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TM 11-5805-387-10-1

OPERATOR'S MANUAL

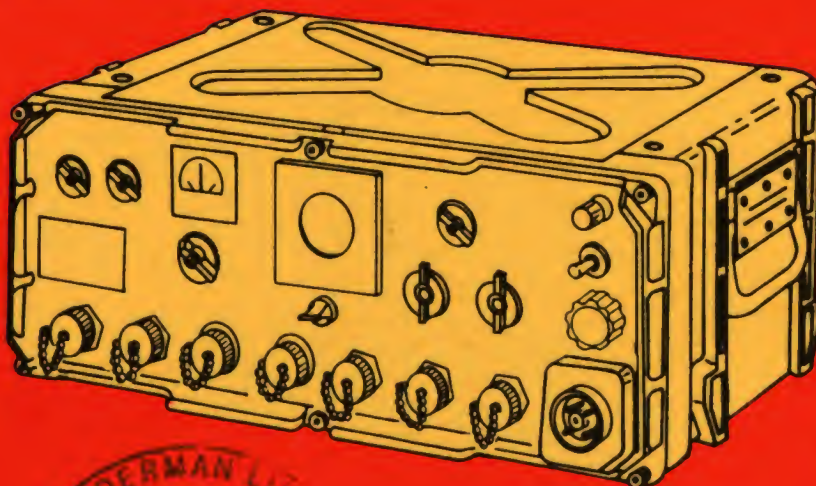
**EQUIPMENT
DESCRIPTION**
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CONTROLS**
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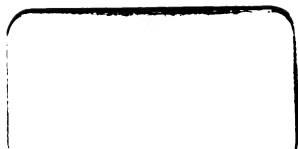
MODEM RADIO TELETYPERWRITER

MD-522/GRC
(NSN 5815-00-999-5277)

HEADQUARTERS, DEPARTMENT OF THE ARMY
WASHINGTON, D.C.

5 APRIL 1984

89-058 Google



5

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

1

DO NOT TRY TO PULL OR GRAB THE INDIVIDUAL

2

IF POSSIBLE, TURN OFF THE ELECTRICAL POWER

3

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

4

SEND FOR HELP AS SOON AS POSSIBLE

5

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

WARNING

HIGH VOLTAGE

is used in the operation of this equipment

DEATH ON CONTACT

may occur if person operating this equipment fails to obey safety precautions. Do not be misled by the term LOW VOLTAGE. Voltage as low as 50 volts may cause death under certain conditions.

DON'T TAKE CHANCES!

Be careful when working on this equipment. Serious injury or death may result from contact with terminals.

HIGH VOLTAGES EXIST IN THE FOLLOWING EQUIPMENT:

Various connectors and power supply components.	27 vdc
DC LOOP NO. 1 and DC LOOP NO. 2 connectors	120 vdc
Loop battery module A5.	127 vdc
Scope module A2	1,100 vdc

WARNING

Adequate ventilation should be provided while using TRICHLOROTRI-FLUOROETHANE. Prolonged breathing of vapor should be avoided. The solvent should not be used near heat or open flame, the products of decomposition are toxic and irritating. Since 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.

WARNING

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

WARNING

RADIATION HAZARD



**RADIOACTIVE MATERIAL
CONTROLLED DISPOSAL REQUIRED
ACCOUNTABILITY NOT REQUIRED**

Meter. RA 226 1.0uCi 6625-00-257-1103

Radiation Hazard Information: The following radiation hazard information must be read and understood by all personnel operating or repairing Modem Radio Teletypewriter MD-522/GRC. Hazardous radioactive materials are present in the above listed component of the MD-522/GRC. The component is potentially hazardous when broken. See qualified medical personnel and the local Radiological Protection Officer (RPO) immediately if you are exposed to or cut by broken components. First aid instructions are contained in TB 43-0116, TB 43-0122, and AR 755-11.

NEVER place radioactive components in your pocket. Use extreme care **NOT** to break radioactive components while handling them.

NEVER remove radioactive components from cartons until you are ready to use them.

If any of these components are broken, notify the local RPO immediately.

The RPO will survey the immediate area for radiological contamination and will supervise the removal of broken components.

The above listed radioactive components will **NOT** be repaired or disassembled.

Disposal of broken, unserviceable, or unwanted radioactive components will be accomplished in accordance with the instructions in AR 755-15.

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TECHNICAL MANUAL

No. 11-5805-387-10-1

HEADQUARTERS
DEPARTMENT OF THE ARMY

Washington, DC, 5 April 1984

OPERATOR'S MANUAL

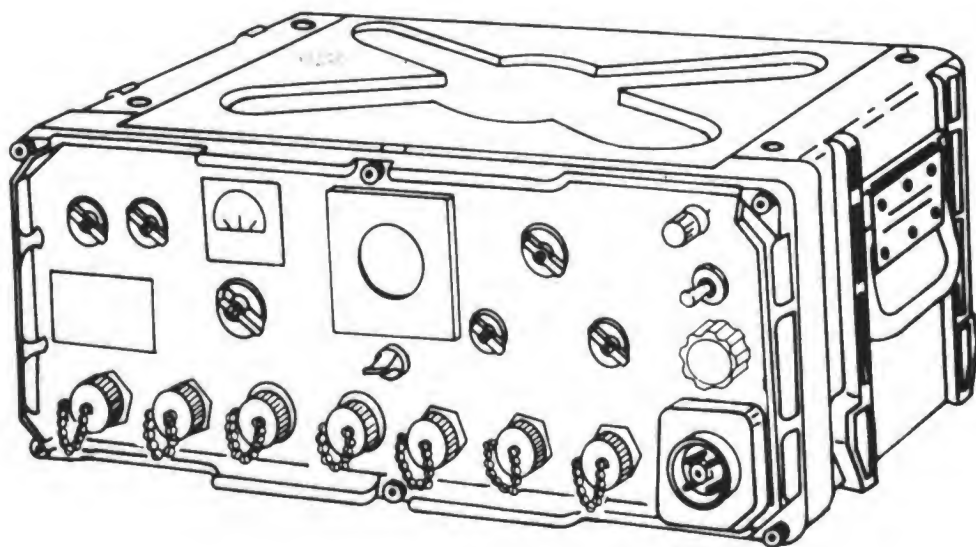
MODEM RADIO TELETYPEWRITER
MD-522/GRC
(NSN 5815-00-999-5277)**REPORTING OF ERRORS AND RECOMMENDING IMPROVEMENTS**

You can help improve this manual. If you find any mistakes or if you know of a way to improve the procedures, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms), or DA Form 2028-2 located in the back of this manual direct to: Commander, US Army Communications-Electronics Command and Fort Monmouth, ATTN: DRSEL-ME-MP, Fort Monmouth, New Jersey 07703. In either case, a reply will be furnished to you.

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*This manual supersedes the operator's portion of TM 11-5805-387-15-1, 2 November 1966, including all changes.

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MODEM RADIO TELETYPEWRITER MD-522/GRC

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CHAPTER 1 INTRODUCTION

Section I. GENERAL INFORMATION

1-1. SCOPE

This manual is for your use in operating the Modem Radio Teletypewriter MD-522/GRC. It gives detailed operating instructions, and will tell you how to maintain the equipment.

Additional information about the MD-522/GRC may be found in the manual for the specific radio teletypewriter with which it is used.

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

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

1-3. MAINTENANCE FORMS, RECORDS AND REPORTS

a. Reports of Maintenance and Unsatisfactory Equipment

Department of the Army forms and procedures used for equipment maintenance will be those prescribed by DA Pam 738-750 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 4355.73A/AFR 400-54/MCO 4430.3F.

c. Discrepancy in Shipment Report (DISREP) (SF 361)

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

1-4. DESTRUCTION OF ARMY ELECTRONICS MATERIEL

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

1-5. ADMINISTRATIVE STORAGE

Administrative Storage of Equipment issued to and used by Army activities will have preventive maintenance performed in accordance with the PMCS charts (page 2-8) 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 are covered in TM 740-90-1, Administrative Storage of Equipment.

1-6. REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIR)

If your Modem Radio Teletypewriter MD-522/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. Put it on an SF 368 (Quality Deficiency Report). Mail it to Commander, US Army Communications-Electronics Command and Fort Monmouth, ATTN: DRSEL-ME-MP, Fort Monmouth, New Jersey 07703. We'll send you a reply.

1-7. NOMENCLATURE CROSS-REFERENCE LIST

Common names will be used when the major components of the MD-522/GRC are mentioned in this manual.

COMMON NAME	OFFICIAL NOMENCLATURE
Modem	Modem Radio Teletypewriter MD-522/GRC

NOTE

Official nomenclature must be used when completing report forms or when looking up technical manuals.

1-8. LIST OF ABBREVIATIONS

Abbreviations are spelled out the first time they appear in this manual. A list of abbreviations used in this manual is given below.

AUX	Auxiliary
BFO	Beat Frequency Oscillator
CRT	Cathode Ray Tube
dc	Direct current
DX	Duplex

FSK.....	Frequency-Shift-Keyed
Hz.....	Hertz
kHz.....	Kilohertz
mA.....	Milliampere
MHz.....	Megahertz
NSK.....	Narrow Shift-Keyed
OWR.....	One Way Reversible
PWR.....	Power
RCV.....	Receive
RCVR.....	Receiver
rf.....	Radio frequency
SSB.....	Single Side Band
TRANS.....	Transmission
tty.....	Teletypewriter
vdc.....	Volts direct current

Section II. EQUIPMENT DESCRIPTION

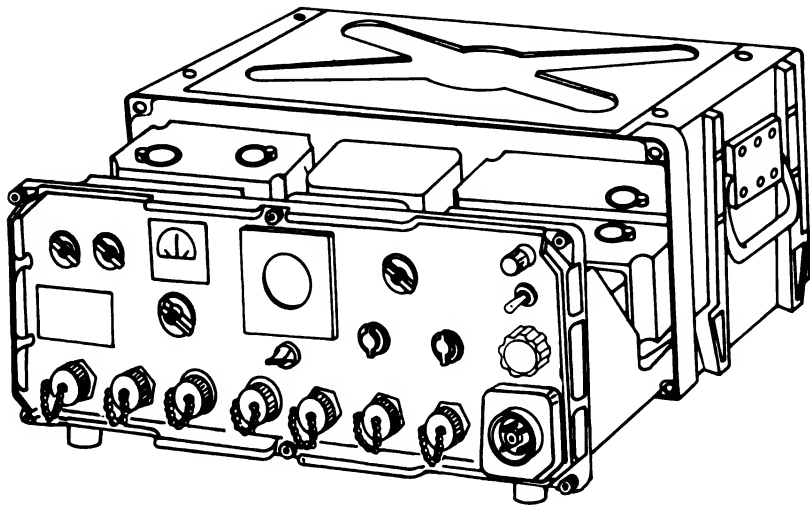
1-9. PURPOSE, CAPABILITIES AND FEATURES

- Used to provide single-channel, one-way reversible or duplex communication when used with radio transmitters and receivers.
- Used with standard teletypewriter equipment using 60-milliampere (mA) and 20 mA inputs and outputs.
- Operates as a modulator-demodulator within the system.

1-10. DESCRIPTION OF THE MODEM

- The modem is a self-contained unit. It consists of a front panel and chassis enclosed in a moistureproof case. All controls, connectors, and indicators are located on the front panel.

- Two handles, one on the left and one on the right side of the case, make it easy to transport.



- Four feet are on the bottom of the modem case, so it may be firmly seated in a modified mounting MT-315/ARC-106 (used with, but not part of the modem).

1-11. PERFORMANCE DATA

- TECHNICAL CHARACTERISTICS: Power requirements for the modem are 27.5 volts dc.
- MODES OF OPERATION: The chart below lists the output for each mode of operation.

MODE OF OPERATION	OUTPUT
850 Hz Shift (FSK) (transmit)	2,000 Hz + 425 Hz Shift
850 Hz Shift (FSK) (receive)	2,000 Hz + 1000 Hz with a + 425 Hz shift
85 Hz Shift (FSK)	2805 Hz + 42.5 Hz
Voice	300-3,000 Hz
85 Hz Diversity (NSK)	2805 Hz + 42.5 Hz & 425 Hz + 42.5 Hz
85 Hz + Voice (NSK)	2805 Hz + 42.5 Hz & Voice 200-2,300 Hz

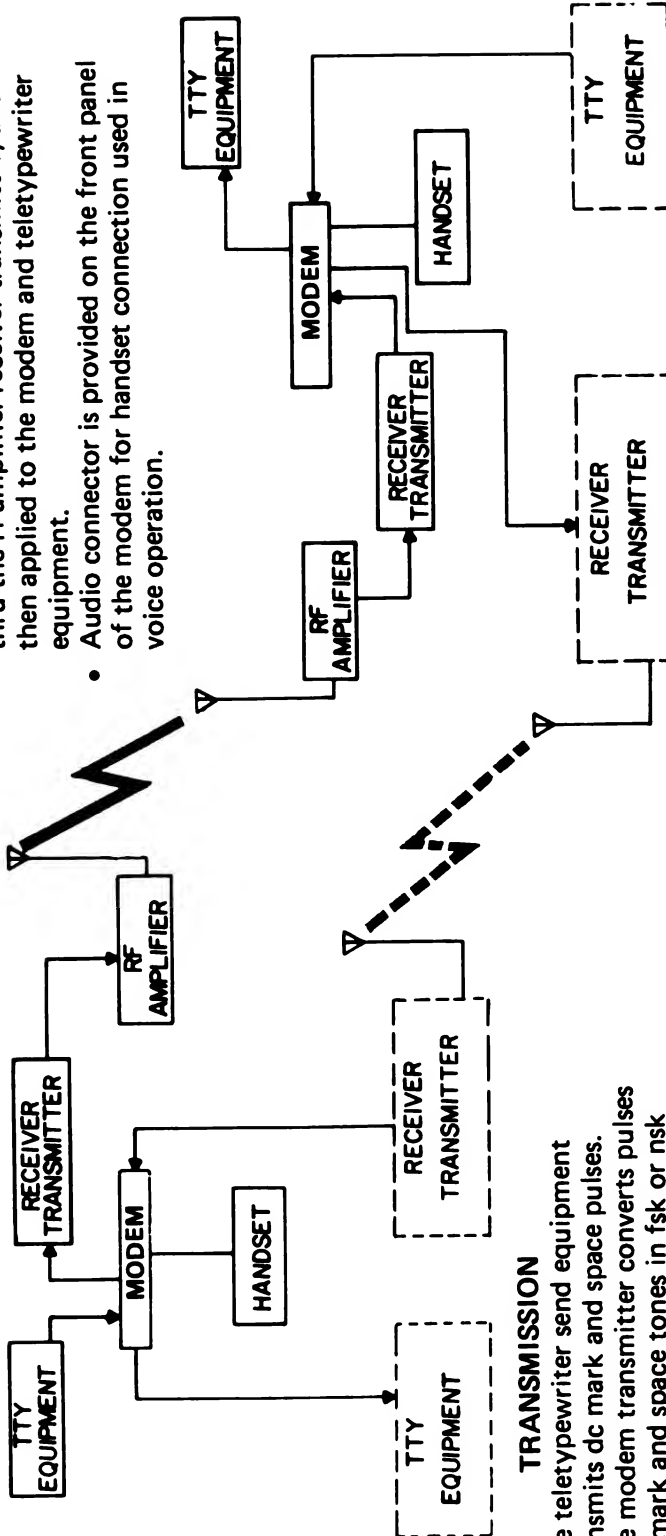
1-12. WEIGHTS AND DIMENSIONS

WEIGHT	HEIGHT	WIDTH	DEPTH
36 pounds (16.32k)	7 inches (17.8cm)	22 inches (55.8cm)	13 inches (30.0cm)

Section III. TECHNICAL PRINCIPLES OF OPERATION 1-13. SIMPLIFIED BLOCK DIAGRAM DESCRIPTION.

RECEPTION

- The received radio teletype signal is processed thru the rf amplifier receiver transmitter, and then applied to the modem and teletypewriter equipment.
- Audio connector is provided on the front panel of the modem for handset connection used in voice operation.



TRANSMISSION

- The teletypewriter send equipment transmits dc mark and space pulses.
- The modem transmitter converts pulses to mark and space tones in fsk or nsk format (depending on setting of mode selector switch).
- The modem output is applied to the receiver transmitter and rf amplifier for transmission over the link.

In DUPLEX operation, an additional teletypewriter and receiver-transmitter is required. This enables the system to transmit and receive at the same time.

NOTE 1: SOLID LINES DENOTE ONE-WAY REVERSIBLE (OWR) OPERATION.

NOTE 2: DOTTED LINES DENOTE DUPLEX (DX) OPERATION.

CHAPTER 2
OPERATING INSTRUCTIONS

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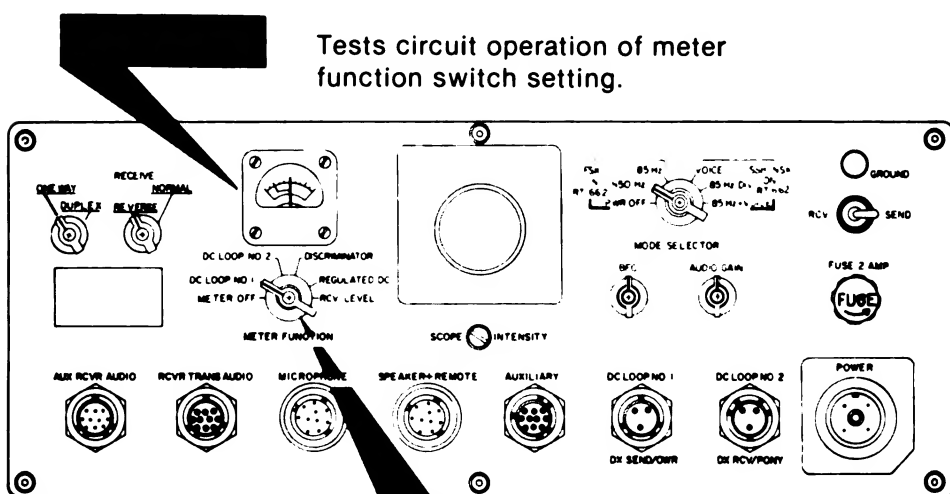
Section I. DESCRIPTION AND USE OF OPERATOR'S CONTROLS, INDICATORS, AND CONNECTORS

2-1. GENERAL INFORMATION

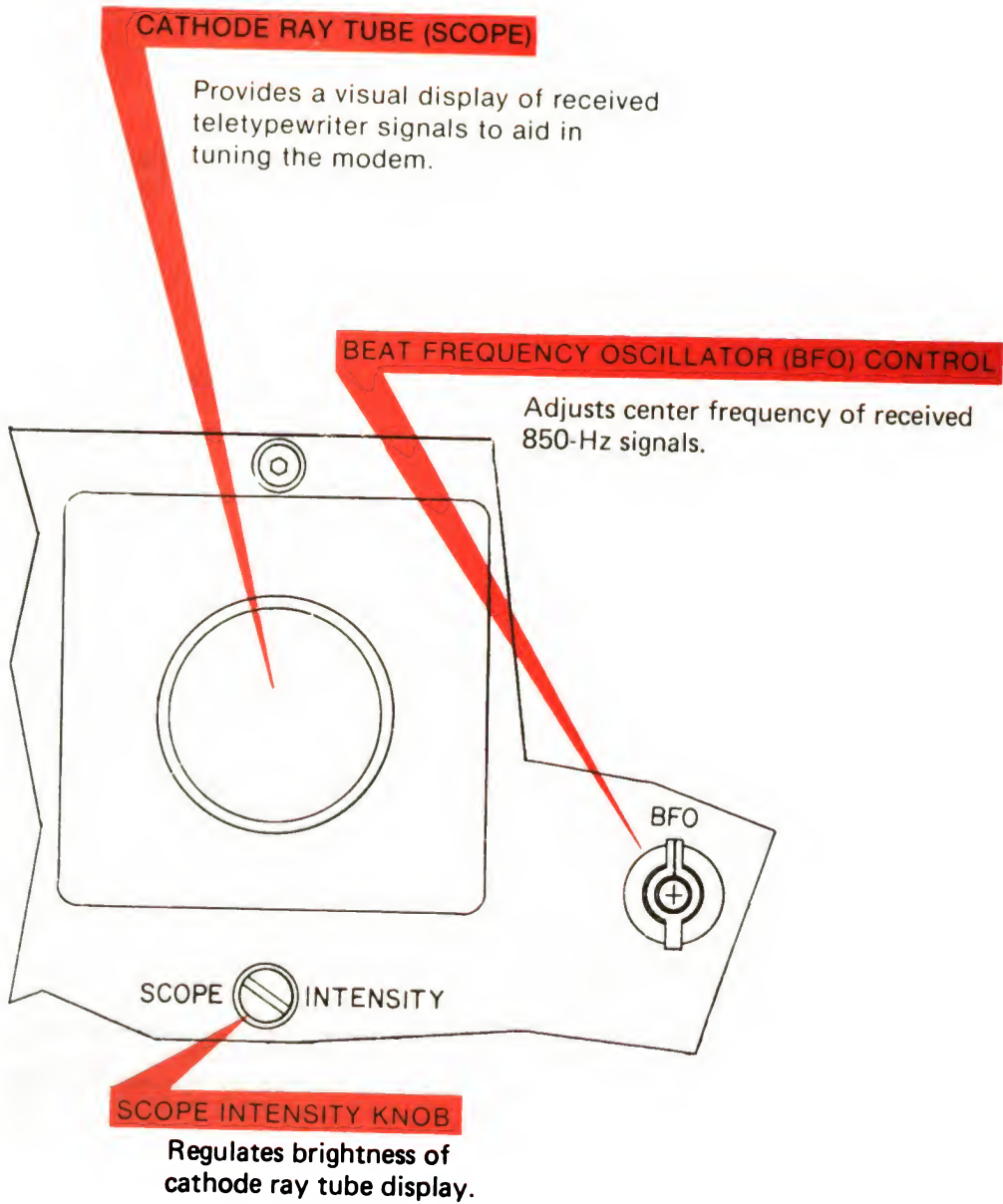
Each type of teletypewriter set uses different operating instructions for the modem. Special instructions are contained in the manual for each radio teletypewriter set used.

This section contains a descriptive guide of modem controls, indicators and connectors for the operator.

2-2. DESCRIPTION OF CONTROLS, INDICATORS AND CONNECTORS

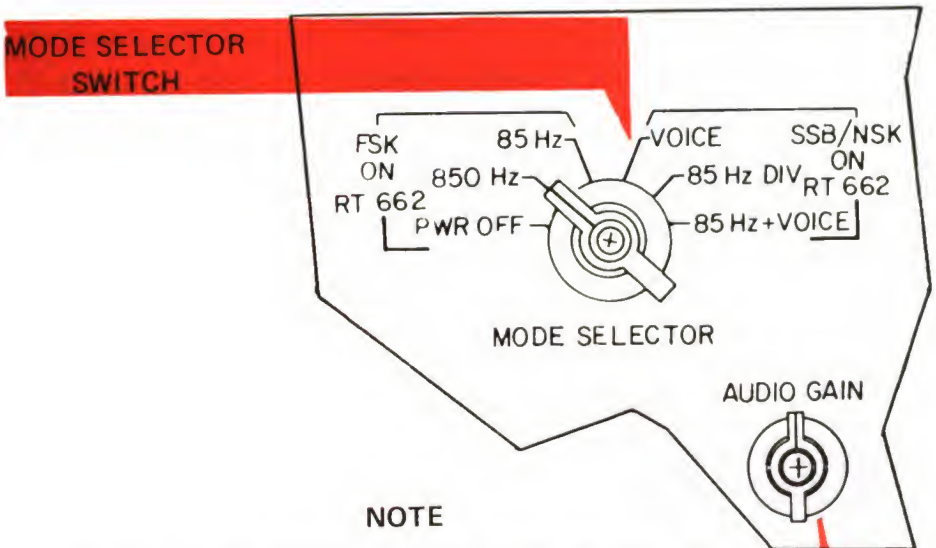


SWITCH POSITION	TEST METER DISPLAY
METER OFF	Test meter (OFF).
DC LOOP NO. 1	Indicates direct current flow in dc loop No. 1.
DC LOOP NO. 2	Indicates direct current flow in dc loop No. 2.
DISCRIMINATOR	Indicates signal strength of received mark and space pulses.
REGULATED DC	Indicates dc voltage level of modem (+ 20 volts) regulated dc supply.
RCV LEVEL	Indicates signal strength of received (audio) signals.



The position of this switch selects the mode of operation.

PWR OFF	turns main power off.
850 Hz	selects 850-Hz fsk operation.
85 Hz	selects 85-fsk operation.
VOICE	selects operation of voice only.
85 Hz DIV	85-Hz diversity position permits nsk operation.
85 Hz + VOICE	permits operation of both voice and nsk at the same time.



Modem mode selector settings must be used with correct service selector settings on RT-662/GRC.

MODE SELECTOR

850 Hz
85 Hz

VOICE
85 Hz DIV
85 Hz + VOICE

SERVICE SELECTOR

FSK
FSK

SSB/NSK

AUDIO GAIN

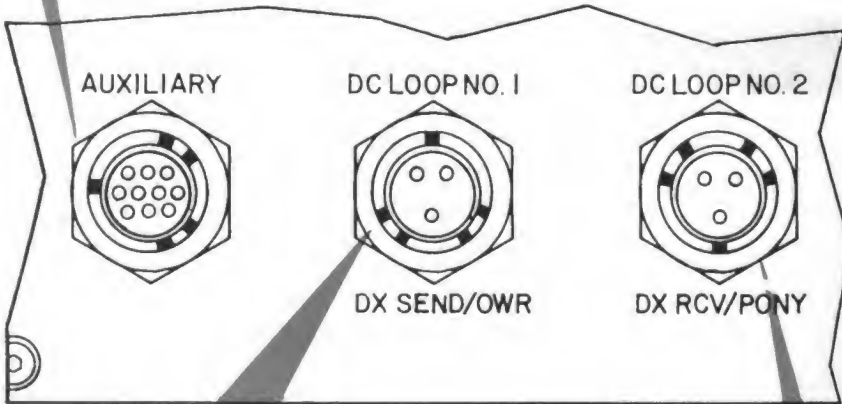
Regulates audio output level to the headset and loudspeakers.

AUXILIARY

CAUTION

The voltage output of the auxiliary connector is not regulated, fused, or protected. Therefore, unprotected equipment supplied with power from the auxiliary connector may be damaged by using the wrong polarity or line spikes.

Provides power (27.5 vdc) to control equipment.
Used for local or remote control functions.



**DC LOOP NO. 1
DX SEND/OWR**

Connects teletypewriter to the modem for one-way reversible operation.

Provides transmit and receive loop current to tty equipment during one-way mode of operation.

Provides transmit loop current in duplex operation.

**DC LOOP NO. 2
DX RCV/PONY**

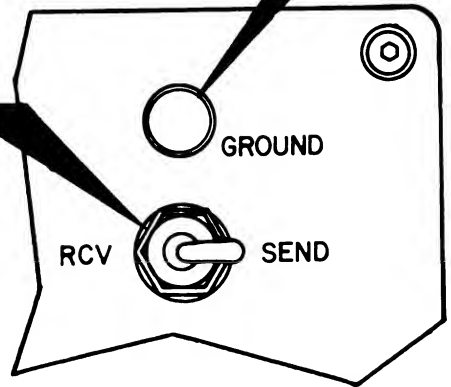
Connects teletypewriter to the modem for reception in duplex operation.

Provides pony circuit (order wire overland lines) loop current during one-way operation.

A pony loop circuit allows teletypewriter order wire transmission and reception over landlines from a remote station when the system is not operating in the duplex mode.

Operates as a safety measure between the modem and other equipment in the system.

SEND position permits transmission.
RCV position permits reception.

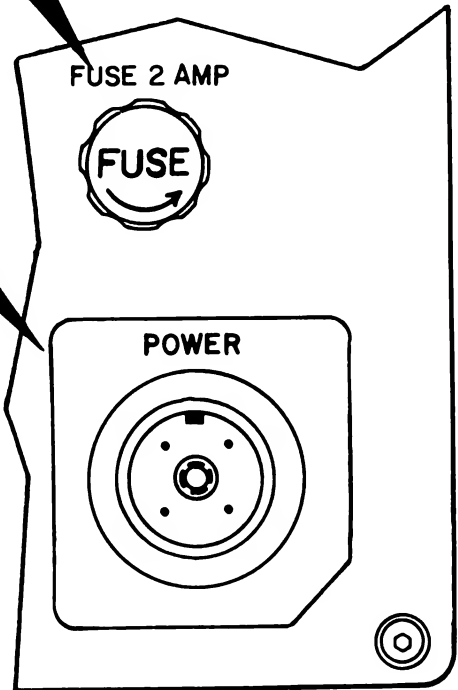


NOTE

Before operating RCV/SEND switch, check ONE WAY/DUPLEX switch for ONE WAY position.

Protects power (+ 27.5 vdc) input line.

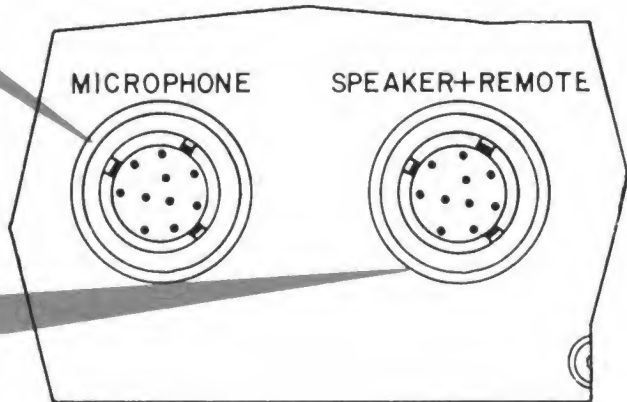
Connects 27.5 volts dc from main power line to the modem.



MICROPHONE

Provides a connection for an audio input to the modem, and for an audio output to a headset.

Used for voice or voice plus teletypewriter transmission.



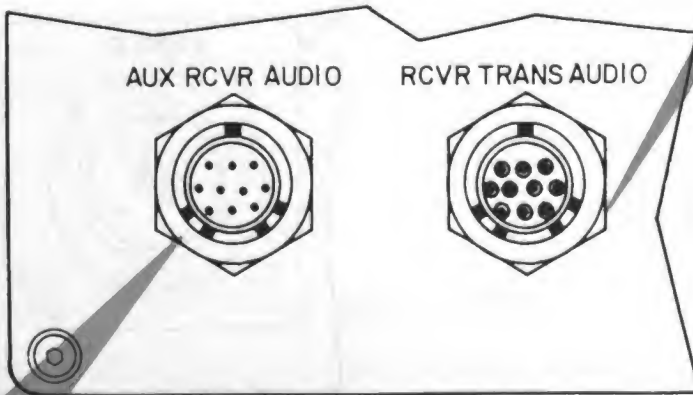
SPEAKER + REMOTE

Provides connection for an audio input to the modem and for an audio output to loudspeaker. May be used with other equipment for remote operation.

RCVR-TRANS AUDIO

Used in duplex and one-way reversible operation to connect audio output circuit from modem to exciter section of receiver-transmitter.

Used in one-way reversible operation to connect audio output from receive section of receiver-transmitter to modem.

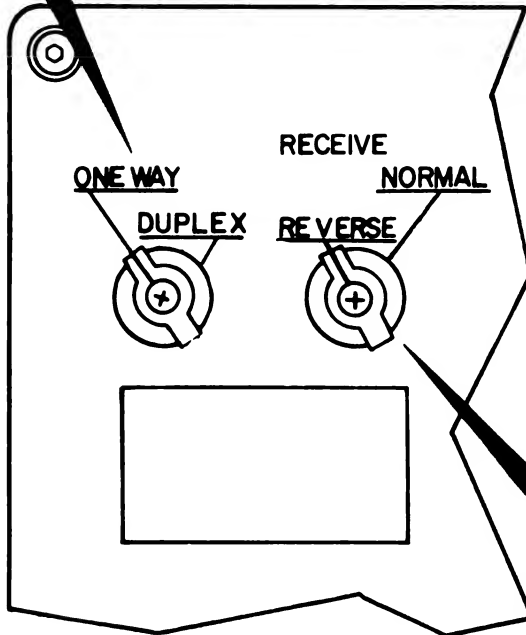


AUX RCVR: AUDIO

Used with duplex operation to connect audio output of auxiliary receiver to modem.

ONE WAY position permits either reception or transmission.

DUPLEX position permits transmission and reception at the same time.



NORMAL allows reception of teletype signals by use of mark space polarities.

REVERSE allows reception of teletype signals by reversing normal polarities for mark and space pulses.

Section II. PREVENTIVE MAINTENANCE CHECKS AND SERVICES

2-3. PREVENTIVE MAINTENANCE

The maintenance duties of the operator are to perform a prescribed sequence of preventive maintenance checks and services. The preventive maintenance procedures are the systematic care, servicing, and inspection of equipment to prevent the occurrence of trouble and to reduce downtime by detecting and correcting the problems. These checks and services are to maintain Army electronic equipment in a combat serviceable and mission ready condition.

a. Tools, Materials, and Equipment Required For Maintenance

No tools or equipment are required for operator maintenance. The following cleaning materials will be useful to the operator.

- Lint-free cloths (item 1, app. D)
- Soft bristle brush (item 2, app. D)
- Dishwashing detergent (item 3, app. D)
- Cleaning compound (item 4, app. D)

NOTE

If your modem must be in USE ALL THE TIME, check and service those items that can be checked and serviced without stopping its operation. Make COMPLETE checks and services ONLY when the modem is finally SHUT DOWN.

b. Routine Services

Routine services are a collection of checks and observations performed by the operator at all times. Routine services are not listed in the preventive maintenance checks and services table. They are things that you should do any time you see they must be done.

You should perform the following routines as necessary.

- | | |
|---------|---------------------------------------|
| • Clean | • Check controls for smooth operation |
| • Dust | • Cover unused receptacles |
| • Wash | • Check for completeness of equipment |

c. Explanation of INTERVAL column of PMCS chart

BEFORE OPERATION — Do your Before (B) PMCS to be sure the modem is ready to use.

DURING OPERATION — Do your During (D) PMCS while you operate your modem, to help spot small problems before they become big problems.

MONTHLY — Do your Monthly (M) PMCS to ensure the modem is functioning properly.

NOTE

All PMCS must be done as regularly scheduled and also under the following conditions:

- Before the modem is used on a mission.
- When the modem is first installed.
- When the modem is re-installed after being removed for any reason.
- You are operating the modem for the first time.

d. Explanation of EQUIPMENT IS NOT READY IF: column of PMCS chart.

- This column tells the condition under which the equipment can not perform the assigned mission requirements.

e. Explanation of ITEM TO BE INSPECTED PROCEDURE: column of PMCS chart.

- This column specifies the item to be inspected and the procedures to perform the required checks and services. Carefully follow these instructions. If tools are needed, or the chart instructions tell you tools are needed, get organizational maintenance to do the necessary work.

NOTE

If any portion of your modem fails to operate, refer to chapter 3 under troubleshooting for possible problems. Report any malfunctions or failures on the proper DA Form 2404 (page 2-10) or, refer to DA Pam 738-750.

DA FORM 2404, EQUIPMENT INSPECTION AND MAINTENANCE WORKSHEET.

[illegible]

TABLE 2-1. PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)

B -- BEFORE OPERATION D -- DURING OPERATION M -- MONTHLY OPERATION

ITEM NO.	ITEM TO BE INSPECTED PROCEDURE	EQUIPMENT IS NOT READY/AVAILABLE IF:
1	<p>Do not operate equipment until all URGENT MWOs have been applied.</p> <p>Modem: Check that all URGENT MWOs have been applied.</p>	URGENT MWOs have not been applied.
2	<p>Operate the equipment as described in section III, chapter 2, of this manual.</p>	Equipment cannot be operated. Mission cannot be accomplished.
3	<p>Headset: a. Put on headset. b. Attach microphone at microphone connection. c. Press and hold switch to key microphone and talk. d. Note sidetone in headset.</p> <p>*Perform prior to deployment to a mission location for the purpose of determining and correcting equipment malfunctions prior to actual mission operation.</p>	No sidetone in headset.

TABLE 2-1. PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS) (Continued)

B – BEFORE OPERATION D – DURING OPERATION M – MONTHLY OPERATION

ITEM NO.		ITEM TO BE INSPECTED PROCEDURE	EQUIPMENT IS NOT READY/AVAILABLE IF:
4		Meter Indicator: Set METER FUNCTION switch to a particular function.	Meter indicator does not work, or improper indication results.

Section III. OPERATION UNDER USUAL CONDITIONS

2.4. TYPES OF OPERATION

- The modem is always used as part of a communication system. Type of operation is controlled by the system installation used.
- The modem can be used for local or remote operation.
- One-way reversible or duplex types of operation can be performed to transmit and/or receive the following signals:

fsk (850 Hz)

fsk (85 Hz)

voice only

nsk diversity (85 Hz diversity)

nsk plus voice (85 Hz + voice)

One-Way Reversible: use to receive or transmit.

Duplex: use to receive and transmit at the same time.

Pony Circuit: use to receive or transmit between local and remote.

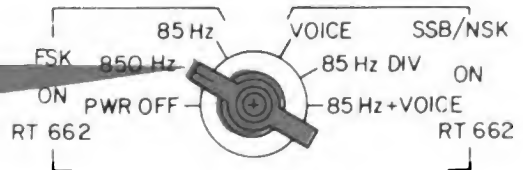
OPERATING PROCEDURES

NOTE

Always allow the modem 10 minutes to warm up before you operate it.

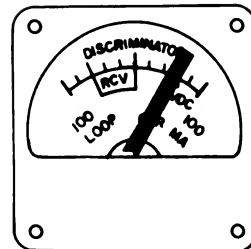
2.5. PRESET START PROCEDURE

Set MODE SELECTOR at desired mode of operation.



MODE SELECTOR

- Be sure RCV/SEND switch is in RCV position.
- Set METER FUNCTION switch to REGULATED DC. TEST METER should indicate +20 vdc.

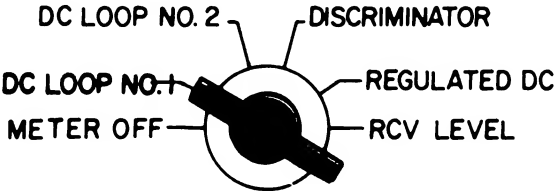


- If improper indication is observed, see troubleshooting table, chapter 3.
- See chapter index to determine the correct paragraph for required operation.

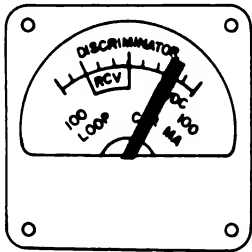
2-6. ONE-WAY REVERSIBLE (OWR) OPERATION

a. DC LOOP NO. 1 CURRENT CHECKS

- Set METER FUNCTION switch at DC LOOP NO. 1 and check for loop current as follows:



- Turn off audio input to the modem by turning the receiver-transmitter AUDIO GAIN fully counter-clockwise.
- Check meter for direct current (20 or 60 mA) flowing through DC LOOP NO. 1.

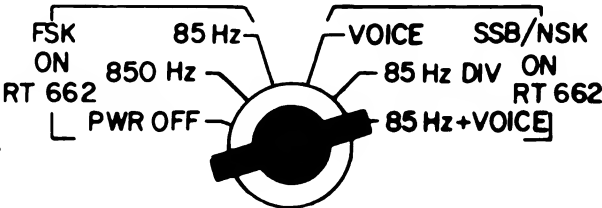


NOTE

Meter will register in the right scale (upscale) when loop battery module INTERNAL-EXTERNAL switch is in INTERNAL position. Meter will read in the left scale (downscale) when in EXTERNAL position.

b. VOICE TRANSMISSION

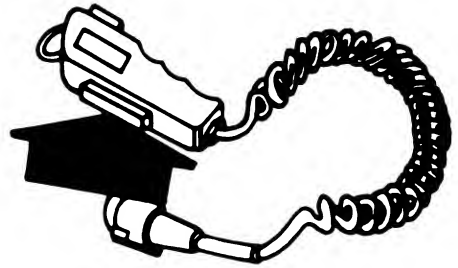
- Set MODE SELECTOR at VOICE or 85 Hz + VOICE.



- Check that the METER FUNCTION switch is at DC LOOP NO. 1.
- Set the RCV/SEND switch to SEND.
- Check ONE WAY/DUPLEX switch for ONE WAY position.



- Attach microphone at microphone connector.
- Press and hold switch to key microphone and talk.
- Note sidetone in headset.



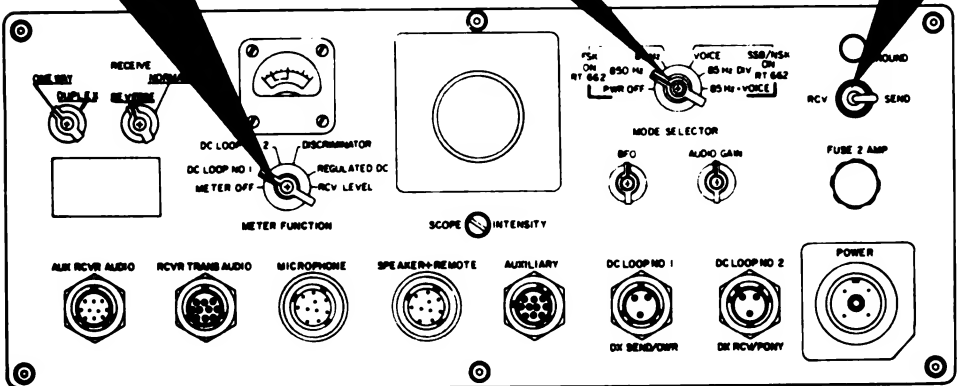
- Make any adjustments necessary at receiver-transmitter to transmit voice signals. (Refer to the appropriate technical manual.)

c. TELETYPEWRITER TRANSMISSION

- Set MODE SELECTOR at desired teletypewriter mode of operation.

- Set METER FUNCTION at DC LOOP NO. 1.

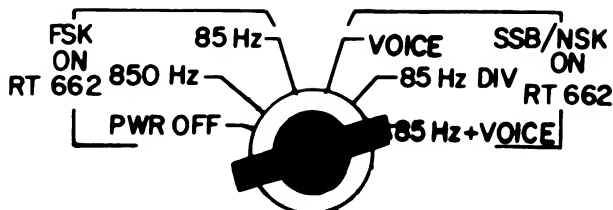
Set RCV/SEND at SEND



- Check ONE WAY/DUPLEX switch for ONE WAY position.
- Check meter to see that it reads 60 or 20 mA.
- Make adjustments if necessary on the receiver-transmitter to transmit signal.
- When teletypewriter transmission is finished set RCV/SEND at RCV.

d. VOICE RECEPTION

- Set MODE SELECTOR at VOICE or 85 Hz + VOICE.



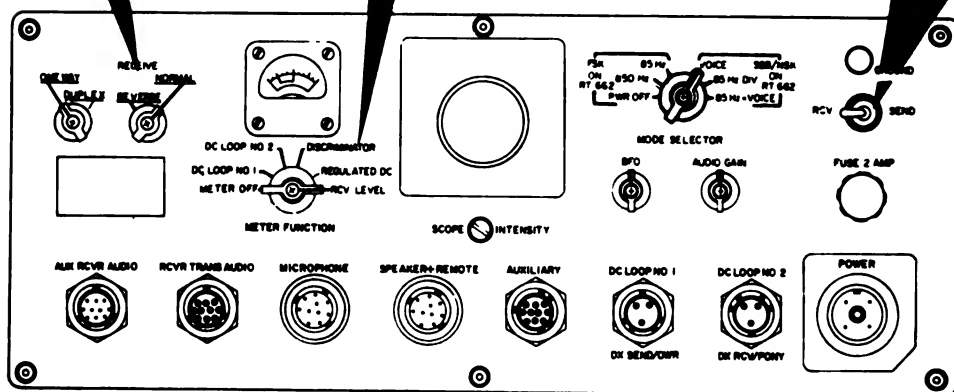
NOTE

Tune receiver-transmitter (or telephone isolation amplifier) to the correct frequency, and fine tune as necessary for correct operation.

- Set RECEIVE switch to NORMAL.

- Set METER FUNCTION at RCV LEVEL.

- Set RCV/SEND at RCV.

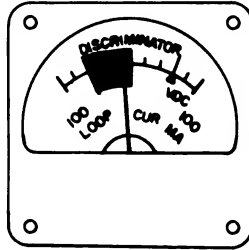


- Check ONE WAY/DUPLEX switch for ONE WAY position.

NOTE

A signal must be received at receiver-transmitter or telephone isolation amplifier in order to properly adjust audio gain control.

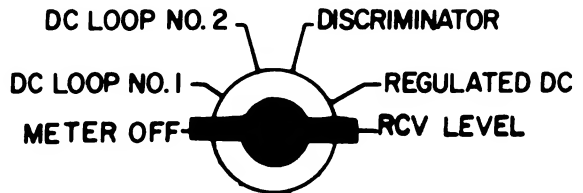
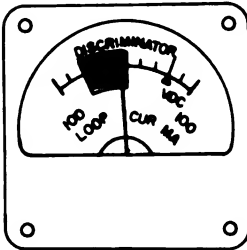
- Adjust audio gain control at receiver-transmitter (or telephone isolation amplifier) until modem METER registers within the boxed area marked RCV.



- Adjust modem AUDIO GAIN to obtain desired voice level at headset or loudspeaker.
- Return METER FUNCTION switch to DC LOOP NO. 1.

e. TELETYPEWRITER RECEPTION

- Set MODE SELECTOR to desired teletypewriter position.
- Set RCV/SEND at RCV.
- Check ONE WAY/DUPLEX switch for ONE WAY position.
- Set METER FUNCTION to RCV LEVEL.



- When a signal is present, adjust AUDIO GAIN control on receiver-transmitter until you get a reading in RCV portion of meter.

NOTE

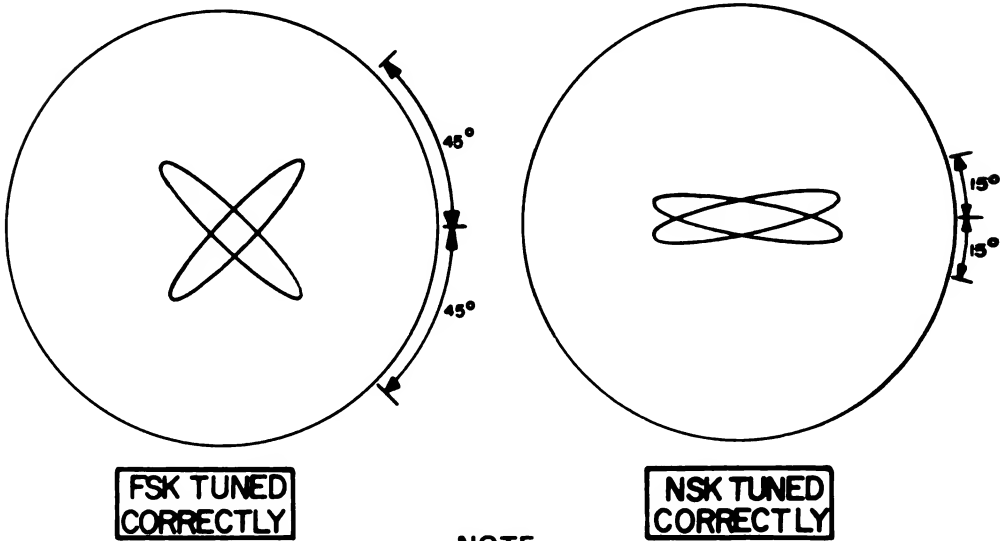
If you do not get a correct reading on the meter, repeat procedures given for voice reception.

2-7. PREFERRED AND ALTERNATE METHOD OF TUNING

- Use the preferred method to tune the signal.
- Use the alternate method to tune the signal when the scope is not working.

a. PREFERRED METHOD

- Observe scope and tune the receiver-transmitter until you get a correct trace pattern.



NOTE

When the modem is warmed up, 5 minutes will be necessary for the BFO to stabilize. If the modem is cold, 15 minutes will be necessary for BFO to become stable. Make necessary adjustments during these time periods to maintain the best signal reception display on the scope.

- In 850-Hz mode only, use the modem BFO control to aid fine tuning, until you get a correct trace pattern.
- In all other modes, use the FREQ VERNIER control on the receiver-transmitter to tune the signal.

CAUTION

Adjust SCOPE INTENSITY control to the minimum level necessary to avoid damage to the face of the scope.

- Adjust SCOPE INTENSITY control to get a display you can see clearly.

SCOPE

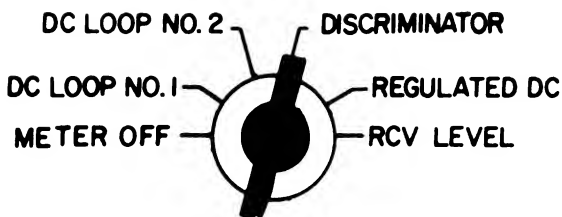


INTENS

b. ALTERNATE METHOD

Coarse tune the signal as follows:

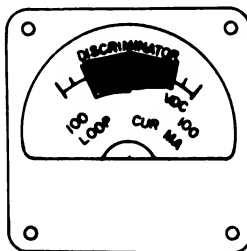
- Set METER FUNCTION at DISCRIMINATOR.



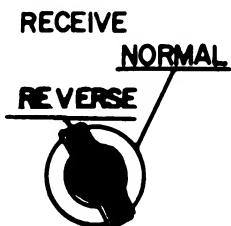
Tell sending station to send a series of teletypewriter test signals using the following messages:

- (1) K-Y.
- (2) The quick brown fox jumped over the lazy dog's back.
- (3) Now is the time for all good men to come to the aid of their country.

Watch the modem meter.
It will indicate signal strength of mark and space pulses.



- Tune the receiver and modem BFO (850-Hz mode only) until the meter registers in the DISCRIMINATOR scale during the entire message. (Tune so that the indicator needle swings the maximum range within the discriminator section of the meter.)
- Set METER FUNCTION to DC LOOP NO. 1.
- Check meter to see that it reads 20 or 60 mA through dc loop No. 1.



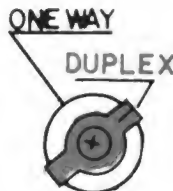
Check teletypewriter machine printout. If you cannot read the printout, place modem RECEIVE switch at REVERSE.

Check again for a satisfactory printout.

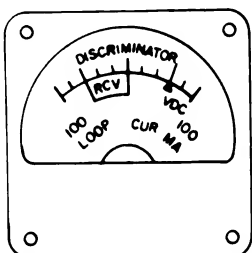
2-8. DUPLEX (DX) OPERATION

- TRANSMISSION:

- Perform the preset procedure for OWR, paragraph 2-6.
- Turn ONE WAY/DUPLEX switch to DUPLEX. ONE



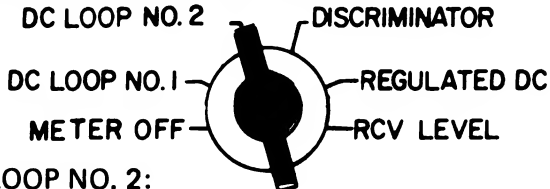
REPEAT PROCEDURES FOR VOICE TRANSMISSION AND TELETYPE-
WRITER TRANSMISSION AS DESCRIBED IN PARAGRAPHS 2-6(b)
AND (c).



- Set METER FUNCTION switch at DC LOOP NO. 2. Meter should indicate current flow of 20 or 60 mA through dc loop No. 2.

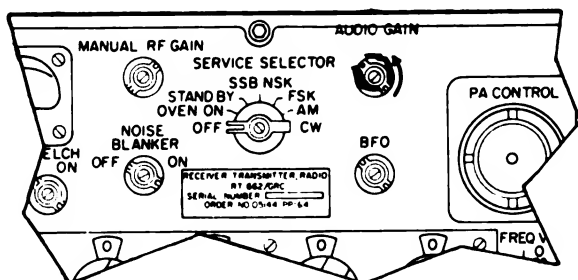
- **RECEPTION:**

Set METER FUNCTION switch at DC LOOP NO. 2.



- Check loop current of DC LOOP NO. 2:

Disable audio input to modem by placing the output level control (AUDIO GAIN) of the receiver-transmitter fully counterclockwise.



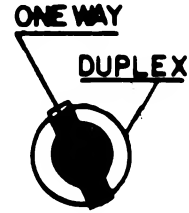
- Check meter to see that correct current flow (20 or 60 mA) is in dc loop no. 2.

**REPEAT PROCEDURES FOR VOICE RECEPTION AND TELETYPE-
WRITER RECEPTION AS DESCRIBED IN PARAGRAPHS 2-6(d) AND (e).**

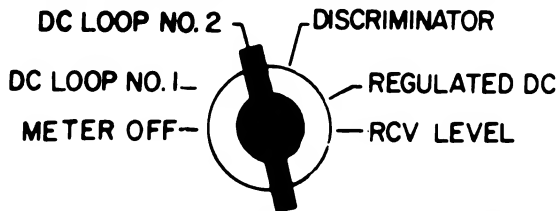
- **Send a series of teletypewriter test signals using alternate R-Y codes.**

2-9. PONY CIRCUIT OPERATION: TRANSMISSION AND RECEPTION

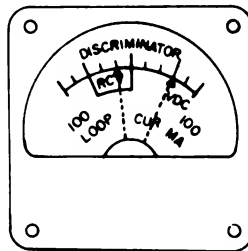
- Prepare pony circuit base and remote station teletypewriter machines for operation.
- Set ONE WAY/DUPLEX switch to ONE WAY.



- Adjust base teletypewriter to produce continuous mark output.
- Turn METER FUNCTION switch to DC LOOP NO. 2.



- Check meter to see that correct current flow (20 or 60 mA) is in pony circuit loop.



NOTE

For Dc Loop No. 2: Meter will register in right scale (upscale) when loop battery module current adjustment switch is in the 60 MA position. Meter will register in left scale (downscale) when current adjustment switch is in 20 MA position.

2-10. REMOTE OPERATION

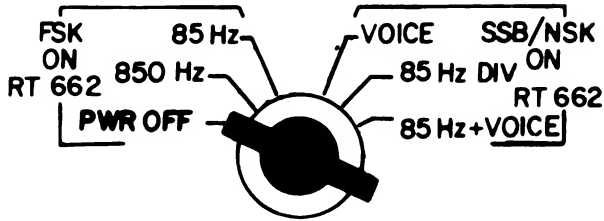
Modem remote operation is described in the technical manual for each type of system and remote control used. Usually modem is preset in a correct operating mode and remotely keyed.

2-11. STOPPING PROCEDURE

- Set RCV/SEND switch at RCV.



- Set MODE SELECTOR switch to PWR OFF.



Section IV. OPERATION UNDER UNUSUAL CONDITIONS

Since the modem must be used as part of a system, operation under unusual conditions may be found in the manual for the specific radio teletypewriter set with which it is used. Refer to TM-5815-334-10, chapter 2, section IV for specifics on cold weather operation.

CHAPTER 3
MAINTENANCE INSTRUCTIONS

	PAGE
Cable Check	3-1
Cleaning	3-3
Routine Inspection	3-3
Fuse Replacement.	3-1
Maintenance Procedures	3-3
Troubleshooting Procedures	3-1
Table.	3-2

Section I. TROUBLESHOOTING

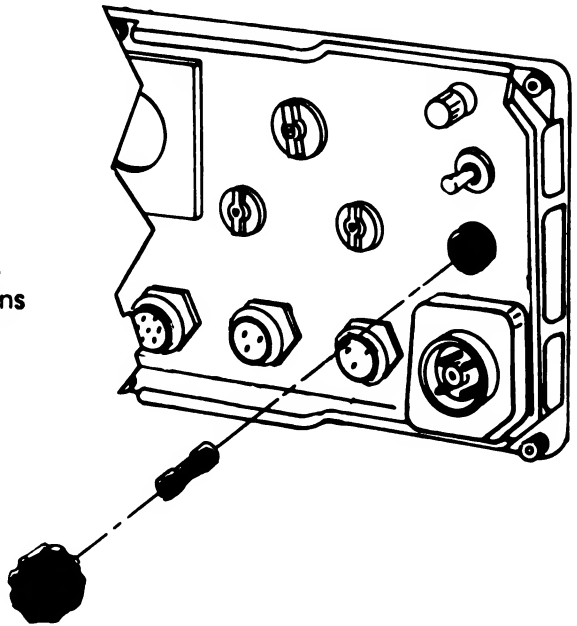
3-1. FUSE REPLACEMENT

Operator's troubleshooting is limited to checking the front panel fuse (2 amp) of the modem.

WARNING

Turn **MODE SELECTOR** to **PWR OFF** before pulling the fuse.

- Check the fuse (2 amp) when the test meter shows no response to any positions of the **MODE SELECTOR** switch.



3-2. CABLE CHECK

- Check all interconnecting cables and connectors for cracks and breaks. If the meter still does not work after you replace the fuse and check the cables, a higher category maintenance is needed.

3-3 TROUBLESHOOTING PROCEDURES

The troubleshooting table tells you some of the troubles you may find during the operation or maintenance of the modem. You should perform the test, inspections, and corrective actions in the order listed.

This manual cannot cover all the troubles that may happen, nor all the tests, inspections or corrective actions. If a trouble is not listed or it cannot be corrected by performing the corrective actions, notify your supervisor.

TROUBLESHOOTING TABLE

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

1. Test meter shows no response to any positions of the mode selector switch.

WARNING

Turn power off before pulling the fuse.

Step 1. Check cable for shorted or opened conductor.

Step 2. Check fuse (2 amp).

Step 3. Check power source (27.5 v).

Replace fuse if necessary. If the test meter still does not work after above checks have been made, higher category maintenance is required.

2. Teletypewriter will not transmit in SEND position.

Check ONE WAY/DUPLEX switch for ONE WAY position.

Turn ONE WAY/DUPLEX switch to ONE WAY position.

Section II. MAINTENANCE PROCEDURES

3-4. INTRODUCTION

Operator's maintenance consists of: performing preventive maintenance checks and services, troubleshooting, and cleaning the modem.

3-5. ROUTINE INSPECTION

Check all interconnecting cables and connectors for cracks and breaks.

Check to see that meter face (glass) is not broken or loose.

Check to see that knobs are tight, and controls function properly.

3-6. CLEANING

WARNING

Do not clean equipment if the power is on.

Remove dust and loose dirt from outside surfaces of the modem with a clean, soft cloth, (item 1, app. D). Cloth may be dampened with water, and mild soap (item 3, app. D) may be used for better cleaning. Clean dust or dirt from plugs and jacks with a brush (item 2, app. D).

WARNING

See trichlorotrifluoroethane warning on page a.

WARNING

See compressed air warning on page a.

CAUTION

Do not press on meter face (glass) when cleaning. The meter may be damaged.

Remove grease, fungus, and ground-in dirt from modem case. Use cloth dampened with cleaning compound (item 4, app. D).

3-3 / (3-4 blank)

APPENDIX A

REFERENCES

A-1. INTRODUCTION

The Consolidated Index of Army Publications and Blank Forms, DA PAM 310-1, should be consulted frequently for revisions, and new publications that pertain to this manual. The following is a list of all forms, technical manuals, and publications referenced in this manual.

A-2. FORMS

DA Form 2028	Recommended Changes to Publications and Blank Forms
DA Form 2404	Equipment Inspection and Maintenance Worksheet
SF Form 361.	Discrepancy in Shipment Report
SF Form 364.	Report of Discrepancy (ROD)
SF Form 368.	Quality Deficiency Report

A-3. TECHNICAL MANUALS

TM 11-5805-387-10-2	Operator's Manual: Modem Radio Teletypewriter MD-522A/GRC
TM 11-5820-520-10	Operator's Manual: Radio Sets AN/GRC-106 and AN/GRC-106A
TM 740-90-1	Administrative Storage of Equipment
TM 750-244-2	Procedures for Destruction of Electronics Material to Prevent Enemy Use (Electronics Command)

A-4. MISCELLANEOUS PUBLICATIONS

AR 385-11	Ionizing Radiation Protection (Licensing Control, Transportation, Disposal, and Radiation Safety)
DA Pam 310-1	Consolidated Index of Army Publications and Blank Forms
DA Pam 738-750	The Army Maintenance Management System (TAMMS)
SC-5180-91-CL-R	Sets, Kits, and Outfits, Component List: Tool Kit, Electronics Equipment, TK 101/G
TB 43-0116	Identification of Radioactive Items in the Army Supply System
TB 43-0122	Instructions for the Safe Handling and Identification of US Army Communication-Electronics Command Managed Radioactive Items in the US Army

A-1(A-2 blank)

APPENDIX B

COMPONENTS OF END ITEM AND BASIC ISSUE ITEMS LISTS

Section I. INTRODUCTION

B-1. SCOPE

This appendix lists components of end item and basic issue items for the modem to help you inventory items required for safe and efficient operation.

B-2. GENERAL

The Components of End Item and Basic Issue Items Lists are divided into the following sections:

a. Section II. Components of End Item. This listing is for informational purposes only, and is not authority to requisition replacements. These items are part of the end item, but are removed and separately packaged for transportation or shipment. As part of the end item, these items must be with the end item whenever it is issued or transferred between property accounts. Illustrations are furnished to assist you in identifying the items.

b. Section III. Basic Issue Items. These are the minimum essential items required to place the modem in operation, to operate it, and to perform emergency repairs. Although shipped separately packaged BII must be with the modem during operation and whenever it is transferred between property accounts. The illustrations will assist you with hard-to-identify items. This manual is your authority to request/requisition replacement BII, based on TOE/MTOE authorization of the end items.

B-3. EXPLANATION OF COLUMNS

The following provides an explanation of columns found in the tabular listings:

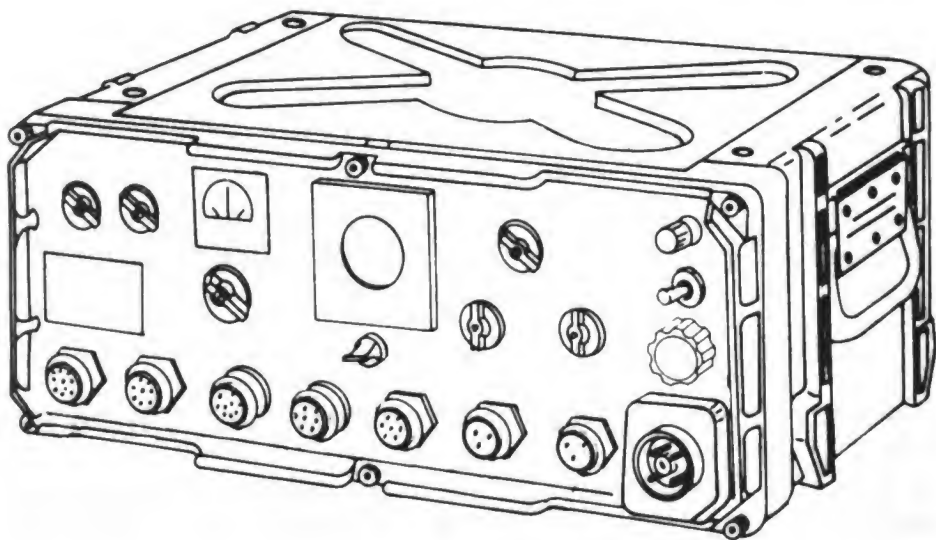
a. Column (1) - Illustration Number (Illus Number). This column indicates the number of the illustration in which the item is shown.

b. Column (2) - National Stock Number. Indicates the National stock number assigned to the item and will be used for requisitioning purposes.

c. Column (3) - Description. Indicates the National item name and, if required, a minimum description to identify and locate the item. The last line for each item indicates the FSCM (in parentheses) followed by the part number. If item needed differs from different models of this equipment, the model is shown under the "Usable On" heading in this column.

d. Column (4) - Unit of Measure (U/M). Indicates the measure used in performing the actual operational/maintenance function. This measure is expressed by a two-character alphabetical abbreviation (e.g., ea, in, pr).

e. Column (5) - Quality required (Qty rqr). Indicates the quantity of the item authorized to be used with/on the equipment.



Section II. COMPONENTS OF END ITEM

(1) ILLUS NO.	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION USABLE (FSCM) AND PART NUMBER ON CODE	(4) U/M	(5) QTY REQD
1	5815-00-999-5277	Modem Radio Teletypewriter MD-522/GRC		

Section III. BASIC ISSUE ITEMS

(1) ILLUS NO.	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION USABLE (FSCM) AND PART NUMBER ON CODE	(4) U/M	(5) QTY REQD
	5810-00-999-5277	Operator's Manual: Modem Radio Teletypewriter MD-522/GRC		1

B-3/B-4 blank

APPENDIX C

ADDITIONAL AUTHORIZATION LIST

NOT APPLICABLE

APPENDIX D

EXPENDABLE SUPPLIES AND MATERIALS LIST

Section I. GENERAL INFORMATION

D-1. INTRODUCTION

This appendix lists expendable supplies and materials you will need to operate and maintain the MD-522/GRC.

D-2. EXPLANATION OF COLUMNS

- a. **ITEM NO.** This number is referenced in the narrative instructions to identify the material (for example, "Use cleaning compound, Item 4, App. D").
- b. **LEVEL.** C - Crew/Operator
- c. **NATIONAL STOCK NUMBER.** Shows the Federal Stock Number assigned to each item and used to requisition that item.
- d. **DESCRIPTION.** Shows the National Item Name and (if required) a short description to identify and locate the item. The last line for each item shows the Federal Supply Code for Manufacturers (FSCM) in parentheses, followed by the part number.
- e. **UNIT OF MEASURE (U/M).** Shows the measure of the item needed to perform the actual operational/maintenance function. This measure is shown by a two-letter abbreviation (for example, EA, OZ, IN).

APPENDIX D

EXPENDABLE SUPPLIES AND MATERIALS LIST

(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION	(5) U/M
1	C	8305-00-267-3015	Cheese cloth (81348)	YD
2	C	7920-00-178-8315	2 3/4" long bristle brush	EA
3	C	7930-01-055-6121	Detergent, GP, Liq	GL
4	C	6850-00-105-3084	Trichlorotrifluoroethane cleaning compound	OZ
5	C	5920-00-280-4960	Fuse, Cartridge (96906) MS 90078-11	EA

GLOSSARY

audio	Frequencies that are heard.
associated	Closely connected.
auxiliary	Any item not directly a part of a specific component or system but required for its functional operation.
coarse tune	To tune the signal within a "ballpark" range for fine tuning.
demodulator	A device used to convert audio tones into dc mark and space pulses.
intensity	A term used to designate brightness or luminance of the spot.
modem	Modulator/demodulator.
modulator	A device used to convert direct current (dc) mark and space pulses into audio tones.
polarities	Having two opposite charges - one positive, one negative.
pony loop circuit	Allows teletypewriter order wire transmission and reception over landlines from a remote station when system is not operating in the duplex mode.
remote	Control indirectly or from a distance.
single-channel	Use of one frequency for transmission and reception.
stabilize	To hold steady.

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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)
Commander
Stateside Army Depot
ATTN: AMSTA-US
Stateside, N.J. 07703

DATE SENT 10 July 1975

PUBLICATION NUMBER

TM 11-5840-340-12

PUBLICATION DATE

23 Jan 74

PUBLICATION TITLE

Radar Set AN/PRC-76

BE EXACT PIN-POINT WHERE IT IS

IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:

PAGE NO. PARA-GRAPH FIGURE NO. TABLE NO.

2-25 2-28

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

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

3-10 3-3

3-1

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

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

5-6 5-8

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

REASON: To replace the cover plate.

F03

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

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

PRINTED NAME, GRADE OR TITLE AND TELEPHONE NUMBER

SSG I. M. DeSpirito 999-1776

SIGN HERE

SSG I. M. DeSpirito

DA FORM 2028-2 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

REVERSE OF DA FORM 2028-2

FILL IN YOUR
UNIT'S ADDRESS

FOLD BACK

DEPARTMENT OF THE ARMY

POSTAGE AND FEES PAID
DEPARTMENT OF THE ARMY
DOD 314



OFFICIAL BUSINESS
PENALTY FOR PRIVATE USE \$300

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