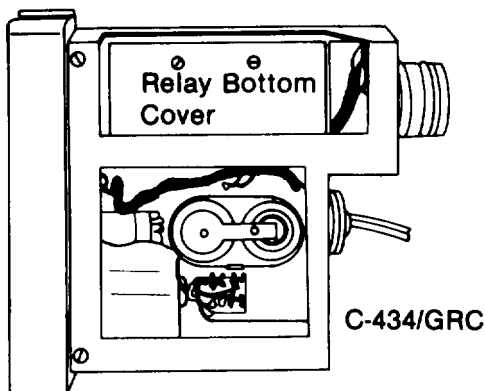


① Check batteries and battery compartments for signs of corrosion or moisture.

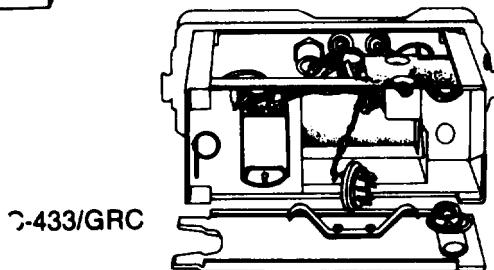


Battery Compartment Cover

② Clean battery contacts and electrodes with a pencil eraser.



③ Wipe interior compartments with clean, soft cloth.



NOTE

If any portion of your Control Group fails to operate, refer to Chapter 2 under TROUBLESHOOTING for possible problems. Report any malfunctions or failures on DA Form 2404 or refer to TM 38-750 (see sample form on following page).

SAMPLE FORM

DA FORM 2404, EQUIPMENT INSPECTION AND MAINTENANCE WORKSHEET.

EQUIPMENT INSPECTION AND MAINTENANCE WORKSHEET									
For use of this form see TM 38-750, the proponent agency is the Office of the Deputy Chief of Staff for Logistics									
1. ORGANIZATION					2. NOMENCLATURE AND MODEL				
3. REGISTRATION/SERIAL/FSN			4a. MILES	b. HOURS	c. ROUNDS FIRED	d. HOT STARTS	5. DATE	6. TYPE INSPECTION	
								PMCS	
7. APPLICABLE REFERENCE									
TM NUMBER			TM DATE		TM NUMBER			TM DATE	
TM 11-5820-489-20									
INSTRUCTIONS - Perform each check listed in the TM applicable to the inspection performed. Following the sequence listed in pertinent TM, complete form as follows: COLUMN a - Enter TM item number. COLUMN b - Enter the applicable condition status symbol. COLUMN c - Enter deficiencies and shortcomings. COLUMN d - Show corrective action for deficiency or shortcoming listed in Column c. COLUMN e - Individual ascertaining completed corrective action initial in this column.									
ALL INSPECTIONS AND EQUIPMENT CONDITIONS RECORDED ON THIS FORM HAVE BEEN DETERMINED IN ACCORDANCE WITH DIAGNOSTIC PROCEDURES AND STANDARDS IN THE TM CITED HEREON.									
8a. SIGNATURE (Person(s) performing inspection)			8b. TIME		9a. SIGNATURE (Maintenance Supervisor)		9b. TIME		10. MANHOURS REQUIRED
<i>John Doe</i>									
TM ITEM NO.	STATUS	DEFICIENCIES AND SHORTCOMINGS			CORRECTIVE ACTION			INITIAL WHEN CORRECTED	
a	b	c			d			e	
		<i>battery corroded</i>			<i>sand contacts</i>			<i>JD</i>	

USE
 PMCS
 ITEM
 NO

Section IV. TROUBLESHOOTING

2-8. GENERAL

Troubleshooting at the Organizational Maintenance level requires that trouble be isolated and traced to a faulty component as quickly as possible. It must be decided if the trouble can be solved at the Organizational Maintenance level or requires a higher level of maintenance. Repairs by Organizational Maintenance are limited by the tools, test equipment, and replacement parts allocated to that level.

When the equipment does not operate properly, inspect it for the following visible trouble before going to the Troubleshooting Table.

2-9. VISUAL INSPECTION

A. Local Control.

- Broken or defective line binding posts.
- Loose or corroded connections to line binding posts.
- Broken, dirty, corroded, or loose AUDIO connector on unit panel.
- Dirty or damaged connector cables.
- Broken call light or damaged dimmer control.
- Improperly installed or burned out call light.
- Leaky or improperly installed batteries.
- Defective or improperly installed control relays 0-1, 0-2, and 0-3. The plug-in type relays are mounted on a shelf which is protected by a cover. Remove the two screws which hold the cover in place and remove the cover. Relay 0-1 is nearest to the panel and relay 0-3 is farthest away from the panel. Do not rock or jiggle the relay if difficulty is encountered. This might damage the relay pins on the relay socket. Pry up gently with a screwdriver, if necessary. Inspect pins; make sure they are not broken or damaged.
- Pinched wires.

B. Remote Control.

- Broken or defective line binding posts,
- Loose or corroded connections to line binding posts.
- Broken, dirty, corroded, or loose AUDIO connector on unit panel.
- Dirty or damaged connector cables.
- Improperly installed or burned out call light.
- Leaky or improperly installed batteries.
- Pinched wires.

C. Handset H-33(*)/PT.

- Improperly connected handset cable or broken wires.
- Improperly operating push-to-talk switch.
- Damaged diaphragm or microphone.
- Damaged or defective microphone or receive elements.

D. Telephone Lines.

- Broken or damaged wires.

NOTE

If the trouble happened while the equipment was in operation; ask the operator for a description of symptoms, before going to the Troubleshooting Table.

2-10. TROUBLESHOOTING TABLE

The Troubleshooting Table lists the common trouble that may be found during operation or maintenance of the equipment.

Follow these steps:

1. Find the trouble under **MALFUNCTION**
2. Check for the possible reason of the trouble under **TEST OR INSPECTION.**
3. Correct the trouble according to the instructions under **CORRECTIVE ACTION.**

This manual cannot list all trouble that may happen, or what to check and how to correct all trouble. If the trouble is not listed in the Troubleshooting Table, or is not corrected by instructions under Corrective Action, notify your supervisor.

Table 2-1. TROUBLESHOOTING

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

1. Call light does not glow at either control unit.
Inspect lamp to see if it is improperly seated in lamp socket or burned out,
(See TM 11-5820-489-10 for procedure.)
Replace lamp if necessary.
2. Remote operator cannot hear local operator.
Step 1. Check headset/handset.
Replace if necessary.
Step 2. Check batteries of both units for proper installation.
(See TM 11-5820-489-10 for procedure).
Replace batteries if necessary.

Section V. MAINTENANCE PROCEDURES

2-11. GENERAL

Organizational Maintenance of Control Group AN/GRA-6 is limited to:

Operational Tests

- Telephone Circuit
- Telephone Line Connectors
- Push-to-Talk Operation of Radio Sets

Tools and Test Equipment

- Tool Kit, Electronic Equipment TK-101/G.
- Multi meter AN/URM-105.

2-12. OPERATIONAL TESTS

A. Telephone Circuit.

NOTE

Agreement and coordination of procedures between two operators is necessary for the following check.

- Crank the ringing generator handle mounted on the panel of one of the control units. Depending on the setting of the BELL-LAMP switch at the other control unit, the bell should ring or the lamp should light.



THE VOLTAGE AT BINDING POSTS L-1 and L-2 MAY BE AS HIGH AS 90 VOLTS.

- Set the control switches of both control units in the TEL and TEL ONLY position.
- Press the push-to-talk switch on the handset and talk into the microphone.
- Duplex operation: both operators talking should be possible.
- Release push-to-talk switch to listen.

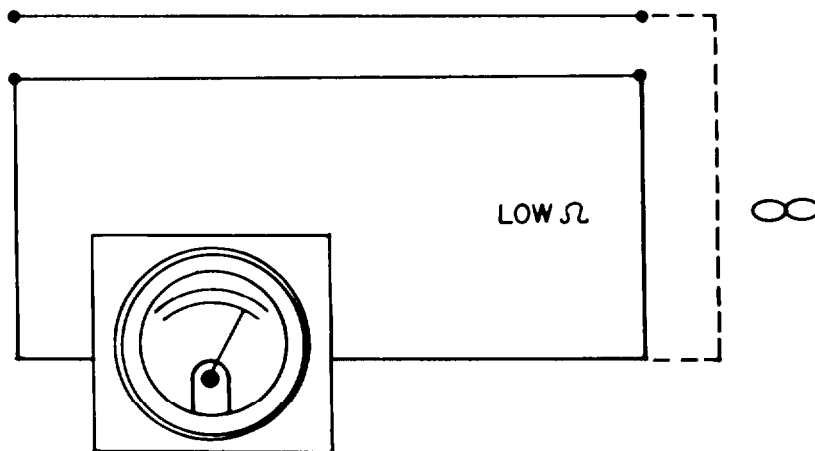
NOTE

To conserve battery power, press the push-to-talk switch only when necessary.

B. Telephone Line Connections.

Continuity Measurement

- The LINE-1 binding post of the remote and local units must be connected by one wire of the two-wire telephone line.
- The LINE-2 binding post must be connected by the other wire of the two-wire telephone line.
- Use Multi meter AN/URM-105 to measure ohms across the ends of the telephone line to help identify the wire ends for proper connection.
- Use Multi meter AN/URM-105 to measure continuity by connecting one lead of multimeter to one end of wire.
- Connect other multimeter lead to either of the two other ends of wire until a low resistance is found.
- Then tag both ends as L-1.



Control Voltage Polarity Measurement

- Connect the telephone lines between the control units.
- At the remote control unit, turn the SELECTOR switch to the left-hand write-in position and press the push-to-talk switch.
- At the local control unit, use Multi meter AN/URM-105 to check the polarity of the dc voltage at the telephone line ends.

NOTE

To be sure there is enough line current for operation of the local control relays, the voltage between the two binding posts should be between 24 and 45 volts.

- At the remote control unit release the microphone push-to-talk switch and return the SELECTOR switch to the TEL position.
- At the local control unit connect the positive wire of the telephone line to the LINE L-1 binding post and the negative wire to the LINE L-2 binding post.

C. Push-to-Talk Operation of the Radio Set.

- At the remote control unit turn the SELECTOR switch to the left-hand write-in position.
- At the local control unit turn the REMOTE switch to the SET-1 position.
- Set the main power switch of the radio set for remote control of power, if it is so equipped. If the radio set is not equipped for remote control of power, turn on power locally. See the Technical Manual for the particular radio set being used.
- At the remote control unit, press the handset push-to-talk switch. At the radio set location, check to see if the radio set is being controlled (transmitter and/or power control).
- At the remote control unit, turn the SELECTOR switch to the middle write-in position. Press and hold the push-to-talk switch. At the radio set location check to see that transmitter is not transmitting and/or power has been turned off.
- If these requirements have been met, the line connections are correct. If they have not been met, reverse the line connections at one of the two units and recheck.



A potential as high as 45 volts exists at the binding posts of both units, when the push-to-talk switch is pressed at the remote control unit.

NOTE

The following instructions do not apply if the radio set does not use SET-2.

- Leave the remote control SELECTOR switch in the left-hand write-in position.
- At the local control unit, turn the remote switch to the SET-2 position.
- Press the push-to-talk switch at the remote control unit. Check to see if radio set transmitter and/or power is controlled.
- At the remote control unit, turn the SELECTOR switch to the middle write-in position and press the push-to-talk switch. Check to see if the radio set transmitter and/or power have been turned off.

If these requirements have been met, installation connections are correct. Use the following table as a guide for filling in blank write-in spaces on units.

Table 2-2.

LOCAL UNIT REMOTE SWITCH POSITION	DESIRED POINT OF POWER CONTROL	SELECTOR SWITCH POSITION (REMOTE UNIT)	
		LEFT-HAND WRITE-IN POSITION	RIGHT-HAND WRITE-IN POSITION
SET 1	remote	Control Set 1; turn on radio set power.	Decontrol Set 1; turn off radio set power.
SET 1	local	Control Set 1.	Decontrol Set 1.
SET 2	remote	Control Set 2; turn on power.	Decontrol Set 2; turn off power.
SET 2	local	Control Set 2.	Decontrol Set 2.
SET 1 & 2	local only	Control Set 1; decontrol Set 2.	Control Set 2; decontrol Set 1.

2-13. 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 warning is followed:



Adequate ventilation should be provided while using TRICHLOROTRIFLUOROETHANE. 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 skin should be avoided. When necessary, use gloves which the solvent cannot penetrate. If the solvent is taken internally, consult a physician immediately.

2-14. PAINTING, REFINISHING, AND MARKING

Refinishing procedures should restore equipment surfaces to original appearance and as-new standards. Minor damage to finishes, such as small scratches, require touch-up painting of the affected areas only. Major surface damage requires complete repainting. Inspect the equipment to determine the extent of painting and refinishing that is required. Refer to MIL-F-14072 for determination of paints, finishing processes, and quality assurance provisions. Instructions for major surface repainting are given in TM 43-0139.

A. Touch-up Procedures.

- Remove all rust and corrosion by lightly sanding the affected area with fine sandpaper (NSN 5350-00-264-3465). Clean with solvent and allow to dry.
- Apply zinc chromate primer 0.0004 and 0.0006-inch thick per Federal Specification TT-P-1757 over the chemical film using small camel's hair brush. Allow to dry.
- Apply one coat of lusterless enamel paint. Refer to SB 11-573 for available paint and preservation supplies. Allow to dry.

B. Major Repainting Procedures.

- Complete repainting procedures should be performed only as required. Paint the equipment in accordance with the requirement of MIL-F-14072 and current established painting practices.

CAUTION

Do not use steel wool. Particles can enter the case and cause harmful internal shorting or grounding of circuits.

C. Marking.

- Marking of electrical and electronic parts shall be in accordance with MIL-STD 1285A.

2-15. FINAL INSPECTION PROCEDURES

The final inspection procedures make sure that all maintenance functions contained in this manual have been complied with before the equipment has been returned to service.

A. Modifications.

- Be sure that any MWO's listed in DA PAM 310-1 have been performed,

B. PMCS.

- Be sure that all PMCS in Section III have been performed.

C. Completeness.

- Inspect the Control Group for completeness. Refer to TM 11-5820-489-20P for a listing of components and accessories.
- Check to make sure that each item is correctly stock numbered.
- Be sure that the correct quantity is in the package.

D. Final Performance Check.

- The components of the Control Group shall meet the requirements of Section V before operating, packaging, or storage. If operation checks, PMCS, or a final performance check cannot be satisfactorily performed, contact the next higher level of maintenance.

Section Vi. PREPARATION FOR STORAGE AND SHIPMENT

2-16. DISASSEMBLY OF EQUIPMENT

Use the procedure below when placing AN/GRA-6 in storage or moving it to a different location.

A. Disconnecting Cables.

Remote Control C-433/GRC.

- Remove Interconnecting Box plug from AUDIO connector on front panel.
- Remove handset if it is attached directly to AUDIO connector on front panel.

Local Control C-434/GRC.

- Remove cables coming from rear of Local Control from SET 1 (and SET 2 if used) AUDIO connectors. Coil cables and store them in compartment on rear of Local Control.
- If Local Control is mounted with a radio set, unplug connector on rear of Local Control from plug in mounting frame of the radio set by pulling it forward and sliding it off of mounting frame.
- Remove handset from AUDIO connector on front panel.

Telephone Lines.

- Loosen Line L1 and L2 binding post knobs on both Remote Control unit and Local Control unit telephone lines and re-tighten the knobs.

2-17. REPACKING FOR STORAGE OR SHIPMENT

- Place Local Control, Remote Control, all technical manuals, and Bag in their original unit packages (or boxes of similar size). Seal unit packages.
- Place unit packages in the two original intermediate cartons.
- Place corrugated fiberboard cells between packages and cover with fiberboard pad.
- Place intermediate cartons in shipping container and re-nail top to container.

2-18. TYPES OF STORAGE

- Short term (administrative): 1 to 45 days. All equipment in administrative storage must be able to be made ready for use within 24 hours. Before placing any item in administrative storage, perform your next scheduled PMCS and correct or repair any deficiencies you find. The administrative storage site should provide required protection from extreme weather conditions and allow you to reach the equipment for visual inspections or exercises when applicable.
- Long term or flyable: no time limit.

APPENDIX A

REFERENCES

A-1. INTRODUCTION

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

A-2. FORMS

Equipment Inspection and Maintenance Worksheet.	DA Form 2404
Quality Deficiency Report	Form SF 368
Recommended Changes to Equipment Technical Manuals	DA Form 2028-2
Recommended Changes to Publications and Blank Forms	DA Form 2028
Report of Discrepancy (ROD)	Form SF 364

A-3. TECHNICAL MANUALS

Operator's and Organizational Maintenance Manual: Multimeter AN/URM-105 and AN/URM-105C (Including Multimeter ME-77/U and ME-77C/U).	TM 11-6625-203-12
Operator's Manual: Control Group AN/GRA-6 (NSN 5820-00-644-4554)	TM 11-5820-489-10
Organizational Maintenance Repair Parts and Special Tool Lists for Control Group AN/GRA-6 (NSN 5820-00-644-4554)..	TM 11-5820-489-20P
Procedures for Destruction of Electronic Materiel to Prevent Enemy Use (Electronics Command).	TM 750-244-2
The Army Maintenance Management System (TAMMS)	TM 38-750
Painting instructions for Field Use.. . . .	TM 43- 0139

A-4. MISCELLANEOUS PUBLICATIONS

Consolidated Index of Army Publications and Blank Forms	DA Pam 310-1
Sets, Kits and Outfits, Components List: Tool Kit, Electronics Equipment, TK-101/G	SC 5180-91-CL-R13
Painting and Preservation Supplies Available for Field Use for Electronics Command Equipment	SB 11-573
Finishes for Ground Electronic Equipment	MIL-F-14072
Marking of Electrical and Electronic Equipment.	MIL-STD 1285A
Primer Coating, Zinc Chromate, Low Moisture Sensitivity.	TT-P-1757

APPENDIX B

MAINTENANCE ALLOCATION

Section I. INTRODUCTION

B-1. GENERAL

This appendix provides a summary of the maintenance operations for the AN/GRA-6. It authorizes categories of maintenance for specific maintenance functions on repairable items and components and the tools and equipment required to perform each function. This appendix may be used as an aid in planning maintenance operations.

B-2. MAINTENANCE FUNCTION

Maintenance functions will be limited to and defined as follows:

a. INSPECT. To determine the serviceability of an item by comparing its physical, mechanical, and/or electrical characteristics with established standards through examination.

b. TEST. To verify serviceability and to detect incipient failure by measuring the mechanical or electrical characteristics of an item and comparing those characteristics with prescribed standards.

c. SERVICE. Operations required periodically to keep an item in proper operating condition, i.e., to clean (decontaminate), to preserve, to drain, to paint, or to replenish fuel, lubricants, hydraulic fluids, or compressed air supplies.

d. ADJUST. To maintain, within prescribed limits, by bringing into proper or exact position, or by setting the operating characteristics to the specified parameters.

e. ALINE. To adjust specified variable elements of an item to bring about optimum or desired performance.

f. CALIBRATE. To determine and perform corrections and adjustments on instruments or test measuring and diagnostic equipment used in precision measurement. Consists of comparisons of two instruments, one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared.

g. INSTALL. The act of emplacing, seating, or fixing into position an item, part, or module (component or assembly) in a manner to allow the proper functioning of the equipment or system.

h. REPLACE. The act of substituting a serviceable part, subassembly, or module (component or assembly) for an unserviceable counterpart.

L REPAIR. The application of maintenance services (inspect, test, service, adjust, aline, calibrate, replace) or other maintenance actions (welding, grinding, riveting, straightening, facing, remachining or resurfacing) to restore serviceability to an item by correcting specific damage, fault, malfunction, or failure in part, subassembly, module (component or assembly), end item, or system.

j. OVERHAUL. That maintenance effect (service/action) necessary to restore an item to a completely serviceable/operational condition as prescribed by maintenance standards (i.e., DMWR) in appropriate technical publications. Overhaul is normally the highest degree of maintenance performed by the Army. Overhaul does not normally return an item to like new condition.

k. REBUILD. Consists of those services/actions necessary for the restoration of unserviceable equipment to a like new condition in accordance with original manufacturing standards. Rebuild is the highest degree of materiel maintenance applied to Army equipment. The rebuild operation includes the act of returning to zero those age measurements (hours, miles, etc.) considered in classifying Army equipments/components.

B-3. COLUMN ENTRIES

a. Column 1: GROUP NUMBER. Column 1 lists group numbers, the purpose of which is to identify components, assemblies, subassemblies, and modules with the next higher assembly.

b. Column 2: COMPONENT ASSEMBLY. Column 2 contains the noun names of components, assemblies, subassemblies, and modules for which maintenance is authorized.

c. Column 3: MAINTENANCE FUNCTIONS. Column 3 lists the functions to be performed on the item listed in column 2. When items are listed without maintenance functions, it is solely for purpose of having the group numbers in the MAC and RPSTL coincide.

d. Column 4: MAINTENANCE CATEGORY. Column 4 specifies, by the listing of a "work time" figure in the appropriate subcolumn(s), the lowest level of maintenance authorized to perform the function listed in column 3. This figure represents the active time required to perform that maintenance function at the indicated category of maintenance. If the number or complexity of the tasks within the listed maintenance function varies at different maintenance categories, appropriate "work time" figures will be shown for each category. The number of task-hours specified by the "work time" figure represents the average time required to restore an item (assembly, subassembly, component, module, end item or system) to a serviceable condition under typical field operating conditions. This time includes preparation time, troubleshooting time, and quality assurance/quality control time in addition to the time required to perform the specific tasks identified for the maintenance functions authorized in the maintenance allocation chart, Subcolumns of column 4 are as follows:

- C - Operator
- O - Organizational
- F - Direct Support
- H - General Support
- D - Depot

e. Column 5: TOOLS AND EQUIPMENT. Column 5 specifies by code, those common tool sets (not individual tools) and special tools, test and support equipment required to perform the designated function.

f. Column 6: REMARKS. Column 6 contains an alphabetic code which leads to the remark in Section IV, Remarks, which is pertinent to the item opposite the particular code.

B-4. TOOLS AND TEST EQUIPMENT REQUIREMENTS

a. TOOL OR TEST EQUIPMENT REFERENCE CODE. The numbers in this column coincide with the numbers used in the tools and equipment column of the MAC. The numbers indicate the applicable tool or test equipment for the maintenance functions.

b. MAINTENANCE CATEGORY. The code letter in this column indicates which one of the four maintenance levels uses the specified tool.

c. NOMENCLATURE. This column lists the noun name and nomenclature of the tools and test equipment required to perform the maintenance functions.

d. NATIONAL/NATO STOCK NUMBER. This column lists the National/Nato stock number of the specific tool or test equipment.

e. TOOL NUMBER. This column lists the manufacturer's part number of the tool followed by the (5 digit) Federal Supply Code for Manufacturers in parentheses.

B-5. REMARKS

a. REFERENCE CODE. This code refers to the appropriate item in Section II, Column 6.

b. REMARKS. This column provides the required explanatory information necessary to clarify items appearing in Section II.

**Section II. MAINTENANCE ALLOCATION CHART
FOR
CONTROL GROUP AN/GRA-6**

(1) GROUP NUMBER	(2) COMPONENT ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY					(5) TOOLS AND EQPT.	(6) REMARKS
			C	O	F	H	D		
00	CONTROL GROUP AN/GRA-6	Inspect	0.2						A
		Service	0.2						A
		Replace		0.2					1,2 B
		Test		0.2					1,2 C
		Test			0.3				1 thru 11 D
		Repair			0.5				1 thru 11 E
		Repair				1.0			1 thru 12 E
		Repair					3.0		1 thru 12 F
		Overhaul					14.0		1 thru 12 F
01	REMOTE CONTROL C-433/GRC	Inspect	0.1						A
		Service	0.1						A
		Replace		0.15					1,2 B
		Test		0.1					1,2 C
		Test			0.2				1 thru 11 D

**Section II. MAINTENANCE ALLOCATION CHART
FOR
CONTROL GROUP AN/GRA-6 - Continued**

(1) GROUP NUMBER	(2) COMPONENT ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY					(5) TOOLS AND EQPT.	(6) REMARKS
			C	O	F	H	D		
01 (cont)	LOCAL CONTROL C-434/GRC	Repair			0.5			1 thru 11	E
		Repair				1.5		1 thru 12	E
		Overhaul					7.0	1 thru 12	F
02		Inspect	0.1						A
		Service	0.1						A
		Replace		0.15				1, 2	B
		Test		0.1				1, 2	C
		Test			0.2			1 thru 11	D
		Repair			0.5			1 thru 11	E
		Repair				1.5		1 thru 12	E
	Overhaul					7.0	1 thru 12	F	

Section III. TOOL AND TEST EQUIPMENT REQUIREMENTS
FOR
CONTROL GROUP AN/GRA-6

TOOL OR TEST EQUIPMENT REF CODE	MAINTENANCE CATEGORY	NOMENCLATURE	NATIONAL/NATO STOCK NUMBER	TOOL NUMBER
1	O,F,H,D	Tool Kit, Electronic Equipment TK-101/G	5180-00-064-5178	
2	O,F,H,D	Multimeter AN/URM-105	6625-00-581-2036	
3	F,H,D	Multimeter TS-352B/U	6625-00-242-5023	
4	F,H,D	Tool Kit, Electronic Equipment TK-105/G	5180-00-610-8177	
5	F,H,D	Voltmeter, Electronic ME-30B/U	6625-00-649-4537	
6	F,H,D	Power Supply PP-1097A/G	6130-00-660-8847	
7	F,H,D	Decade Resistor ZM-16/U	6625-00-669-0266	
8	F,H,D	Dummy Load, Electrical DA-269/GRC*	5820-00-893-0095	
9	F,H,D	Dummy Load, Electrical DA-270/GRC*	5820-00-893-0094	
10	F,H,D	Radio Set AN/GRC-3	5820-00-543-1784	
11	H,D	Audio Oscillator TS-421C/U	6625-00-435-2588	
12		USM-281C Oscilloscope *Part of Test Facilities Kit, Radio, MK-153/GRC.	6625-00-106-9622	

Section IV. REMARKS

REFERENCE CODE	REMARKS
A	Preventive maintenance in accordance with TM 11-5820-489-10
B	Replace lamps and batteries.
C	Operational tests.
D	Continuity tests and troubleshooting in accordance with TM 11-5280-489-20.
E	All repairs not requiring major disassembly.
F	All repairs requiring major disassembly.

APPENDIX C

EXPENDABLE SUPPLIES AND MATERIALS LIST

Section I. INTRODUCTION

C-1. General

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.

C-2. EXPLANATION OF COLUMNS

a. **ITEM NO.** This number is referenced in the narrative instructions to identify the materials (for example, "Use cleaning compound, Item 1, App. C").

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

- C - Crew/Operator
- O - Organizational Maintenance

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).

Section II. EXPENDABLE SUPPLIES AND MATERIALS LIST

ITEM NO.	LEVEL	NATIONAL STOCK NUMBER	DESCRIPTION	U/M
1	c	6850-00-984-5853	Cleaning compound	QT
2	c	8305-00-267-3015	Cleaning cloth	YD
3	0	5350-00-284-3485	Sandpaper, PP-105	EA
4	0		Paint	QT
5	0	8020-00-245-4509	Camel's hair brush	EA
6	c	6850-00-105-3084	Trichlorotrifluoroethane	QT

GLOSSARY

AMPLIFIER - A device usually employing electron tubes or transistors to obtain amplification of voltage, current, or power.

AUDIBLE - Heard or capable of being heard.

AUDIO - Frequencies that are heard.

CHASSIS - The metal framework on which the parts of the control group are mounted.

DIRECT CURRENT (dc) - Electric current that flows in one direction only and remains essentially constant in value.

REMOTE - Control indirectly or from a distance.

VENTILATION - Provides fresh air circulation.

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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

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5-6	5-8		
		FO3	

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.

TEAR ALONG PRIORITIZED LINE

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

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SAMPLE

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TEAR ALONG PERFORATED LINE

Commander
US Army Communications-Electronics Command
and Fort Monmouth
ATTN: DRSEL-ME-MP
Fort Monmouth, New Jersey 07703

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TEAR ALONG PERFORATED LINE

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