

TECHNICAL MANUAL

**OPERATOR'S, ORGANIZATIONAL, AND
DIRECT SUPPORT MAINTENANCE MANUAL
ANTENNA AS-2731/GRC
(NSN 5985-01-017-0785)**

**This copy is a reprint which includes current pages from
Changes 1 and 2.**

HEADQUARTERS, DEPARTMENT OF THE ARMY

APRIL 1978

WARNING

Operator and maintenance personnel should be familiar with the requirements of TB SIG 291 before attempting installation or operation of the equipment. Failure to follow the requirements of TB SIG 291 could result in injury or DEATH.

WARNING

Dangerous rf voltages exist at all metal surfaces above plastic base insulator, including spring mount and lower ferrule of whip, when the radio is transmitting.

WARNING

DO NOT tie down the whip on a vehicle because of possible serious injury to personnel.

CHANGE }
No. 2

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, DC, 30 July 1982

**Operator's, Organizational, and Direct Support
Maintenance Manual
ANTENNA AS-2731/GRC
(NSN 5985-01-017-0785)**

TM 11-5985-355-13, 12 April 1978, is changed as follows:

1. New or changed material is indicated by a vertical bar in the margin of the page.
2. Added or revised illustrations are indicated by a vertical bar in front of the figure caption.
3. Remove and insert pages as indicated below:

<i>Remove</i>	<i>Insert</i>
i and ii.....	i and ii
1-1 through 1-3	1 through 1-4
2-1 and 2-2.....	2-1 and 2-2
3-1 and 3-2.....	3-1 and 3-2
4-1 through 4-5	4-1 through 4-5
6-1 through 6-7	6-1 through 6-7
A-1 and A-2.....	A-1 and A-2
B-1 and B-2.....	B-1 and B-2
C-3 and C-4	C-3 and C-4
E-1 and E-2.....	E-1 and E-2
Figure FO- 1.....	Figure FO-1

4. File this change sheet in front of the publication for reference purposes.

By Order of the Secretary of the Army:

Official:

ROBERT M. JOYCE
*Brigadier General, United States Army
The Adjutant General*

E. C. MEYER
*General, United States Army
Chief of Staff*

Distribution:

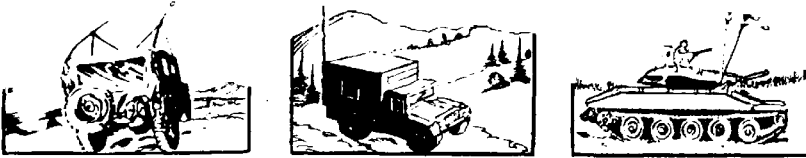
To be distributed in accordance with DA Form 12-51, Operator, requirements for AN/VRC-12, AN VRC-43 Thru 49, AN/VRC-64 and AN/GRC- 160.

WARNING

SERIOUS INJURY OR EVEN DEATH CAN HAPPEN IF THE FOLLOWING ARE NOT CAREFULLY OBSERVED WHEN INSTALLING AND USING THE ANTENNAS USED WITH YOUR RADIO SETS.

**BEFORE ANY
MISSION FIND
OUT**

1. ARE THERE ANY POWERLINES IN YOUR AREA OF OPERATION ?
2. HOW HIGH ARE THESE POWERLINES ?
3. HOW TALL ARE THE POLES OR TOWERS CARRYING POWERLINES ?

MOBILE OPERATION WITH WHIP ANTENNAS**DO NOT STOP YOUR VEHICLE UNDER POWERLINES.**

- IF POSSIBLE, TRY TO MAINTAIN MOBILE COMMUNICATIONS WITH YOUR ANTENNA(S) TIED DOWN.
- MAKE SURE AN ANTENNA TIP CAP IS SECURELY TAPED ON THE END OF EACH WHIP ANTENNA.
- DO NOT LEAN AGAINST OR TOUCH A WHIP ANTENNA WHILE THE TRANSMITTER IS ON.
- DURING CROSS-COUNTRY OPERATION, DO NOT ALLOW ANYONE TO STICK AN ARM, LEG OR WEAPON OVER THE SIDES OF THE VEHICLE. IF YOUR ANTENNA ACCIDENTALLY TOUCHES A POWERLINE AND A LEG, ARM OR WEAPON CONTACTS A DAMP BUSH OR THE GROUND, A SERIOUS OR FATAL ACCIDENT CAN HAPPEN.
- IF YOU ARE NOT SURE THAT AN ANTENNA ON YOUR VEHICLE WILL CLEAR A POWERLINE, STOP BEFORE YOU GET CLOSE TO THE POWERLINE AND EITHER CAREFULLY TIE DOWN THE ANTENNA OR REMOVE ANTENNA SECTIONS TO MAKE SURE THAT YOU CAN SAFELY DRIVE UNDER THE POWERLINE.

Change 1 0-i



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 DRY WOODEN POLE OR A DRY 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

**OPERATOR'S, ORGANIZATIONAL, AND DIRECT SUPPORT
MAINTENANCE MANUAL
ANTENNA AS-2731 /GRC
(NSN 5985-01-017-0785)**

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 (Recommended Changes to Publications and Blank Forms), or DA Form 2028 2 located in the back of this manual direct to Commander, US Army Communications-Electronics Command, ATTN: DRSEL- ME MQ, Fort Monmouth, NJ 07702.

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

		Paragraph	Page
CHAPTER 1.	INTRODUCTION		
SECTION I.	General		
	Scope	1-1	1-1
	Index of technical publications	1-2	1-1
	Maintenance forms, records and reports	1-3	1-1
	Destruction of Army electronics material	1-4	1-1
	Administrative storage.....	1-5	1-1
	Reporting equipment improvement recommendations (EIR).....	1-5.1	1-1
SECTION II.	Description and data		
	Purpose and use	1-6	1-2
	Tabulated data	1-7	1-2
	Description	1-8	1-2
CHAPTER 2.	INSTALLATION AND OPERATION		
SECTION I.	Service upon receipt of equipment		
	Checking unpacked equipment.....	2-1	2-1
	Siting	2-2	2-1
	Installation instructions.....	2-3	2-1
SECTION II.	Operating instructions		
	Operator's control and connectors	2-4	2-5
	Operating procedure	2-5	2-5
CHAPTER 3.	OPERATOR CREW MAINTENANCE		
	Scope of operator's maintenance	3-1	3-1
	Materials required	3-2	3-1
	Operator's crew preventive maintenance.....	3-3	3-1
	Preventive maintenance checks and services periods	3-4	3-1
	Cleaning.....	3-5	3-2
CHAPTER 4.	ORGANIZATIONAL MAINTENANCE		
	Scope of organizational maintenance	4-1	4-1
	Test equipment, tools and materials required.....	4-2	4-1
	Organizational preventive maintenance checks and services (PMCS)	4-3	4-1
	Touchup painting.....	4-4	4-1
	Organizational maintenance troubleshooting procedures.....	4-5	4-1
	Repair procedures: General.....	4-6	4-2
	Antenna Element AS- 2732 GRC removal and replacement.....	4-7	4-2
	Matching Unit-Base MX-9146 GRC removal and replacement	4-8	4-4
	Using Test Set, RF Power AN URNI-182 with AS-2731 GRC	4-9	4-4
	Painting	4-10	4-4
CHAPTER 5.	CIRCUIT ANALYSIS		
	General	5-1	5-1
	Matching Unit-Base MX 9146 GR.....	5-2	5-1

CHAPTER 6.	DIRECT SUPPORT MAINTENANCE INSTRUCTIONS		
SECTION I.	Troubleshooting		
	Scope of direct support maintenance	6-1	6-1
	Tools, test equipment, and materials required	6-2	6-1
	Direct support maintenance troubleshooting	6-3	6-1
SECTION II.	Repair procedures		
	General	6-4	6-1
	Special precautions.....	6-5	6-1
	Antenna Element AS-2732 GRC parts removal and replacement.....	6-6	6-1
	Matching Unit-Base NIIX 9146 GRC parts removal and replacement	6-7	6-2
	Antenna performance test.....	6-8	6-7
APPENDIX A.	REFERENCES.....		A-1
APPENDIX B.	COMPONENTS OF END ITEM LIST		
SECTION I.	Introduction		B-1
SECTION II.	Integral Components of End Item		B-2
APPENDIX C.	MAINTENANCE ALLOCATION		
SECTION I.	Introduction		C-1
SECTION II.	Maintenance Allocation Chart		C-3
SECTION III.	Tool and Test Equipment Requirements		C-4
SECTION IV.	Remarks		C-5
APPENDIX E.	EXPENDABLE SUPPLIES AND MATERIALS LIST		
SECTION I.	Introduction		E-1
SECTION II.	Expendable Supplies and Materials List		E-2

LIST OF ILLUSTRATIONS

<i>Figure</i>	<i>Title</i>	<i>Page</i>
1-1	Antenna AS-273 GRC, overall view, less restraint assembly.....	1-3
1-2	Restraint assembly, installation.....	1-3
2-1	Antenna siting locations, good and poor	2-2
2-2	Antenna AS 2731 GRC, partial view, parts location.....	2-3
2-3	NIX 9146 GRC, bottom view, installed in mounting bracket, parts location	2-4
2-4	Typical bonding jumper setups	2-5
2-5	Antenna AS 2731 GRC, control and connectors.....	2-6
4-1	Typical receiver-transmitter test setup with AN URNI-182	4-5
6-1	Antenna Element AS 2732 GRC. partial view, parts location.....	6-2
6-2	Cable Mount Assembly, exploded view, parts location	6-3
6-3	Matching Unit-Base MX 9146 GRC, side view, parts location with restraint assembly.....	6-5
6-4	Matching Unit-Base MX-9146 GRC, case cover removed parts location	6-6
6-5	Cable Assembly, Special Purpose MX-13055 GRC, schematic diagram	6-7
FO-1	Matching Unit-Base MX 9146 GRC, schematic diagram	Back of Manual

CHAPTER 1 INTRODUCTION

Section I. GENERAL

1-1. Scope

a. This manual describes Antenna AS-2731 GRC and covers its installation, operation, and operator's, organizational, and direct support maintenance. Detailed functioning of the AS-2731 GRC is covered in the circuit analysis chapter. Maintenance coverage is limited to those procedures that do not require operation of the AS-2731 GRC as part of a specific communication system.

b. The AS-2731 GRC is always used as part of a communication system. The information in this manual supplements the information given for the AS-2731 GRC in the technical manual for the radio set with which the AS-2731 GRC is used.

c. Antenna AS-2731 GRC is usually mounted on vehicles. Mounting instructions will differ for the various vehicles on which the AS-2731 GRC is installed. Refer to SB 11 - 131 for the list of authorized vehicular radio sets and installation kits.

d. The basic issue items list appears in appendix B, and the maintenance allocation chart appears in appendix C.

1-2. Index of Technical Publications

Refer to the latest issue of DA Pam 310-4 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 TM 38-750, The Army Maintenance Management System.

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 NAVMATINST4355.73 AFR 400-54 MICO 4430.3E.

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 NAV'SUPINST4610.33B AFR75-18 MCO 4610.19C DL AR 4500.15.

1-4. Destruction of Army Electronics Materiel

Administrative Storage of the AS-2731 GRC will be handled as follows. The requirements apply whether the antenna is stored as part of the vehicle, with an associated radio, or stored alone.

a. If the AS-2731/GRC is removed from the vehicle, the mounting hardware should be stowed in a small bag attached to the MX-9146 GRC. Apply a layer of graphite grease (item 2, app F) to the screw threads to prevent rust.

b. Before and after storage, perform the following:
(1) Clean the unit (para 3-5) and spot-paint bare metal parts (para 4-4).

(2) Perform quarterly PMSC (table 4-1). Correct all deficiencies.

c. Store in dry, moisture-free area. Records and reports shall be maintained as prescribed in TM 38-750 for equipment in use.

1-5.1. Reporting Equipment Improvement Recommendations (EIR)

If your AS-2731 GRC 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. Tell us why a procedure is hard to perform. Put it on an SF 368 (Quality Deficiency Report). Mail it to Commander, US Army Communications-Electronics Command and Fort Monmouth ATTN: DRSEI, -ME-MQ, Fort Monmouth, NJ 07703.

We'll send you a reply.

Section II. DESCRIPTION AND DATA

1-6. Purpose and Use

a. *Purpose.* Antenna AS-2731 GRC (fig. 1-1) is an omnidirectional vertically polarized whip antenna

assembly that provides for transmission and reception of radio signals between 30 and 80 megaHertz (MHz).

b. *Use.* Antenna AS-2731 GRC is used with AN

VRC 12 series radios (AN VRC-12 and AN VRC-43 through AN VRC-49 (TM 11-5820-401-12)) and low-powered Radio Sets AN VRC-53, AN VRC 64 AN GRC-125 and AN GRC-160(TM11-5820-498-12). The AS-2731 GRC can be installed in jeeps, tanks, and other armored vehicles and where Antenna AS-1729 VRC (TM 11-5985-262-15) has been installed.

1-7. Tabulated Data

a. *Technical Characteristics.*

Antenna type	Whip.
Frequency range	30 to 80 MHz.
Power-handling capability	70 watts
.....	maximum.
Input impedance.....	50 ohms.
Weight	10 pounds.

b. *Component Dimensions.* Refer to appendix B for component National stock numbers (NSN's). Refer to TM 11 -5985-355-24P for parts and NSN's of the installation hardware (fig. 1-1).

<i>Item</i>	<i>Largest dia (in)</i>	<i>Length (in)</i>	<i>Weight (lb)</i>
Matching Unit-Base MX-9146 GRC	5.50	16.00	6.5
Antenna Element AS-2732 GRC	1.75	64 25	2.5
Cable Assembly, Special Purpose, Electrical CX-13055 GRC		12.00	1.0
Cable Assembly. special Purpose, Electrical CX-13184 GRC			
<i>Largest dia (in)</i>	<i>Length (in)</i>	<i>Weight (lb)</i>	
	1.0	18.00	1.0

1-8. Description

(fig. 1-1)

Antenna AS 2731 GRC consists of Matching Unit-Base MIX-9146 GRC with mounting hardware, Antenna Element AS-2732 GRC, and Cable Assembly, Special Purpose, Electrical CX-13055 GRC.

a. *Antenna Element AS-2732GRC.* The AS-2732 GRC is a 5 ½-foot whip section assembly with a threaded base. It is attached in a vertical position to the top of the cable mount on Matching Unit-Base NMX-9146 GRC, extending the transmit-receive range capabilities of the associated radio. To prevent the AS-2732 GRC from vibrating loose, a lock wire (fig. 2-2) is attached between the AS-2732 GRC and the MIX-9146 GRC.

b. *Matching Unit-Base MX-9146 GRC.*

(1) Matching Unit-Base MX-9146 GRC usually is attached on the outside of a wheeled vehicle, tank or armored personnel carrier. It consists of a spring assembly, base assembly, matching unit case, and mounting hardware. On the bottom of the MX-9146 GRC, three posts provide physical protection for the

frequency selector switch and two connectors.

(2) Base assembly consists of a Lexan plastic housing, rf coil container, and an rf coil. The rf coil container is an rf coil cage, and the rf coil assembly is an RG-303 U 50-ohm coaxial cable wrapped around a ferrite rod that transfers rf energy to the antenna. To minimize antenna current, the susceptance of the rf coil to ground is changed at different subband frequencies by a step-action rotary solenoid selector switch.

(3) The frequency selector assembly provides required components for each subband to maintain a vswr of 3.5 to 1 or lower. Switching and relay assembly directs to the desired subband the required shunt reactors and impedance networks. Control voltages from an associated radio receiver-transmitter unit (ret unit) positions the rotary solenoid to the correct subband, or if desired, a manual selection of the desired subband can be made using frequency selector switch S1.

(4) The spring assembly is mounted on top of the base assembly, and consists of a spring mount assembly through which an rf cable assembly runs. The spring mount provides threaded connection at the top of the spring for attaching the AS-2732, GRC. It supports the AS-2732'GRC in a vertical position and is flexible enough for the AS-2732 GRC to survive high impact blows from obstructions.

(5) Mounting hardware includes screws, nuts, lockwashers, a gasket, and a bonding jumper assembly for installation of the AS-2731 GRC. The supplied gasket is placed between the base cover flange of the MX-9146/GRC and the antenna mounting bracket for preventing water leaks into a ground vehicle, especially in tank installations. The bonding jumper is connected between one of the posts under the MX-9146 GRC and the other end to the vehicle. A lock wire is obtained locally.

c. *Cable Assembly, Special Purpose, Electrical CX-13055 GRC.* The cable assembly is a short adapter cable connected between cable connector of AS-2731 'GRC and control cable of associated radio (fig. 2-5). Cable Assembly, Special Purpose, Electrical CX-4722(*)VRC is the control cable used to connect the radio to the MX-9146:GRC. (*) represents all models of the cable assembly.)

d. *Cable Assembly, Special Purpose, Electrical CX-13184/GRC* (fig. 1-1). This cable is 18 inches long and performs the same function as CX-13055/GRC. CX-13184'GRC is provided in lieu of CX-13055/GRC on contract DAAB07-76-C-0164 *This cable must be installed as part of the AS-2731/GRC*

in M1 Abrams Tank (and other vehicles that may require the double shielding built into the cable). Double shielding prevents signals in cable from interfering with tank equipment.

NOTE

All references in this manual to CX-13055/GRC also apply to CX-13184/GRC unless otherwise indicated.

e. *Restraint Assembly (Safety)* (fig. 1-2). The restraint assembly is provided to prevent the whip antenna section and the spring on the top of the MX-9146/GRC from bending. The restraint assembly consists of the following:

1. Adapter (1) (B4011680) with:

- (a) Screw, cap (MS35308-304): 1/4"-28X9, 16 in. long.
- (b) Washer, lock (MS35338-139): 1/4" in.
2. Restraint Assembly (2) (B4011673) with:
 - (a) Insert (3) (B401167).
 - (b) Screw, cap (MS35308-302): 1/4"-28X7/16 in. long.
 - (c) Washer, lock (MS35338-139): 1/4" in.
3. Clamp (4) (B4011672) with:
 - (a) Screw, cap (MS35308-312): 1/4"-28X1.5 in. long.
 - (b) Washer, lock (MS35338-139): 1/4" in.

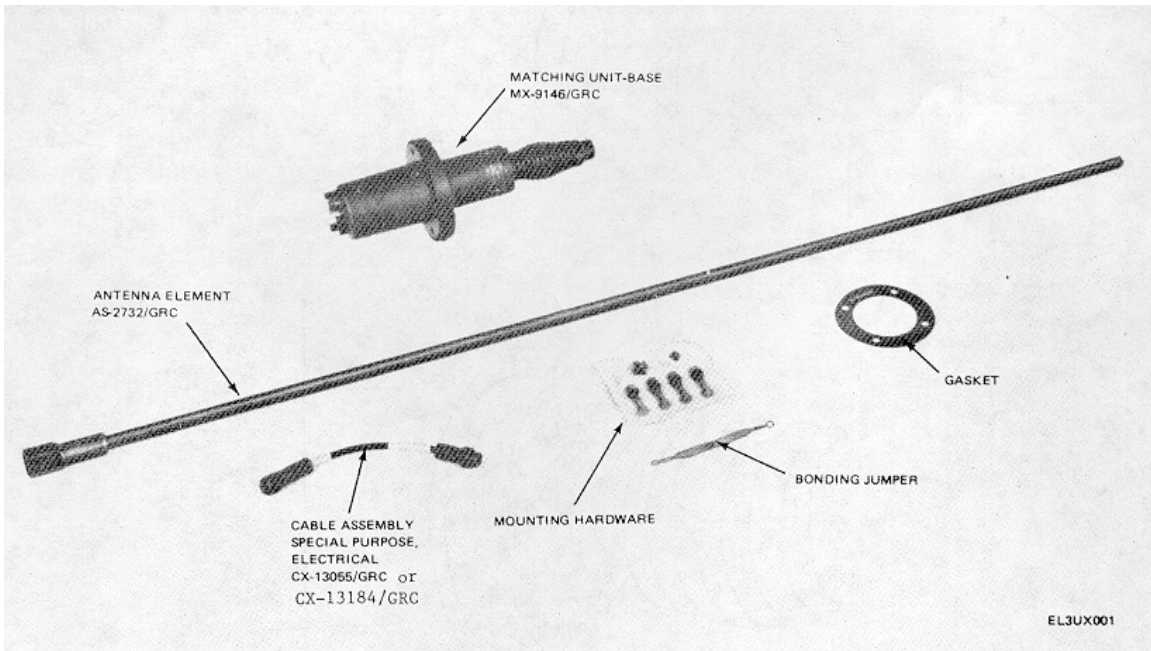
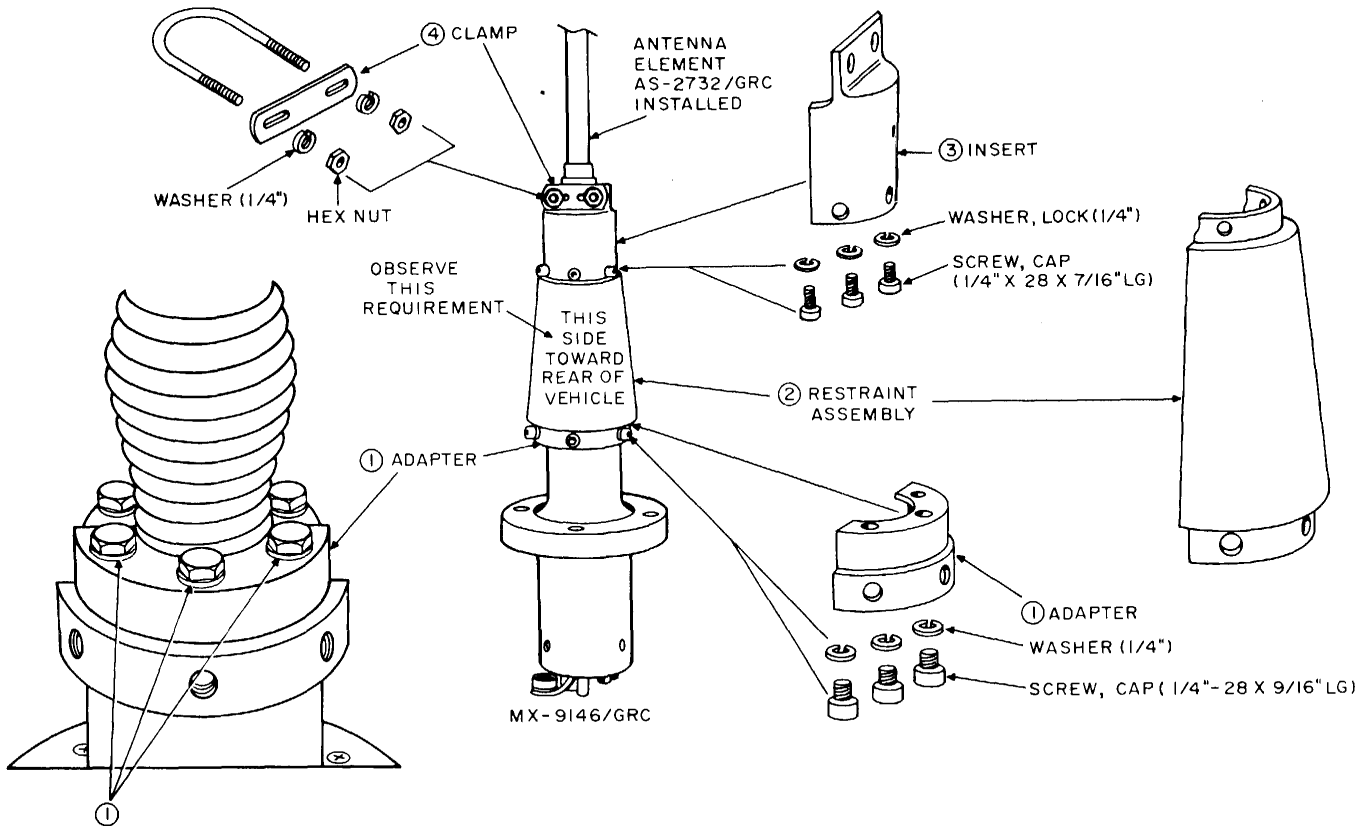


Figure 1-1. Antenna AS-2731 CRC Overall View, Less Restraint Assembly.



① REMOVE ORIGINAL 3 SCREWS & LOCKWASHERS
 INSTALL ADAPTER (1) WITH SCREW CAP (7/16" LG) & LOCKWASHER (1/4")

1. CAUTION: WHEN INSTALLED, THE RESTRAINT ASSEMBLY (2) MUST FACE THE REAR OF VEHICLE. THEREFORE, DETERMINE THE POSITION OF THE ADAPTER (1) AND IF NECESSARY, REPOSITION MX-9146/GRC IN VEHICLE.
2. INSTALL THE ADAPTER (1) WITH ITS SCREWS/LOCKWASHERS
3. PLACE RESTRAINT ASSEMBLY (2) AGAINST THE SPRING. INSTALL SCREWS/LOCKWASHERS TO HOLD THE ASSEMBLY TO THE ADAPTER.
4. INSTALL THE INSERT (3) WITH SCREWS/LOCKWASHERS.
5. INSTALL THE CLAMP (4) WITH SCREWS/LOCKWASHERS TO THE RESTRAINT ASSEMBLY.

EL3JX021

Figure 1-2. Restraint assembly, installation.

CHAPTER 2 INSTALLATION AND OPERATION

WARNING

Dangerous rf voltages exist at AS-2731/GRC elements and connectors. KEEP AWAY AT LEAST 8 INCHES (approx 20 cm) FROM THE ANTENNA. YOU NEVER KNOW WHEN SOMEONE IS TRANSMITTING ON THE RADIO.

Section I. SERVICE UPON RECEIPT OF EQUIPMENT

2-1. Checking Unpacked Equipment

a. Inspect the equipment for damage that may have occurred during shipment. If the equipment has been damaged, fill out and forward SF 364.

b. Check to see that the equipment is complete as listed on the packing slip. If a packing slip is not available, check the equipment against the components list (app B). Report all discrepancies in accordance with instructions given in paragraph 1-3c (DISREP).

c. Check to see whether the equipment has been modified. If the equipment has been modified, the MWO number will appear on the MX-9146/GRC, near the nomenclature plate. Check DA Pam 310-4 to see whether all MWO's current at the time the equipment is placed in use have been applied.

2-2. Siting

(fig. 2-1)

The best location for the AS-2731/GRC depends on the type of vehicle and the terrain. The AS-2731/GRC will have a greater effective range if it is high and clear of hills, buildings, cliffs, and wooded areas. Valleys and other low places are poor locations for radio reception and transmission because the surrounding high terrain absorbs radio frequency (rf) energy. Clear, strong signals cannot be expected if the AS-2731/GRC is operated under, or close to, steel bridges, underpasses, powerlines, power units, or hospitals. If possible, choose a location on a hilltop or other high place. A flat surrounding terrain is desirable. Generally, reception and transmission is better over water than over land.

2-3. Installation Instructions

(fig. 2-2, 2-3 and 2-4)

a. Antenna AS-2731/GRC mounting dimensions are the same as those in Antenna AS-1729/VRC; thus, the AS-2731/GRC can be mounted on the same

brackets and surfaces as AS-1729/VRC. Refer to SB 11-131 for the list of authorized vehicular radio sets and installation kits.

CAUTION

When mounting the MX-9146/GRC in a mounting bracket, or in a vehicle hole, do not tighten the mounting bolts above 100 inch-pounds (snug tight). Excessive force may crack the base insulator or damage the helicoil threads in the hulls of some vehicles.

b. Attach the MX-9146/GRC on the vehicle (fig. 2-3 and 2-4) as described in the installation kit (a above) with the supplied mounting hardware.

c. Remove the dust cover from threaded end of cable mount assembly. Insure that the contact on top of MX-9146/GRC protrudes fully and two setscrews and a cap screw (fig. 2-2) holding rf assembly contact in place are firmly secured.

NOTE

The dust cover protects the contact on top of the cable mount from dirt, dust and other damage. The dust cap should be installed whenever the AS-2732/GRC is not connected to the MX-9146/GRC.

d. Apply a small quantity of silicone comp. (item 3 appx E) to the threads of the spring mount assembly and to the O-ring (MS9068-213) at the base of the threads.

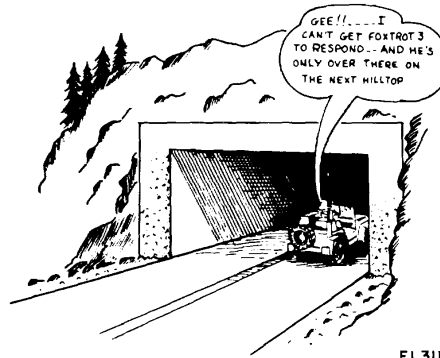
e. Screw and tighten the AS-2732/GRC onto the cable mount assembly.

f. Thread a 5-inch length of lockwire (item 6, app E) through the two small holes in the hexagonal portion of the AS-2732/GRC and then through a pair of safety holes in the cable mount on the MX-9146/GRC.

GOOD LOCATIONS: CLEAR OF BUILDING, CLIFFS, WOODED AREAS, STEEL CONSTRUCTIONS,etc.



POOR LOCATIONS: LOW AREAS ENCLOSED BY WOODED AREAS, BUILDINGS, STEEL CONSTRUCTIONS OR OTHER TYPICAL TYPE BARRIERS.



EL3UX002

Figure 2-1. Antenna siting locations, good and poor.

NOTE

There are three pairs of safety wire holes in the cable mount; select the particular pair for which the safety wire will be held in tension if the AS-2732/GRC tends to loosen.

g. Twist the two ends of the safety wire together into a pigtail, keeping the safety wire in tension. The

pigtail should contain three to six twists.

NOTE

Excess safety wire should be trimmed and the pigtail bent back so that it lies flat against the surface of the hexagonal portion of the spring mount.

h. If applicable, connect the bonding jumper

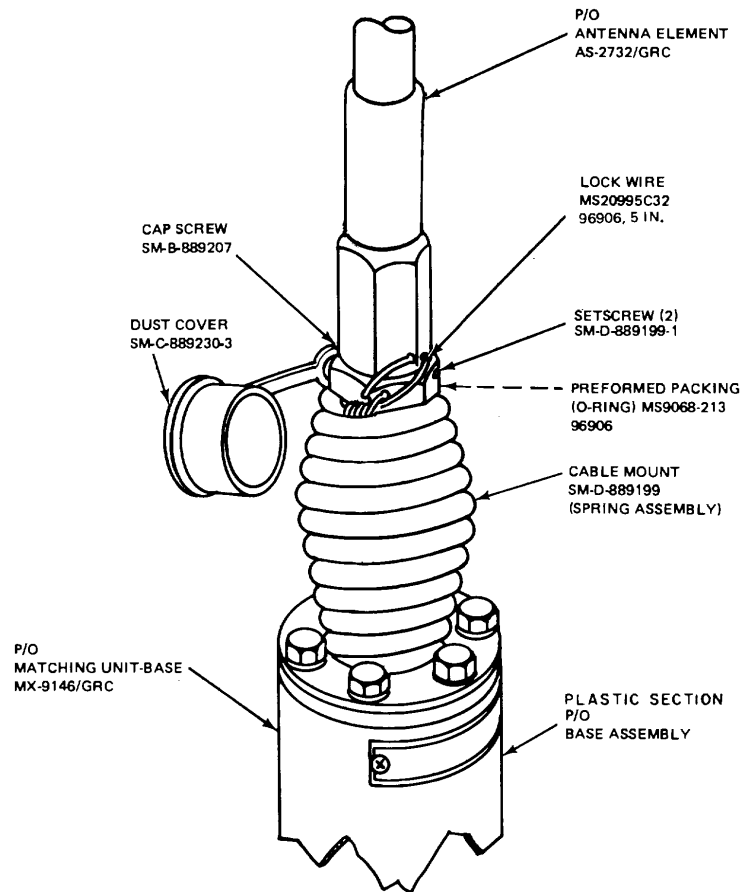


Figure 2-2. Antenna AS-2731/GRC partial view, parts location

between MX-9146/GRC threaded stud and the antenna mounting bracket per type of setup (fig. 2-4).

i. Connect control cable assembly CX-13055/GRC to J2 connector of NIX-9146/GRC.

CAUTION

Before connecting CX-13055/GRC to control cable of radio rt unit, be sure your radio rt unit is turned off. If the MX-

9146/GRC unit is not aligned with the frequency radio setting, and the rt unit is on, arcing may occur which will result in burnt connector pins.

i. Connect control cable from the associated rt unit to free end of CX-13055/GRC connector.

k. Connect the rf cable from the associated radio to connector J1 of MX-9146/GRC (fig. 2-5).

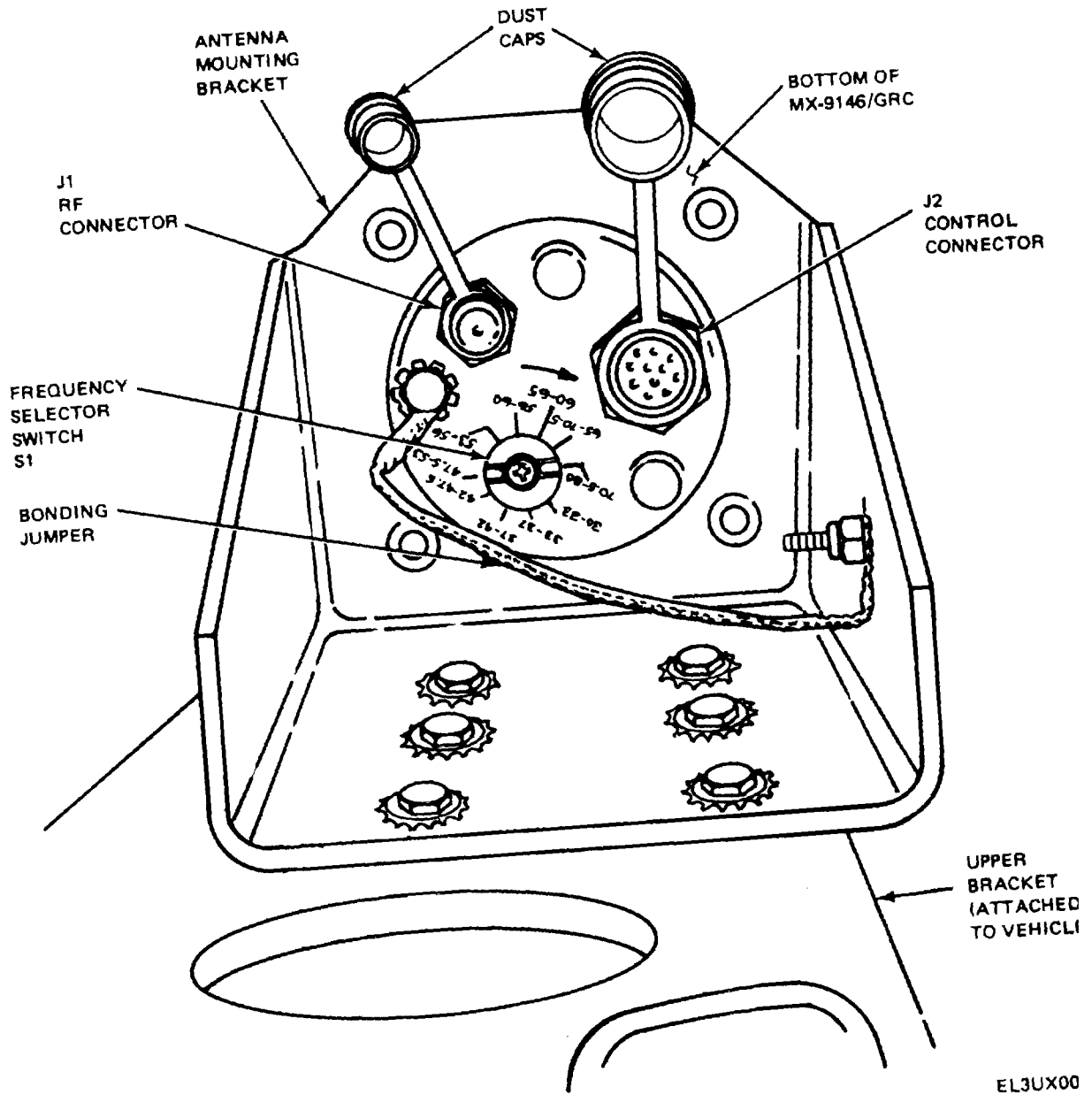


Figure 2-3. MX-9146/GRC, bottom view, installed in mounting bracket, parts location.

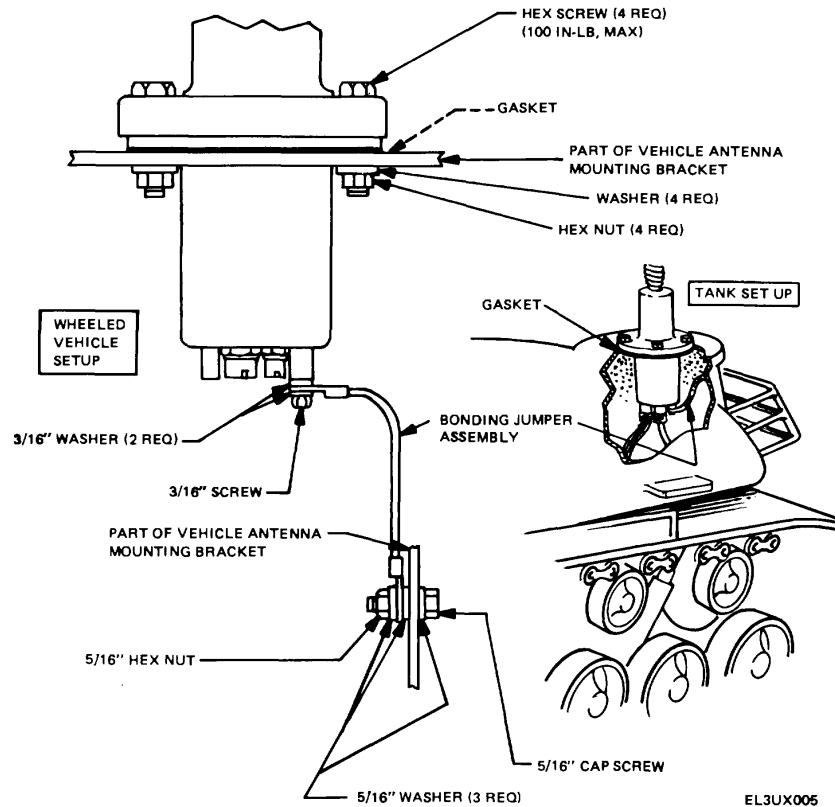


Figure 2-4. Typical bonding jumper setups.

Section II. OPERATING INSTRUCTIONS

2-4. Operator's Control and Connectors

(fig. 2-5)

Frequency selector switch S1 is used for manual selection of the correct tuning components for the 10 frequency band segments. This switch operates automatically when the AS-2731/GRC is connected to a compatible receiver-transmitter which contains automatic antenna tuning facilities. Connector J1 connects the AS-2731/GRC to a receiver-transmitter rf out-put circuit. Connector J2 provides coding input information (from a

compatible receiver-transmitter) which positions frequency selector switch S1. Cable assembly CX-13055/GRC adapts radio control cable to connector J2.

2-5. Operating Procedure

(fig. 2-5)

a. The AS-2731/GRC is automatically tuned to the operating frequency band segment when used with a compatible receiver-transmitter. When used with radios not provided with the automatic tuning function, or when radio automatic tuning circuit is defective, the AS-2731/

GRC must be manually tuned by turning frequency selector switch S1 to the operating frequency band of the radio.

MX-9146/GRC when the it unit is on. Burnt pins or connectors will be the result.

- b. Observe the following precautions:
 - (1) Never connect the control cable to the

- (2) Do not disconnect the cable connectors unless maintenance is needed. Unnecessary removal and replacement increases the chance

NOTE: WHEN S1 IS MANUALLY OPERATED, DO NOT POSITION TO INDICATED BLANK DETENT POSITIONS.

ANTENNA AS-2731/GRC

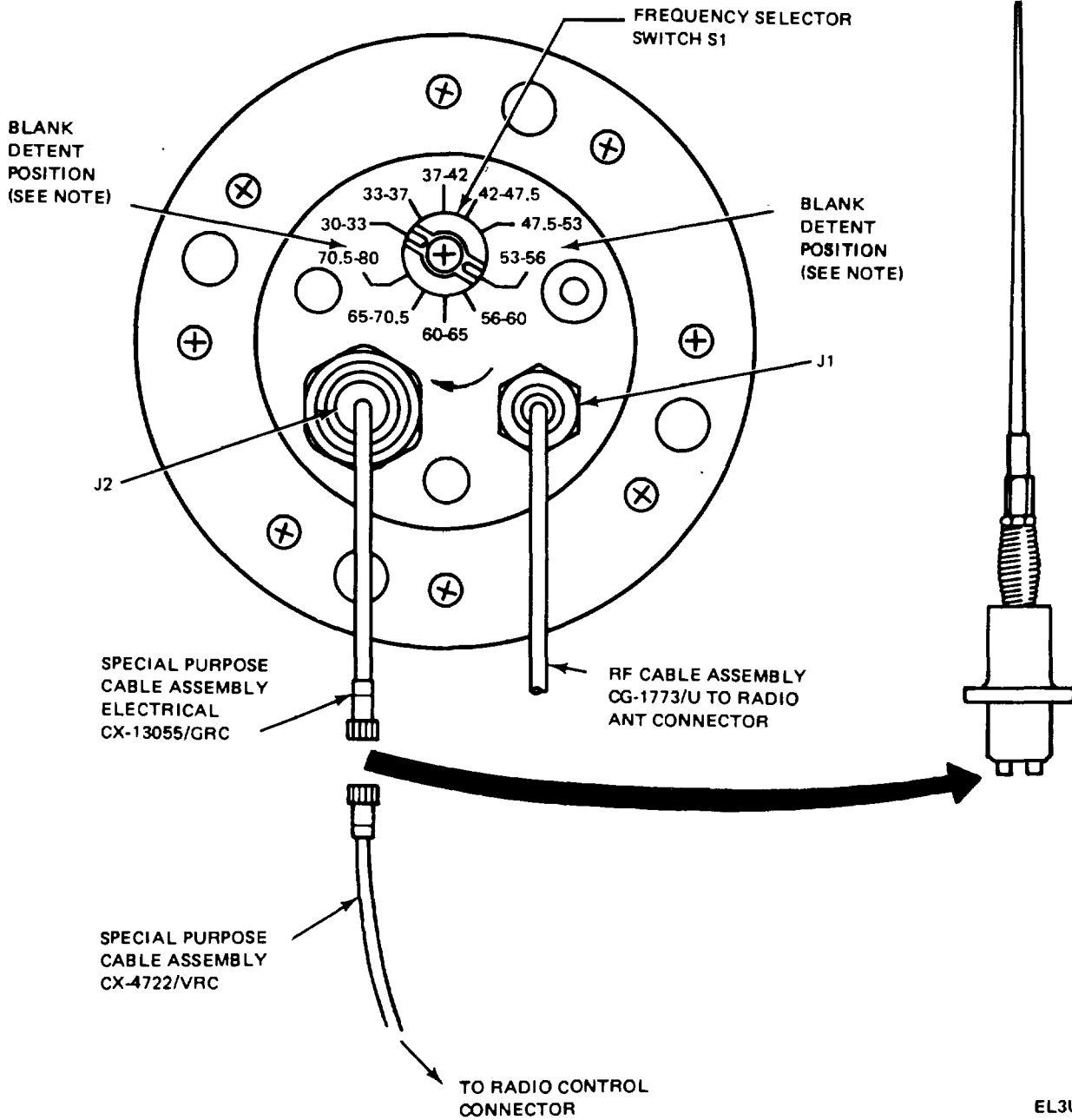


Figure 2-5. Antenna AS-2731/GRC, control and connectors.

for cuts and breaks in the cable, for wear and tear on connectors, and for film and dirt to collect in the connectors.

(3) Make sure that the rf power cable is

connected to the radio before keying the transmitter. Without the antenna connected, the transmitter can be damaged.

CHAPTER 3 OPERATOR/CREW MAINTENANCE

WARNING

Dangerous rf voltages exist at AS-2731/GRC elements and connectors. Personnel should be familiar with the requirements of TB SIG-291 before attempting maintenance.

3-1. Scope of Operator's Maintenance

Following is a list of maintenance duties normally performed by the AS-2731/GRC operator. These procedures do not require special tools or test equipment.

- a. Preventive maintenance checks and services chart (table 3-1).
- b. Cleaning (table 3-1).

3-2. Materials Required

- a. Cleaning fluid: Trichlorotrifluoroethane (item 1, appx E).
- b. Cleaning cloth.

3-3. Operator's/Crew Preventive Maintenance

Preventive maintenance is the systematic care, servicing, and inspection of equipment to prevent the occurrence of trouble, reduce downtime, and assure that the equipment is operational.

a. *Systematic Care.* The procedures given in table 3-1 cover routine, systematic care and cleaning essential to proper upkeep and operation of the equipment.

b. *Preventive Maintenance Checks and Services.* The preventive maintenance checks and services chart (table 3-1) outlines functions to be performed daily. These checks and services are to maintain Army electronic equipment in a combat-serviceable condition; that is, in good general (physical) condition and in good operating condition. To assist operators in maintaining combat serviceability, the chart indicates when to check, how to check, and what the normal conditions are. The "For readiness reporting, equipment is not ready/available if: column lists the criteria when the AS-2731/GRC is classified as not ready for its primary mission. If the defect cannot be remedied by the operator, higher category maintenance or repair is required. Records and reports of these checks and services must be made in accordance with the requirements set forth in TM 38-750.

3-4. Preventive Maintenance Checks and Services Periods

Preventive maintenance checks and services (PMCS) of the AS-2731/GRC are required on a daily basis. Table 3-1 specifies checks and services that must be accomplished under the conditions listed below.

a. *Before You Operate.* Perform the before (B) procedures before using the equipment. This will be done if you are operating/using the equipment for the first time, or if you are the assigned operator and have not operated/used the equipment since the last weekly (W) PMCS.

b. *After You? Operate.* Be sure to perform A (after) PMCS procedures.

c. *During Operation.* Observe the performance of the equipment during (D) operation.

d. *4Weekly Procedure.* If the equipment is not used during the week, perform the B, D, and (W) PMCS together with the weekly (W) PSMCS.

e. *If Your Equipment Fails to Operate.* Troubleshoot the radio system, as outlined in the applicable technical manual for the radio system (app A). If you are unable to clear the trouble, report the failure using the proper form (TM 38-750).

NOTES

1. Routine checks are not listed as PMCS; such as: cleaning (para 3-5), dusting, washing; checking for frayed cables; stowing items not in use; covering unused receptacles; checking for loose nuts and bolts. These are things that should be done anytime you see they must be done.
2. The *Item No.* in table 3-1 shall be used as a source of item numbers for the *TM number* column on DA Form 2404

(Equipment Inspection and Maintenance Worksheet) in recording the results of the PMCS.

3. If the equipment must be kept in constant operation, check and service only those items that can be checked and serviced without disturbing operation. Make complete checks and services when the equipment can be shut down.

3-5. Cleaning

a. To remove dirt from the surface of the equipment, use a cleaning cloth.

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.

b. Remove grease, fungus, and ground-in dirt with a cloth dampened with trichlorotrifluoroethane (item 1, appx E).

c. Clean the plastic body of the MX-9146/GRC (fig. 1-1) with clean water. Never use the following on the plastic surface:

- (1) Cleaning solvent
- (2) Carbon tetrachloride.
- (3) Trichlorotrifluoroethane.
- (4) Penetrating oils.
- (5) Paint thinner.
- (6) Detergent soap.

d. Clean the contact at the top of the MX-9146/GRC and the curved spring contact SM-B-542008 (fig. 6-1) at the base of the AS-2732/GRC with a rubber eraser of a pencil. Do not use an ink eraser, and never use an abrasive, such as emory cloth or scouring powder.

Table 3-1. Operator's Preventive Maintenance Checks and Services (PMCS)

NOTE

Within the designated interval, these checks are to be performed in the order listed.

B-Before D-During A-After W-Weekly

ITEM NO	INTERVAL				Item to be inspected	Procedure	Equipment is Not Ready/Available If:
	B	D	A	W			
1	"				Lockwire	When the AS-27332/GRC is installed, the lockwire is in place (fig. 2-2).	
2	"		"		AS-2732/GRC	Tighten the unit on the spring assembly (fig. 2-2).	
3				"	AS-2732/GRC	If the AS/2732/GRC is removed from the spring assembly, clean the bottom contact (para 3-5d).	
4				"	MX-9146/GRC	a. If the AS-2732/GRC is removed, clean the top contact (para 3-5d). b. Apply graphite grease (item 3, app E) to the threads above the spring assembly.	
5		"			AS-2731/GRC	Check communication function of associated radio.	Associated radio communication fails because of AS-2731/GRC.
6				"	Restraint	Check that the upper insert screw caps have not cut into the Restraint Assembly	

CHAPTER 4
ORGANIZATIONAL MAINTENANCE

WARNING

Dangerous voltages exist at the AS-2731/GRC antenna and connectors. Personnel should be familiar with the requirements of TB SIG 291 before attempting maintenance.

4-1. Scope of Organizational Maintenance

Organizational maintenance of the AS-2731/GRC consists of the following:

- a. Preventive maintenance (para 4-3).
- b. Troubleshooting (para 4-5).
- c. Repair and testing (para 4-6 through 4-9).

4-2. Test Equipment, Tools and Materials Required

Organizational repair parts are listed in TM 11-5985-355-24P.

- a. *Test Equipment.*
 - (1) Multimeter AN/URM-105.
 - (2) Test Set, RF Power AN/URM-182 (TS-2609/U) (para 4-9).

b. *Tools.* Tool Kit, Electronic Equipment TK-101/G. (Torque wrench, 0-100 inch-pounds is part of the tool kit.)

c. *Materials.* See appendix E for available materials.

4-3. Organizational Preventive Maintenance Checks and Services (PMCS)

Preventive maintenance is the systematic care, inspection, and servicing of equipment to maintain it in serviceable condition, prevent breakdowns, and assure maximum operational capability. Organizational preventive maintenance checks and services (PMCS) are performed quarterly (table 4-1).

- a. Quarterly PMCS will be scheduled in accordance with procedures specified in TM 38-750.
- b. The *Item No.* in table 4-1 shall be used as a source of item numbers for the *TM number* column on DA Form 2404 (Equipment Inspection and Maintenance Worksheet) in recording the results of the PMCS.
- c. If the equipment fails to meet the criteria in the

Procedures column of table 4-1, report the failure in accordance with the procedures specified in TM 38-750.

d. If the equipment must be kept in constant operation, check and service only those items that can be done without disturbing operation. Make the complete checks and services when the equipment can be shut down.

e. Routine checks are not listed in the PMCS table; such as: cleaning (para 3-3), dusting, washing; checking for frayed cables; stowing items not in use; covering unused receptacles; and checking for loose nuts and bolts. These are things that should be done anytime you see they must be done.

4-4. Touchup Painting

a. When the finish on any metal parts of the MX-9146/GRC has been badly scarred or damaged by corrosion, lightly clean the surfaces with sandpaper. Brush two thin coats of paint (item 5, app E) on the bare metal surface (previously painted areas only) to protect it from further corrosion. Refer to the applicable painting and refinishing instructions given in SB 11-57:3 and TB 43-0118.

b. The plastic body of the MX-9146/GRC shall be painted only with paint type recommended per MIL-F-14072 (item 8, app F), and the surface should be cleaned with a clean cloth dampened with water and soap. Do not attempt to remove the paint. The paint remover solvent will damage the plastic surface. If the vehicle is to be painted, remove the -IX-91461/GRC.

4-5. Organizational Maintenance Troubleshooting Procedures

Perform the applicable organizational maintenance procedure using the technical manual for the radio set which the AS-2731/GRC is used. If it is determined that the AS-2731/GRC is defective, perform the troubleshooting operations given in the troubleshooting chart (table 4-2). If the corrective measures given in the chart do not clear the trouble, higher category maintenance is required.

Table 4-1. Organizational Preventive Maintenance Checks and Services - Quarterly Schedule

ITEM NO.	ITEM TO BE INSPECTED	PROCEDURES																						
1	Completeness	All components required to make the AS2731/GRC operational are on hand (appx B) or are available.																						
2	Publications	TM 11 -5985-355-13 & TM 11-5985 355-13P are on hand with latest changes- see DA Pam 310-4 for current publication listing.																						
3	Modifications	Check DA Pam 310-7 to see if any modification work orders (MWO's) are listed for the AS-2731/GRC or its components. All URGENT MWO's must be applied immediately; all NORMAL MWO's must be scheduled.																						
4	Metal surfaces	Remove rust, corrosion, and fungus; spot-paint bare metal spots (para 4-4a).																						
5	Mounting bolts	The mounting bolts that attach the MX-9146/GRC to the vehicle are no more than snug-tight (100 (fig. '24) inch-pounds, maximum).																						
6	Control receptacle J2 (fig. 2-3)	Apply a small amount of silicone compound (item 3, app E) to the outer shell of J2 (to facilitate cable installation).																						
7	A.2732/GRC (fig. C 1)	<p>a. The tip is not worn so that the metal inside can be seen.</p> <p>b. At the bottom, check to see that center contact SM-B-524007 is level with the top curve of spring contact SNM-B-524008; and that spring contact SM-B-524008 is curved and held by its two screws MS51987-1. Replace defective contact or missing screws (para 4-7b).</p> <p>c. Using a screwdriver or similar instrument, press down contact SM-B-524007 several times; the contact should spring back each time.</p> <p>d. Check to see that ring SM-B-889201 is screwed in fully; use a needle-nosed pliers or spanner wrench to screw in the ring.</p>																						
8	Tuning switch S1 operation (fig 2-3; item 2, para 4-6)	<p>Tune the associated radio and observe that tuning switch S1 rotates to the position that includes the following tuning switch positions:</p> <table border="0"> <thead> <tr> <th style="text-align: left;"><i>Tune -radio to MHz</i></th> <th style="text-align: left;"><i>Tuning switch S1 position</i></th> </tr> </thead> <tbody> <tr><td>31.00</td><td>30-33</td></tr> <tr><td>35.00</td><td>33-37</td></tr> <tr><td>40.00</td><td>37-42</td></tr> <tr><td>45.00</td><td>42-47.5</td></tr> <tr><td>50.00</td><td>47.5-52</td></tr> <tr><td>55.00</td><td>53-56</td></tr> <tr><td>58.00</td><td>56-60</td></tr> <tr><td>62.00</td><td>60-65</td></tr> <tr><td>68.00</td><td>65-70.5</td></tr> <tr><td>72.00</td><td>70.5-76</td></tr> </tbody> </table> <p style="text-align: center;">NOTE</p> <p>If switch S1 consistently points to the frequency band opposite the required position, loosen the switch knob, position the white indicator to the proper frequency band, and tighten the knob screw.</p>	<i>Tune -radio to MHz</i>	<i>Tuning switch S1 position</i>	31.00	30-33	35.00	33-37	40.00	37-42	45.00	42-47.5	50.00	47.5-52	55.00	53-56	58.00	56-60	62.00	60-65	68.00	65-70.5	72.00	70.5-76
<i>Tune -radio to MHz</i>	<i>Tuning switch S1 position</i>																							
31.00	30-33																							
35.00	33-37																							
40.00	37-42																							
45.00	42-47.5																							
50.00	47.5-52																							
55.00	53-56																							
58.00	56-60																							
62.00	60-65																							
68.00	65-70.5																							
72.00	70.5-76																							
9	MX-9146/GRC	<p>a. Inspect the plastic top section (fig. 2-2) for cracks that appear large enough to allow water or moisture to enter the unit.</p> <p style="text-align: center;">NOTE</p> <p>Hairline cracks or paint on the plastic section is not a condition for replacing the unit</p> <p>b. Two setscrews SM-D-889199-1 and the cap screw SM-B-889207 (fig. 2-2) with the dust cover SM-C-889230-3 are in place.</p> <p>c. The dust caps for connector J1 and J2 (fig. 2-3) are in place and not damaged.</p> <p>d. Inspect RF connector J1 and control connector J2 pins (fig. 2-3) for damage.</p>																						
10	CX-10355/GRC CX-13184/GRC	Inspect the cable and the connectors for damage.																						

4-6. Repair procedures: general

This section contains organizational maintenance requirements for AS-2731/GRC. Those requirements include removal and replacement, and testing after repair.

4-7. Antenna Element AS-2732/GRC Removal and Replacement

(fig. 2-2)

a. *Antenna Element.*

(1) Remove safety lock wire between the

Table 4-2. Organizational Maintenance Troubleshooting Chart

Item No.	Trouble symptom	Probable trouble	Corrective measure
1	Antenna Element AS-2732/GRC is damaged.	Defective AS-2732/GRC.	Replace AS-2732/GRC.
2.	Receiver-transmitter power supply fuse blows on any AS-2731/GRC selector switch Position, or when a new subband is selected	<p>a. Defective r/t control cable NOTE Do not turn on transmitter when the AS-2371/GRC is disconnected from R/T unit.</p> <p>b. Defective CX-13055/GRC cable.</p> <p>c. Defective rf cable.</p> <p>d. Defective MX-9146/GRC</p> <p>(CX-13055/GRC)</p>	<p>a. Disconnect rf and control (CX-13044/GRC) cables at r/t end of cables. (1) If fuse blows, replace r/t unit control cable. (2) If fuse does not blow, Go to b below.</p> <p>b. Connect control cable (CX-13055/GRC) to r/t control cable, and disconnect at J2 connector. If fuse blows, replace cable</p> <p>c. If fuse does not blow, replace rf cable.</p> <p>d. Replace MS-9146/GRC.</p>
3	MX-9146/GRC tunes to BAND 1 or BAND 2, but not to both.	<p>a. Defective control cable CX-13055/GRC or CX-4722(*)/VRC.</p> <p>c. Defective MX-9146/GRC.</p> <p>d. Defective r/t unit.</p>	<p>a. Verify that the MX-9146/GRC rotary solenoid is Heard operating and indexing by changing BAND switch and MHz control or manually change frequency select-or S1 to a number of frequencies at least 10 MHz apart. If rotary solenoid operates in manual, but not in auto mode, go to b below.</p> <p>b. Replace control Adapter Cable CX-13055/GRC or CX-4722(*)/VRC, in turn.</p> <p>c. If rotary solenoid does not turn, replace MX-9146/GRC with one known to be good.</p> <p>d. If rotary solenoid does not turn, associated r/t unit is defective.</p>
4	MX-9146/GRC cycles continuously when new frequency is selected.	Defective MX-9146/GRC.	Replace MX-9146/GRC.
5	Weak or no transmission/reception on associated receiver or forward or reflected power indications of AN/URM-182 exceed specified limits.	<p>a. Defective MS-9146/GRC.</p> <p>b. Defective AS-2732/GRC.</p>	<p>a. Remove AS-2732/GRC and perform continuity checks between J1 (rf input) and J3 (rf output) For each position of selector switch S1. In positions 42-47.5, 47.5-53, 53-56, 56-60, and 60-65, resistance should be approximately zero. If not, replace MX-9146/GRC</p> <p>NOTE Insure that contact on top of MX-9146/GRC protrudes fully and is secured by setscrews and cap-screw (fig. 2-2).</p> <p>b. Check performance of AS-2732/GRC using procedures in item No. 8, table 4-1.</p>

AS-2732/GRC and cable mount assembly.
 (2) Remove the AS-2732/GRC from cable mount assembly by turning the AS-2732/GRC counterclockwise.
 (3) To replace the AS-27.32/GRC, apply silicone compound (item 3, app E) on O-ring (MS9068-213) and threaded portion of cable mount, and replace the new AS-2732/GRC to cable mount assembly.
 (4) Install the safety lock wire (para 2-3f).
 b. Spring Contacts (fig. 6-1).
 (1) Perform the AS-2732/GRC removal procedures above (a (1) and (2) above).

(2) Remove contact (SM-B-542008) with two screws.
 (3) Remove ring (SM-B-889201) with screwdriver.
 (4) Remove contact (SM-B-542007) from insert (SM-B-542004).
 (5) Replace contact (SM-B-542007), insert (SM-B-542004), and ring (SNI-B-889201).
 (6) Replace contact (SM-B-542008) with two screws. Apply 1 to 2 (drops of sealant (item 8 or 8A, app E).

- (7) Secure ring (SMI-B-889201).
- (8) Replace the AS-2732/GRC (a(3) and (4)

above).

4-8. Matching Unit-Base MX-9146/GRC Removal and Replacement

a. *Removal.*

(1) Remove safety lock wire between the AS-2732/GRC and cable mount assembly.

(2) Remove the AS-2732/GRC from cable mount assembly.

(3) Remove rf and control cables from J1 and J2. Place dust caps over connectors.

(4) Remove MX-9146/GRC from antenna mounting bracket, bonding jumper and applicable mounting hardware.

b. *Replacement.*

(1) Replace IMX-9146/GRC and bonding jumper to mounting bracket with applicable mounting hardware. Torque the four mounting bolts not to exceed 100 inch-pounds (snug tight).

(2) Screw the AS-2732/GRC to cable mount assembly.

(3) Install the safety lock wire (para 2-3f).

(4) Connect rf and control cables to MX-9146/GRC J1 and J2 connectors respectively.

4-9. Using Test Set, RF Power AN/URM-182 with AS-2731/GRC

The AN/URM-182 (TM 11-6625-2718-14&P) is a through-line directional wattmeter that measures rf forward and reflected power in 50-ohm coaxial systems. By observing forward and reflected power indications of a transmitter, it can be determined whether or not Antenna System AS-2731/GRC or the receiver-transmitter is defective.

4-10. Painting

- a. *Test Setup* (fig. 4-1).

(1) Connect the AN/URM-182 between the AS-2731/GRC and the receiver-transmitter unit. Antenna must be mounted upright in an open area away from buildings and trees which would offset forward and reflected power indications of the AN/URM-182.

(2) If the control cable is not used, set frequency selector switch S1 to the position that includes the operating frequency of the rt unit.

b. *Minimum Performance Tests.*

(1) Set rt unit to frequency setting of 31.5 MHz (subband 1). The AS-2731/GRC selector switch must correspond with applicable subband according to the frequency setting of rt unit.

NOTE

If automatic tuning is not used, manually set the frequency selector switch of MX-9146/GRC to applicable subband.

(2) Key the transmitter, note and record forward and reflected power indications. The required minimum forward power shall not be less than specified in the applicable rt unit manual, and reflected power shall be less than 30 percent of forward power.

(3) Repeat (1) and (2) above for the following frequency settings:

- (a) 35.0 MHz (subband 2).
- (b) 39.5 MHz (subband 3).
- (c) 44.5 MHz (subband 4).
- (d) 50.0 MHz (subband 5).
- (e) 54.5 MHz (subband 6).
- (f) 58.0 MHz (subband 7).
- (g) 62.5 MHz (subband 8).
- (h) 67.5 MHz (subband 9).
- (i) 73.5 MHz (subband 10).

The antenna may be painted using lusterless Forest Green paint (Item 5, appx E).

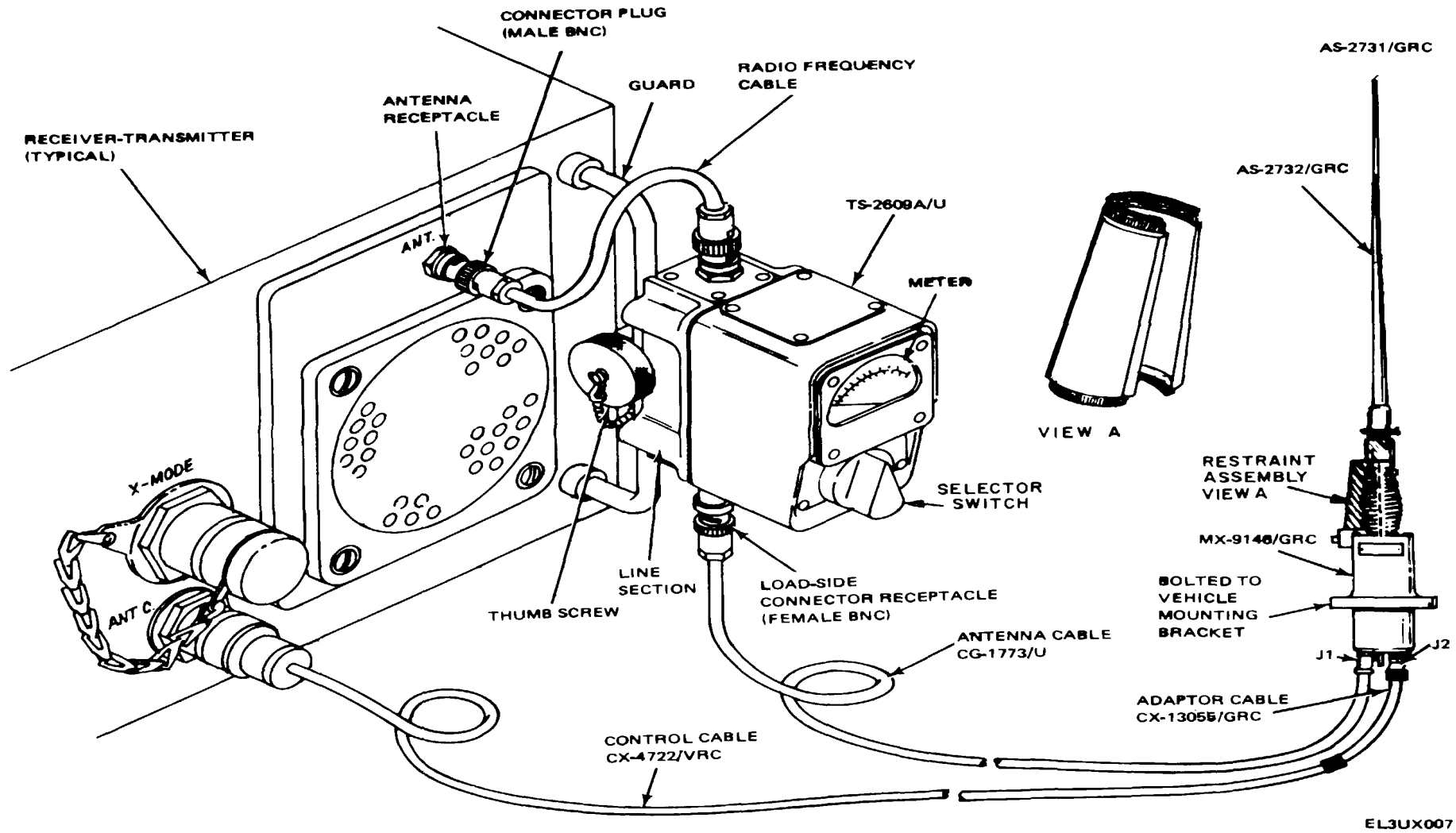


Figure 4-1. Typical receiver-transmitter test setup with ANURM-182.

Change 2 4-5

5-1. General

Antenna AS-2731/GRC consists of Matching Unit-Base NIX-9146/GRC and an Antenna Element AS-2732/GRC. The MX-9146/GRC matches (max VSWR 3.5:1) the impedance of the 5-1/2-foot, vertical whip antenna to the 50-ohm transmitter output impedance and receiver input impedance over the entire frequency range of 30 to 80 NMHz.

a. Antenna Element AS-2732/GRC is a single whip antenna consisting of straight copper conductor placed between two layers of bonded glass fiber strip, and either a brass or aluminum coaxial cable enclosed by a fiberglass envelope mast. The AS-2732/GRC is fed with rf energy at the junction of the straight conductor and the coaxial cable through a coaxial transmission line in the lower quarter of the antenna. The transmission line also uses shunt reactors to provide a good standing wave ration (swr) at the base of the whip section. The upper three quarters of the antenna, the radiating element, is an extension of the center conductor of the coaxial transmission line.

b. The AS-2732/GRC impedance is matched to the receiver-transmitter by the MX-9146/GRC. Current distribution in the AS-2732/GRC is controlled at a particular frequency by a helical inner conductor sleeve choke and a selected shunt reactance in the IX-9146/GRC. These shunt reactances are manually or automatically selected by a compatible receiver-

transmitter.

5-2. Matching Unit-Base MX-9146/GRC

The MX-9146/GRC consists of a group of shunt reactance components, a rotary latching solenoid (part of S1), and a rotary switch (S1). Rotary switch S1, which may be positioned manually or automatically, selects the shunt reactance that is connected to the base of the whip antenna portion of the AS-2732/GRC. The rf output from the receiver-transmitter is fed through connector J1 (fig. FO-1), a matching network, helical choke L16, and connector J3 directly to the whip antenna.

a. *Components.* The components which form the shunt reactances, and the segment of the frequency band in which they are used, are listed in the chart below.

b. *Control Voltages.* When a compatible receiver-transmitter is connected through connector J2 of the IMX-9146/GRC, the rt unit supplies control voltages (nominal +25 volts dc) to the MX-9146/GRC. In Receiver-Transmitter, Radio RT-246/VRC or RT-524 VRC (TM 11-5820401-34-2), these control voltages are supplied by the band switch and a cam-operated switch driven by a gear train. In the RT-246/VRC, the cam-operated switch is S309; in the RT-524fVRC, it is S359. Both switches function identically.

c. *Functioning of Input Control Voltage.* Depending on the position of the cam-operated switch in the receiver-transmitter, +25 volts dc is fed through terminal D, E, F, G, or H of MX-

Band	Frequency range of segment (MHz)	Capacitor	Inductor
A	30-33	C12-C16, C20	L7, L11, L12
A	33-37	C10, C11, C17, C21, C26	L9, L10
A	37-42	C9, C19, C22, C23	L5, L6
A	42-47.5	C18, C24	L8
A	47.5-53	C8	L4
B	53-56	C7	L3
B	56-60	C7	L3
B	60-65	C6	L2, L15
B	65-70.5	C2, C3	L14
B	70.5-80	C4, C5	L13

9146/GRC connector J2 to the rotary switch(S1). Plus 25 volts dc is applied to terminal K of connector J2 whenever the equipment is on. When the BAND switch in the receiver-transmitter is in position A, 25 volts dc is applied to terminal A of connector J2 or in position B to terminal B. The switching action of the band switch increases the number of selectable reactance networks from 5 to 10. The control voltage from S309 or S:359 feeds through switch S1-B rear (band A) or S1-B front (band B). Plus 25 volts on terminal K of J2 is applied through switch S1-A to the rotary latching solenoid (part of switch S1). Diode CR1 provides arc suppression for switch S1-A and the rotary latching solenoid, thyristor Q1 is turned off on whether or not it is gated by a control voltage.

d. *RF Path.* Rf energy is applied through a coaxial cable to connector J1, switch S1, matching networks, shunt reactors, cable choke L16, connector J:3 and to the whip antenna.

c. *Functioning of Rotary Latching Solenoid.* The rotary latching solenoid (part of S1) advances switch S1 in steps. At each step, the solenoid connects switches S1-C, S1-D and S1-E to one of the shunt reactance networks (except where none is necessary) and opens switch S1-A. After each step, switch S1-A closes, and if power is still available at switch S1-B front or rear, it will step again. During the last step, a normally operating thyristor Q1 cuts off removing ground from the rotary latching solenoid and steps the stepping action. When the stepping action stops, a reactance network (except where none is required) remains connected to the outer conductor, and matching networks to the inner conductor.

f. *Switch Positions..*

(1) *Position, 1.* If the associated receiver-transmitter is set to 42-47.5 MHz (band segment 4), switch S1 assumes switch position 1. Control voltage (+25 volts dc) is connected to terminals K, A and G of J2, but not to terminal B. In this position, coil L8 and capacitor C18 are connected to the inner conductor of the transmission line and capacitor C24 is connected between ground and the outer connector. If the frequency setting of the receiver-transmitter is changed to 37-42 MHz range (band segment 3), control voltage is switched from J2-G to J2-F, remains applied to A and K, but not to terminal B. There is a closed path for current through Q1, latching solenoid S1, and normally closed switch S1-A. The latching solenoid is energized and rotates the switch to position 2 (37-42 MHz range) as explained in e above.

(2) *Position 2.* In position 2, the S1-B front and S1-B rear rotors have moved one position clockwise; neither is connected to its no. 11 contact. Since no voltage is applied to contact No. 6, there cannot be a

current path from Q1 to the latching solenoid. Without a current path to the solenoid, switch S1 remains in position 2. In that position capacitor C23 is connected between ground and the outer conductor, and reactance elements connected to the inner conductor are shown in the chart (a above).

(3) *Positions .3 and 4.* If the frequency, is changed to 33-37 MHz (band segment 2) and then to 30-33 MHz (band segment 1), the sequence is the same as explained above, except that voltage is applied to J2-E and J2-D, respectively, the switch positions are 3 and 4, and the reactance elements are as shown in chart ((u above).

(4) *Positions 5, 6, and 7.* If the 70.5-80 MHz range (band segment 10) is selected next, control voltage will be applied to J2-H, and J2-B, as well as J2-K. Latching voltage for the latching solenoid is provided through J2-H, contact no. 9 to S1-B rear, the interconnection from S1-B rear to S1-B front wafer, contact no. 6 on S1-B front to resistor R1, Q1 and S1-A. Since control voltage exists at J2-B, Band 2 is selected; therefore an alternate path contacts No. 8 and No. 6 of S1-B front to resistor R1 is completed. Switch S1 rotates to position 5. Although the connection a from contact No. 8 of S1-B front has opened, contact No. 8 of S1-B rear remains connected and the latching step will step, rotating switch S1 to position 6. The switch remains at rest in this position since contact No. 8 is no longer connected to S1-B rear wafer, and coil L13 is connected to the outer conductor. Capacitor C5 is connected between ground and the inner connector while capacitor C4 is connected in series with the rf input line. If the frequency is then changed to 65-70.5 MHz (band segment 9), control voltage is switched from J2-H to J2-G, and remains applied to J2-B and J2-K. One patch for latching solenoid voltage exists through J2-G, contact No. 10 of S1-B rear, interconnection from S1-B rear to S1-B front wafer, contact no. 6 of S1-B front. The switch rotates to position 7 and, since the current path to the solenoid has opened, remains there. Coil L14 is connected to the outer conductor. Capacitor C3 is connected between ground and the inner connector, while capacitor C2 is connected in series with the rf input line.

(5) *Positions 8 through 12.* If the frequency is changed consecutively to 60-65 MHz (band segment 8), 56-60 MHz (band segment 7), 53-56 MHz (band segment 6), the sequence is the same

as explained in (4) above with the control voltage shifting to J2-F, J2-E and J2-D respectively. The switch comes to rest in positions 8, 9, 10. Reactance elements connected are shown in the charts ((t above). Finally, if the frequency is changed to 47.5-53 MHz (band segment 5), the control voltage is applied to J2-K, J2-A and J2-H. Voltage paths are available through J2-H to contact 9 of S1-B front, contact 6 of S1-B front, as well as through J2-A to contact 8 of S1-B rear, contact 6 of S1-B rear, S1-B rear to S1-B front interconnection, contact 6 of S1-B front. The switch is stepped to position 11, and the solenoid voltage path through J2-B is opened at contact 8 of S1-B rear; however, the other path remains closed

and the switch is stepped again to position 12. Since all current paths to the latching solenoid are now open, the switch will remain in that position. No reactance is connected to the outer connector and coil L4 is connected in series to the rf input, and C8 is connected between ground and the inner connector. If the frequency is returned to 42-47.5 MHz (band segment 4), control voltage is again applied to J2-G and J2-A, but not to J2-B. The only voltage path is from J2-G to contact No. 10 of S1-B front, contact No. 6 of S1-B front. The switch steps to position 1 and, since the current path to the solenoid is now open, will remain there and the cycle of action is complete.

CHAPTER 6 DIRECT SUPPORT MAINTENANCE INSTRUCTIONS

Section I. TROUBLESHOOTING

6-1. Scope of Direct Support Maintenance

The direct support maintenance instructions supplement the maintenance procedures covered in the technical manual for the radio set with which the AS-2731/GRC is used. A troubleshooting chart is given in paragraph 6-4; repair procedures are given in paragraphs 6-5, 6-6, and 6-7, and performance test procedures are given in paragraph 6-8.

6-2. Tools, Test Equipment, and Materials Required

The following tools, test equipment, and materials, or appropriate equivalents, are required to perform direct support maintenance:

- a. *Tools.*
 - (1) Tool Kit, Electronic Equipment TK-101/G.
 - (2) Tool Kit, Electronic Equipment TK-100/G.
 - (3) Torque screwdriver, 0-Z5 inch-lb (NSN

5120-00-568-4742).

- b. *Test Equipment.*

- (1) Receiver-Transmitter, Radio RT-524/VRC, or RT-246/VRC.

- (2) Wattmeter AN/URM-120.

- (3) Multimeter TS-352B/U.

- c. *Materials.* Refer to appendix E for materials required for direct support maintenance.

6-3. Direct Support Maintenance Troubleshooting

Perform the applicable direct support procedures as outlined by the technical manual for the radio r/T unit used with the AS-2731/GRC. If the AS-2731/GRC is defective, perform the troubleshooting procedures given in troubleshooting chart (table 6-1). If the corrective measures given in the chart do not clear the trouble, higher category of maintenance is required.

Section II. REPAIR PROCEDURES

6-4. General

This section contains direct support repair procedures for the AS-2731/GRC.

- a. *Antenna Element AS-2732/GRC.* Repairs are limited to the removal and replacement of certain parts (para 6-6).

- b. *Matching Unit-Base MX-9146/GRC.* Repairs consist of parts removal and replacement (para 6-7) and performance tests (para 6-8).

6-5. Special Precautions

- a. *Observe the following precautions when removing and replacing wires.* When soldering or unsoldering wires, solder quickly to allow as little heat conduction as possible. However, avoid making a cold-solder joint by first heating the joint where solder is to be applied. When wiring permits, use a heat sink (such as long-nosed pliers) between the soldering iron and a component. Excessive heat may damage the component.

- b. *Orientation of Parts.* When an electronic part is moved aside, note the position of the part and its leads

and duplicate the original position after repair.

6-6. Antenna Element AS-27321GRC Parts Removal and Replacement

(fig. 6-1)

- a. *Contact (SM-B-542008).*

- (1) Remove contact (SM-B-542008) by removing two screws (MS51957-1).

- (2) Replace contact (SM-B-542008) with the screws removed in (1) above. Apply 1 or 2 drops of sealing compound (item 7, app E) after starting the screws.

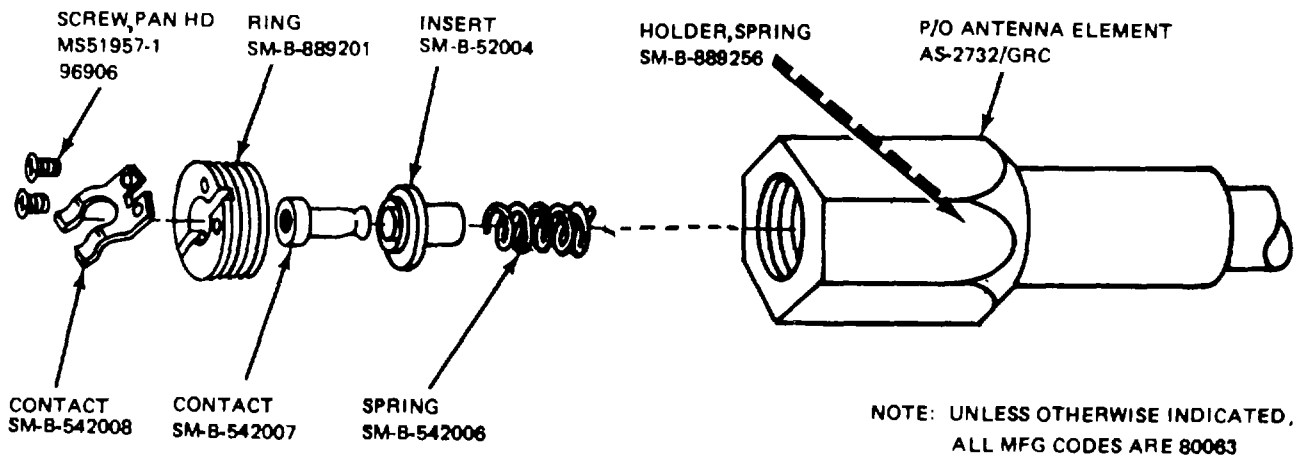
- b. *Contact (SM-B-542007) and Contact Spring Assembly Parts.*

- (1) Unscrew and remove ring (SM-B-889201). Tap the AS-2731/GRC on the bench to remove contact (SM-B-542007), insert (SM-B-542004), and spring (SM-B-542006).

- (2) Replace the parts in the sequence shown in figure 6-1 and tighten ring (SM-B-889201).

Table 6-1. Troubleshooting Chart

Item No.	Trouble symptom	Probable trouble	Corrective measure
1	MX-9146/GRC will not tune or will not select proper subband.	Open wire in CX-13055/GRC.	Check cable continuity per figure 6-5. If defective, repair cable.
2	MX-9146/GRC will not tune or r/t unit t)lows fuse.	Ware shorted to ground in CX-13055/GRC.	Check continuity of cable. If defective repair cable.
3	+24-volt supply fuse when matching unit is connected and frequency is set on any band segment.	Pin K on J2 short-circuited to ground.	Check pins on J2 for resistance to ground.
4	24-volt supply blows when new frequency is selected	Pin D, E, F, G, or H on J2Same as 3 above. short-circuited to ground.	Same as 3 above.
5	MX-9146/GRC will not tune to any band segment.	No control voltage.	Check switch S1-A and connectorJ2 for control voltages shown in figure FO-1.
S1 for binding.		Manually rotate knob of switch S1 to	check
6	Select subband in ascending order; MX-9146/GRC tunes only to BAND 2 frequencies.	No control voltage on pin A or B of J2 from radio through CX-13055/GRC.	Select a frequency in BAND I and check pin A of J2 with TS-352B/U for +24 volts.
7	MX-9146/GRC tunes to wrong subband or cycles continuously.	Open connection on J2 or short-circuited J2 connector.	Check resistance from J2 terminals to ground (fig. FO-1).
8	MX-9146/GRC will not pass rf (all bands).	Open coaxial connector or rf cable assembly 47.5 MHz position (fig. FO-1).	a. Check for continuity from input connector J1.to output connector J3 in 42- b. Check for continuity front bottom of rf cable assembly to connector J3. If cable is open replace rf cable assembly. c. Repair or replace MX-9146/GRC.



EL3UX008

Figure 6-1. Antenna Element AS-2732/GRC, partial view, parts location.

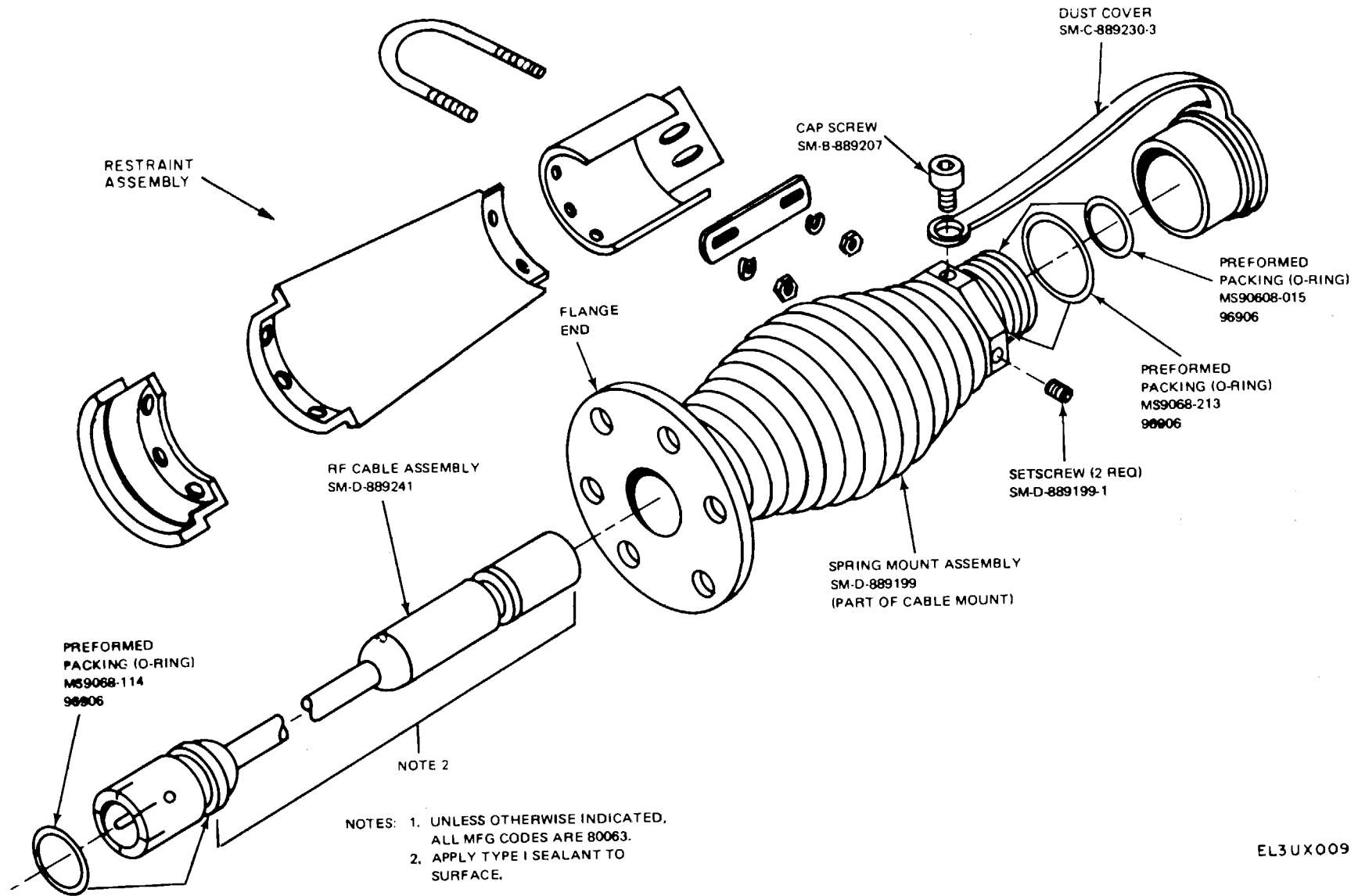
6-7. Matching Unit-Base MX-9146/GRC Parts Removal and Replacement

a. Rf Cable Assembly (SM-D-889241) (fig. 6-2 and 6-3).

(1) Removal.

(a) Remove six cap screws (SM-D-889206) and washers (MS35338-139B) and separate cable mount assembly from the MX-9146/GRC.

Change 2 6-2



EL3UX009

Figure 6-2. Cable mount assembly, exploded view, parts location, with restraint assembly.

CAUTION

Do not use any other type lubricant on this O-ring. (This lubricant will not freeze up or prevent frequency selector switch S1 from rotating in extreme cold weather.)

(b) Lubricate anticapillary gasket (SC-D-877432) with silicone compound (item 3, app E), and install the gasket in the base assembly.

(c) Install O-ring (supplied) on J2 and lubricate with the silicone compound.

(d) Install O-ring (supplied) on J1 and lubricate with the silicone compound.

(e) Slide matching unit case onto shaft of selector switch and seat the case firmly against the base assembly.

(f) Check frequency selector switch for binding. If the shaft binds, loosen the bushing nut (SM-C-889212) so that the bushing is free to find a position that does not bind. Retighten the nut to a torque of 50 inch-pounds.

(g) Replace six screws (MS3212-21) to secure case to selector assembly.

(h) Replace case eight mounting screws (MS1959-31) to base assembly. Tighten screws to a torque of 20 in.-lb using a torque screwdriver (sec. III, app C).

(i) Replace nuts and the lockwashers dust caps on J1 and J2 connectors.

(j) Align the white line on the knob with the black line on shaft of frequency selector switch and secure using screw (MS210977-06006).

c. *Anticapillary Gasket* (fig. 64).

(1) *Removal.*

(a) Remove case, matching unit (b(l) above).

(b) Remove anticapillary gasket (SC-D-877432).

(2) *Replacement.*

(a) Lubricate the gasket (SC-D-877432) with a light film of silicone compound (item 3, app E).

(b) Reassemble the MX-9146/GRC as described in (b(2) above).

d. *J1 Connector Assembly* (fig. 6-3 and FO-1).

(1) *Removal.*

(a) Remove matching unit case (b(l) above).

(b) Unsolder rf connections at J1 connector assembly.

(c) Remove J1 connector assembly (SM-B-889239).

(2) *Replacement.*

(a) Connect the outer conductor (braid) of rf coaxial cable to the ground lug of J1 connector assembly (SM-B-889239) with No. 22 AWG wire.

(b) Remove two setscrews (SM-D-889199-1) and cap screw (SM-B-889207) with dust cover (SM-C-8892303).

(c) Push rf cable assembly out of spring mount assembly from the flange end; do not attempt to pull the rf cable out from the threaded end.

(2) *Replacement.*

(a) Remove all dirt, grease and fungus from inside of the spring mount. If necessary, use trichloroethane (item 1, app E) in a properly ventilated area for cleaning.

(b) Apply a bead of type I sealant (item 8, app E) around the circumference of the shell of rf cable assembly (fig. 6-2) that is assembled into the flanged end of spring mount assembly. Apply one bead above the groove for the setscrews and one below.

(c) Apply a thin film of silicone compound (item 3, app E) to O-rings (MS9068-114 and MS9068-213) and assemble to rf cable assembly.

(d) Insert the rf cable assembly into the flanged end of the spring mount assembly.

(e) Twist the short body connector rf cable assembly in spring mount, and secure with two setscrews (SM-D-889119-1) and cap screw (SM-889207) with dust cover (SM-C-889230-3).

(f) Apply a thin film of silicone compound to O-ring (MS90684)15) and press it into the groove at the threaded end of spring mount assembly.

(g) Apply a thin film of silicone compound to O-ring (MS9068-213) and press into groove at top of base assembly.

(h) Replace cable mount to base assembly with six lockwashers and cap screws.

b. *Case Matching [nit (S.M-D-889211)* (fig. 6-3 and 6-4).

(1) *Removal.*

(a) Remove dust caps, mounting nuts and the lockwashers from J1 and J2 connectors.

(b) Remove screw (MS21097-6006) and knob (MS91524-1) from frequency selector shaft.

(c) Remove six screws (MS3212-21) securing base to selector assembly.

(d) Remove eight case mounting screws (MS51959-31) from base assembly.

(e) While holding the matching unit, carefully press in on the frequency selector shaft and disengage case from base assembly. When sliding matching unit case off selector assembly, allow connectors to drop through case holes.

(2) *Replacement.*

(a) Lubricate O-ring (MS29513-06) on frequency selector switch S1 with pneumatic grease (item 9, app E).

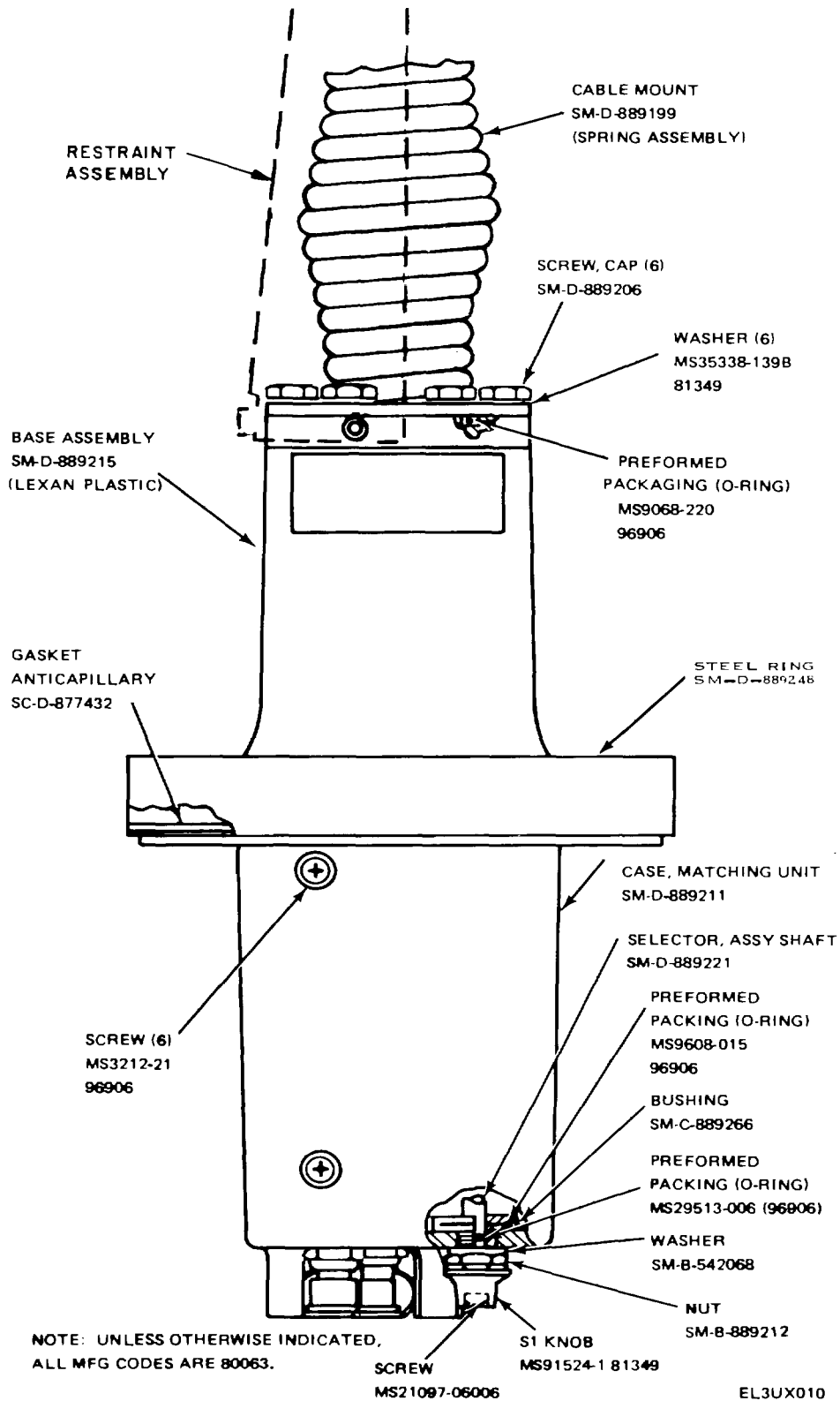


Figure 6-3. Matching Unit-Base, MX-9146/GRC, side view, parts location.

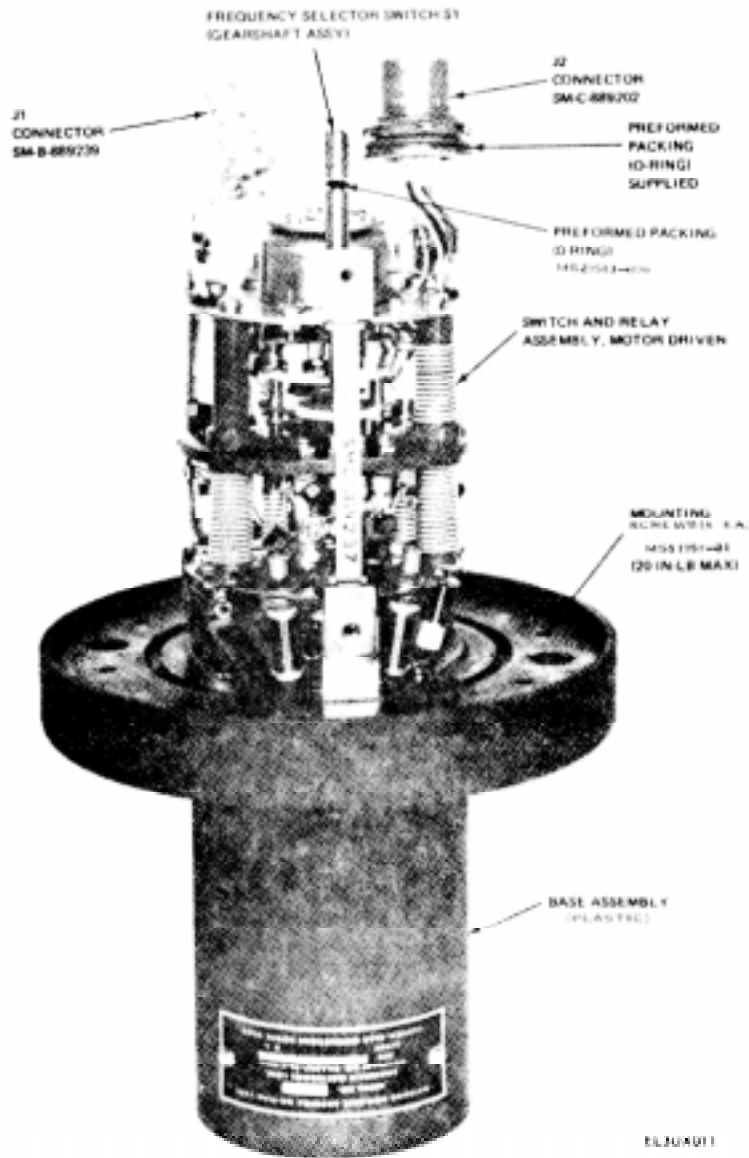


Figure 6-4. Matching Unit-Base, MX-9146/GRC, case cover removed, parts location

(b) Connect the center conductor of rf coaxial cable to center terminal of J1 connector assembly.

(c) Reassemble the MXS-9146/GRC as described in (b(2) above).

e. J2 Connector Assembly (fig. 6-4 and FO-1).

(1) Removal.

(a) Remove matching unit case (b(1) above).

(b) Tag and unsolder eight wires from J2 connector (S.M-C-889202).

(2) Replacement.

(a) Solder disconnected wires to J2 connector (SM-C-889202).

(b) Reassemble the MX-9146 GRC as described in (b(2) above).

6-8. Antenna Performance Test

a. Tests necessary to confirm the AS-2731 GRC, has been restored to serviceable condition are contained in paragraph 4-9, except substitute AN/URM 120 for the

AN URM-182. Any trouble that is beyond the scope of direct support maintenance shall be referred to a higher category of maintenance.

b. To test Cable Assembly, Special Purpose CX-13055 GRC, perform continuity checks per figure 6-5 using Multimeter TS-352B/U.

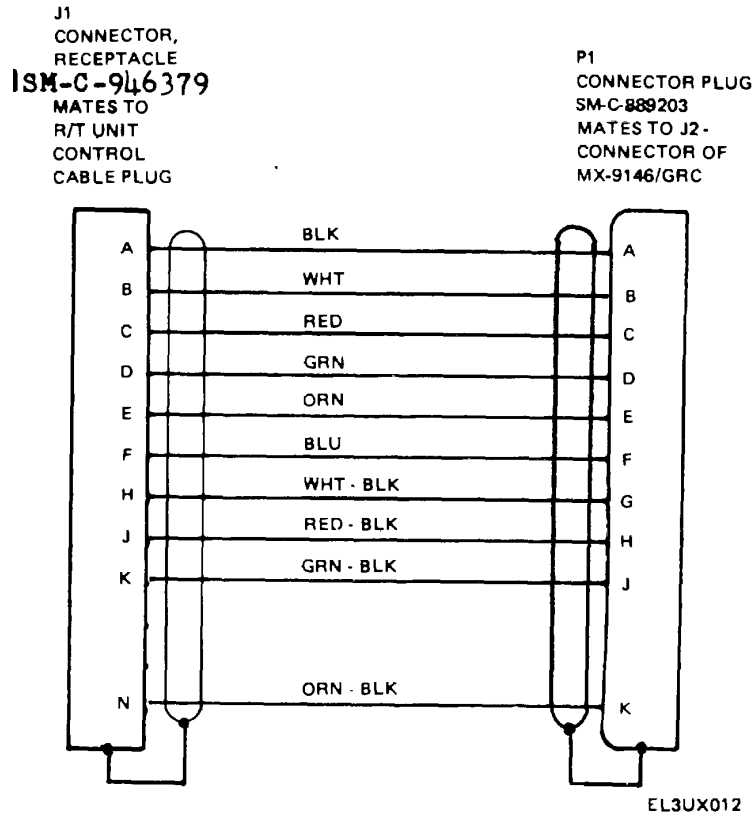


Figure 6-5. Cable Assembly, Special Purpose CX-13184/GRC, Schematic Diagram.

Change 2 6-7

APPENDIX A REFERENCES

The following is a list of applicable publications available to the operator and maintenance personnel of Antenna AS-2731/GRC.

■ DA Pam 310-4	Index of Technical Publications.
SB 11-131	Vehicular Radio Sets and Authorized Installations.
SB 11-573	Painting and Preservation Supplies Available for Field Use for Electronics Command Equipment
SB 11-604	Replacement of Tool Kits, Radar and Radio Repairman TK-87 U and TK-88 U with Tool Kits, Electronic Equipment TK-105/G and TK-100/G.
■ SB 11-639	Addition of New Items to Tool Kit, Electronic Equipment TK-101 G (NSN 5180-00-064-5178).
SB 38-100	Preservation, Packaging, Packing and Marking Materials, Supplies, and Equipment Used by the Army.
TB SIG 291	Safety Measures to be Observed When Installing and Using Whip Antennas, Field-Type Masts, Towers and Antennas and Metal Poles That Are Used With Communications, Radar, and Direction Finder Equipment.
TB 43-0118	Field Instructions for Painting and preserving Electronics Command Equipment Including Camouflage Pattern Painting of Electrical Equipment Shelters.
TM-11-5820-401-12	Operator's and Organizational Maintenance Manual (Including Repair Parts and Special Tools List): Radio Sets AN/VRC-12 (5820-00-223-7412), AN/VRC-43 (5820-00-223-7415), AN/VRC-44 (5820-00-223-7417), AN/VRC-45 (5820-00-223-7418), AN/VRC-46 (5820-00-223-7433), AN/VRC-47 (5820-00-223-7434), AN/VRC-48 (5820-00-223-7435), AN/VRC-49 (5820-00-223-7437), AN VRC-54 (5820-00-223-7567), and AN/VRC-55 (5820-00-402-2265, ; Mounting MT-1029/VRC (5820-00-893-1323) and MT-1898/VRC (5820-00-893-1324); Antenna AT-912/VRC (5820-00-897-6357); Control, Frequency Selector C-2742/VRC(5820-00-892-3343), and Control, Radio Set C-2299/VRC (5820-00-892-3340).
■ TM 11-5820-401-34-2	Direct Support and General Support Maintenance Manual: Radio Sets AN/VRC- 12 (NSN 5820-00-223-7412), AN/VRC-43 (NSN 5820-00-223-7415), AN VRC-44 (NSN 5820-00-7417), AN/VRC-45 (NSN 5820-00-223-7418), AN/VRC-46 (NSN 5820-00-223-7433), AN/VRC-47 (NSN 5820-00-223-7434), AN VRC-48 (NSN 5820-00-223-7435), and AN/VRC-49 (NSN 5820-00-223-7437), Receiver-Transmitters, Radio RT-246VRC, RT-246AN/VRC (NSN 5820-00-892-0623), RT-524'VRC and RT-524A VRC (NSN 5820-00-892-0622).
■ TM 11-5820-498-12	Operator's and Organizational Maintenance Manual: Radio Sets AN/VRC-53 (NSN 5820-00-223-7467), AN/VRC-64 (NSN 5820-00-223-7475), AN/GRC-125 (NSN 5820-00-223-7411), and AN GRC-160 (NSN 5820-00-223-7473), and Amplifier-Power Supply Groups OA-3633 GRC and OA-3633AN/GRC (NSN 5820-00-973-3383).
■ TM 11-5820-667-12	Operator's and Organizational Maintenance Manual (Including Repair Parts list): Radio Set AN PRC-77, (NSN 5820-00-930-3724) (Including Receiver-Transmitter, Radio RT-841 PRC-77) (5820-00-930-3725).
TM 11-5985-355-24P	Organizational Direct Support and General Support Repair Parts and Special Tools List: Antenna AS-2731/GRC.
■ TM 11-6130-233-12	Operator's and Organizational Maintenance Manual: Power Supplies PP-2953 U, PP-2953A U, PP-2953B'U and PP-2953C U (NSN 6130-00-985-7899).
■ TM 11-6625-366-15	Operator's Organizational, DS, GS, and Depot Maintenance Manual: Mmultimeter TS-352B U.
TM 38-750	The Army Maintenance Management System (TAMMS).
■ TM 43-0139	Painting Instructions for Field Use.

**APPENDIX B
COMPONENTS OF END ITEM LIST**

Section I. INTRODUCTION

B-1. Scope

This appendix lists integral components of and basic issue items for the AS-2731/GRC to help you inventory items required for safe and efficient operation.

B-2. General

This Components of End Item List is divided into the following sections:

a. *Section II. Integral Components of the End Item.* These items, when assembled, comprise the AS-2731/GRC and must accompany it whenever it is transferred or turned in. The illustrations will help you identify these items.

b. *Section III. Basic Issue Items.* These are the minimum essential items required to place the AS-2731/GRC in operation, to operate it, and to perform emergency repairs. Although shipped separately packed they must accompany the AS-2731/GRC during operation and whenever it is transferred between accountable officers. The illustrations will assist you with hard-to-identify items. This manual is your authority to requisition replacement B1, based on TOE/MOTE authorization of the end item.

B-3. Explanation of Columns

a. *Illustration.* This column is divided as follows:

(1) *Figure number.* Indicates the figure number of the illustration on which the item is shown.

(2) *Item number.* (Not applicable.)

b. *National Stock Number.* Indicates the National

stock number assigned to the item and which will be used for requisitioning.

c. *Description.* Indicates the Federal item name and, if required, a minimum description to identify the item. The part number indicates the primary number used by the manufacturer, which controls the design and characteristics of the item by means of its engineering drawings, specifications, standards, and inspection requirements to identify an item or range of items. Following the part number, the Federal Supply Code for Manufacturers (FSCM) is shown in parentheses.

d. *Location.* The physical location of each item listed is given in this column. The lists are designed to inventory all items in one area of the major item before moving on to an adjacent area.

e. *Usable on Code.* Not applicable.

f. *Quantity Required (Qty Reqd).* This column lists the quantity of each item required for a complete major item.

g. *Quantity.* This column is left blank for use during an inventory. Under the Rcvd column, list the quantity you actually receive on your major item. The Date columns are for your use when you inventory the major item.

SECTION II. INTEGRAL COMPONENTS or END ITEM

(1) ILLUSTRATION (A) (B) FIG. ITEM	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION		(4) LOCATION	(5) USABLE ON CODE	(6) QTY	(7) QUANTITY
		PART NUMBER	CAGE			REQD	RCVD DATE
1-1	5985-01-017-0785	ANTENNA AS-2731/GRC SM-8-889205	80063				
1-1	5985-01-01T-078L	INCLUDES ANTENNA ELEMENT AS-2732/GRC SM-D-889249	80063				
1-1	5995-01-038-2203	CABLE ASSEMBLY, SPECIAL PURPOSE ELECTRICAL CX-13055/GRC SM-D-889260	80063				
1-1	5985-01-025-8892	MATCHING UNIT-BASE, ANTENNA MX-9146/GRC SN-D-889210	80063				
1-2		RESTRAINT ASSEMBLY (SAFETY) DLB4011671 (W/HARDWARE)					
1-2		ADAPTER (W/HARDWARE) DLB4011679					

Change 2 B-2

APPENDIX C MAINTENANCE ALLOCATION

Section I. INTRODUCTION

C-1. General

This appendix provides a summary of the maintenance operations for AS-2731/GRC. It authorizes categories of maintenance for specific maintenance functions on reparable 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.

C-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 require 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. *Align.* To adjust specified variable elements of an item to bring about optimum or desired performance.

f. *Calibrate.* To determine and cause corrections to be made or to be adjusted on instruments or test measuring and diagnostic equipments 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, 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 like type part, subassembly, or module (component or assembly) for an unserviceable counterpart.

i. *Repair.* The application of maintenance services (inspect, test, service, adjust, align, 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 a part, subassembly, module (component or assembly), end item, or system.

j. *Overhaul.* That maintenance effort (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 applies 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.

C-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 "worktime" 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 vary at different maintenance categories, appropriate "worktime" figures will be shown for each category. The number of task-hours specified by the "worktime" 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 c) art. Subcolumns of column 4 are as follows:

- C-Operator/Crew
- 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.

C-4. Tool and Test Equipment Requirements (sec III)

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 codes in this column indicate the maintenance category allocated the tool or test equipment.

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 Federal Supply Code for manufacturers (5-digit) in parentheses.

C-5. Remarks (sec IV)

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

ANTENNA AS-2731/GRC

(1) GROUP NUMBER	(2) COMPONENT ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY					(5) TOOLS AND EQUIPMENT	(6) REMARKS
			C	O	F	H	D		
00	ANTENNA AS-2731/GRC	Inspect	0.1						
		Service	0.2						1
		Install		0.25				1,5	
		Replace		0.25				1,5	
		Test		0.25				3	2
		Repair					0.75	23,24,26	
		Repair			0.25			1	4
01	ANTENNA ELEMENT AS-2732/GBC	Repair			0.50			1,2,3,5,25	5
		Repair					1.00	6,7,18	6
		Overhaul					1.50		7
		Inspect	0.1						
		Service	0.2						1
		Test		0.25				1	2
		Repair		0.50				1	8
02	MATCHING UNIT-SASE I-9146/NGRC	Replace		0.25				1	
		Inspect	0.1						
		Service	0.2						1
		Test		0.25				1	2
		Test					0.75	23,24,26	3
		Repair			0.5			1,2,3,5	5
		Repair					1 (L)	1 thru 24,26	9,10
03	RESTRAINT ASSEMBLY AND ADAPTER	Repair	0.1						
		Overhaul							7
		Replace		0.25					1
Change 2 C-3									

**SECTION III. TOOL AND TEST EQUIPMENT REQUIREMENTS
FOR
ANTENNA AS-2731/GRC**

(1) TOOL OR TEST EQUIPMENT REF CODE	(2) MAINTENANCE LEVEL	(3) NOMENCLATURE	(4) NATIONAL/NATO STOCK NUMBER	(5) TOOL NUMBER
1	O	Tool Kit, Electronic Equipment TK-101/G	5180-00-064-5178	
2	O	Multimeter AW/URM-105	6625-00-581-2036	
3	O	Test Set, RF Power AN/URM-182	6625-00-148-9371	
4	F	Wattaeter AN/UR4-120 (includes Dv=y Load, Electrical DA-75/U)	6625-00-813-8430	
5	O	Wrench, Torque: 0-100 inch pounds	5120-00-720-1975	
6	F	Tool Kit, Electronic Equipment TK-100/C	5180-00-605-0079	
7	F	Multimeter TS-352B/U	6625-00-553-0142	
8	D*	MATCHING UNIT-BASE, ANTENNA X-914b/CRC, (CALIBRATED)	5985-01-025-8892	
9	L, D	Tool Kit, Electronic Equipment TK-105/C	5180-00-610-8177	
10	L, D	Generator, Signal AN/USM-44A	6625-00-539-9685	
11	L, D	Counter, Electronic, Digital Readout AN/USM-207	6625-00-911-6368	
12	L, D	Power Supply PP-1104/C	6130-00-542-6385	
13	L, D	Radio Interference Measuring Set AN/URM-85	6625-00-776-0595	
11	L, D	Voltmeter, Electronic ME-313/U (HP 113A)	Note	
15	L, D	Termination, 50 ohms GR 1602-P4	Note	
16	L, D	Admittance Meter AN/USM-231	5625-00-511-0512	
17	L, D	Multimeter ME-26/U	6625-00-913-9781	
18	L, D	Wattmeter, Bird Model 614	Note	
19	L, D	Admittance Bridge, Wayne Kerr Type B-801	6625-00-918-9418	
20	L, D	Crystal Detector, Hewlett-Packard Type 8471A	5985-00-125-1313	
21	L, D	Adapter, GR 874-2BPA	Note	
22	L, D	Cord, GR 874-R22 LA	5995-00-009-5434	
23	L, D	Antenna Test Chamber MX-9930/ CRC (SM-D-889270)	5865-01-038-2401	
24	L, D	Alignment Cavity MX-993/GRC (SN-D-889277)	5985-01-047-3246	
25	P	Screwdriver, Torque: 0-25 inch-pounds	5120-00-568-4242	
26	L, D	Control, Alignment Cavity C-10349/ CR (SM-D-899278)	5985-01-047-3245	
NOTE				
The National stock numbers (NSN's) that are missing from this list have been requested and will be added by a changes to the list upon receipt.				
* Authorized for use by Depot for antenna alignment, part of MX-q943!GRC Antenna alignment Cavity.				
Change 2 C-4				

SECTION IV. REMARKS

REFERENCE CODE	REMARKS
1	Preventive maintenance.
2	Operational test.
3	Alignment, VSWR, power tests.
4	By replacing AS-2732/GRC antenna spring contacts and Mx-911i6/GRC.
5	By replacing FMX-9146/GRC gaskets, spring and RF cable assembly, sealing screws, and connectors.
6	All repairs.
7	Depot only.
8	By replacing spring contact
9	Repair by replacing defective tuned circuit components on the selector assembly and aligning the MX-9146/GRC.
10	(L) identifies Specialized Repair Activity (SRA) at Pirmasens, West Germany.

APPENDIX E
EXPENDABLE SUPPLIES AND MATERIALS LIST

Section I. INTRODUCTION

E-1. Scope

This appendix lists expendable supplies and materials you will need to operate and maintain the AS-2731/GRC. These items are authorized to you by CTA 50-970, Expendable Items (Except Medical, Class V, Repair Parts, and Heraldic Items).

E-2. Explanation of Columns

a. *Column 1-Item Number.* This number is assigned to the entry in the listing and is referenced in the narrative instructions to identify the material (e.g., "Use cleaning compound, item 5, app D").

b. *Column 2-Level.* This column identifies the lowest level of maintenance that requires the listed item.

C-Operator/Crew

O-Organizational Maintenance

F-Direct support Maintenance

H-General Support Maintenance

c. *Column 3--National Stock Number.* This is the National stock number assigned to the item; use it to request or requisition the item.

d. *Column 4-Description.* Indicates the Federal item name and, if required, a description to identify the item. The last line for each item indicates the part number followed by the Federal Supply Code for Manufacturer (FSCM) in parentheses, if applicable.

e. *Column 5-Unit of Measure (U/M).* Indicates the measure used in performing the actual maintenance function. This measure is expressed by a two-character alphabetical abbreviation (e.g., ea, in, pr). If the unit of measure differs from the unit of issue, requisition the lowest unit of issue that will satisfy your requirements.

Change 2 E-1

SECTION II. EXPENDABLE SUPPLIES AND MATERIALS LIST

(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION PART NO. AND FSCM	(5) UNIT OF MEAS.
1	C	6650-00-105-3084	Trichlorotrifluoroethane, cleaning solvent	oz
2			Deleted	oz
3	O	6850-00-880-7616	Silicone Compound	sh
4	O	5350-00-235-0124	Paper, Abrasive, Flint	gal
5	O	8010-00-111-7937	P-P-105 (81349) Paint, Forest Green, heat-reflecting (solar)	ea
6	O	5905-00-293-4208	MIL-E-52798E (96906) Lockwire (Safety wire)	oz
7	O	8030-00-823-9717	MS20995C32 (96906) Sealing Compound	oz
8	F	8040-01-009-1562	MIL-A-46146 (81349) Sealant, Type I (12 oz)	oz
8A	F	8040-01-024-9581	MIL-A-46146 (81349) Sealant, Type I (12 oz)	oz
9	F	9150-00-269-8255	MIL-A-46146 (81349) Grease, Pneumatic Systems 55M (71984)	lb

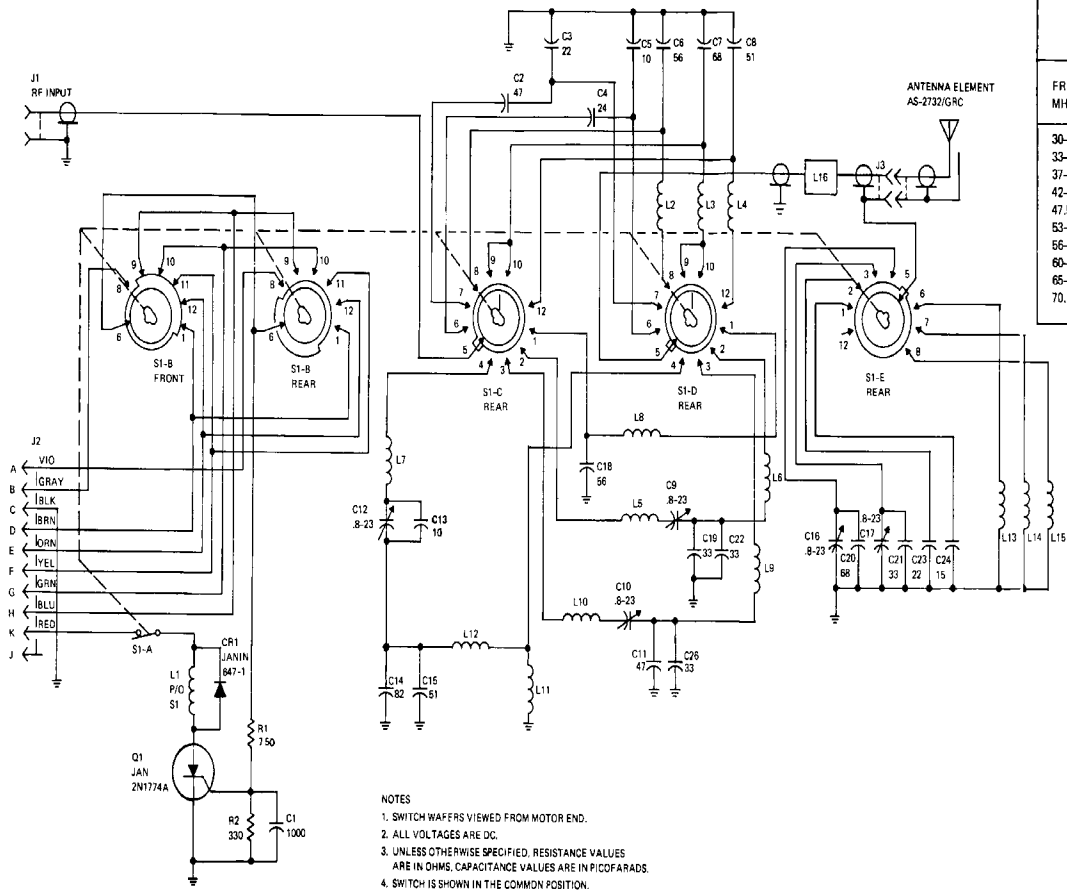
Change 2 E-2

		RESISTANCE TO GROUND-OHMS							
		PIN DESIGNATIONS							
FREQ MHZ	SUBBAND	J1 TO J3	J2-A	J2-B	J2-C	J2-D	J2-E	J2-F	J2-G
30-33	1	-	-	1.7 K	0	-	1.7 K	1.7 K	1.7 K
33-37	2	-	-	1.7 K	0	1.7 K	-	1.7 K	1.7 K
37-42	3	-	-	1.7 K	0	1.7 K	1.7 K	-	1.7 K
42-47.5	4	0	-	1.7 K	0	1.7 K	1.7 K	1.7 K	-
47.5-53	5	0	-	1.7 K	0	1.7 K	1.7 K	1.7 K	1.7 K
53-56	6	0	1.7 K	-	0	-	1.7 K	1.7 K	1.7 K
56-60	7	0	1.7 K	-	0	1.7 K	-	1.7 K	1.7 K
60-65	8	0	1.7 K	-	0	1.7 K	1.7 K	-	1.7 K
65-70.5	9	-	1.7 K	-	0	1.7 K	1.7 K	1.7 K	-
70.5-80	10	-	1.7 K	-	0	1.7 K	1.7 K	1.7 K	1.7 K

		CONTROL VOLTAGES								
SUB-BAND	FREQ MHZ	BAND	K	A	B	D	E	F	G	H
1	30-33	A	24	24	0	24	0	0	0	0
2	33-37	A	24	24	0	0	24	0	0	0
3	37-42	A	24	24	0	0	0	24	0	0
4	42-47.5	A	24	24	0	0	0	24	0	0
5	47.5-53	A	24	24	0	0	0	0	24	0
6	53-56	B	24	0	24	24	0	0	0	0
7	56-60	B	24	0	24	0	24	0	0	0
8	60-65	B	24	0	24	0	0	24	0	0
9	65-70.5	B	24	0	24	0	0	0	24	0
10	70.5-80	B	24	0	24	0	0	0	0	24

SWITCH POSITION	SUBBAND	COMPONENTS IN CIRCUIT
1	4	L8,C18,C24
2	3	L5,L6,C9,C19,C22,C23
3	2	L9,L10,C10,C11,C17,C21,C26
4	1	L7,L11,L12,C12,C13,C14,C15,C16,C20
5	COMMON	---
6	10	L13,C4,C5
7	9	L14,C2,C3
8	8	L2,L15,C6
9	7	L3,C7
10	6	L3,C7
11	NC	---
12	5	L4,C8

- COIL
- L2
- L3
- L4
- L5
- L6
- L7
- L8
- L9
- L10
- L11
- L12
- L13
- L14
- L15
- L16



- NOTES
1. SWITCH WAFERS VIEWED FROM MOTOR END.
 2. ALL VOLTAGES ARE DC.
 3. UNLESS OTHERWISE SPECIFIED, RESISTANCE VALUES ARE IN OHMS, CAPACITANCE VALUES ARE IN PICOFARADS.
 4. SWITCH IS SHOWN IN THE COMMON POSITION.

Figure FO-1. Matching Unit-Base MX-9146/GRC, schematic diagram.

FO-1. Matching Unit-Base MX-9146/GRC, schematic diagram.

By Order of the Secretary of the Army:

BERNARD W. ROGERS
General, United States
Chief of Staff

Official:


J. C. PENNINGTON
Brigadier General, United States Army
The Adjutant General

Distribution:

To be distributed in accordance with DA Form 12-51, Operator maintenance requirements for AN/VRC-12, AN/VRC-43 thru 49, AN/VRC-64 and *AN/GRC-160.

***U.S. GOVERNMENT PRINTING OFFICE: 1995-388-421/01301**

RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL PUBLICATIONS



SOMETHING WRONG WITH THIS PUBLICATION?

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

FROM: (PRINT YOUR UNIT'S COMPLETE ADDRESS)

DATE SENT

PUBLICATION NUMBER

PUBLICATION DATE

PUBLICATION TITLE

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

PRINTED NAME, GRADE OR TITLE, AND TELEPHONE NUMBER

SIGN HERE:

TEAR ALONG PERFORATED LINE

DA FORM 2028-2
1 JUL 79

PREVIOUS EDITIONS ARE OBSOLETE.

P.S.—IF YOUR OUTFIT WANTS TO KNOW ABOUT YOUR RECOMMENDATION MAKE A CARBON COPY OF THIS AND GIVE IT TO YOUR HEADQUARTERS.

PIN: 033737

This fine document...

Was brought to you by me:



[Liberated Manuals -- free army and government manuals](#)

Why do I do it? I am tired of sleazy CD-ROM sellers, who take publicly available information, slap “watermarks” and other junk on it, and sell it. Those masters of search engine manipulation make sure that their sites that sell free information, come up first in search engines. They did not create it... They did not even scan it... Why should they get your money? Why are not letting you give those free manuals to your friends?

I am setting this document FREE. This document was made by the US Government and is NOT protected by Copyright. Feel free to share, republish, sell and so on.

I am not asking you for donations, fees or handouts. If you can, please provide a link to liberatedmanuals.com, so that free manuals come up first in search engines:

<A HREF=<http://www.liberatedmanuals.com/>>Free Military and Government Manuals

– Sincerely
Igor Chudov
<http://igor.chudov.com/>