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D 101.11:  
11-5805-  
210-20

# TM 11-5805-210-20

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

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GOVERNMENT DOCUMENTS

## ORGANIZATIONAL MAINTENANCE SECOND ECHELON FREQUENCY SHIFT CONVERTER CV-278/GR

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**HEADQUARTERS, DEPARTMENT OF THE ARMY**  
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CHANGE }  
No. 3 }

HEADQUARTERS  
DEPARTMENT OF THE ARMY  
Washington, DC, 15 September 1987

**Organizational Maintenance Second Echelon  
FREQUENCY SHIFT CONVERTER  
CV-278/GR  
(NSN 5815-00-543-1728)**

TM 11-5805-210-20, 6 May 1959, is changed as follows:

Page 2. Paragraph 1.1 is superseded as follows:

**1.1. Consolidated Index of Army Publications and Blank Forms**

Refer to the latest issue of DA Pam 25-30 to determine whether there are new editions, changes, or additional publications pertaining to the equipment.

Paragraph 1.2 is superseded as follows:

**1.2. Maintenance Forms, Records, and Reports**

*a. Reports of Maintenance and Unsatisfactory Equipment.* Department of the Army forms and procedures used for equipment maintenance will be those prescribed by DA Pam 738-750, as contained in Maintenance Management Update.

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

*c. Discrepancy in Shipment Report (DISREP) (SF 361).* Fill out and forward Discrepancy in

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

Paragraph 1.3 is superseded as follows:

**1.3. Reporting Equipment Improvement Recommendations (EIR)**

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

Paragraph 1.4 is superseded as follows:

**1.4. Administrative Storage**

Administrative storage of equipment issued to and used by Army activities will have preventive maintenance performed in accordance with the PMCS charts before storing. When removing the equipment from administrative storage, the PMCS should be performed to assure operational readiness. Disassembly and repacking of equipment for shipment or limited storage is covered in chapter 3.

Distribution authorized to the Department of Defense and DOD contractors only for official use or for administration or operational purposes. This determination was made on 14 May 1987. Other requests for this document will be referred to Commander, US Army Communications-Electronics Command and Fort Monmouth, ATTN: AMSEL-ME-P, Fort Monmouth, NJ 07703-5000.

DESTRUCTION NOTICE—Destroy by any method that will prevent disclosure of contents or reconstruction of the document.

Page 9, section I. Delete section I and substitute:

**11. Scope of Second Echelon Maintenance**

The maintenance duties assigned to second echelon maintenance personnel are listed below, together with a reference to the paragraph covering the specific maintenance function. The duties assigned require the tools and test equipment indicated in appendix II.

- a. Monthly preventive maintenance checks and services (table 2-1).
- b. Troubleshooting (paras. 13 and 14).
- c. Tube testing (para. 15).

**12. Preventive Maintenance**

Preventive maintenance is the systematic care, inspection, and servicing of equipment to maintain it in serviceable condition, prevent breakdowns, and assure maximum operational capability.

a. *Systematic Care.* The procedures given in table 2-1 cover systematic care essential to proper upkeep and operation of the CV-278/GR at the organizational maintenance level.

b. *Preventive Maintenance Checks and Services.* The preventive maintenance checks and services table outlines functions to be performed at specific intervals. These checks and services are designed to maintain Army equipment in a combat-serviceable and mission-ready condition. Routine checks, such as cleaning, dusting, washing, checking for frayed cables, checking for loose nuts and bolts, and completeness are not listed as PMCS checks. They are things you should do any time you see they must be done. If the equipment does not meet readiness/availability requirements, refer to section II, Troubleshooting, page 12, (paras. 13 and 14).

Table 2-1. Organizational Preventive Maintenance Checks and Services

M – Monthly

Item No.	Interval	Item to be inspected	Procedures Check for and have repaired or adjusted as necessary	Equipment is not ready/available if:
	M			
1.	*	Fuses and indicators	Check that all operating fuses are of proper value and that indicator lamp will illuminate.	Unit is over- or under-fused or indicator will not illuminate.

## **APPENDIX I REFERENCES**

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Following is a list of applicable references available for Organizational Maintenance of the Frequency Shift Converter, CV-278/GR:

- DA Pam 25-30..... Consolidated Index of Army Publications and Blank Forms.
- DA Pam 738-750 ..... The Army Maintenance Management System (TAMMS).
- SB 38-100 ..... Preservation, Packaging and Packing Materials, Supplies, and Equipment Used by the Army.
- TM 11-5805-210-10 ..... Frequency Shift Converter CV-278/GR, Operator's Manual.
- TM 11-5815-204-10 ..... Radio Teletypewriter Sets AN/GRC-46 and AN/VRC-29, Operator's Manual.
- TM 11-5815-204-20 ..... Radio Teletypewriter Sets AN/GRC-46 and AN/VRC-29, Organizational Maintenance.
- TM 11-5820-205-10 ..... Radio Transmitter Modulator MD-203/GR, Operator's Manual.
- TM 11-5820-205-20 ..... Radio Transmitter Modulator MD-203/GR, Organizational Maintenance.

**By Order of the Secretary of the Army:**

**CARL E. VUONO**  
*General, United States Army*  
*Chief of Staff*

**Official:**

**R.L. DILWORTH**  
*Brigadier General, United States Army*  
*The Adjutant General*

**DISTRIBUTION:**

To be distributed in accordance with DA Form 12-51 literature requirements for CV-278.

CHANGE }  
No. 2 }

HEADQUARTERS  
DEPARTMENT OF THE ARMY  
WASHINGTON, DC, 16 September 1977

**Organizational Maintenance Second Echelon  
FREQUENCY SHIFT CONVERTER CV-278/GR  
(NSN 5815-00-543-1728)  
Current as of 26 May 1977**

TM 11-5805-210-20, 6 May 1959, is changed as follows:

The title is changed as shown above.

Page 2. Paragraph 1c is deleted in its entirety.

Paragraph 1.1 is superseded as follows:

**1.1. Indexes of Publications**

a. DA Pam 310-4. 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.

b. DA Pam 310-7. Refer to DA Pam 310-7 to determine whether there are modification work orders (MWO's) pertaining to the equipment. Add paragraphs 1.2, 1.3, 1.4, and 1.5 after paragraph 1.1.

**1.2. Reporting of Errors**

You can help improve this manual by calling attention to errors and by recommending improvements and stating your reasons for the recommendations. Your letter or DA Form 2028 (Recommended Changes to Publications and Blank Forms) should be mailed direct to Com-

mander, US Army Electronics Command, ATTN: DRSEL-MA-Q, Fort Monmouth, NJ 07703. A reply will be furnished direct to you.

**1.3. Reporting of Equipment Improvement Recommendations (EIR)**

EIR's will be prepared using DA Form 2407 (Maintenance Request). Instructions for preparing EIR's are provided in TM 38-750, The Army Maintenance Management System. EIR's should be mailed direct to Commander, US Army Electronics Command, ATTN: DRSEL-MA-Q, Fort Monmouth, NJ 07703.

**1.4. Administrative Storage**

Administrative storage of equipment issued to and used by Army activities shall be in accordance with TM 740-90-1.

**1.5. Destruction of Army Electronics Materiel**

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

Page 17. Appendix II is superseded as follows:

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TECHNICAL MANUAL

**Organizational Maintenance Second Echelon  
FREQUENCY SHIFT CONVERTER CV-278/GR**

TM 11-5805-210-20

CHANGE No. 1

HEADQUARTERS,  
DEPARTMENT OF THE ARMY  
WASHINGTON, D.C., 20 September 1963

TM 11-5805-210-20, 6 May 1959, is changed as follows:

Page 2, paragraph 1. Make the following changes:

Delete subparagraph *c* and substitute:

*c.* Forward all comments on this publication direct to: Commanding Officer, U.S. Army Electronics Materiel Support Agency, ATTN: SELMS-MP, Fort Monmouth, N.J. DA Form 1598 (Record of Comments on Publications), DA Form 2496 (Disposition Form), or letter may be used.

Add paragraph 1.1 after paragraph 1.

**1.1. Index of Publications**

Refer to the latest issue of DA Pam 310-4 to determine whether there are new editions, changes, or additional publications pertaining to your equipment. Army Pam 310-4 is an index of current technical manuals, technical bulletins, supply bulletins, lubrication orders, and modification work orders which are available through publications supply channels. The index lists the individual parts (-10, -20, -35P, etc.) and the latest changes to and revisions of each equipment publication.

Page 9, section I. Delete section I and substitute:

**Section I. MAINTENANCE**

**11. Scope of Second Echelon Maintenance**

The maintenance duties assigned to second echelon maintenance personnel are listed below, together with a reference to the paragraph covering the specific maintenance function. The duties assigned require the tools and test equipment indicated in appendix II.

- a.* Monthly preventive maintenance checks and services (par. 12.2).
- b.* Touchup painting (par. 12.4).
- c.* Cleaning (par. 12.3).
- d.* Troubleshooting (pars. 13 and 14).
- e.* Tube testing (par. 15).

**12. Preventive Maintenance**

*a.* Preventive maintenance is the systematic care, inspection, and servicing of equipment to maintain it in serviceable condition, prevent breakdowns, and assure maximum operational capability. Preventive maintenance is the responsibility of all echelons concerned with the equipment and includes the inspection and testing of parts, assemblies, or units that inspections and tests indicate would probably fail before the next scheduled periodic service. Preven-

tive maintenance checks and services at the second echelon level are made at monthly intervals unless otherwise directed by the commanding officer. The preventive maintenance checks and services should be scheduled concurrently with the periodic service schedule of the other equipment that is part of the same system.

*b.* Maintenance forms and records to be used and maintained on this equipment are specified in TM 38-750.

Add paragraphs 12.1 through 12.4 after paragraph 12.

**12.1. Monthly Maintenance**

Perform the maintenance functions indicated in the monthly preventive maintenance checks and services chart (par. 12.2) once each month. A month is defined as approximately 30 calendar days of 8-hour-per-day operation. If the equipment is operated 16 hours a day, the monthly preventive maintenance checks and services should be performed at 15-day intervals. Adjustment of the maintenance interval must be made to compensate for any unusual operating conditions. Equipment maintained in a standby (ready for immediate operation) con-

dition must have monthly maintenance checks and services performed on it. Equipment in limited storage (requires service before operation) does not

require monthly preventive maintenance. All deficiencies or shortcomings will be recorded in accordance with the requirements of TM 38-750.

## 12.2. Monthly Preventive Maintenance Checks and Services Chart

*Note.* The monthly preventive maintenance checks and services chart items are performed only during an authorized downtime. Do not attempt to perform the procedures below when the equipment is operating as part of a radio system.

Sequence No.	Item	Procedure	References
1	Equipment interior . . . . .	Check for cleanliness. Clean with lint-free cloth or with brush, as required.	Fig. 3.
2	Preservation . . . . .	Check painted surfaces for rust and corrosion. . . . .	Par. 12.4.
3	Modifications . . . . .	Check to see if applicable MWO's have been performed. All URGENT MWO's must be applied immediately and all NORMAL MWO's must be scheduled.	DA Pam 310-4.
4	Running spares . . . . .	Make sure that authorized quantities of running spares are on hand.	TM 11-5805-210-10.
5	Fuses and indicators . . . . .	See that all operating fuses are of proper value and that indicator lamp is illuminated.	TM 11-5805-210-10.
6	Accessible pluckout items.	Inspect seating of pluckout items . . . . .	Fig. 3 and par. 15.
7	Interior wiring and parts.	Check for damages to insulation, loose connections, blistering, fractures, or other signs of deterioration.	
8	Operation . . . . .	Check for normal operation . . . . .	Par. 14.

## 12.3. Cleaning

Inspect the exterior and interior surfaces of the equipment. The surfaces should be free of dust, dirt, grease, and fungus.

**Warning:** Cleaning compound is flammable and its fumes are toxic. Do not use near a flame.

a. Remove grease, fungus, and ground-in dirt with a clean, soft, lint-free cloth. If necessary, dampen (not wet) the cloth with cleaning compound (FSN 7930-395-9542) and then wipe clean with a clean lint-free cloth.

b. Remove dirt or dust from plugs and jacks with a brush.

c. Clean the front panels and control knobs; use a soft lint-free cloth. If necessary, dampen cloth or brush with mild soap and water and then wipe dry.

## 12.4. Touchup Painting

Remove rust and corrosion from metal surfaces by lightly sanding them with fine sandpaper. Brush two thin coats of paint on the bare metal to protect it from further corrosion. Refer to the applicable cleaning and refinishing practices specified in TM 9-213.

Page 10. Delete figure 5.

Page 11. Delete figure 6.

Page 16, appendix I. Add the following references to appendix I:

DA Pam 310-4 Index of Technical Manuals, Technical Bulletins, Supply Bulletins, Lubrication Orders, and Modification Work Orders.

TM 9-213 Painting Instructions for Field Use.

TM 38-750 The Army Equipment Records System and Procedures.

By Order of the Secretary of the Army:

**EARLE G. WHEELER,**  
*General, United States Army,*  
*Chief of Staff.*

Official:

**J. C. LAMBERT,**  
*Major General, United States Army,*  
*The Adjutant General.*

Distribution:

To be distributed in accordance with DA Form 12-32, Section II (Unclass) requirements for Redstone, Honest John, Sergeant, Corporal, Nike-Hercules, Lacrosse, Pershing, Nike-Ajax, Hawk, Improved Nike-Hercules and Target Missile—TM—Teletypewriter.



# APPENDIX II MAINTENANCE ALLOCATION

## Section I. INTRODUCTION

### 1. General

This appendix provides a summary of the maintenance operations for CV-278/GR. 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.

### 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. 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. This function does not include the trial and error replacement of running spare type items such as fuses, lamps, or electron tubes.

*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 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.

### 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 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 chart. 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 sup-

port 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.

#### 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.

#### 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  
FREQUENCY SHIFT CONVERTER CV-278/GR

(1) GROUP NUMBER	(2) COMPONENT/ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY					(5) TOOLS AND EQPT.	(6) REMARKS
			C	O	F	H	D		
00	FREQUENCY SHIFT CONVERTER CV-278/GR	Inspect	0.1					2	
		Service		0.2				4,12	A
		Test		0.3				5,9,10,	B
		Test			0.7			11,14,15	
		Test				1.0		4-12,14,	C
		Test						15	
		Repair		0.2				2,4,12	D
		Repair			0.8			1,3,5,9,	
		Align				0.7		10,11,14	
		Overhaul						15	
						3,5,9,10			
						11,14,15			
						4.0	1,3,5-15		
01	Mount MR-791/U	Inspect	0.1						
		Replace		0.3			2		
02	Cable Assembly CX-4547/U	Inspect	0.1						
		Test		0.5			2,4		
		Replace		0.1					
03	Cable Assembly CX-4540/U	Inspect	0.1						
		Test		0.5			2,4		
		Replace		0.1					
04	Cable Assembly CG-1127/U	Inspect	0.1						
		Test		0.5			2,4		
		Replace		0.1					



SECTION III. TOOL AND TEST EQUIPMENT REQUIREMENTS  
FOR  
FREQUENCY SHIFT CONVERTER CV-276/CR

TOOL OR TEST EQUIPMENT REF CODE	MAINTENANCE CATEGORY	NOMENCLATURE	NATIONAL/NATO STOCK NUMBER	TOOL NUMBER
1	F,R,D	TOOL KIT, ELECTRONIC EQUIPMENT TK-100/G	5180-00-605-0079	
2	O	TOOL KIT, ELECTRONIC EQUIPMENT TK-101/G	5180-00-064-5178	
3	F,R,D	TOOL KIT, ELECTRONIC EQUIPMENT TK-105/G	5180-00-610-8177	
4	O	MULTIMETER AM/UHM-105	6625-00-581-2036	
5	F,R,D	MULTIMETER TS-352B/U	6625-00-953-0162	
6	R,D	TEST SET, TELETYPEWRITER TS-917/00	6625-00-648-8746	
7	R,D	TEST SET DISTORTION TS-383/00	6625-00-222-1714	
8	R,D	TEST SET, TELETYPEWRITER AM/UHM-1	6625-00-965-0195	
9	F,R,D	RF SIGNAL GENERATOR AM/UHM-23F	6625-00-643-1548	
10	F,R,D	ELECTRONIC MULTIMETER ME-268/U	6625-00-913-9781	
11	F,R,D	COUNTER, ELECTRONIC, DIGITAL READOUT AM/UHM-207	6625-00-911-6368	
12	O,F,R	ELECTRONIC TUBE TESTER TV-7/U	6625-00-820-0064	
13	O	ELECTRONIC TUBE TESTER TV-2/U	6625-00-669-0263	
14	F,R,D	VOLTMETER ME-30A/U	6625-00-643-1670	
15	F,R,D	OSCILLOSCOPE OS-8/U	6625-00-643-1740	

SECTION IV. REMARKS  
 FREQUENCY SHIFT CONVERTER CV-276/GR

REFERENCE CODE	REMARKS
A	Operation test.
B	All tests except those specified in D.
C	Bias distortion test.
D	Repair by replacement of fuse, tubes, crystal, keying relay, knobs, lamps.

**By Order of the Secretary of the Army:**

**BERNARD W. ROGERS**  
*General, United States Army*  
*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, organizational maintenance requirements for CV-287/GR.**

**FREQUENCY SHIFT CONVERTER CV-278/GR**

	Paragraph	Page
<b>CHAPTER 1. INSTALLATION</b>		
<b>Section I. Introduction.</b>		
Scope.....	1	2
Unpacking.....	2	2
Checking unpacked equipment.....	3	2
<b>Section II. Installation of Frequency Shift Converter CV-278/GR.</b>		
General.....	4	4
Mounting MT-791/U.....	5	4
Frequency Shift Converter CV-278/GR.....	6	4
Removal of Tubes, fuse, and crystal.....	7	4
Connections.....	8	4
<b>Section III. Initial adjustment of converter.</b>		
Initial adjustment of operating frequency.....	9	7
Selection of neutral or polar output.....	10	7
<b>CHAPTER 2. MAINTENANCE INSTRUCTIONS</b>		
<b>Section I. Maintenance.</b>		
Tools, materials, and test equipment required.....	11	9
Preventive maintenance.....	12	9
<b>Section II. Troubleshooting.</b>		
Visual inspection.....	13	12
Equipment performance check list.....	14	12
Tube testing techniques.....	15	14
<b>CHAPTER 3. SHIPMENT AND LIMITED STORAGE</b>		
Disassembly of equipment.....	16	16
Repacking for shipment or limited storage.....	17	17
<b>APPENDIX I. REFERENCES</b> .....	--	16
<b>APPENDIX II. MAINTENANCE ALLOCATION CHART FOR FREQUENCY SHIFT CONVERTER CV-278/GR</b> .....	--	17

# CHAPTER 1

## INSTALLATION

### Section I. INTRODUCTION

#### 1. Scope

a. This manual describes the installation, second echelon maintenance, shipment and limited storage of Frequency Shift Converter CV-278/GR. Operating instructions for this equipment are contained in TM 11-5805-210-10, Frequency Shift Converter CV-278/GR, Operator's Manual. For information on the operation of this equipment as part of a complete system, refer to TM 11-5815-204-10, Radio Teletypewriter Sets AN/GRC-46 and AN/VRC-29, Operator's Manual.

b. Second echelon maintenance of Frequency Shift Converter CV-278/GR consists of the following:

- (1) Replacement of defective fuse (par. 7).
- (2) Preventive maintenance (par. 12).
- (3) Visual inspection (par. 13).
- (4) Equipment performance check list (par. 14).
- (5) Tube testing techniques (par. 15).

c. Forward comments concerning this manual to the Commanding Officer, United States Army Signal Publications Agency, Fort Monmouth, N. J.

*Notes.* For applicable forms and records, see paragraph 2, TM 11-5805-210-10.

#### 2. Unpacking

##### a. Packaging Data.

- (1) *When shipped as part of AN/GRC-46.* Frequency Shift Converter CV-278/GR is shipped as a complete unit, already mounted with all cables connected and ready for operation in the S-89 shelter. Two copies of TM 11-5805-210-10 and a box of running spares are in the spares box immediately behind the teletypewriter operator's seat in the shelter.
- (2) *When shipped as part of AN/VRC-29.* When packed for shipment, Frequency Shift Converter CV-278/GR

is placed in a carton that also contains the manuals and the box of running spares. The mounting is packed in a separate box. A typical shipping box and its contents are shown in figure 1.

Box No.	Height (in.)	Width (in.)	Depth (in.)	Volume (cu ft)	Unit weight (lb)	Contents of box
1 of 2	20	10½	10	1.2	24½	Converter, 2 manuals, and spares box.
2 of 2	4½	9½	13¾	1.8	16½	Mounting.

Total weight 41

b. *Removing Contents.* Perform all the steps outlined below when unpacking the converter:

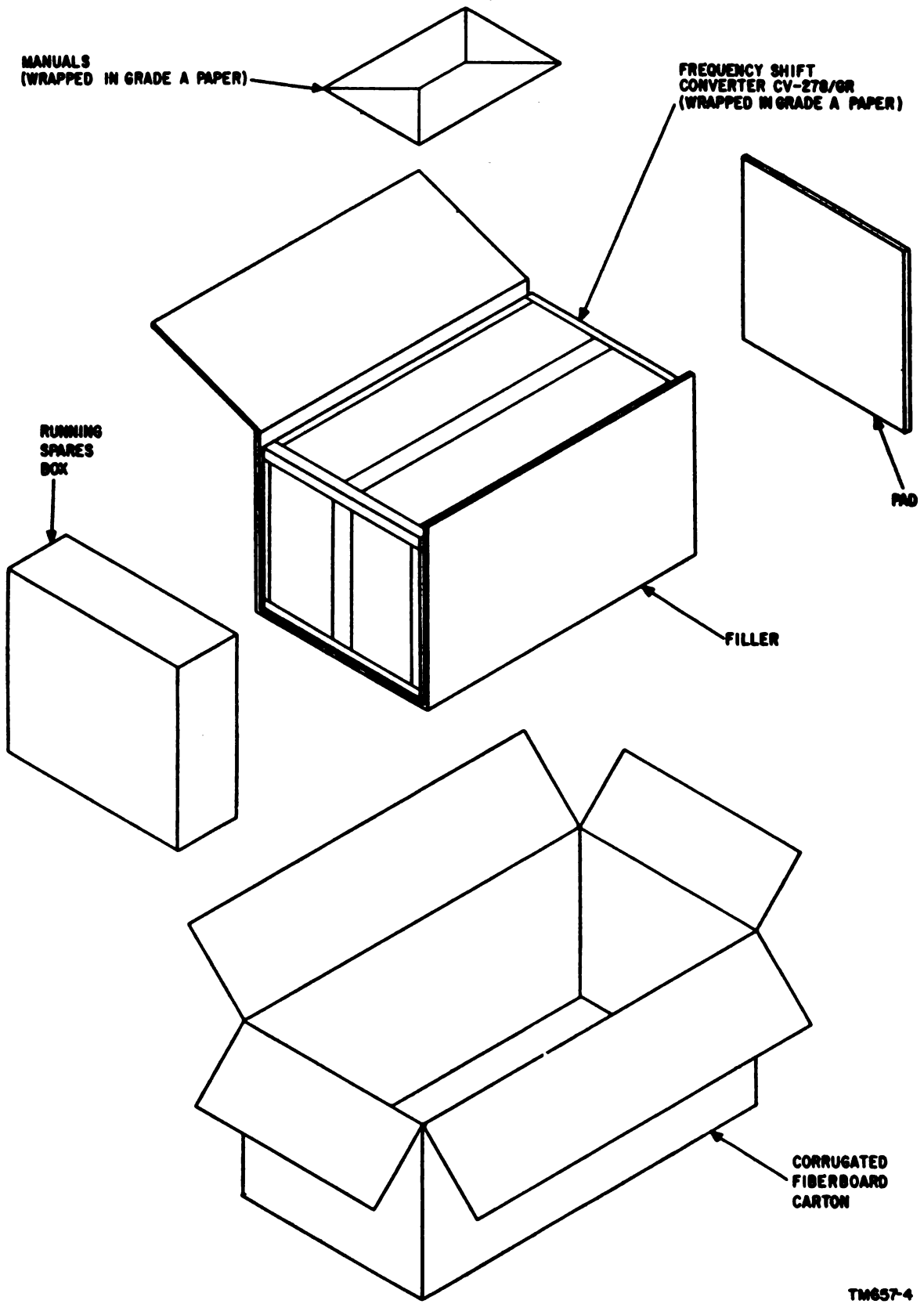
- (1) Open the carton and remove the technical manuals.
- (2) Remove the fiberboard box that contains the running spares; then remove the converter.
- (3) Remove the running spares from the fiberboard box.
- (4) Open the other carton and remove the mounting.

#### 3. Checking Unpacked Equipment

a. Inspect the equipment for damage incurred during shipment. If the shipment has been damaged, refer to paragraph 2b, TM 11-5805-210-10.

b. See that the equipment is complete as listed on the packing slip. If a packing slip is not available, check the equipment against the table of components; see paragraph 5, TM 11-5805-210-10.

c. If the equipment has been used or reconditioned, see whether it has been changed by a modification work order (MWO). If modified, the MWO number will appear on the front panel near the nomenclature plate.



TM657-4

Figure 1. Packaging of Frequency Shift Converter CV-278/GR.

## Section II. INSTALLATION OF FREQUENCY SHIFT CONVERTER CV-278/GR

### 4. General

The converter is shipped ready for installation; all removable parts (tubes, fuse, relay, dummy plug, and crystal) are in place. The polar relay is in the socket, the dummy plug is in place, and the quartz crystal unit, the fuse, and all tubes and other removable parts are in place.

### 5. Mounting MT-791/U

If the converter is to be installed in a vehicle, Mounting MT-791/U is used. Figure 2 indicates the minimum clearances needed in any installation. Install the mount as follows:

a. Place the mounting on a solid flat surface that is large enough to accommodate the mounting.

b. Spot and drill the mounting holes in accordance with the dimensional data (fig. 2) or use the mounting as a template. Be sure that the clearances are adequate.

c. See that a good electrical ground contact is made between the mount and the vehicular frame, and between the mount and the converter case. If necessary, scrape paint away from the inside of the hooks that hold the case; this will provide a good ground contact for the converter.

### 6. Frequency Shift Converter CV-278/GR

Secure the converter to the mount as follows:

a. Press up slightly on the levers on the mount under the front panel; move the levers to the left.

b. Place the converter on the mount with the front panel above the levers. Align the channels under the case of the converter in the wells in the mount.

c. Move the levers to the right (to secure the case) until both levers are locked in the detent slots.

### 7. Removal of Tubes, Fuse, and Crystal (fig. 3)

The converter is shipped with the fuse, crystal, and all tubes in place. The fuse and indicator lamp are replaceable at the front panel. To remove the tubes, fuse, indicator lamp, and crystal, follow the procedure given below.

a. *Fuse.* To remove the 3-ampere fuse, push in on the fuse cap, turn it counterclockwise about  $\frac{1}{4}$  turn, and pull out the cap and fuse.

b. *Indicator Lamp.* To remove the indicator lamp, unscrew the jewel, press down on the lamp, turn it counterclockwise, and pull out the lamp.

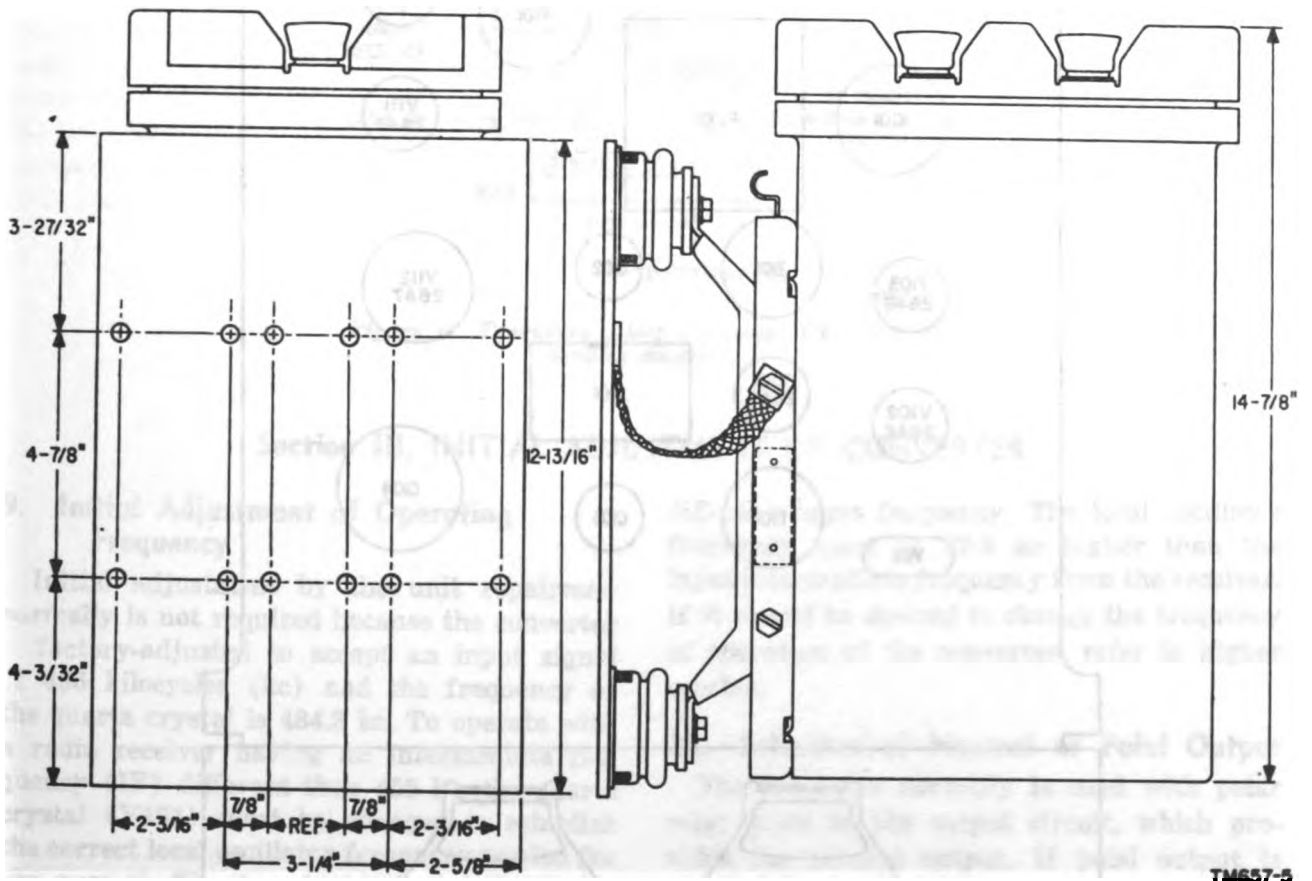
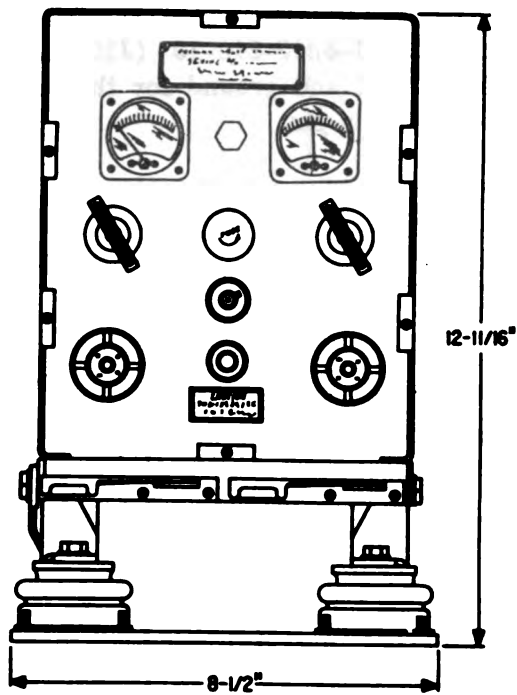
c. *Tubes.* To remove or check the installation of a tube, loosen the fasteners on the front panel (par. 15) and pull the panel-chassis assembly out of the case. Remove the tube shield or holding clamp that secures the tube, and remove the tube.

d. *Crystal.* To remove or check the installation of the crystal, loosen the fasteners on the front panel and pull the panel-chassis out of the case. Remove the crystal.

### 8. Connections

a. After installing the converter according to the instructions in paragraph 5 and in the vehicular installation kit, connect the cables according to the cording diagram (fig. 4). The following table lists the cable connections shown in the cording diagram.

Cable No.	Type	Common name	Required No.	Length (ft)	Connects	
					From	To
W211	CG-1127/U	Signal cable	1	2 $\frac{1}{2}$	Converter	Receiver.
W213	CX-4540/U	Power cable	1	4 $\frac{1}{2}$	Converter	Interconnecting box.
W215	CX-4547/U	Output cable	1	5 $\frac{1}{2}$	Converter	Interconnecting box.



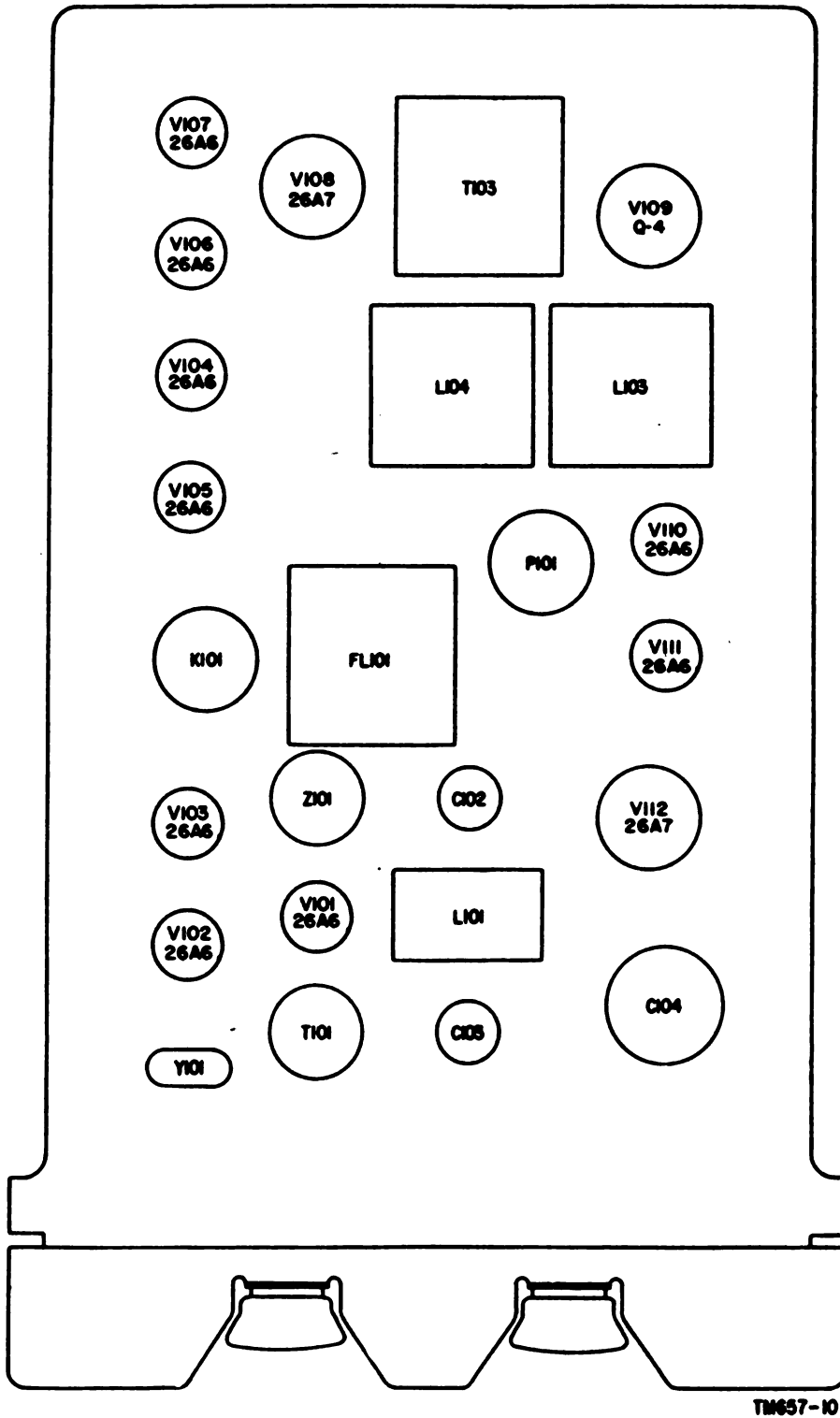
TM657-5

Figure 2. Frequency Shift Converter CV-278/GE, installation drawing.



b. Remote control of the mark hold circuit is also possible when the converter is not used in the AN/GRC-46 or AN/VRC-29. If remote control of the mark hold circuit is desired when the converter is not used in the system, connect

an external switch to pin D of J103 (fig. 1 of TM 11-5805-210-10 (J103 is labeled PRINTER)), and ground for the purpose of grounding this pin.



TM657-10

Figure 3. Frequency Shift Converter CV-278/GR, tube location.

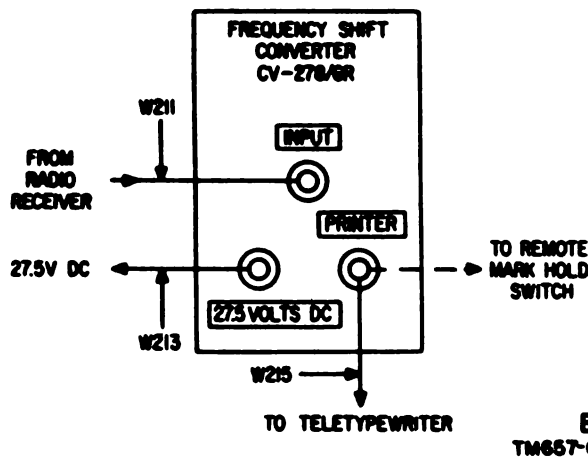
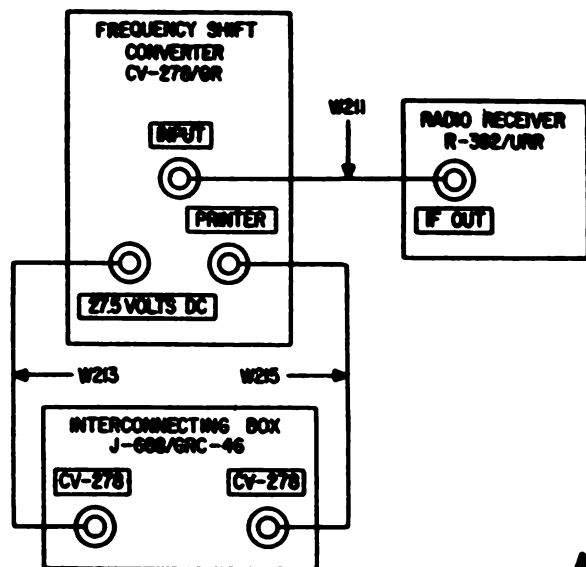


Figure 4. Frequency Shift Converter CV-278/GR, connection diagram.

### Section III. INITIAL ADJUSTMENT OF CONVERTER

#### 9. Initial Adjustment of Operating Frequency

Initial adjustment by the unit repairman normally is not required because the converter is factory-adjusted to accept an input signal of 455 kilocycles (kc) and the frequency of the quartz crystal is 484.3 kc. To operate with a radio receiver having an intermediate frequency (IF) different than 455 kc, the quartz crystal (Y101) must be changed to establish the correct local oscillator frequency needed for the new if. The tuned circuits of T101 and Z101 also must be readjusted to peak at the

different input frequency. The local oscillator frequency must be 29.3 kc higher than the input intermediate frequency from the receiver. If it should be desired to change the frequency of operation of the converter, refer to higher echelon.

#### 10. Selection of Neutral or Polar Output

The converter normally is used with polar relay K101 in the output circuit, which provides for neutral output. If polar output is desired, dummy plug P101 must be installed in socket XK101 in place of polar relay K101. To

**interchange K101 and P101, proceed as follows:**

**a. Remove the chassis of the converter from the case (par. 15c).**

**b. Remove the holding clamp from the top of K101 (fig. 3), and remove K101 from the**

**socket.**

**c. Remove dummy plug P101 from the socket (fig. 3), and insert relay K101 in the socket.**

**d. Insert dummy plug P101 in the socket (fig. 3), and replace the holding clamp.**

# CHAPTER 2

## MAINTENANCE INSTRUCTIONS

### Section I. MAINTENANCE

#### 11. Tools, Materials, and Test Equipment Required

The tools and test equipment required for second echelon maintenance are listed below.

- a. Tool Equipment TE-41.
- b. Multimeter AN/URM-105.
- c. Electron Tube Test Set TV-7/U.

#### 12. Preventive Maintenance

a. *DA Form 11-238*. DA Form 11-238 (figs. 5 and 6) is a preventive maintenance check list to be used by the unit repairman. Items not applicable to the equipment are lined out in the figures. References in the ITEM block in the figures are to paragraphs that contain additional maintenance information pertinent to the particular item. Additional preventive maintenance information concerning items 1, 2, 3, 6, and 7 on DA Form 11-238 will be found in paragraph 16b, TM 11-5805-210-10, Frequency Shift Converter CV-278/GR, Operator's Man-

ual. Instructions for the use of the form appear on the form.

b. *Items*. The information shown in this subparagraph is supplementary to DA Form 11-238. The item numbers correspond to the ITEM numbers on the form.

**Warning:** Disconnect all power before performing the following operations. When power to the equipment is disconnected, some capacitors still may retain voltages of dangerous potentials. Before touching exposed electrical parts, short-circuit the part to ground. When maintenance is completed, reconnect the power, and check for satisfactory operation.

Item	Maintenance procedures
12	Check the seating of tubes, tube shields, and/or holding clamps.
15	Check component parts underneath the chassis for signs of overheating.

<p><b>ADDITIONAL ITEMS FOR 2D AND 3D ECHELON INSPECTIONS</b></p> <p>36. <del>.....</del></p> <p>37. CHECK FOR NORMAL OPERATION. <input checked="" type="checkbox"/></p> <p>38. <del>.....</del></p>	<p><b>CONDITION</b></p> <p><b>10-CONNECTOR ON CORD W203 DAMAGED. REPORTED TO 3D ECHELON FOR REPLACEMENT.</b></p>																				
<p>IF DEFICIENCIES NOTED ARE NOT CORRECTED DURING THE INSPECTION, INDICATE ACTION TAKEN FOR CORRECTION.</p>																					
<p><b>INSTRUCTIONS</b></p> <p>This form may be used for a period of one month by using the correct dates and results of the month. It is to be used as a Preventive Maintenance check list for Signal equipment in actual use, or for a check on equipment prior to issue.</p> <p>1. For detailed Preventive Maintenance instructions see:</p> <ul style="list-style-type: none"> <li>a. The Technical Manual (in 78 II series) for the equipment. (See DA Pamphlet Number 310-4)</li> <li>b. The Supply Bulletin (SB 11-100 series) for the equipment. (See DA Pamphlet Number 310-4)</li> <li>c. The Department of the Army Lubrication Order. (See DA Pamphlet Number 310-4)</li> </ul> <p>2. The following action will be taken by either the Communications Officer/Chief for 1st echelon, or the Inspector for higher echelon:</p> <ul style="list-style-type: none"> <li>a. Enter Equipment Nomenclature and Serial Number.</li> <li>b. Strike out items that do not apply to the equipment.</li> </ul> <p>3. Operator/Inspector will enter in the columns entitled <b>CONDITION</b>, on the proper line, a notation regarding the condition, using symbols specified under <b>LEGEND</b>.</p> <p>4. After operator completes each daily inspection he will initial over the appropriate dates under "Daily Condition for Month", then return form to his supervisor.</p>																					
<p><b>TYPE OF INSPECTION</b></p> <table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 15%;">OPERATOR</th> <th style="width: 15%;">2/3 ECHELON</th> <th style="width: 15%;">DATE</th> <th style="width: 55%;">SIGNATURE</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;"><input checked="" type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;">30 April 69</td> <td style="text-align: center;"><i>John Smith</i></td> </tr> <tr> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td></td> <td></td> </tr> <tr> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td></td> <td></td> </tr> <tr> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td></td> <td></td> </tr> </tbody> </table>		OPERATOR	2/3 ECHELON	DATE	SIGNATURE	<input checked="" type="checkbox"/>	<input type="checkbox"/>	30 April 69	<i>John Smith</i>	<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>	<input type="checkbox"/>		
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<p><b>EQUIPMENT NOMENCLATURE</b></p> <p><b>FREQUENCY SHIFT CONVERTER CV-27B/6A</b></p> <p><b>EQUIPMENT SERIAL NUMBER</b>      <b>987</b></p>																					
<p><b>MAINTENANCE CHECK LIST FOR SIGNAL EQUIPMENT</b>  <b>SOUND EQUIPMENT, RADIO, DIRECTION FINDING</b>  <b>RADAR, CARRIER, RADIOSONDE AND TELEVISION</b>  <small>(AR 750-425)</small></p>																					

**DA FORM 11-238**  
MAY 61

REPLACES DA FORMS 11-238, 1 NOV 50; 11-239, 11-244, 11-246, 11-248, 11-249, 11-250, AND 11-251; WHICH ARE OBSOLETE.

TM657-39

Figure 5. DA Form 11-238, pages 1 and 4.

DAILY CONDITION FOR MONTH OF <b>APRIL 1959</b>		DAILY CONDITION FOR MONTH OF <b>APRIL 1959</b>																												
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
<p><b>Legend for marking conditions:</b> Satisfactory, ✓ Adjustment, Repair or Replacement required, X. Defect corrected, ⊗.</p>																														
DAILY ITEM																														
1. COMPLETENESS AND GENERAL CONDITION OF EQUIPMENT. (Reference instructions concerning cleanliness, cables, substitutions, tubes, spare parts, technical manuals).																														
2. CLEAN DIRT AND MOISTURE FROM ANGEN... ... ... PLUS, COMPONENT PANELS.																														
3. INSPECT CONTROLS FOR NORMAL OPERATION. TAP CONTROLS LIGHTLY FOR EVIDENCE OF CUT-OUT FROM LOOSE CONTACTS.																														
4. CHECK FOR NORMAL OPERATION OF EQUIPMENT. BE ALERT FOR UNUSUAL OPERATION OR CONDITION.																														
WEEKLY		CONDITION EACH WEEK							ADDITIONAL ITEMS FOR 2D AND 3D ECHELON INSPECTIONS																					
		1ST	2D	3D	4TH	5TH	6TH	7TH	CONDITION																					
5. CLEAN AND TIGHTEN EXTERIORS OF CASES, RACKS, MOUNTS, ...									15. INSPECT SEATING OF READILY ACCESSIBLE PLUCK-OUT ITEMS: TUBES, LAMPS, FUSES, CRYSTALS, CONNECTORS, ...																					
6. INSPECT CASES, MOUNTS, ... ... AND EXPOSED METAL SURFACES FOR RUST, CORROSION.									16. ...																					
7. INSPECT CORDS, CABLES, ... ... SHOCK MOUNTS FOR CUTS, KINKS, BREAKS, PRAYING, UNDUSE STRAIN.									17. INSPECT VARIABLE CAPACITORS FOR DIRT, MIS-ALIGNMENT OF PLATES, LOOSE MOUNTINGS, MOISTURE.																					
8. ...									18. INSPECT RESISTORS, BUSHINGS AND INSULATORS FOR CRACKS, CHIP PIPS, BLISTERING, MOISTURE, DISCOLORATION.																					
9. ...									19. CLEAN AND TIGHTEN SWITCHES, ... ... AND INTERIORS OF CHASSIS AND ... NOT READILY ACCESSIBLE.																					
10. INSPECT ACCESSIBLE ITEMS FOR LOOSE NUTS, SWITCHES, KNOBS, ... ... CONNECTORS, LIGHTS, ... ETC.									20. INSPECT TERMINAL BLOCKS FOR LOOSE CONNECTIONS, CRACKS AND BREAKS.																					
11. CLEAN AND/OR INSPECT ... ... BRASS NAME PLATES, ...									21. INSPECT TERMINALS OF LARGE FILLED CAPACITORS AND RESISTORS FOR DIRT, CORROSION, LOOSE CONTACTS.																					
12. ...									22. INSPECT TRANSFORMERS, CHOKES, POTENTIOMETERS AND RHEOSTATS FOR OVERHEATING AND OIL LEAKAGE.																					
13. ...									23. ...																					
14. ...									24. ...																					
15. ...									25. INSPECT WATERPROOF BAGS FOR LEAKS, WORN OR LOOSE PARTS.																					

CONTINUED ON PAGE 4

Figure 6. DA Form 11-588, pages 2 and 3.

## Section II. TROUBLESHOOTING

### 13. Visual Inspection

Before operating the equipment, inspect it. This will save repair time and may avoid further damage to the converter. Inspect the following for obvious defects:

- a. Improper setting of controls.
- b. Worn, broken, or disconnected cords or plugs.
- c. Burned out fuse or indicator lamp.
- d. Knobs loose on shafts.
- e. Sticking meter pointers or pointers not set at zero (power off).
- f. Improperly connected cables.

### 14. Equipment Performance Check List

*a. General.* The equipment performance check list is used to systematically check converter performance. All corrective measures which the unit repairman can perform are given in the *Corrective measures* column. When using the check list, start at the beginning and follow the step-by-step procedure in the order given. If the corrective indicated measures do not fix the converter, troubleshooting is required by higher echelon. Note on the repair tag how the converter performed and what corrective measures were taken.

*b. Procedure.* Operate the converter as shown in the check list below.

	Step	Action	Normal indication	Corrective measures
PERFORMANCE EQUIPMENT PREPARATORY	1	Turn POWER switch to OFF.		
	2	Check connection of Power cable from CV-278 receptacle on the interconnecting box to the 27.5 VOLTS D. C. receptacle on the converter.		
	3	Check connection of the IF INPUT cable from the IF OUT receptacle on the receiver to the INPUT receptacle on the converter.		
	4	Check connection of the PRINTER cable from CV-278 receptacle on the interconnecting box to the PRINTER receptacle on the converter.		
	5	Turn SERVICE switch to MARK HOLD.		
	6	Turn POWER switch to ON. Allow the converter to warm up for 5 minutes.	Indicator lamp lights.	Check fuse. Check indicator lamp. Replace defective items. If fuse blows again, unit is shorted. Refer to higher echelon. Check voltage of dc power source. Check power cable. Check SERVICE switch.
	7	Turn the radio receiver to a radio teletype or fak transmission.	Signal strength indication on SIGNAL INPUT meter reaches a maximum reading.	Check V101, V102, V103, and V104 (par. 15). Refer to higher echelon repair.
	8	Turn the radio receiver carefully until the DISCRIMINATOR meter pointer oscillates around the zero mark on the scale.	The radio teletypewriter should not print copy. The pointer of the DISCRIMINATOR meter should vibrate in both directions from the zero scale division.	Check V109, by substitution, and replace if defective. Check wiring of POWER switch. Refer to higher echelon repair.

	Step	Action	Normal indication	Corrective measures
STOP PERFORMANCE EQUIPMENT PERFORMANCE EQUIPMENT	9	With the same signal input given in step 8, turn the SERVICE switch to NOR.	DISCRIMINATOR meter should read as indicated in step 8. The radio teletypewriter should print accurate copy.	Increase the strength of the radio signal, or change the receiver tuning slightly. Check the SERVICE switch and wiring. Check keying relay K101 by substitution (with neutral output), and V112 by substitution (with polar output). If noise level of radio signal is too high, reduce the noise level. Check V110, V111, and V112. Check the PRINTER connectors and cable.
	10	With the same signal input given in step 8, turn the SERVICE switch to REV.	Pointer of DISCRIMINATOR meter should vibrate as indicated in step 8. Radio teletypewriter should print garbled copy, on radio signals from AN/GRC-19 and AN/VRC-29 equipments.	Check connections to the SERVICE switch.
	11	With a steady radio signal (not modulated), tune the radio receiver until the pointer of the DISCRIMINATOR meter is at zero on the scale.	Pointer of DISCRIMINATOR meter should stay on or near zero when the SERVICE switch is turned to any of its three positions.	Higher echelon repair required.
	12	Turn SERVICE switch to NOR. Apply a steady mark signal to the receiver (850-cycle frequency shift). The steady mark signal is obtained by turning the TEST KEY on Radio Transmitter T-105/GRC-19 to ON while transmitting frequency shifted radio signals with AN/GRC-46 and AN/VRC-29 equipments.	Pointer of DISCRIMINATOR meter should stay at the right-hand 4th scale division (approx).	Check V109 by substitution. Higher echelon repair required.
	13	With the same signal input shown in step 12, turn the SERVICE switch to REV.	Pointer of DISCRIMINATOR meter should stay at the left-hand 4th scale division (approx).	Check V109 by substitution. Higher echelon repair required.
	14	With the same signal input shown in step 12, turn the SERVICE switch to MARK HOLD.	Pointer of DISCRIMINATOR meter should stay at the right-hand 4th scale division (approx).	Check V109 by substitution. Higher echelon repair required.
	15	Apply a steady space signal to the radio receiver. Turn the SERVICE switch to NOR. The space signal is obtained by removing the cable connector from the KEYING INPUT receptacle on MODULATOR MD-203/GR while transmitting fak radio signals with the AN/GRC-46 and AN/VRC-29 equipments.	Pointer of DISCRIMINATOR meter should stay at the left-hand 4th scale division (approx).	Same as step 12.
	16	With the same signal input as in step 15, turn the SERVICE switch to REV.	Pointer of DISCRIMINATOR meter should stay at the right-hand 4th scale division (approx).	Same as step 13.
	17	Turn SERVICE switch to OFF.	Indicator light should extinguish.	Check POWER switch and wiring.



## 15. Tube Testing Techniques

When trouble occurs, check the fuse, cabling, cable connectors, and the power source voltage before removing any tubes. First check the tubes visually for obvious troubles (with the chassis out of the case) such as open heaters, soft tubes (usually evidenced by a bluish glow), and shorted tubes. If tube failure is suspected, use the applicable procedure below to check the tubes.

**Caution:** Do not rock or rotate a tube when removing it from a socket; pull it straight out with a tube puller.

*a. Use of Tube Tester.* Remove and test one tube at a time. Discard a tube only if its defect is obvious or if the tube tester shows it to be defective. Do not discard a tube that tests at or near its minimum test limit on the tube tester. Put back the original tube, or insert a new one if required, before testing the next one. Do not leave a new tube in the socket, if the converter operates satisfactorily with the original tube.

*b. Tube Substitution Method.* An inoperative converter may be repaired, when the trouble is caused only by a defective tube, by noting the trouble symptoms, and finding the mal-

functioning tube from the equipment performance check list, which is based upon normal and abnormal meter reading (par. 14). Replace a suspected tube with a new tube. If the converter remains inoperative, remove the new tube and put back the original tube. Repeat this procedure with each suspected tube until the defective tube is located. If the converter has more than one bad tube at the same time, substituting tubes one at a time will not locate the defective tube. To correct this trouble, install new tubes one at a time until normal operation is restored. The last tube replaced is defective and must be discarded. To determine whether another tube is bad, return an original tube to its socket. If there is a noticeable change in operation, discard the last original tube installed.

*c. Removal of Tubes.* Check tubes as follows:

- (1) Remove the converter from the mounting (par. 6).
- (2) Turn the six wing-type fasteners on the edge of the front panel  $\frac{1}{4}$  turn counterclockwise, and pull the chassis from the case.
- (3) Remove the tube shield or the holding clamp securing the tube, and remove the tube.

## CHAPTER 3

### SHIPMENT AND LIMITED STORAGE

#### 16. Disassembly of Equipment

The following instructions are recommended as a guide for preparing the frequency shift converter for shipment and storage.

*a. Removal of Converter.*

- (1) Disconnect the cables from the front panel of the converter.
- (2) Remove the converter from its mounting, by lifting the two levers at the front of the mount, to clear the detents, and move them all the way to the left, then lift the converter from the mount.

*b. Removal of Mount.* Remove the four mounting bolts to remove the mounting.

#### 17. Repacking for Shipment or Limited Storage

The exact procedure for repackaging depends on the material available and the conditions under which the converter is to be shipped or stored. Adapt the procedures outlined below whenever possible. The information concerning the original packaging (par. 2) will also be helpful.

*a. Material Requirements* The following materials are required for packaging Frequency

Shift Converter CV-278/GR. For stock numbers of materials, consult SB 88-100, Preservation, Packaging and Packing Materials, Supplies, and Equipment Used by the Army.

Material	Quantity
Grade A paper	7 sq ft
Fiber board	25 sq ft
Tape (3 in. wide)	200 in.
Plywood (1/4 in.)	1 sq ft

*b. Packaging.* Package the converter, spares, and mounting as outlined below:

- (1) *Converter.* Wrap the converter in neutral paper. Cut a piece of plywood larger than the front panel to protect the controls, and tape in place. Wrap corrugated cardboard around the unit and tape.
- (2) *Mounting.* Wrap the mounting in corrugated cardboard, with extra cardboard around the corners.

*c. Packing.* Pack the separate packages in a cardboard carton with filler material between them.

# APPENDIX I

## REFERENCES

Following is a list of applicable references that are available to the unit repairman of Frequency Shift Converter CV-278/GR:  
SB 38-100

- SB 38-100      Preservation, Packaging and Packing Materials, Supplies, and Equipment Used by the Army.
- TM 11-5805-210-10      Frequency Shift Converter CV-278/GR, Operator's Manual.
- TM 11-5815-204-10      Radio Teletypewriter Sets AN/GRC-46 and AN/VRC-29, Operator's Manual.

TM 11-5815-204-20      Radio Teletypewriter Sets AN/GRC-46 and AN/VRC-29, Organizational Maintenance.

TM 11-5820-205-10      Radio Transmitter Modulator MD-208/GR, Operator's Manual.

TM 11-5820-205-20      Radio Transmitter Modulator MD-208/GR, Organizational Maintenance.

## APPENDIX II

# MAINTENANCE ALLOCATION CHART FOR FREQUENCY SHIFT CONVERTER CV-278/GR

---

### 1. General

a. The maintenance allocation portion of this manual assigns maintenance functions and repair operations to be performed by the lowest appropriate maintenance echelon.

b. Columns are defined as follows:

- (1) *Part or component.* Column 1 shows only the nomenclature or standard item name. Additional descriptive data are included only where clarification is necessary to identify the part. Components and parts comprising a major end item are listed alphabetically. Assemblies and subassemblies appear in alphabetical order with their components listed alphabetically immediately below the assembly listing.
- (2) *Maintenance function.* Column 2 indicates the various maintenance procedures allocated to the echelon capable of performing the operation. These are defined as follows:
  - (a) *Service.* To clean, preserve, and replenish fuel and lubricants.
  - (b) *Adjust.* To regulate periodically to prevent malfunction.
  - (c) *Inspect.* To verify serviceability and detect incipient electrical or mechanical failure by scrutiny.
  - (d) *Test.* To verify serviceability and detect incipient electrical or mechanical failure by use of special equipment such as gages, meters, etc.
  - (e) *Replace.* To substitute serviceable assemblies, subassemblies, and parts for unserviceable components.
  - (f) *Repair.* To restore to a serviceable condition by replacing unserviceable parts or by any other action required, utilizing tools, equipment, and skills available, including welding, grinding, riveting, straightening, adjusting, etc.

- (g) *Align.* To adjust two or more components of an electrical system so that their functions are properly synchronized.
  - (h) *Calibrate.* To determine, check, or rectify the graduation of an instrument, weapon, or weapons system, or components of a weapons system.
  - (i) *Rebuild.* To restore to a condition comparable to new by disassembling the item to determine the condition of each component and reassembling it with serviceable, rebuilt, or new assemblies, subassemblies, and parts.
- (3) *1st, 2d, 3d, 4th, 5th echelon.* The symbol "X" in column 3, 4, 5, 6, or 7 indicates that this echelon *and* higher echelons are responsible for the maintenance function indicated. Repair parts may not necessarily be stocked at the echelon indicated; refer to the applicable repair parts and special tools list. Echelons higher than the echelon marked X are authorized to perform the indicated function. The symbol "%%", which may be placed in the second echelon column, indicates that second echelon may perform the particular maintenance function provided the request originates from organizational level and is specifically authorized by the direct support technical service officer. Use of the symbol will be strictly limited, and will apply only to replacement of major assemblies and time-consuming operations which are within the capabilities of organizational maintenance, but over which control by the technical service is considered essential. In no case will performance of a "double percent" function be directed by the direct support technical services officer, and in

no case will a "double percent" function authorize stockage of parts at organizational level.

- (4) *Tools required.* The numbers in column 8 indicate tool, test, and maintenance equipments required to perform the maintenance functions of equipment. These numbers are identified in the chart, Allocation of Tools for Maintenance Functions.
- (5) *Remarks.* Column 9 contains any notations necessary to clarify the data cited in the preceding columns.

c. The Allocation of Tools for Maintenance Functions chart contains columns as follows:

- (1) *Tools required for maintenance function.* Column 1 lists the tools and the test and maintenance equipment re-

quired to perform the maintenance functions.

- (2) *1st, 2d, 3d, 4th, and 5th echelon.* The symbol "+" in columns 3, 4, 5, and 6 indicates that the tool or test equipment is allocated to that echelon.
- (3) *Repair facilities code.* The numbers in this column are code numbers used in the maintenance allocation chart to refer to the indicated item.
- (4) *Remarks.* Column 8 is used for explanatory notes.

## 2. Comments or Suggestions

Any comments concerning omissions and discrepancies in this Maintenance Allocation Chart will be prepared on DA Form 2028 and forwarded direct to Commanding Officer, U. S. Army Signal Equipment Support Agency, Fort Monmouth, N. J., ATTN: SIGFM/ES-M.

# MAINTENANCE ALLOCATION CHART

(1) PART OR COMPONENT	(2) RELATED OPERATION	(3) 1st ECH	(4) 2nd ECH	(5) 3rd ECH	(6) 4th ECH	(7) 5th ECH	(8) REPAIR FACILITIES CODE	(9) REMARKS
FREQUENCY SELECT CONVERTER CV-276724	service	X					1	12,14, and 17 only in 2nd Echelon
	service		X				2	
	service		X	X			3	
	inspect		X				4,7,8,12,14,17	
	test		X				3,6,9,16,16,	
	test				X		18,19,20	
	test					X	2,7,8,9,18	
align						18,19,20		
CABLES	replace			X			1 or 2	
	service	X	X					
	inspect		X				3	
CAPACITORS	test		X					
	replace			X			1 or 2	
	service			X				
CONNECTORS	inspect		X	X			1 or 2	
	test			X			3	
	replace	X	X				1 or 2	
CRYSTAL, 404.3 KC	service		X					
	inspect		X				2	
	test			X			13	
CRYSTAL, DIODES	replace		X					
	service		X	X			2	
	inspect		X	X	X		3	
COILS	test			X				
	replace		X	X			2	
	service		X	X			3	
DISCRIMINATOR	inspect			X				
	test			X			2	
	replace			X			3	

(1) PART OR COMPONENT	(2) RELATED OPERATION	(3) 1st ECH	(4) 2nd ECH	(5) 3rd ECH	(6) 4th ECH	(7) 5th ECH	(8) REPAIR FACILITIES CODE	(9) REMARKS
CV-379/GR (continued) DISCRIMINATOR, RECTIFIER	replace service inspect test	X	X	X	X		2 3	
ELECTRON, TUBES	replace service inspect test test	X	X	X	X	X	1 or 2 10 11	
FILTER, BAND PASS	replace repair service inspect	X	X	X	X	X	2	
FUSE	replace inspect	X	X					
FUSEHOLDER	replace service inspect	X	X	X	X		2	
GRIDS	replace service inspect	X	X	X			1 or 2	
LAMP	replace service inspect	X	X	X			1 or 2	
METERS	replace repair service inspect test	X	X	X	X	X	2 3	
RELAY	replace service inspect test adjust	X	X	X	X	X	2 3 2	

CV-379/GR

3

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
PART OR COMPONENT	RELATED OPERATION	1st ECH	2nd ECH	3rd ECH	4th ECH	5th ECH	REPAIR FACILITIES CODE	REMARKS
CV-370/CR (cont. in next)	replace			X				
REACTOR	service			X			3	
	inspect			X			3	
	test			X			3	
RESISTORS	replace			X			3	
	service			X			3	
	inspect			X			3	
	test			X			3	
SOCKETS	replace			X			3	
	service			X			3	
	inspect			X			3	
SWITCHES	replace			X			3	
	service			X			3	
	inspect			X			3	
	test			X			3	
TRANSFORMERS	replace			X			3	
	service			X			3	
	inspect			X			3	
	test			X			3	

3

CV-370/CR



# ALLOCATION OF TOOLS FOR MAINTENANCE FUNCTIONS

(1) FACILITIES REQUIRED FOR MAINTENANCE OPERATIONS	(2)	(3)	(4)	(5)	(6)	(7)	(8) REMARKS
	1st ECH	2nd ECH	3rd ECH	4th ECH	5th ECH	REPAIR FACILITIES CODE	
CV-376/CB (continued)							
TOOL EQUIPMENT TE-41	†					1	
TOOL EQUIPMENT TE-113		†				2	
MULTIMETER AN/UM-108	†	†	†	†	†	3	In production
SHUNT, INSTRUMENT, MULTIRANGE MZ-1471/U		†	†	†	†	4	In production
TEST SET, TELETYPEWRITER TS-917/GC						5	
TEST SET, DISTORTION TS-383/GC						6	
R. F. SIGNAL GENERATOR AN/UM-28						7	
ELECTRONIC MULTIMETER TS-808/U						8	
FREQUENCY METER AN/UM-26						9	
ELECTRON TUBE TEST SET TV-7/U						10	
ELECTRON TUBE TEST SET TV-2/U						11	
FREQUENCY METER AN/UM-33						12	
CRYSTAL IMPEDANCE MOTOR TS-857/TM						13	
FREQUENCY METER FR-67/U						14	
TELETYPEWRITER TEST SET TS-689/UC						15	
RELAY-RELAY TEST SET						16	Stewart Warner Test Set, Fixture A; S.W. DMC #1276497
POWER SUPPLY PP-1345/U						17	
RAISED RECEIVER R-392/UBA						18	
FREQUENCY METER EXCITER O-59/TMA-7						19	
CONTROL UNIT C-592/TMA-7						20	

FORM 1000A

By Order of *Wilber M. Brucker*, Secretary of the Army:

**MAXWELL D. TAYLOR,**  
*General, United States Army,*  
*Chief of Staff.*

**Official:**

**R. V. LEE,**  
*Major General, United States Army,*  
*The Adjutant General.*

**Distribution:**

**Active Army:**

ASA (2)  
CNGB (1)  
Tech Stf, DA (1) except  
  CSigO (30)  
Tech Stf Bd (1)  
USCONARC (5)  
USA Arty Bd (1)  
USA Armor Bd (1)  
USA Armor Bd Test Sec (1)  
USA Inf Bd (1)  
USA Air Def Bd (1)  
USA Air Def Bd Test Sec (1)  
USA Abn & Elct Bd (1)  
USA Avn Bd (1)  
USA Arctic Test Bd (1)  
USARADCOM (2)  
USARADCOM Rgn (2)  
OS Maj Comd (5)  
OS Base Comd (5)  
Log Comd (5)  
MDW (1)  
Armies (5) except  
  First US Army (7)  
Corps (2)  
Div (2)  
USATC (2)  
Fld Comd, AFSWP (5)  
YUMA Test Sta (2)  
USA Elct PG (1)  
Svc Colleges (5)

Br Svc Sch (5) except  
  USASCS (25)  
Gen Depot (2) except  
  Atlanta Gen Depot (none)  
Sig Sec, Gen Depot (10)  
Sig Depots (17)  
AFIP (1)  
WRAMC (1)  
AMS (1)  
Engr Maint Cen (1)  
USA Comm Agcy (2)  
USA Sig Comm Engr Agcy (1)  
USA Sig Eqp Spt Agcy (2)  
USA Sig Msl Spt Agcy (18)  
Trans Terminal Comd (1)  
Army Terminals (1)  
Port of Emb (OS) (2)  
OS Sup Agcy (2)  
Sig Fld Maint Shops (3)  
Sig Lab (5)  
Mil Dist (1)  
USA Corps (Res) (1)  
Sectors, USA Corps (Res) (1)  
TASSA (15)  
Midwestern Rgn Ofc (TASSA) (1)  
JBUSMC (2)  
USA Sig Pubs Agcy (8)  
Army Pictorial Cen (2)  
USA Ord Msl Comd (3)

**Units org under fol TOE:**

1-57 (2)	10-17 (2)
5-15 (2)	10-45 (2)
5-16 (2)	10-46 (2)
5-215 (2)	11-5 (2)
5-216 (2)	11-7 (2)
5-464 (2)	11-16 (2)
6-100 (2)	11-37 (2)
6-101 (2)	11-55 (2)
6-125 (2)	11-57 (2)
6-126 (2)	11-500 AA-AE (2)
6-300 (2)	11-555 (2)
6-301 (2)	11-587 (2)
6-315 (2)	11-592 (2)
6-316 (2)	11-597 (2)
6-325 (2)	17-2 (2)
6-326 (2)	17-22 (2)
6-415 (2)	17-25 (2)
6-416 (2)	17-26 (2)
6-435 (2)	17-45 (2)
6-525 (2)	17-46 (2)
6-535 (2)	17-77 (2)
6-536 (2)	39-51 (2)
6-545 (2)	39-61 (2)
6-635 (2)	39-71 (2)
7-11 (2)	44-12 (2)
7-12 (2)	44-15 (2)
7-25 (2)	44-16 (2)
7-26 (2)	44-35 (2)
7-52 (2)	44-36 (2)
8-15 (2)	44-85 (2)
8-16 (2)	44-86 (2)
8-75 (2)	44-115 (2)
8-76 (2)	44-116 (2)
9-25 (2)	44-145 (2)
9-26 (2)	44-146 (2)
9-65 (2)	44-535 (2)
9-66 (2)	44-536 (2)
9-217 (2)	55-116 (2)
	57-5 (2)

**NG:** State AG (3); units—same as Active Army except allowance is one copy to each unit

**USAR:** None.

For explanation of abbreviations used, see AR 320-50.



