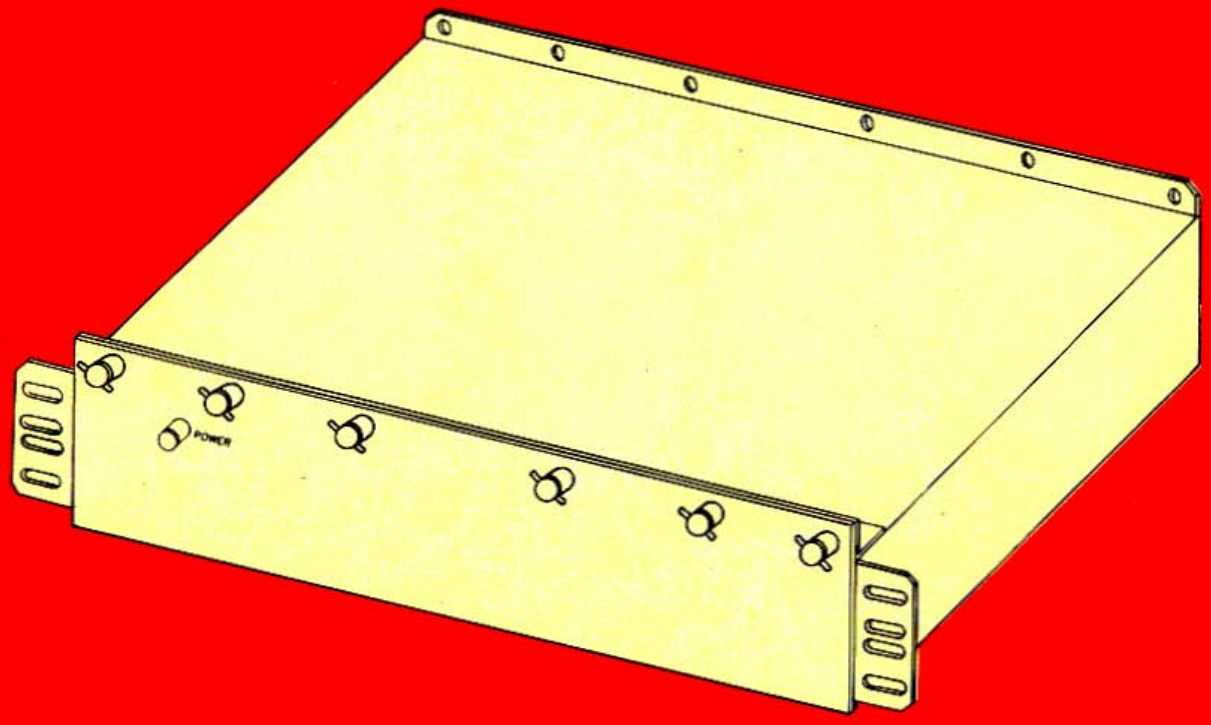
ARMY TM 11-7440-232-12

NAVY NAVELEX 0967-LP-275-5010

OPERATOR'S AND ORGANIZATIONAL MAINTENANCE MANUAL FOR MODEM, DIGITAL DATA



MD-701/UY (NSN 7025-00-999-9289), MD-701A/UY (NSN 7025-00-878-8317)

AND

MD-701B/UY (NSN 7025-00-878-8316)

DEPARTMENTS OF THE ARMY AND THE NAVY

21 JUNE 1984

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

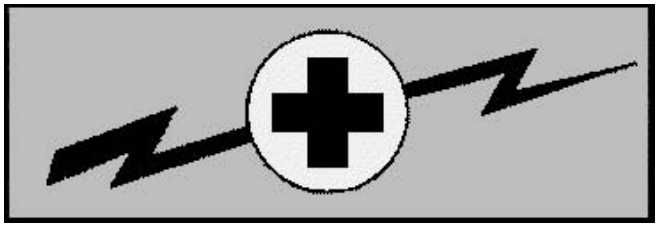
1. DO NOT TRY TO PULL OR GRAB THE INDIVIDUAL

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 result if personnel fail to observe safety precautions

When maintenance adjustments on this equipment are made with power applied, be careful when working near the interior of the equipment, or near the ac power distribution wiring.

Never work on electronic equipment unless there is another person nearby who is familiar with the operation and hazards of the equipment and who is competent in administering first aid. When the technician is aided by operators, he must warn them about dangerous areas.

Whenever possible, the power supply to the equipment must be shut off before beginning maintenance work on the equipment. Take particular care to ground every capacitor likely to hold a dangerous potential. When working inside the equipment, after the power has been turned off, always ground every part before touching it.

Be careful not to contact high-voltage connections or 115 volt ac input connections when installing or operating this equipment.

Whenever the nature of the operation permits, keep one hand away from the equipment to reduce the hazard of current flowing through vital organs of the body.

WARNING
Do not be misled by the term "low voltage." Potentials as low as 50 volts may cause death under adverse conditions.

For Artificial Respiration, refer to FM 21-11.

WARNING

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

When compressed air is required for cleaning, the following precaution shall be adhered to:

WARNING

To be usable for cleaning, the compressed air source must limit the nozzle pressure to no more than 29 pounds per square inch (PSIG). Goggles must be worn at all times while cleaning with compressed air.

Technical Manual
No. 11-7440-232-12
Technical Manual
No. 0967-LP-275-5010

DEPARTMENTS OF THE ARMY
AND THE NAVY
Washington, DC, 21 June 1984

OPERATOR'S AND ORGANIZATIONAL MAINTENANCE MANUA FOR MODEMS, DIGITAL DATA MD 701/UY (NSN 7025-00 999-9289), MD-7014/UY (NSN 7025-00 878 8317) AND MD 701B/UY (NSN 7025 00-878 8316)

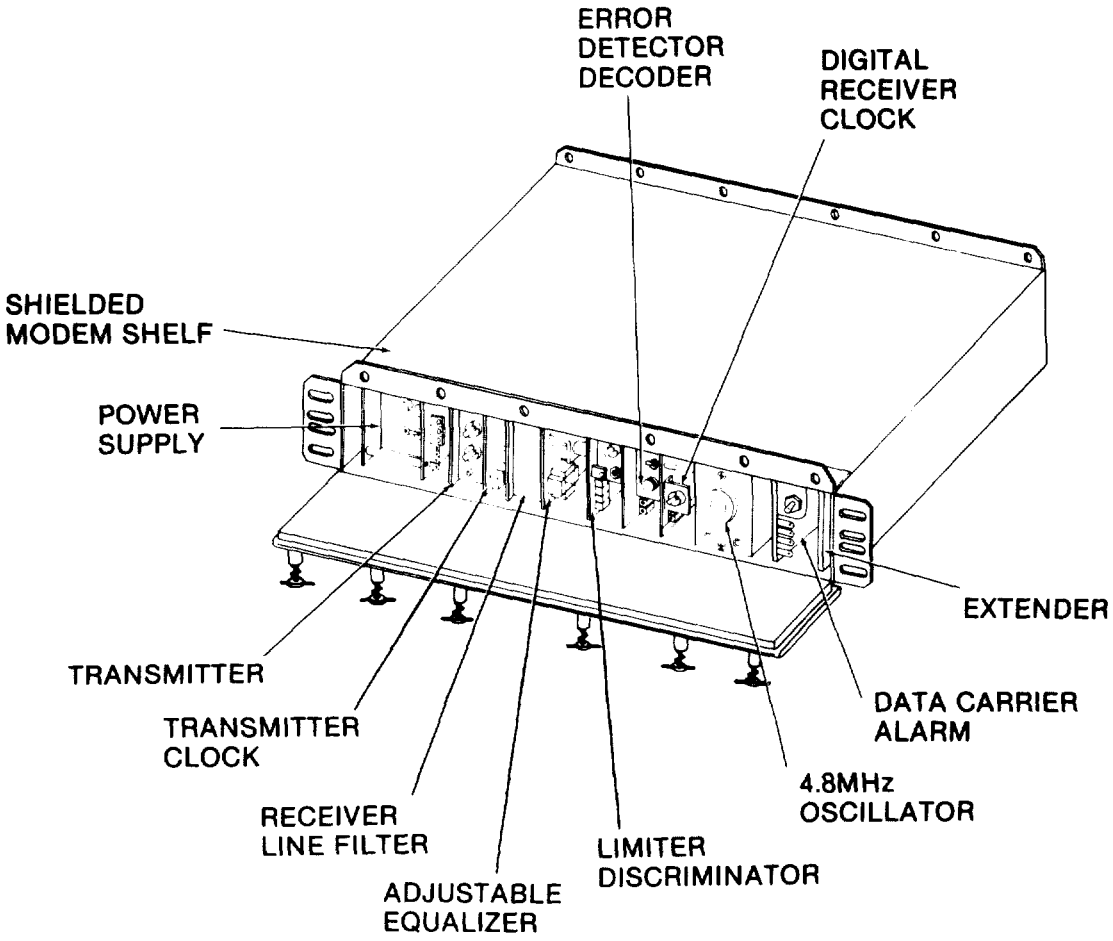
REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

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

For Navy, mail comments to the Commander, Naval Electronic Systems Command, ATTN: ELEX 8122, Washington, DC 20360.

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

***This manual supersedes so much of TM 11 -7440-232-15/NAVSHIPS-0967-275-5010, 20 November 1967 including all changes as pertains to operator's and organizational maintenance.**



HOW TO USE THIS MANUAL

This manual tells you how to operate and how to perform organizational maintenance of the MD 701(*)/UY.

Refer to TM 11-7440-232-20P for organizational maintenance repair parts and special tools lists (RPSTL) used with this manual.

In this manual, paragraphs are numbered sequentially. If you are looking for specific information; use subject index at back of this manual to locate paragraph and page where topic is discussed.

CHAPTER 1

INTRODUCTION

Section I. GENERAL INFORMATION

1-1. SCOPE

Type of Manual: Operator's And Organizational Maintenance Model Number and Equipment Name: MD-701(*)/UY Modem, Digital Data (Includes MD-701/UY, MD-701A/UY and MD-701/IUY (configurations))

Purpose of Equipment: Transmits and receives serial-by-bit binary data at rates of 600, 1200, and 2400 bits per second (bps) over a standard 3kHz voice frequency path which interconnects two data processing terminals.

Special Limitations on Equipment: Ambient temperature of 0° to +50°C. Relative humidity of 95%.

Special Inclusions in Manual: Hatch mark in parenthesis immediately after nomenclature MD-701 indicates all models of equipment treated as a single model.

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 733-750 as contained in Maintenance Management Update. Navy personnel will report maintenance performed utilizing the Maintenance Data Collection Subsystem (MDCS) IAW OPNAVINST 4790.2, Vol 3 and unsatisfactory material/conditions (UR submissions) IAW OPNAVINST 4790.2 Vol 2, chapter 17.

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.

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.

1-3. REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIR'S)

Army. If your Modem MD 701(*)/UY 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.

Navy. Navy personnel are encouraged to submit EIR's through their local Beneficial Suggestion Program.

1-4. PREPARATION FOR STORAGE OR SHIPMENT

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 are covered in chapter V, section VI.

1-5. DESTRUCTION OF ARMY MATERIAL TO PREVENT ENEMY USE

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

1-6. OFFICIAL NOMENCLATURE, NAMES, AND DESIGNATIONS

The following list should help you locate the official nomenclature of major equipment in Digital Data Modem MD 701(*)/UY. Official nomenclature must be used when completing a report forms or when looking up technical manual.

a. Nomenclature Cross Reference List

COMMON NAME	OFFICIAL NOMENCLATURE
Digital Data Modem or Modem	Modem, Digital Data MD 701/UY, MD 701AIUY, MD 701BIUY
Power Supply	Power Supply Assy Al
Digital Data Transmitter	Digital Data Xmtr A2
Transmitter Clock	Clock, Transmitter A3
Receiver Line Filter	Limiter, Elek, Noise A4
Adjustable Equalizer	Equalizer Assembly A5
Limiter Discriminator	Limiter, Dscrm A6
Decoder Error Detector	Decoder A7
Digital Receiver Clock	Dgtl Receiver Clock A8
Data Carrier Alarm	Data Carrier Alarm All
RF Oscillator	Oscillator, RF A9
Modem Shelf	TR Shelf, Code A & Code AB 911-46880-01
RFI Shielded Modem Shelf	TR Shelf, Code A 911-46870-01
Module Extender	Extender Unit

b. Abbreviations

Abbreviations are spelled out the first time they appear in text. However, a complete list of all abbreviations used in this manual is given below as an additional aid to knowing their full meaning. Acronyms also are included.

ac	alternating current
Assy	assembly
AFC	automatic frequency control
bps	bits-per-second
db	decibels
dbm	unit used for measuring absolute power levels; power in db measured for a one milliwatt reference level
dc	direct current
Dgtl	digital
Dscrm	discriminator
Hz	Hertz
kHz	kiloHertz
MHz	megaHertz
MODEM	modulator/demodulator
NRZ	non-return to zero
PCC	printed circuit card
PMCS	preventive maintenance checks and services
RF	radio frequency
V	volts
vf	voice frequency
VTVM	Vacuum tube voltmeter
Xmtr	transmitter

1-7. HAND RECEIPT

Hand receipts for Components of End Item (COEI), Basic Issue Items (BII), and Additional Authorization List (AAL) items are published in a Hand Receipt Manual, TM 11-7440-232-12-HR. This manual is published to aid in property accountability and is available through: Commander, US Army Adjutant General Publication Center, ATTN: AGDL-OD, 1655 Woodson Road, St. Louis, MO 63114.

Section II. EQUIPMENT DESCRIPTION AND DATA

1-8. EQUIPMENT PURPOSE, CHARACTERISTICS, CAPABILITIES, AND FEATURES

Purpose of MD-701(*)/UY

Modulator-demodulator for transmitting and receiving serialized digital data at 600, 1200, or 2400 bits per second over a standard 3-kHz voice channel.

Capabilities and Features

Major Electronic System Components

a. Solid State Components

1. Power Supply
2. Transmitter
3. Transmitter Clock
4. Receiver Line Filter
5. Adjustable Equalizer
6. Limiter Discriminator
7. Decoder Error Detector
8. Digital Receiver Clock
9. Data Carrier Alarm

- Modular construction
- Fail-safe alarm
- RFI shielding
- Built-in self testing

b. MD-701B/UY is one-way interchangeable with Digital Data Modem MD-701/UY and MD-701A/UY. MD-701B/UY performs the same function as Digital Data Modem MD701A/UY, and in addition, provides a RFI shielded modem shelf.

c. Digital Data Modem MD-701B/UY has one observable indicator light on the front cover labeled POWER. Digital Data Modem MD-701/UY and MD-701AIUY have two observable indicator lights on the front cover labeled POWER and ERRORS.

1-9. LOCATION AND DESCRIPTION OF MAJOR COMPONENTS

a. The major components of the Digital Data Modem MD-701(*)/UY are a rackmounted modem shelf, a power supply, nine plug-in PCC modules, a shelf-mounted RF oscillator, and a module extender.

b. The location of plug-in modules, operating controls, and test pin-jacks is shown on a decal on the inside of the front cover of the modem shelf.

c. The MD-701BIUY uses an RFI shielded modem shelf.

d. The MD-701/UY and MD-701A/UY use an unshielded modem shelf.

e. Refer to paragraph 1-10 for the plug-in modules and modem shelf used in each model of the Digital Data Modem.

f. The location and function of each module are described on the following pages.

• RFI Shielded Modem Shelf Code A 46870 used in MD-701BIUY provides electrically and magnetically shielded mounting facilities and electrical connections for one complete modem that consists of a power supply and nine plug-in modules and a module extender.

• The RFI Shielded Modem Shelf is wired for a duplex set consisting of a digital data transmit branch and a digital data receive branch.

• The RFI Shielded Modem Shelf occupies two mounting spaces on a standard 19-inch equipment rack.

• Code A provides a stable 4.8. MHz crystal clock RF oscillator that mounts in shelf position A9. Position A9 is equipped with a front retainer plate. This position also has a bracket that holds the oscillator output and ground test points. The retainer plate contains a center hole, which allows frequency adjustment of the oscillator.

• A termination panel at the rear of the shelf allows external connections to be made by bare or spade-lug terminated wire or cable. The panel is constructed of a barrier terminal strip, interconnecting cable with connectors, and a metal housing.

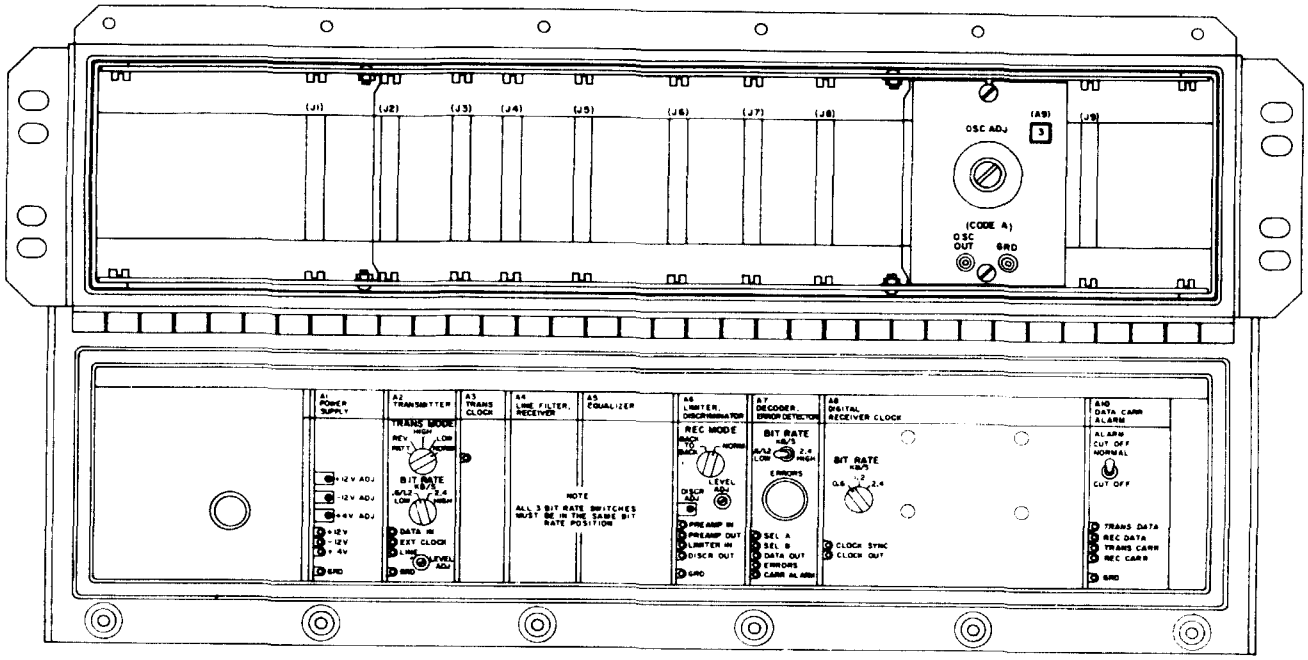
• Modem Shelf*46880 used in MD-701/UY and MD-701A/UY provides unshielded mounting facilities and electrical connections for one complete modem that consists of a power supply and up to nine plug-in modules and a module extender. (*Code AB) .

• The modem shelf is wired for a duplex set consisting of a digital data transmit branch and a digital data receive branch.

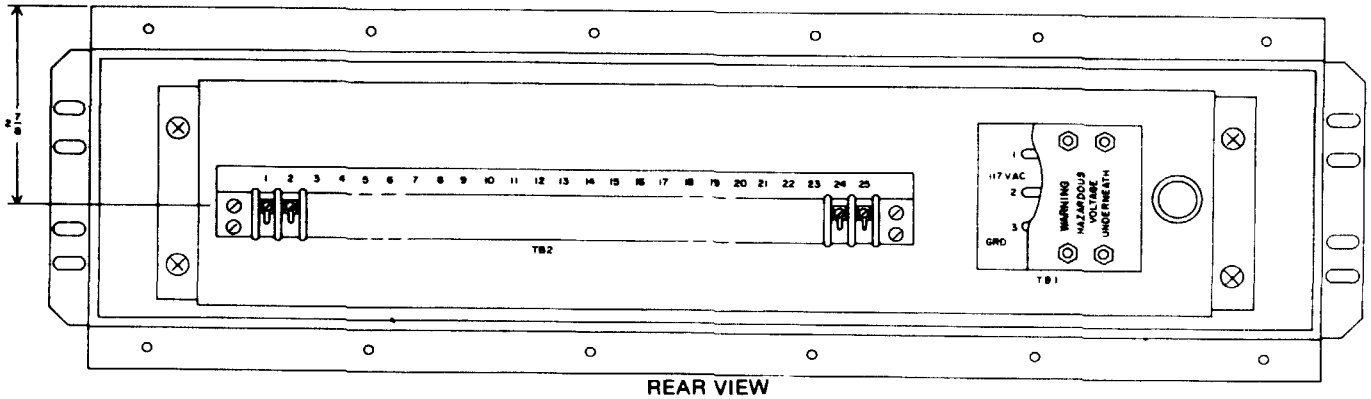
• Modem shelf Code A provides a termination panel at the rear of the shelf. This panel allows external connections (other than ac power and primary protective ground) to be made by bare or spade-lug terminated wire or cable. The panel is constructed of a barrier terminal strip, interconnecting cable with connectors, and a metal housing.

• Modem Shelf Code B provides a stable 4.8-MHz crystal clock RF oscillator that fits in modem shelf position A9. Position A9 is equipped with a front retainer plate. This position also has a bracket that holds the oscillator output and ground test points. The retainer plate contains a center hole, which allows frequency adjustment of the oscillator.

RFI SHIELDED MODEM SHELF CODE A46870
46870
RFI SHIELDED DATA SET SHELF

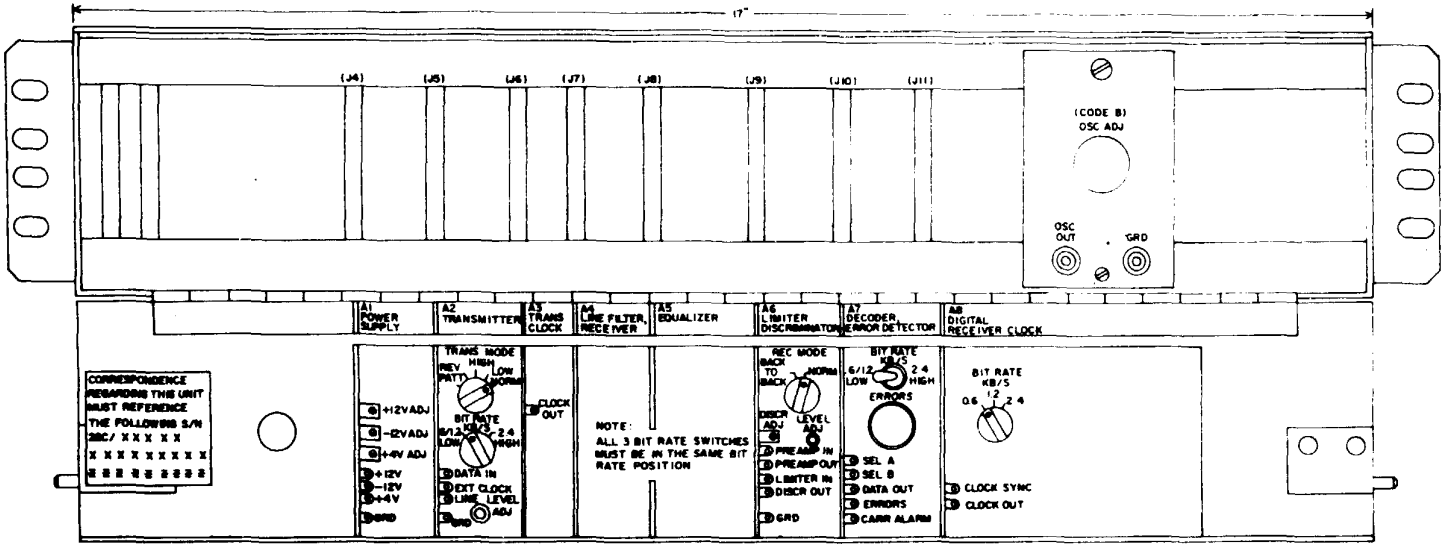


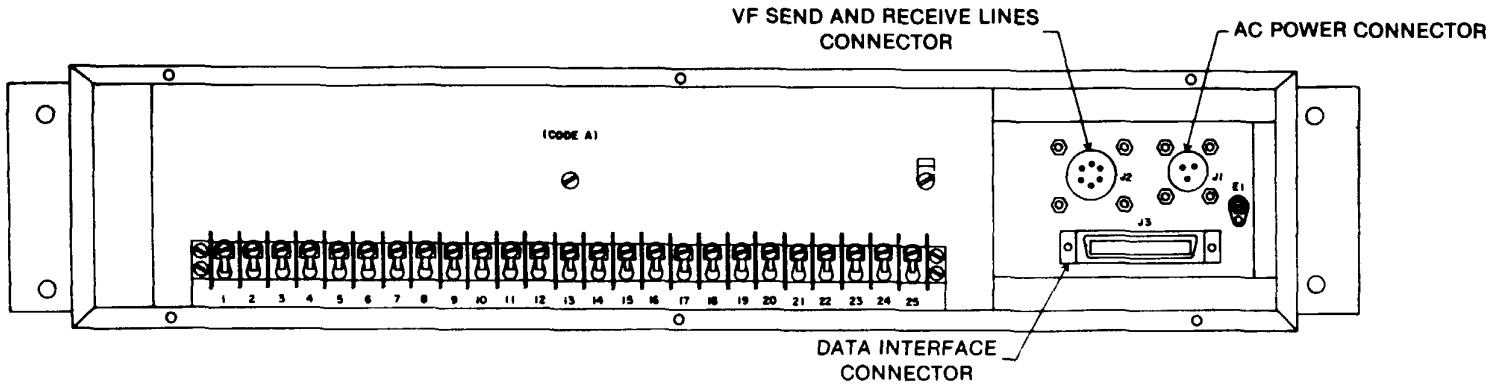
FRONT VIEW
(COVER OPENED)



REAR VIEW
(COVER REMOVED)

MODEM SHELF CODE AB 46880
46880
DATA SET SHELF
(FRONT VIEW)





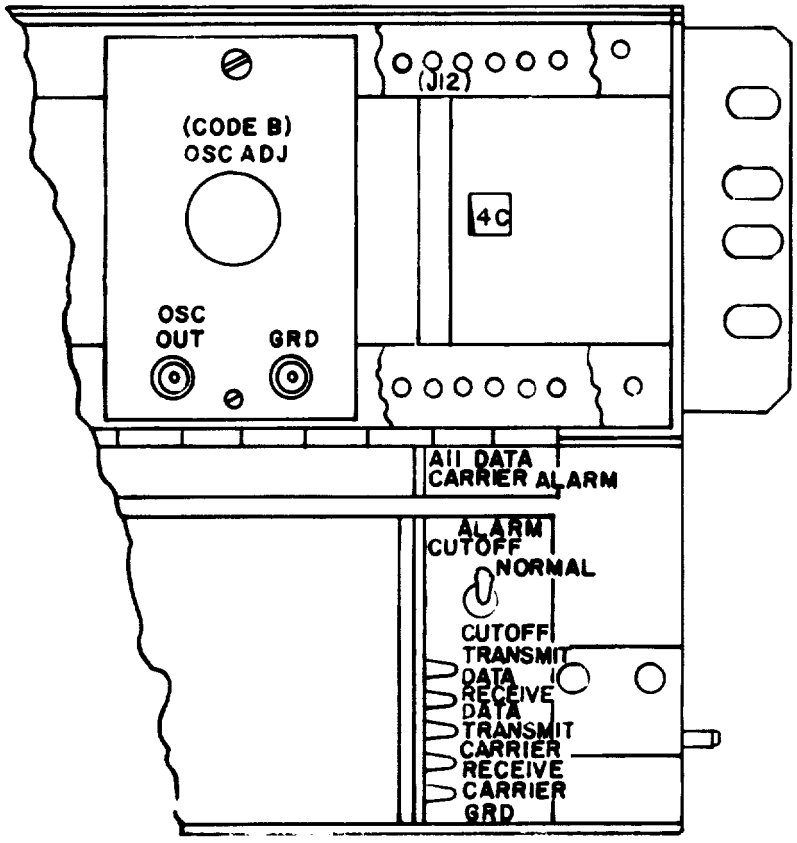
46880
DATA SET SHELF EQUIPPED WITH CODE A
REAR VIEW
REAR COVER REMOVED

MODIFICATION 1 TO MODEM SHELF

• Modification 1 to Modem Shelf 46880 provides wiring, a module connector, and a data carrier alarm module so that a data carrier alarm module can be installed into an unshielded modem shelf. When the modem shelf has been modified to accept a data carrier alarm module (as is used for the Digital Data Modem MD-701A/UY) a modification has been made to the power supply, transmitter, and decoder error detector; and the digital receiver clock module 900-44760-01 has been replaced by digital receiver clock module 900-44760-02.

• This modification to the modules provides alarm output interconnecting wiring connections to the data carrier alarm module.

PART OF 46880
26C DATA SET SHELF
(MODIFIED)

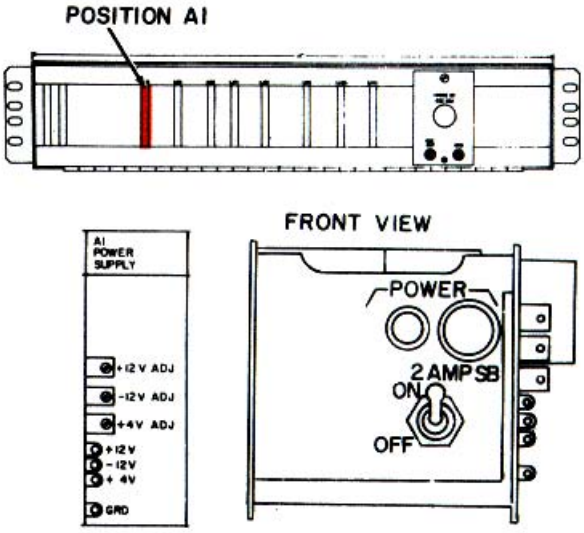


POWER SUPPLY

• Power supply (PIN 900-44751-01) consists of a chassis and a printed circuit card which plug into a jack in the modem shelf. On the front of the chassis is an on-off switch, pilot lamp, and ac line fuse. On the PCC module are three potentiometers and three test jacks which are used for adjusting the output voltages.

• The 01 Option provides regulated +12, +4, and -12 volts from an ac source. The 02 option provides the same outputs as the 01 option, plus an alarm contact closure if any of the supply voltages fail.

• The power supply supplies power to all the modules. The power supply has one operable POWER switch and one POWER indicator.

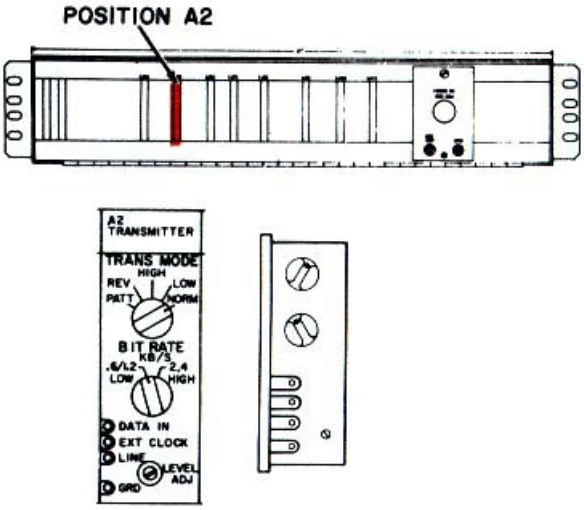


DIGITAL DATA TRANSMITTER

• Digital Data Transmitter (PIN 900-44752-01) consists of a printed circuit module which plugs into the modem shelf. All operating controls and test pin jacks are on the front panel. The operating speed of the transmitter is determined by the two position BIT RATE switch on the front panel.

• The digital data transmitter accepts serial binary data at 1200 or 2400 bits per second and an accompanying clock signal, and produces a synchronous fm output for transmission over a vf path. It supplies a square wave output at the desired bit rate to the transmitter clock. It, also, contains a generator that provides test signals for checking system operation.

• The test pattern generator facilitates system alinement and maintenance, and eliminates the need for other data generators. This circuit produces four types of test signals that result in a transmitter output of steady 1200 Hz, steady 2400 Hz, reversals (alternate one and zeros), or a random one and zero pattern.



TRANSMITTER CLOCK

• Transmitter Clock (P/N 900-44761-01) consists of a printed circuit module which plugs into the modem shelf. From the 4.8 MHz RF oscillator stable source, the transmitter clock provides a 2400-Hz clock output used by the digital data transmitter for all timing functions. It also provides 2400, 1200, or 600-Hz clock output for external timing applications.

• One test point is located at the front of the module for monitoring the clock output from the output amplifier.

• There are no controls on this printed circuit card (PCC) module.

RECEIVER LINE FILTER

• Receiver Line Filter (PIN 900-44753-01) consists of a hermetically sealed filter case mounted on a module card which plugs into a jack in the modem shelf. The receiver line filter accepts the desired band of received duobinary signals and shapes them for application to the receive circuits of the digital data modem.

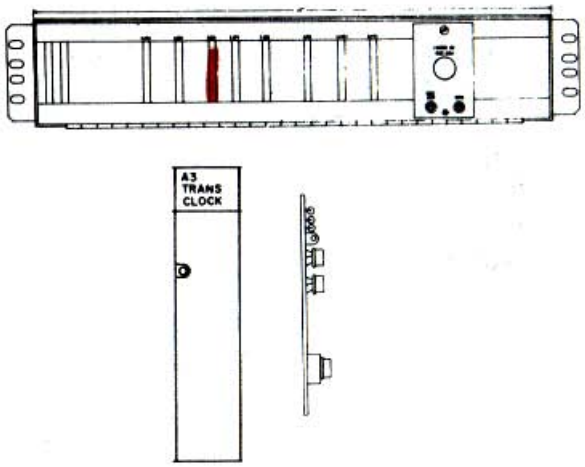
• There are no controls or test pinjacks on this module.

ADJUSTABLE EQUALIZER

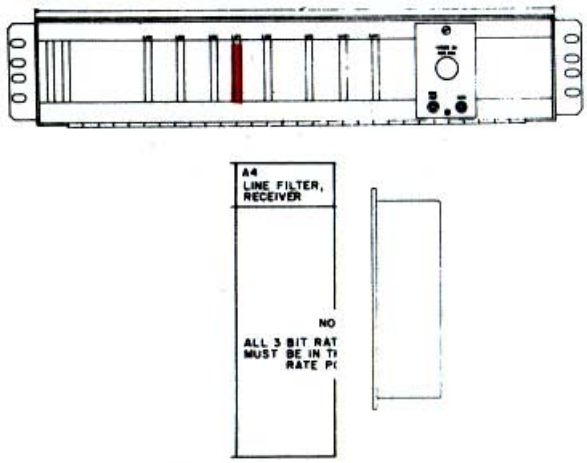
• Adjustable Equalizer (PIN 900-44755-01) consists of a PCC module which plugs into the modem shelf. It equalizes delay and amplitude distortion at the receiving modem.

• The Equalizer has no operating controls or test pin-jacks located on the front of the PCC module.

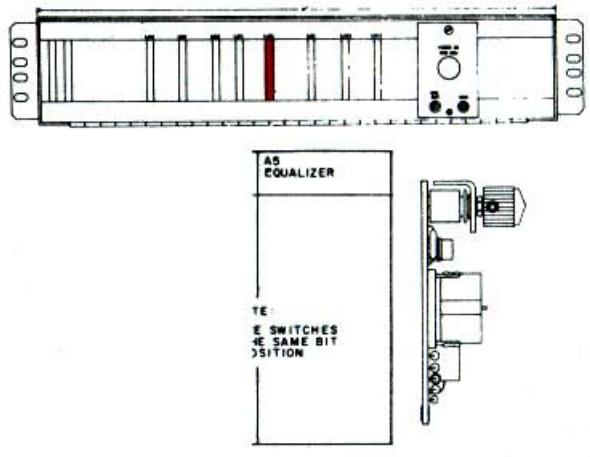
POSITION A3



POSITION A4



POSITION A5



LIMITER DISCRIMINATOR

• The Limiter Discriminator (PIN 900-44756-01) PCC module plugs into the modem shelf. It converts fm binary or duobinary signals that represent the information originally modulated by the distant transmitter.

• The REC MODE operating control is located at the front of the PCC module.

• All test pin-jacks are located at the front of the PCC module.

DECODER ERROR DETECTOR

• Decoder Error Detector (PIN 900-44757-01) PCC module plugs into the modem shelf. It regenerates signals from the limiter discriminator to a serial-by-bit NRZ form for driving a receiving data processor. It also detects data pattern errors and loss of received signals and provides outputs to peripheral alarm equipment.

• All test pin-jacks are located at the front of the PCC module.

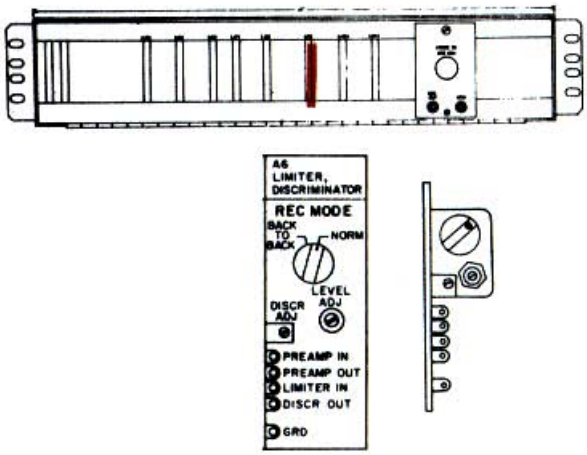
• The BIT RATE operating control and the ERRORS indication lamp are located at the front of the PCC module.

DIGITAL RECEIVER CLOCK

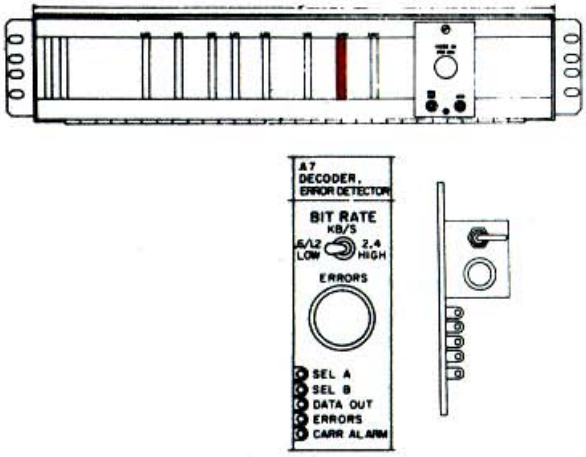
• Digital Receiver Clock (PIN 900-44760-01) PCC module plugs into the modem shelf. It provides a clock signal (phase corrected to regenerated data signal from the associated receiver) for data retiming and for external clocking functions.

• The BIT RATE operating control and the test pin-jacks are located at the front of the PCC module.

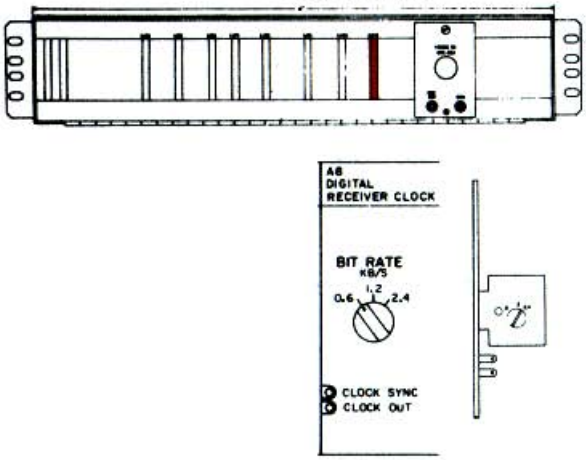
POSITION A6



POSITION A7



POSITION A8



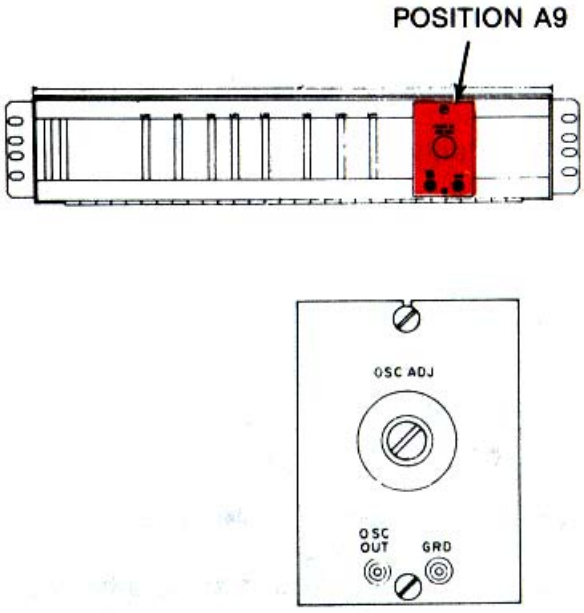
RF OSCILLATOR

• The stable 4.8 MHz crystal clock RF oscillator (PIN 190-47861-01 for Code AB shelf) plugs into a subassembly mounted in position A9 on the modem shelf.

• Position A9 is equipped with a front retainer plate and a bracket which mounts the oscillator output test jack and a ground test jack. The retainer plate contains a center hole to allow adjustment of the oscillator frequency.

• There are no operating controls on this module.

• Test pin-jacks are located on the front of the module.

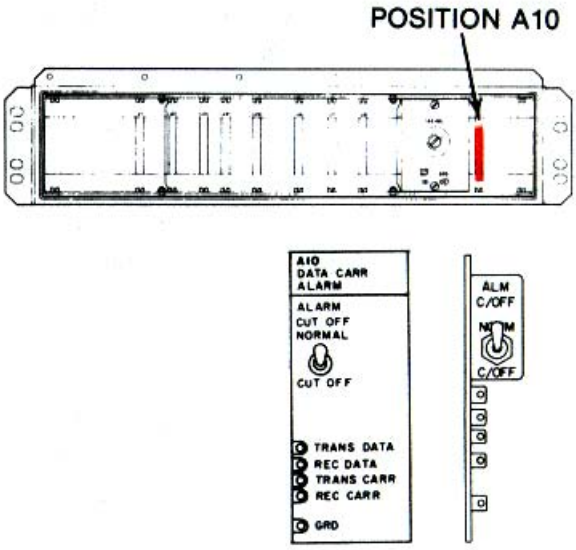


DATA CARRIER ALARM

• The Data Carrier Alarm (PIN 090-46841-01) PCC module plugs into the modem shelf. It provides delayed alarm signals for transmit data, transmit carrier, receive carrier, and receive data signals.

• It provides individual alarm outputs if trouble occurs in any of the monitored signal paths. The type of alarm output used provides a fail-safe feature, in that, failure of the circuit being monitored, failure of the alarm circuit, or failure within the entire digital data modem will always produce an alarm output.

• The operating control (ALARM CUTOFF switch) and the test pin-jacks are located at the front of the PCC module.



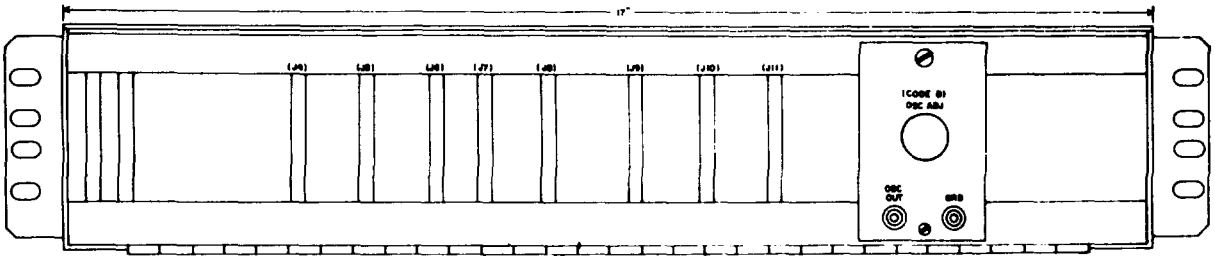
MODULE EXTENDER

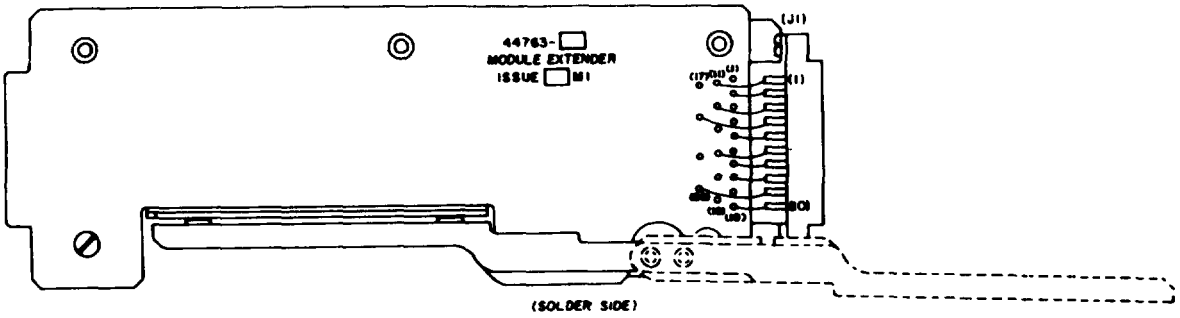
• Module Extender (PIN 900-44763-01) is used to extend modules in front of the modem shelf for adjustment or maintenance.

• The extender stores in a pair of unused module guides inside the modem shelf.

• When used, it plugs into the modem shelf jack of the module under test, and the module under test plugs into the jack at the front of the extender.

• A bracket folds out to support the module under test.





1-10. DIFFERENCES BETWEEN MODELS

a. The differences between models are tabulated below.

b. The major difference is the modem shelf used for each digital data modem.

• MD-701/UY uses unshielded modem shelf with rear termination panel and RF oscillator.

• MD-701A/UY uses modified unshielded modem shelf with rear termination panel and RF oscillator and is modified for use of a data carrier alarm module.

• MD-701B/UY uses RF shielded modem shelf (which includes a rear termination panel) with RF oscillator and includes a data carrier alarm module.

c. The minor differences are the unmodified modules used in the MD-701/UY and the modified modules used in the MD-701A/UY and MD-701B/UY. Refer to the specific modules listed below in table 1-1.

d. Also, refer to paragraph 1-12, Equipment Configuration, for an illustration of each digital data modem, including the differences.

TABLE 1-1. DIFFERENCES

DIGITAL DATA MODEM MD-701(*)/UY

COMPONENT/ASSEMBLY	701/UY	701A/UY	701B/UY
DIGITAL DATA MODEM			
MD-701/UY (26C1-30006-2A)	*		
MD-701A/UY (26C1-30006-03AC)		*	
MD-701B/UY (26C1-30006-04AC)			*
POWER SUPPLY ASSEMBLY, A1			
900-44751-01	*		
900-44571-01 modified by MK2-44571-01		*	*
DIGITAL DATA TRANSMITTER, A2			
900-44572-01	*		
900-44572-01 modified by MK1-44572-01		*	*

TABLE 1-1. DIFFERENCES - continued

DIGITAL DATA MODEM MD-701(*)/UY

COMPONENT/ASSEMBLY	701/UY	701A/UY	701B/UY
TRANSMITTER CLOCK, A3			
900-44761-01	*	*	*
RECEIVER LINE FILTER, A4			
900-44753-01	*	*	*
EQUALIZER, A5			
900-44755-01	*	*	*
LIMITER-DISCRIMINATOR, A6			
900-44756-01	*	*	*
DECODER ERROR DETECTOR, A7			
900-44757-01	*		
900-44757-01 modified by MK-2-44757-01		*	*
DIGITAL RECEIVER CLOCK, A8			
900-44757-01	*		
900-44760-02		*	*

Table 1-1. DIFFERENCES-Continued

DIGITAL DATA MODEM MD-701(*)/UY

COMPONENT/ASSEMBLY	701/UY	701A/UY	701B/UY
EXTENDER UNIT 900-44763-01	*	*	*
DATA CARRIER ALARM,A11 900-46841-01		*	*
TRANSMITTER RECEIVER SHELF, CODE AB 911-46880-01	*		
TRANSMITTER RECEIVER SHELF, CODE AB 911-46880-01 modified by MK-1-46880-01		*	
TRANSMITTER RECEIVER SHELF, CODE AB 911-46870-01			*
RADIO FREQUENCY OSCILLATOR, 4.8 MHz, A9 190-47861-01	*	*	*

1-11. EQUIPMENT DATA

Data Rates	1200 or 2400 bits per second.

DATA INPUT

Input Line	Single wire ground return.
Format	NRZ serial-by-bit binary data.
Level Options	See Data Level Options tabulation
Input Sensibility	Voltage transients of up to 0.8V peak-to-peak do not affect operation.
Input Impedance	Greater than 5000 ohm, shunted by not more than 200 picofarads.
Rise/Fall Times	Up to 200 microseconds acceptable.

DATA OUTPUT

Output Line	Single wire ground return.
Format	NRZ serial-by-bit binary data.
Level Options	-6V for "1" or mark, +6V for "0" or space. Can be reversed by strapping options.
Output Impedance	Less than 100 ohms at load currents up to 10 milliamperes.
Load Impedance	600 ohms minimum shunted by not more than 2500 picofarads.
Rise/Fall Times	Between 1 and 2 microseconds, with provisions for adding capacitor to increase time to 10% of bit length.

TRANSMITTER OUTPUT

Signal	Synchronous fm.
Frequency	1200 to 2400 Hz nominal.
Level	-10 to +6 dbm, adjustable.
Impedance	300, 600 or 900 ohms balanced.

RECEIVER INPUT

Signal	Synchronous or nonsynchronous frequency modulation
Frequency	1200 to 2400 Hz nominal.
Level	Adjustable to accept level between -30 and 0 dbm. Short term variations 10 db above and 20 db below the set level are acceptable.
Impedance	300, 600, or 900 ohms balanced.

TRANSMITTER CLOCK OUTPUT

Waveform	Square wave.
Frequency	Same as data rate.
Level	±6 volts, balanced to within 10%.
Output Impedance, Load Impedance, and Rise/Fall Times	Same as Data output.
Phasing	Strapping options permit either positive or negative-going edges to be coincident with data transitions.
Frequency Stability	0.01%.

RECEIVER CLOCK OUTPUT

Waveform	Square wave.
Frequency	Same as data rate.
Level	+6 volts, balanced to within 10%.
Output and Load Impedances	Same as data output.
Rise Time	Between 1 and 4 microseconds, with provisions for adding capacitor to increase time to 10% of bit length.
Phasing	Strapping options permit either positive or negative-going edges to be coincident with data transitions.
Frequency Stability	Synchronized to transmitter clock.

Carrier On-Off Control:

	ON	OFF
Standard	Ground	Open
EIA Circuit CA	+3 volts	-3 volts
(optional)	(min)	(min)
Interlock Circuit	NORMAL	INOPERABLE
Standard	Ground	Open circuit
EIA Circuit CC	+ 3 volts	-3 volts
(optional)	(min)	(min)

CARRIER ALARM OUTPUT

Level	+6V normal and OV alarm.
Output Impedance, Load Impedance, and Rise Time	Same as data output.

ERROR ALARM OUTPUT

Indication	Indicator lamp lights for 40 milliseconds
Alarm Signal	One 15-microsecond positive or negative going pulse for each error, or a 40-millisecond pulse.

Output Impedance, Load Impedance, and Rise/Fall Time	Same as data output.
Power Supply Alarm	Provides normally open and normally closed outputs from alarm relay.

TRANSMISSION LINE REQUIREMENTS

Frequency Response	Without Equalization: +1 db from 900 to 2500 Hz. With Adjustable Equalizer: -2 to +6 db from 900 to 2700 Hz.
Envelope Delay	Without Equalization: Within 300
microseconds from 900 to 2500 Hz.	With Adjustable Equalizer: Within 1800 microseconds from 700 to 2700 Hz.
Line Impedance	300, 600, or 900 ohms balanced.
Signal/Noise Ratio	10.5 db at 1200 Hz. 13 db at 2400 Hz.
Interface System Compatibility	Conforms to E1A Standard RS-232-2-B recommendations and meets low level interface requirements of MIL-STD 188B.
Transmission Facilities	Low-speed system arrangement operates over FCC Tariff 237 Schedule 4A telephone networks, or any standard 3-KHz voice channel derived on open-wire, cable, carrier, or microwave facilities.
Power Requirements	100 to 134 volts ac, 47 to 63 cps, 17 watts.

ENVIRONMENTAL CONDITIONS

Ambient Temperature	0° to +50°C (+32° to +122° F)
Relative Humidity	95%
Altitude	10,000 feet

DIMENSIONS

Height	3-1/2 inches (2 mounting spaces)
Width	17 inches nominal, 19-1/2 inches with mounting flanges.
Depth	10 inches.
Weight	MD-701/UY-19 lbs. fully equipped.
MD-701A/UY-19 lbs.	fully equipped.
MD-701B/UY-50 lbs.	fully equipped.
Installation	Digital data modem mounts on a standard 19-inch equipment rack. All external connections are made at the rear.

TABLE 1-2. INPUT DATA OPTIONS AND VOLTAGE RANGES

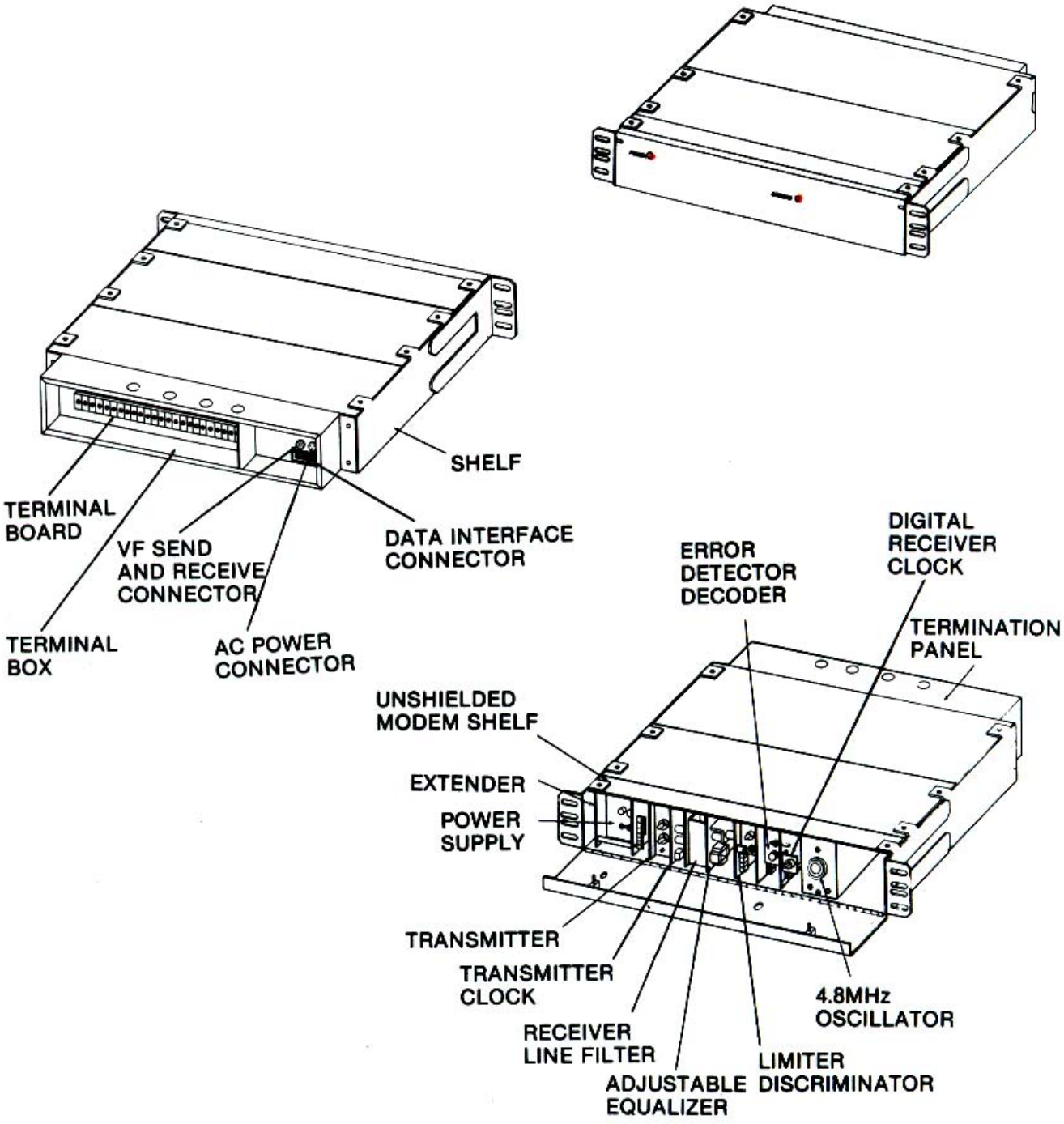
DATA INPUT LEVEL OPTIONS	INPUT VOLTAGE RANGES	
Input Data	**"1" or Mark**	**"O" or Space**
Zero Reference	-10 to -0.5v +10 to +0.5v	+0.5 to10v -0.5 to -10v
Positive Offset	-10 to +1v +10 to +2.2v	+2.2 to 10v +1 to 10v
Negative Offset	-10 to -2.2v +10 to -1v	-1 to 10v -2.2 to -10v

NOTES:

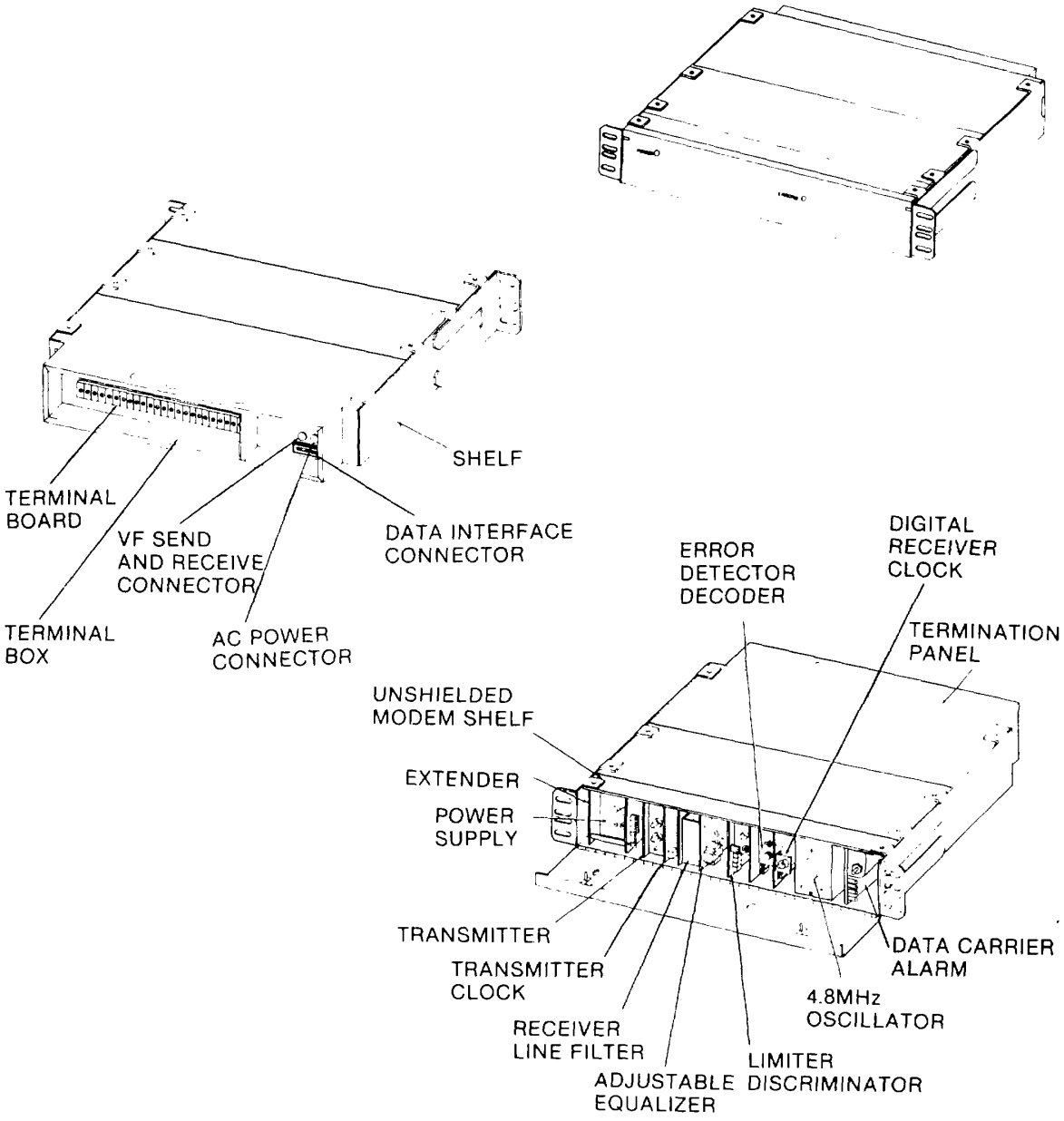
1. **Positive and negative operating points for zero reference option are balanced within 10%.**
2. **Additional Strapping options will accept input voltages up to twice those listed above.**

1-12. EQUIPMENT CONFIGURATIONS

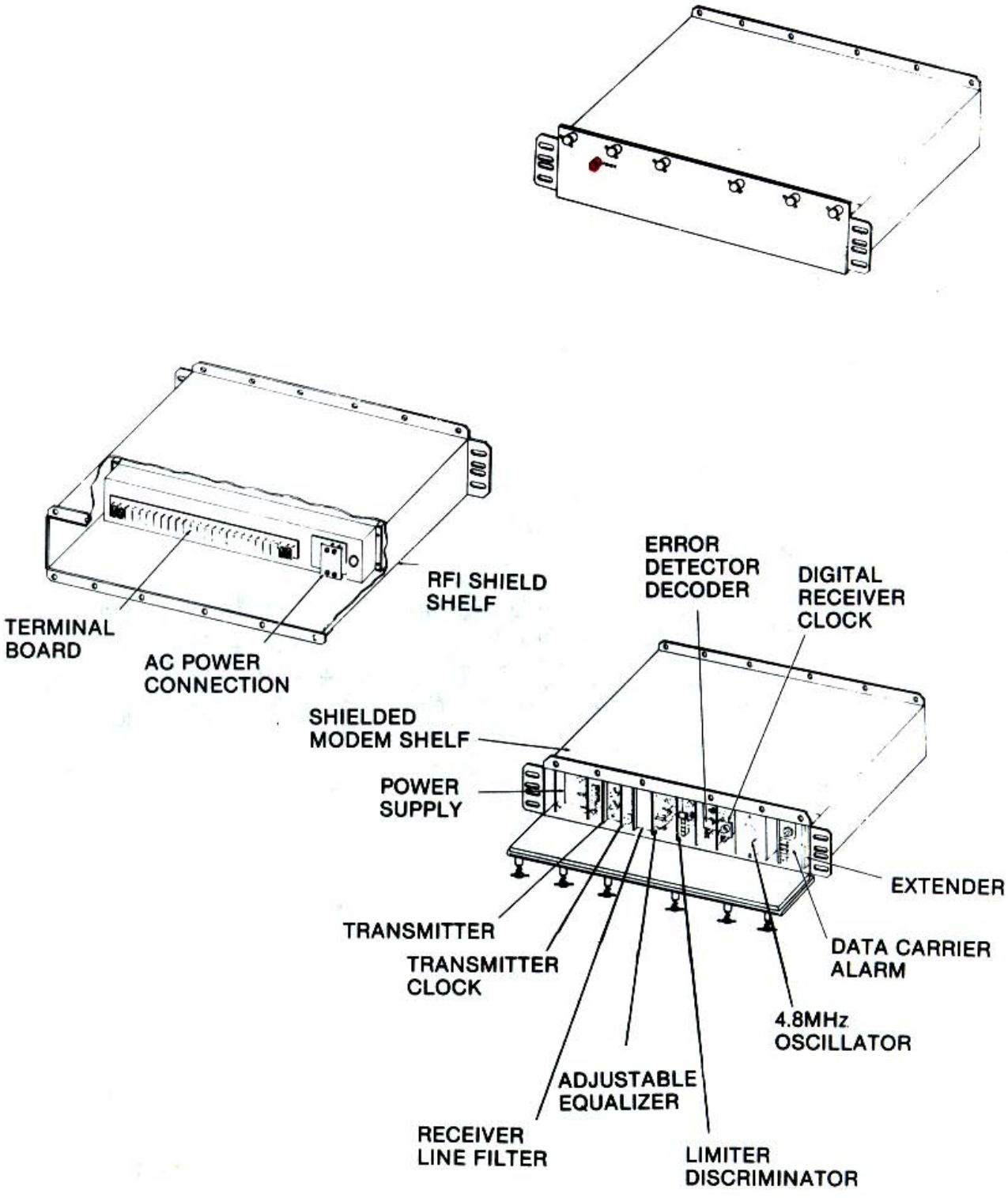
- MD-701/UY
- Unshielded Modem Shelf
- No Data Alarm Module
- External POWER and ERRORS Indicators



- MD-701A/UY
- Unshielded Modem Shelf
- Data Alarm Module and required Modem Shelf Modification
- External POWER and ERRORS Indicators



- MD-701B/UY
- Shielded Modem Shelf
- External POWER Indicator Only



1-13. SAFETY, CARE, AND HANDLING

- **CAUTION: Proper grounding is essential to satisfactory operation of the digital data modem.**
- **CAUTION: Test points are accessible at the front of the modules and should be used to avoid needless disassembly of the equipment.**
- **WARNING: When troubleshooting or making repairs in this equipment, be extremely careful. Voltages as high as 135 volts ac are present in the ac power circuit. Use insulated test probes when making the required voltage measurements. Always disconnect the ac power plug at shelf connector J1 or TB1 or otherwise interrupt the ac supply to the equipment before touching any of the internal parts.**
- **WARNING: Ground electronic parts having high voltages thereon, such as capacitors, to remove stored residual voltage.**
- **CAUTION: This equipment is transistorized; observe all cautions to prevent transistor damage. Do not make continuity or resistance checks other than those specified in the tests. Damage to the transistors and microelectronics devices, which can impair the performance of the equipment, may result if improper battery voltages and polarities are applied.**
- **WARNING: Don't take chances. Avoid personal injury. MD-701B/UY is heavy--it weighs 50 pounds. Use two men to lift.**

Section III. TECHNICAL PRINCIPLES OF OPERATION

1-14. GENERAL

a. The Digital Data Modem MD-701(*)/UY is a 4-wire duplex terminal consisting of a transmit branch, receive branch, and a common power supply and common RF oscillator.

(1) The digital data modem is used for transmitting and receiving serial-by-bit binary digital data at rates of 600, 1200, or 2400 bits per second (bps) over a standard 3-KHz voice frequency (vf) path which interconnects two data processing terminals.

(2) The vf path can be any facility such as open wire, cable, or wire or microwave carrier that accommodates a 3-kHz signal band and meets the minimum requirements for signal/noise and amplitude and delay distortion.

(3) Typical data processing terminals can include computers, card readers, computer and card reader combinations, high speed telegraph, facsimile, or digitalized voice equipment.

(4) The digital data modem operates with any type of equipment that produces and accepts an NRZ serial-by-bit binary signal having voltage and impedance characteristics within the ranges listed in Chapter 1, Equipment Data.

b. Indicators, visible at the front cover when the front cover is closed, allow monitoring the operation of the digital data modem. The POWER indicator when lit, shows that power is applied to the modem modules. The ERRORS indicator when lit, shows that there is trouble with the modem.

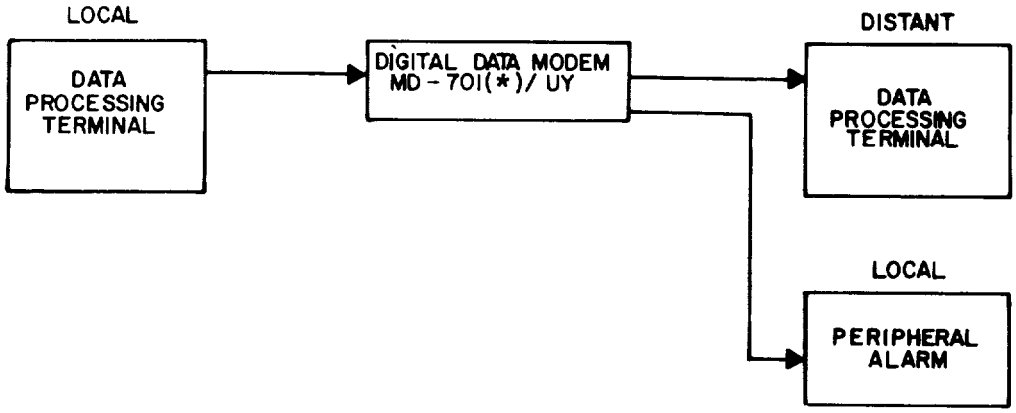
c. The data carrier alarm module provides alarm signals to a peripheral, visual and audible alarm located on the local data center console if a malfunction occurs in the digital data modem transmit branch, receive branch, or power supply.

1-15. TRANSMIT

a. Transmit branch contains two modules: a transmitter and a transmitter clock. The transmit branch converts serial-by bit NRZ binary data to a form which can be transmitted over the transmission path.

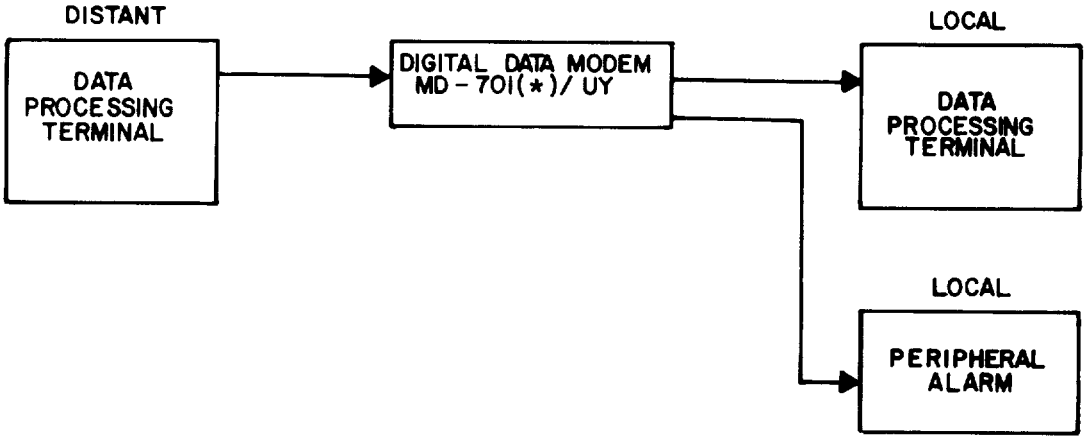
b. TRANS MODE switch on transmitter module is used for selecting the mode of transmission and during the mission is set to NORM. Four other positions provide test patterns for use during modem maintenance.

c. BIT RATE switch on transmitter module is used to select the operating bit rate of the transmit branch. Although located on digital receiver clock module in the receive branch, the BIT RATE switch controls the operating rate of transmitter clock module and is set to the same bit rate position as the BIT RATE switch on the transmitter during transmission.



1-16. RECEIVE

a. Receive branch contains five modules: a receiver line filter, adjustable equalizer, limiter discriminator, decoder error detector, and receiver clock. The receive branch converts signals on the receive line to serial-by-bit NRZ binary signals to drive the receiving data processor. The decoder error detector provides an error indicator at the front cover and supplies error output signals to alarm equipment.



b. REC MODE switch on limiter discriminator module is used for selecting the mode of reception and during the mission is set to NORM. The other position, BACK-TO-BACK, is used during modem maintenance. BIT RATE switch on decoder error detector module and the BIT RATE switch on the digital receiver clock are used for selecting the operating bit rate of the receive branch.

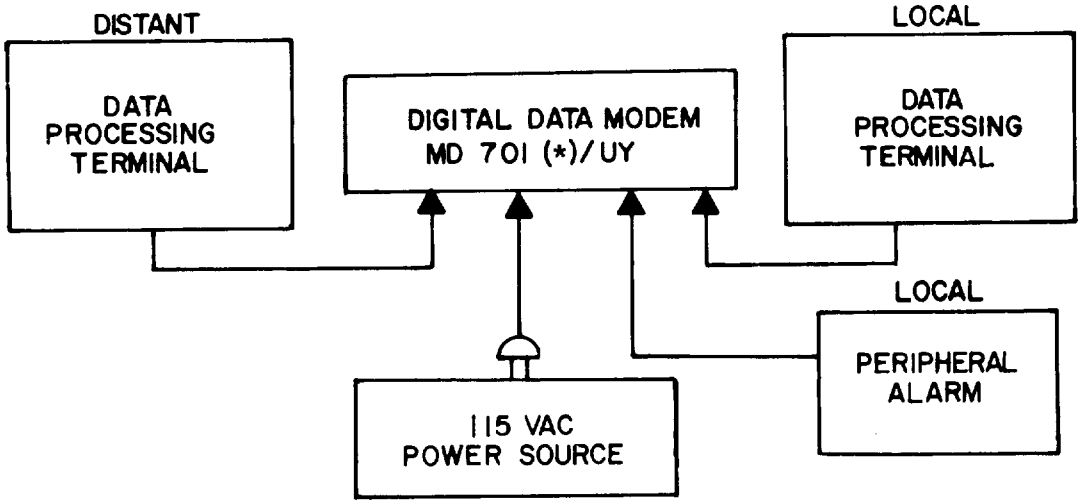
1-17. ALARMS

The Data Carrier Alarm module provides individual alarm outputs if trouble occurs in any of the monitored signal paths: transmit data, transmit carrier, receive carrier, and receive data signals. This type of alarm output provides a fail-safe feature, in that, failure of the circuit being monitored, failure of the alarm circuit, or failure within the entire digital data modem will always produce an alarm output. ALARM CUTOFF switch when set to NORM is used for providing an alarm signal and when set to CUTOFF for cancelling an alarm signal.

1-18. INTERCONNECTION

a. Digital data modem is interconnected by use of the rear termination panel. The distant data processing terminal, the local data processing terminal, the local peripheral alarm, and the 115-volt ac power/protective ground connector are connected to the rear termination panel.

b. Interconnection will have been performed by maintenance personnel prior to operation.



CHAPTER 2

OPERATING INSTRUCTIONS

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

2-1. GENERAL

a. As the operator of the digital data modem, you will be concerned with four types of controls and two indicators.

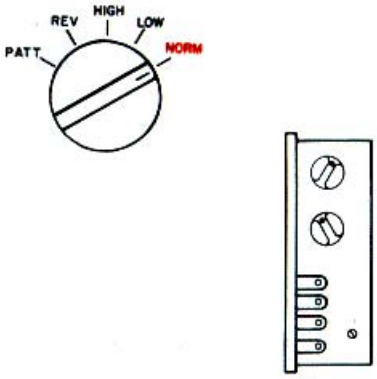
CONTROLS	INDICATORS
Transmit And Receive Mode	Power
Bit Rate	Errors
Alarm	
Power Supply	

b. Location of operating controls and indicators on modules is shown on a decal on the inside of the Modem shelf front cover.

2-2. CONTROLS

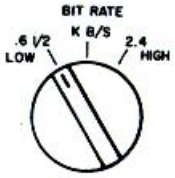
TRANS MODE Switch

- Five position rotary switch
- During operation, switch position **NORM** allows transmission of input digital data.
- During organizational maintenance and testing:
  LOW-1200 Hz signal is applied to transmit line
  HIGH-2400 Hz signal is applied to transmit line
  REV-test pattern generator produces a reversal pattern of alternate ones and zeroes; and signal appearing on transmit line resembles alternate one and zero data input pattern for particular data rate applied.
  PATT-test pattern generator produces a random data input which results in a random data output on transmission line.



BIT RATE Switch

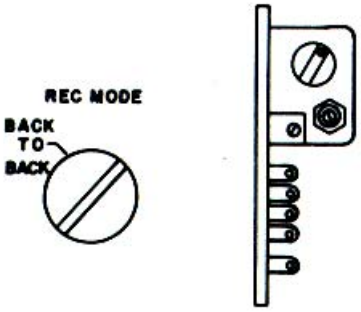
- Two position rotary switch
- During operation controls transmitted data rate
  LOW-600/1200 bps
  HIGH-2400 bps



LIMITER DISCRIMINATOR

REC MODE SWITCH

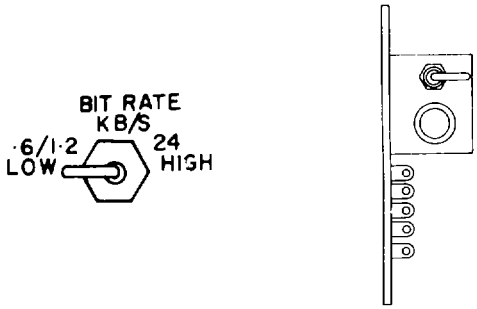
- Two position rotary switch
- During operation switch position allows reception of received digital data



- During maintenance and testing, switch position BACK-TO-BACK allows testing of the receive and transmit branch by routing the transmit branch output into the receive branch.

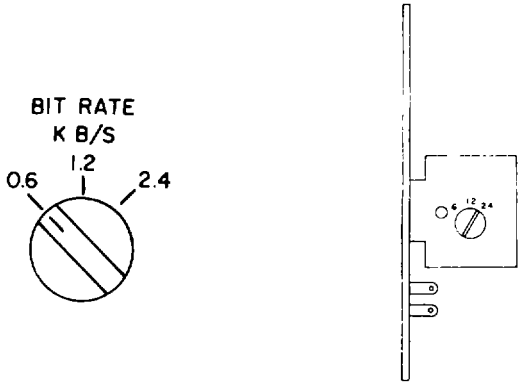
DECODER ERROR DETECTOR

BIT RATE Switch ·
- Two position toggle switch ·
- During operation, controls received data rate
  LOW-600/1200 bps
  HIGH-2400 bps



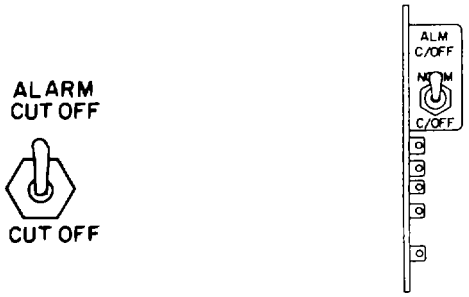
DIGITAL RECEIVER CLOCK

BIT RATE Switch ·
- Three position rotary switch
- During operation, controls operating data rate of receive and transmit branches 0.6, 600 bps 1.2, 1200 bps 2.4, 2400 bps



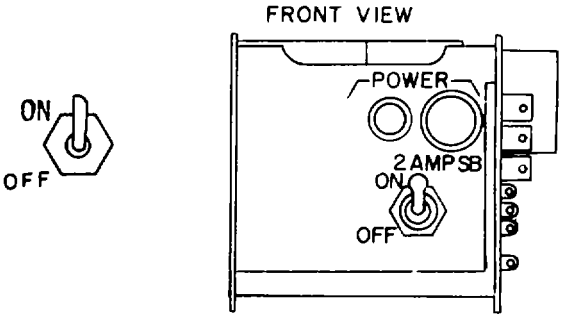
DATA CARRIER ALARM

ALARM CUTOFF Switch
- Two position toggle switch
- During operation, controls output of alarm signal to peripheral data center visible/audible alarms NORM, alarm signal routed to peripheral alarm IN CUT OFF Position, cancels alarm signal



POWER SUPPLY

ON/OFF Switch
- Two position toggle switch
- Turns power supply on or off
- During operation, switch position ON applies low voltage power to digital data modem



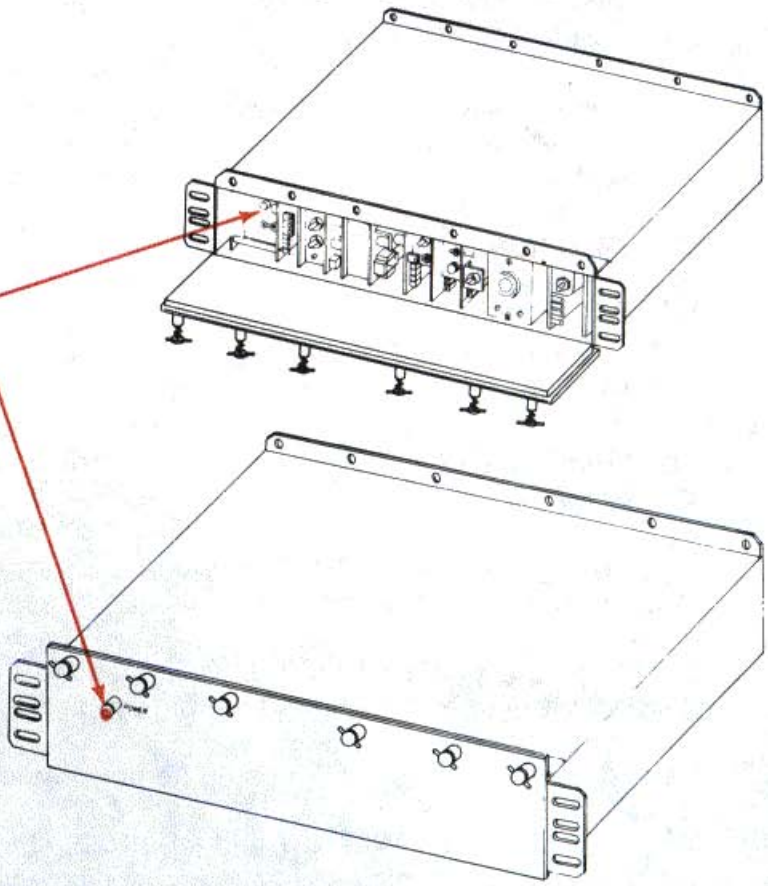
2-3. INDICATORS

POWER SUPPLY

POWER LAMP INDICATOR

Indicates power supply has been turned on and power applied.

MD 701B/UY

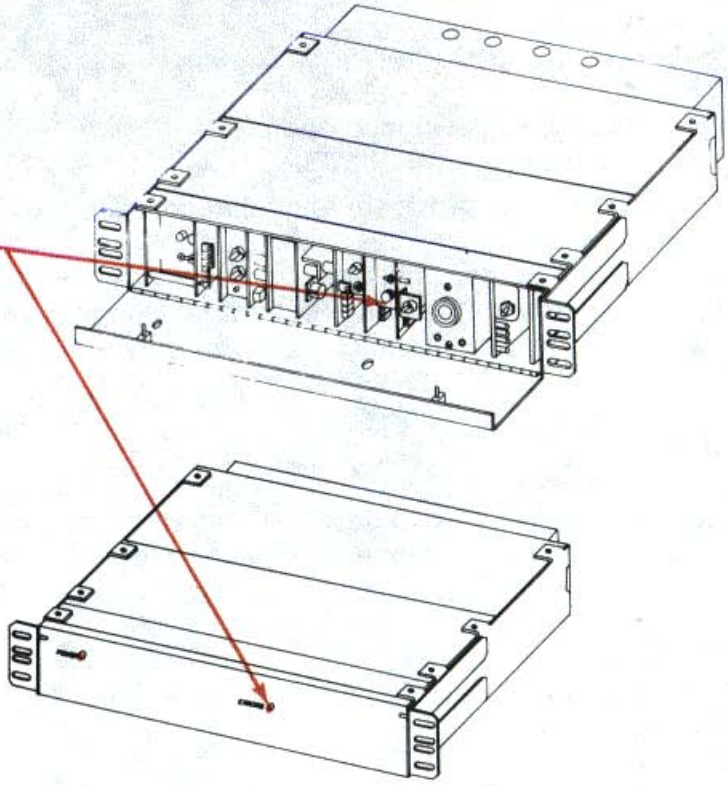


DECODER ERROR DETECTOR

ERRORS Lamp Indicator

Indicates errors in received data.

MD 701/UY and MD 701A/UY



NOTE

No ERRORS indicator is provided at the exterior of the front cover of the MD-701B/UY modem shelf.

Section II. PREVENTIVE MAINTENANCE CHECKS AND SERVICES (Operator's)

2-4. GENERAL

To insure that the digital data modem is always ready for operation, you must do scheduled preventive maintenance checks and services (PMCS). When you are doing any PMCS or routine checks, keep in mind the WARNINGS and CAUTIONS about electrical shock and bodily harm.

2-5. PMCS TABLE

A PMCS table for Digital Data Modem MD-701(*)/UY appears at the end of this section. There are five categories or intervals of PMCS: B, D, A, W, and M. They head the INTERVAL columns of the PMCS TABLE. A check mark in one or more of the INTERVAL columns indicates the check and/or service that should be performed by the operator at a particular time.

a. B stands for Before. (B) PMCS should be performed BEFORE operation to make sure your equipment is ready for your mission.

b. D stands for During. (D) PMCS is performed DURING operation. This will help you spot small troubles before they become big problems.

c. A stands for After. (A) PMCS should be performed AFTER operation.

d. (W) PMCS stands for WEEKLY and (M) PMCS stands for MONTHLY. These are important preventive maintenance checks and services you make at those intervals to keep serious problems from suddenly happening.

e. You should perform (W) PMCS as well as (B) PMCS if:

- You are the assigned operator and have not operated the digital data modem since the last (W) PMCS.
- You are operating the digital data modem for the first time.

f. If your equipment fails to operate, notify the proper personnel as directed in your station's Standard Operating Procedure. Corrective action will be taken by the next level of maintenance personnel. No operator/crew/ troubleshooting is authorized for the M D-701 (*)/UY.

NOTE

Use your PMCS table to get the number for the TM ITEM NO. column of DA Form 2404 (Equipment Inspection and Maintenance Worksheet.)

NOTE

If your equipment MUST be in operation all the time, check and service those items that can be checked and serviced without disturbing operation. Make the complete checks and services when the equipment CAN be shut down.

g. Whenever an equipment is reinstalled after removal for any reason perform the necessary (B) PMCS to be sure that the item meets the readiness reporting criteria.

h. Routine checks are NOT listed as PMCS checks. They are checks such as the following:

- Cleaning
- Dusting
- Checking for frayed cables
- Storing items not in use
- Checking for loose nuts, bolts, and screws
- Checking for loose or broken knobs

i. Routine checks are things that you should do anytime you see they must be done. If you find a routine check like one of those listed in your PMCS table it was listed because other personnel reported problems with this item.

EQUIPMENT INSPECTION AND MAINTENANCE WORKSHEET

For use of this form, see TM 38-750; the proponent agency is the office of the Deputy Chief of Staff for Logistics.

1. ORGANIZATION	2. NOMENCLATURE AND MODEL
126 Signal Company, Fort Myer, VA	Modem, DIGITAL DATA MD-1026 ( ) (P)/G

3. REGISTRATION/SERIAL/FSN	4a. MILES	b. HOURS	c. ROUNDS FIRED	d. HOT STARTS	5. DATE	6. TYPE INSPECTION
					13 Jun 79	PMCS

7. APPLICABLE REFERENCE

TM NUMBER	TM DATE	TM NUMBER	TM DATE
11-5820-865-10	OCT 79		

INSTRUCTIONS - Perform each check listed in the TM applicable to the inspection performed. Following the sequence listed in pertinent TM, complete form as follows:

COLUMN a - Enter TM item number.

COLUMN b - Enter the applicable condition status symbol.

COLUMN c - Enter deficiencies and shortcomings.

COLUMN d - Show corrective action for deficiency or shortcoming listed in Column c.

COLUMN e - Individual ascertaining completed corrective action initial in this column.

ALL INSPECTIONS AND EQUIPMENT CONDITIONS RECORDED ON THIS FORM HAVE BEEN DETERMINED IN ACCORDANCE WITH DIAGNOSTIC PROCEDURES AND STANDARDS IN THE TM CITED HEREON.

8a. SIGNATURE (Person(s) performing inspection)	8b. TIME	9a. SIGNATURE (Maintenance Supervisor)	9b. TIME	10. MANHOURS REQUIRED
Joseph D. Stetter	0920 hours			

TM ITEM NO. a	STATUS b	DEFICIENCIES AND SHORTCOMINGS c	CORRECTIVE ACTION d	INITIAL WHEN CORRECTED e
11		Power indicator lamp failed to light.	Replaced bulb	J.D.L

USE PMCS ITEM NO

DA FORM 2404

Table 2-1. OPERATOR/CREW PREVENTIVE MAINTENANCE CHECKS AND SERVICES

Item No.	INTERVAL B	D	A	W	M	Item To Be Inspected	Procedures Check For And Have Repaired Or Adjusted As Necessary.	Equipment Is Not Ready/Available If:
1	•			•		POWER ON switch	Set power supply switch to ON.	Power switch cannot be set to ON.
2	•	•		•		Power applied, visual Indication	Observe that POWER indicator lamp is lighted. Replace bulb if necessary.	POWER lamp does not light.
3	•	•		•		ERRORS visual Indication	Observe that ERRORS indicator lamp is not lighted.	ERRORS lamp is lighted.
4	•	•		•		Malfunction of modem audible indication	Listen for alarm sound from peripheral alarm.	Alarm sounds.
5	•			•		Alarm CUTOFF switch	If alarm sounds, on data carrier alarm set ALARM CUTOFF switch to CUTOFF position. Alarm sound should cease.	Alarm sounds.
6	•			•		Alarm CUTOFF switch	If alarm sounds, on data carrier alarm set ALARM CUTOFF switch through both switch setting positions. Check that switch can be positioned to NORMAL OR CUTOFF. **NOTE** **The following PMCS can be performed without power applied to the digital data modem, if required. Go to and perform PMCS item numbers 12 and 13.Then, return to and perform PMCS item numbers 7 through 11.**	Alarm CUTOFF switch will not move or does not align with applicable switch position.
7	•			•		TRANS MODE switch switch	On transmitter, rotate TRANS MODE switch through all switch setting positions. Check that can be positioned to NORM, LOW, HIGH, REV. and PATT.	TRANS MODE switch will not rotate or does not align with applicable switch position.

Table 2-1. OPERATOR/CREW PREVENTIVE MAINTENANCE CHECKS AND SERVICES (Continued)

Item No.	INTERVAL B	D	A	W	M	Item To Be Inspected	Procedures Check For And Have Repaired Or Adjusted As Necessary.	Equipment Is Not Ready/Available If:
8	•			•		BIT RATE switch	On transmitter, rotate TRANS MODE switch through all switch setting positions. Check that switch can be positioned to NORM, LOW, HIGH, REV. PATT.	BIT RATE switch will not rotate or does not align with applicable switch position.
9	•			•		REC MODE switch	On limiter discriminator, rotate REC MODE switch through both switch setting positions. Check that switch can be positioned to NORM or BACK TO BACK.	REC MODE switch will not rotate or does not align with applicable switch position.
10	•			•		BIT RATE switch	On decoder error detector move BIT RATE switch through both switch setting positions. Check that switch can be Positioned to LOW or HIGH.	BIT RATE switch will not move or does not align with applicable switch position.
11	•			•		BIT RATE switch	On digital receiver clock, rotate BIT RATE switch through all switch setting positions. Check that switch can be positioned to 0.6, 1.2, 2.4.	BIT RATE switch will not rotate or does not align with applicable switch position.
12	•		•			Shutdown	Set power supply switch to OFF.	
13	•		•			POWER OFF visual indication	Observe that POWER indicator lamp is not lighted.	POWER lamp is lighted.

Section III. OPERATION UNDER USUAL CONDITIONS

2-6. ASSEMBLY AND PREPARATION FOR USE

The digital data modem will be transported to the site and installed by maintenance personnel. Preliminary adjustments and system-check will have been performed before you operate the equipment. Grounding and power connections and system application strapping will have been made by maintenance personnel.

2-7. INITIAL CHECKS

You will be ready for operation after making the initial checks listed below.

- Digital data modem - Inspect your modem. Use the Components of End Item List (COEIL) in Appendix B to be sure you have everything needed to operate the modem. Also look for damaged items. Report missing or damaged material to the proper personnel.
- Power - Make sure 115-volts power connections are tight at the 115-volt ac power source.
- Grounding - Check the protective grounding connection. Look for a loose connection, and tighten if necessary.

2-8. OPERATING PROCEDURES

a. After the digital data modem has been installed and checked out for a particular system application, it is placed in operation.

b. Simplified operating procedures are as follows: Set TRANS MODE, REC MODE, BIT RATE, AND ALARM CUTOFF switches in accordance with the Standard Operating Procedures (SOP) of the day for the system application. Then, turn the power supply switch to ON.

NOTE

Do not turn power supply to ON unless the transmitter branch and receive branch controls are set for the assigned system application; otherwise, you will transmit at an unauthorized data rate.

c. Operating Instructions - Turn on

- Set transmitter TRANS MODE switch to NORM.
- Set transmitter BIT RATE switch to LOW or HIGH bit rate in accordance with the stations SOP for the day.
- Set limiter discriminator REC MODE switch to NORM.
- Set decoder error detector BIT RATE switch to LOW or HIGH in accordance with the stations SOP.
- Set digital receiver clock BIT RATE switch to 0.6, 1.2, or 2.4 in accordance with the stations SOP.

NOTE

All three BIT RATE switches must be in the same BIT RATE position.

- Set ALARM CUTOFF switch to NORM, or in accordance with the stations SOP.
- Set power supply switch to ON.

CAUTION

Do not turn power supply switch to ON unless the transmitter branch and receive branch controls are set for the assigned system application; otherwise, you will transmit at an unauthorized data rate.

NOTE

Do not turn digital data modem off except under direction of your chief operator or in an emergency. During actual use it has been found that the digital data modem operates more efficiently when the RF oscillator is allowed to remain stabilized with power applied.

2-9. STOPPING PROCEDURE

NOTE

Perform only during authorized shutdown or in an emergency.

a. Set power switch to OFF.

b. In an emergency, set main circuit breaker to OFF.

2-10. OPERATING INSTRUCTION ON DECALS AND INSTRUCTION PLATES

a. There are no operating instructions on decals and no instruction plates.

b. On the inside of the front cover of the modem shelf is a decal which shows the location of controls and test pin jacks, and their nomenclature.

Section IV. OPERATION UNDER UNUSUAL CONDITIONS

2-11. OPERATION UNDER UNUSUAL CONDITIONS

Your chief operator will tell you how to operate and how to set the switches on the digital data modem under unusual conditions.

2-12. EMERGENCY STOPPING PROCEDURE

To turn the digital data modem off in an emergency, set the power switch on the power supply to OFF.

CAUTION

If the equipment is turned off by the use of the emergency stopping procedure, operate all circuit breakers and equipment power switches to OFF before attempting to restart the digital data modem.

CHAPTER 3

OPERATOR'S MAINTENANCE INSTRUCTIONS

Section I. LUBRICATION INSTRUCTIONS

3-1. NO LUBRICATION IS REQUIRED FOR THE DIGITAL DATA MODEM.

Section II. TROUBLESHOOTING PROCEDURE

3-2. NO OPERATOR/CREW TROUBLESHOOTING IS AUTHORIZED FOR THE DIGITAL DATA MODEM

If you turn on the power switch on the power supply and the POWER lamp does not light, report this trouble to the system control point and/or your chief operator. Any trouble detected by you is to be reported to the system control point and/or your chief operator. Corrective action will be taken by the next level of maintenance personnel.

3-3. NO OPERATOR/CREW MAINTENANCE IS AUTHORIZED FOR THE DIGITAL DATA MODEM.

CHAPTER 4

ORGANIZATIONAL MAINTENANCE PRINCIPLES OF OPERATION

Section I. BLOCK DIAGRAM DESCRIPTION

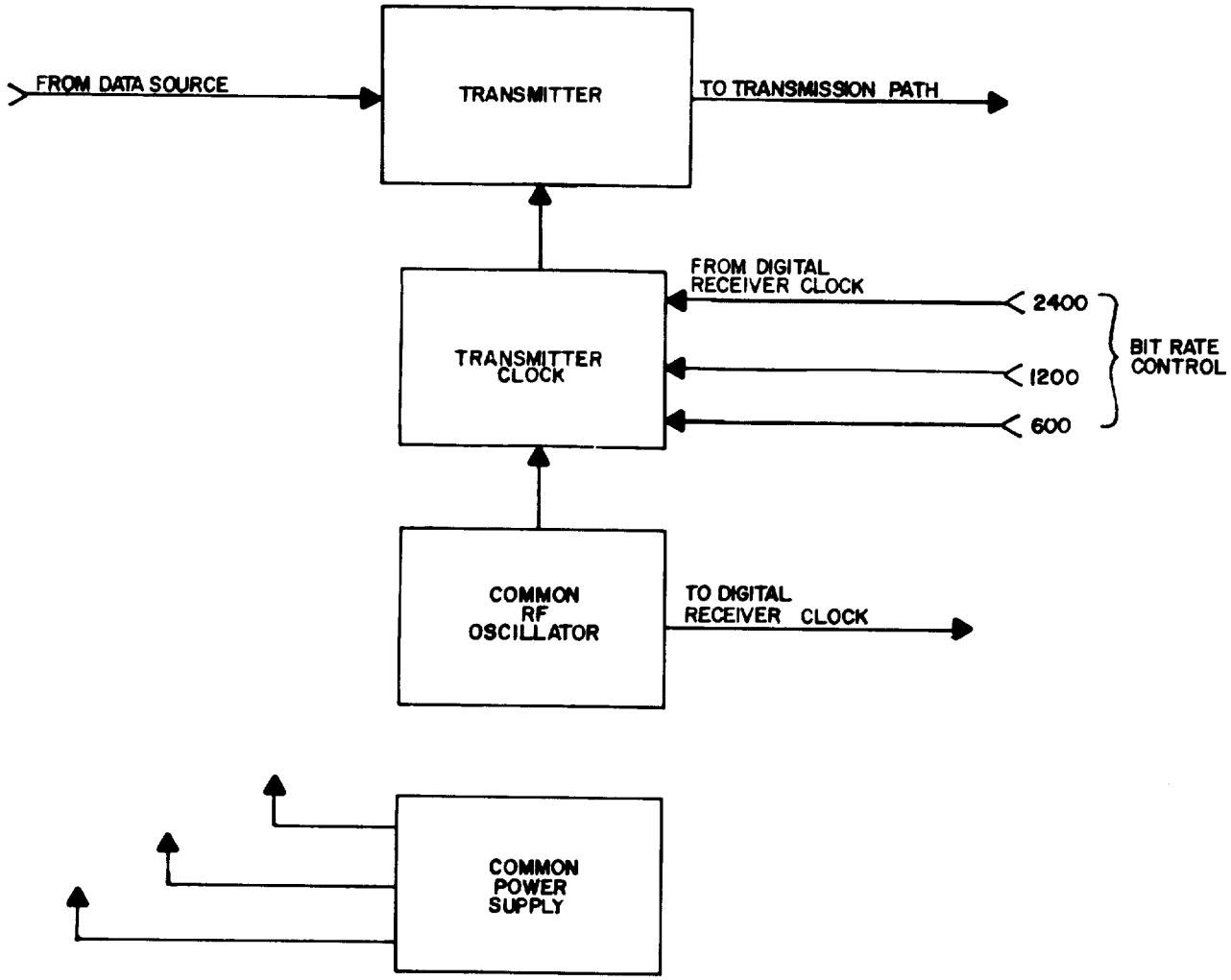
4-1. GENERAL

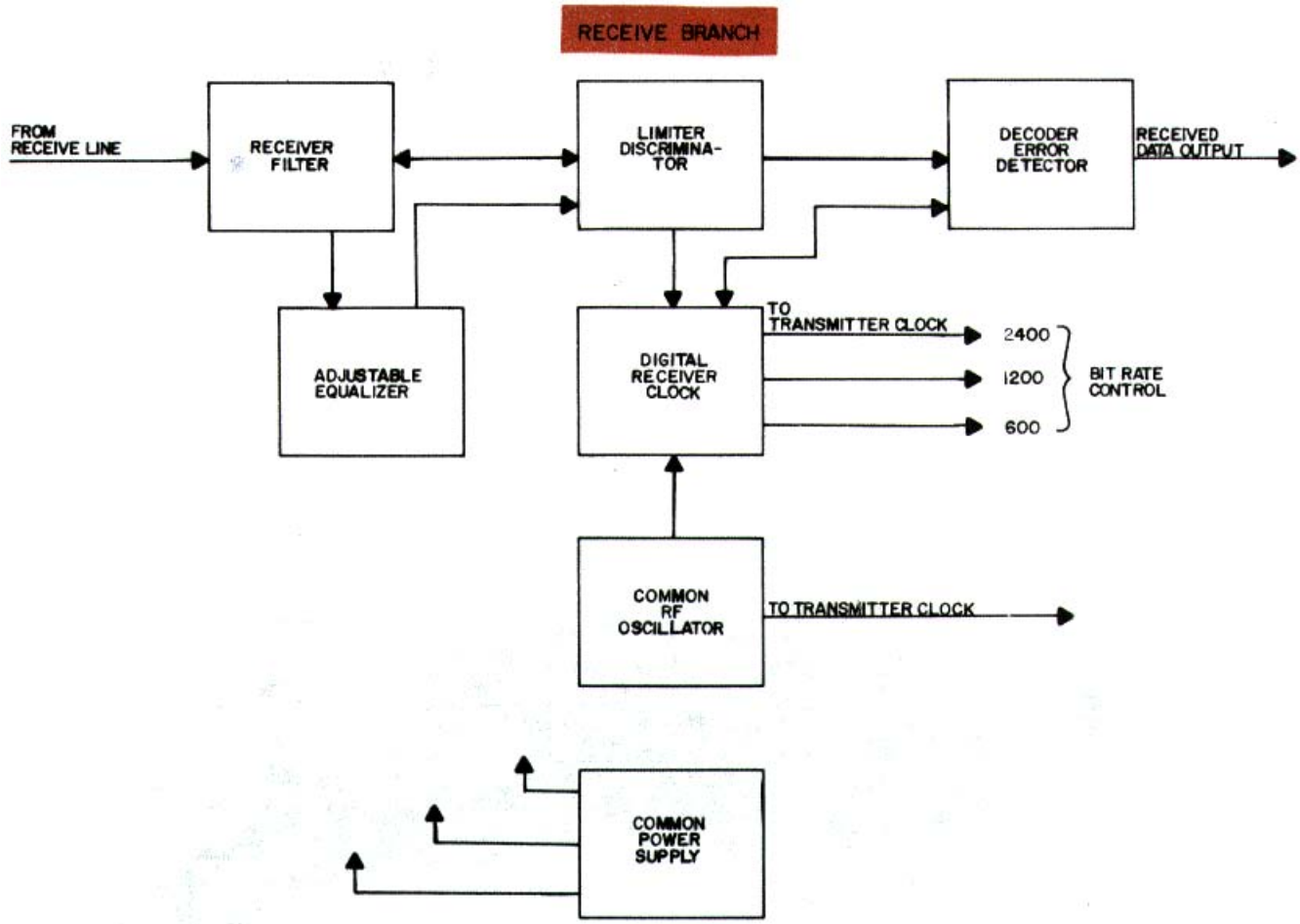
The Digital Data Modem MD-701(*)/UY is a modulator-demodulator used for transmitting and receiving serialized digital data at speeds of 600, 1200, and 2400 bps over a standard 3kHz voice channel. It has a transmit branch, which consists of two modules and a RF oscillator, and a receive branch, which consists of five modules and the same RF oscillator. A power supply is common to both branches. The MD-701A/UY and MD701B/UY have a data carrier alarm module which provides a fail-safe alarm output if the modem malfunctions.

Transmitter	• Accepts serial-by-bit binary data at specified bps rate. • Produces synchronous frequency modulated output. • Matching transformer couples transmitter output to vf path. • Supplies square wave output to transmitter clock at specified bps rate. • Provides test pattern generator for checking modem operation.
Transmitter Clock	• Receives stable 4.8 MHz sine wave from RF oscillator. • Provides 2400 Hz square wave timing signal to transmitter. • Produces secondary timing source for synchronizing related data equipment.
Receiver Line Filter	• Matching transformer couples input signal to low pass filter. • Low pass filter amplifies signal and applies it to band pass filter. • Band pass filter initially shapes duobinary signal.
Adjustable Equalizer	• Equalizes any delay and amplitude distortion that occurs in receive signal path.
Limiter Discriminator	• Receives binary or duobinary encoded frequency modulated signals. • Converts signals into analog form. • Controls a path between the output transmitter line filter and the limiter discriminator when REC MODE switch is placed in BACK-TO-BACK mode for checking modem operation. • Provides local testing of some receive circuits.
Decoder Error Detector	• Regenerates signals from limiter discriminator to a serial-by-bit NRZ form. • Monitors the received data pattern and provides alarm signal when errors are detected. • Monitors the received carrier signal level and provides alarm signal if level decreases below a preset level. • Provides an error visual indication by means of an ERRORS indicator lamp.

Digital Receiver	• Receives a stable 4.8 MHz timing frequency from the RF oscillator. • Provides two outputs: one for data retiming within the internal system, and the other for retiming external sources. • May be operated at 600, 1200, or 2400 bps. • Controls transmitter clock.
Data Carrier Alarm	• Provides four alarm circuits which monitor the transmitter and receiver data and carrier signals. • Provides fail-safe alarm output to peripheral audible/visual alarm if trouble occurs in any monitored signal path, or in the power supply.
RF Oscillator	• Provides stable 4.8 MHz sine wave timing signal to transmitter clock and digital receiver clock.
Power Supply	• Provides regulated +12, -12, and +4 volts to all modules.

TRANSMIT BRANCH





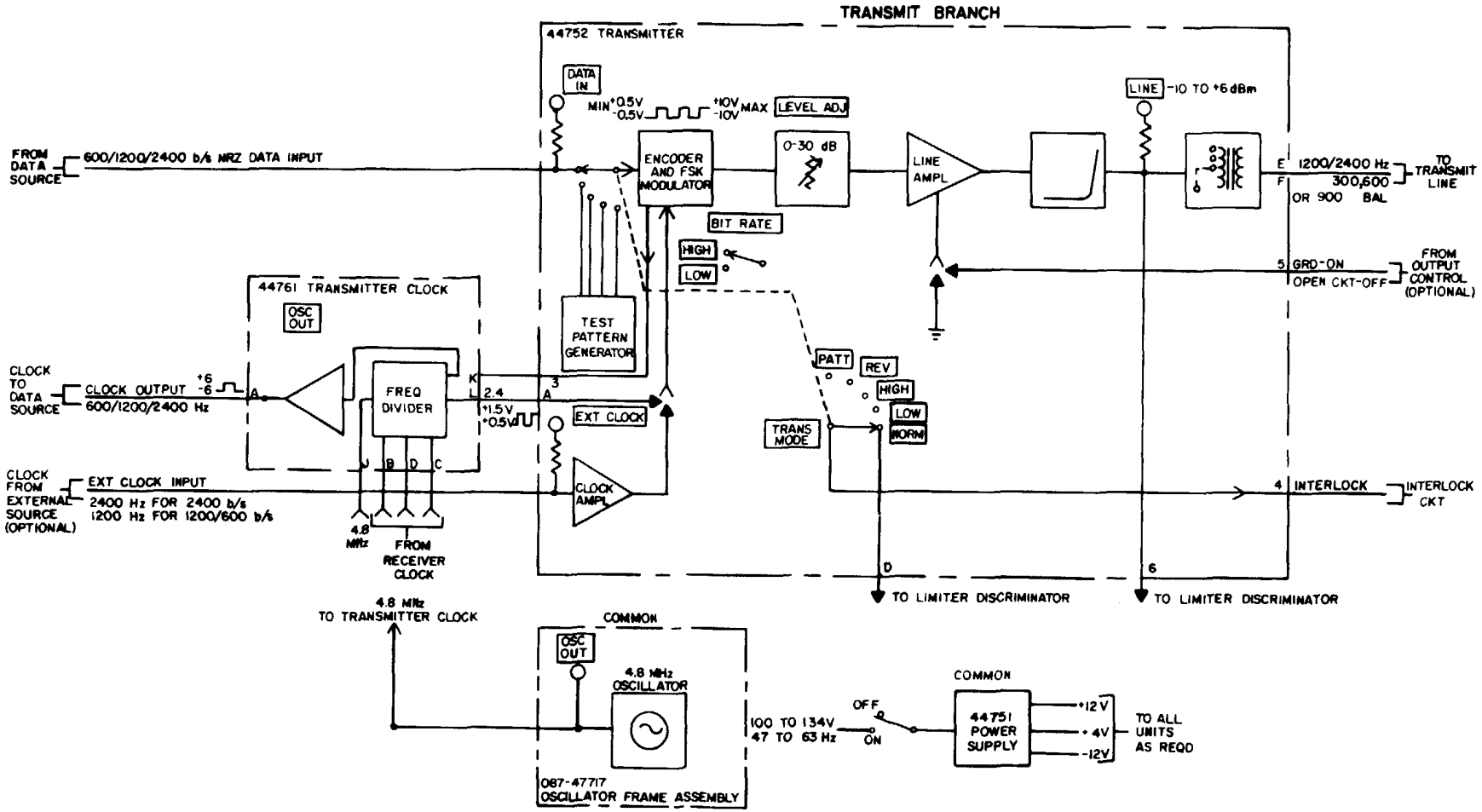
4-2. SIMPLIFIED PCC BOARD LEVEL CIRCUIT DESCRIPTION

a. Transmit Branch

(1) The primary function of the transmit branch is to convert the serial-by-bit NRZ data at the input to a form which can be accommodated by the transmission path.

(2) The transmitter clock supplies a 2400 Hz square wave which is derived from the 4.8 MHz RF oscillator. This output is applied to the encoder, FSK modulator, and the test pattern generator in the transmitter. For high speed operation, the transmitter clock signal is returned to the clock, amplified, and then supplied to any external equipment requiring a timing signal. For low speed operation, the encoder portion of the transmitter divides the clock signal by two and then extends the 1200 Hz signal to the FSK modulator, test pattern generator, and transmitter clock. Operating speed for the transmitter clock is controlled by the digital receiver clock.

(3) The encoder is used for high speed operation, and is controlled by the clock signal in such a manner that each data bit is sampled in the middle during the negative transition of the clock signal. This action encodes the original data to a duobinary form which is then applied to the FSK modulator.


TRANSMIT BRANCH
44752 TRANSMITTER
DATA IN
MIN +0.5V -0.5V
+10V -10V MAX
LEVEL ADJ
LINE -10 TO +6 dBm
FROM DATA SOURCE
600/1200/2400 b/s NRZ DATA INPUT
ENCODER AND FSK MODULATOR
0-30 dB
LINE AMPL
E 1200/2400 Hz
F 300,600 OR 900 BAL
TO TRANSMIT LINE
BIT RATE
HIGH
LOW
5 GRD-ON
OPEN CKT-OFF
FROM OUTPUT CONTROL (OPTIONAL)
44761 TRANSMITTER CLOCK
OSC OUT
TEST PATTERN GENERATOR
PATT
REV
HIGH
LOW
NORM
TRANS MODE
CLOCK TO DATA SOURCE
CLOCK OUTPUT +6 -6
600/1200/2400 Hz
FREQ DIVIDER
2.4
+1.5V +0.5V
EXT CLOCK
CLOCK FROM EXTERNAL SOURCE (OPTIONAL)
EXT CLOCK INPUT
2400 Hz FOR 2400 b/s
1200 Hz FOR 1200/600 b/s
CLOCK AMPL
4.8 MHz
FROM RECEIVER CLOCK
4 INTERLOCK
INTERLOCK CKT
D
6
TO LIMITER DISCRIMINATOR
TO LIMITER DISCRIMINATOR
4.8 MHz TO TRANSMITTER CLOCK
COMMON
OSC OUT
4.8 MHz OSCILLATOR
087-47717 OSCILLATOR FRAME ASSEMBLY
100 TO 134V 47 TO 63 Hz
OFF
ON
COMMON
44751 POWER SUPPLY
+12V
+4V
-12V
TO ALL UNITS AS REQD

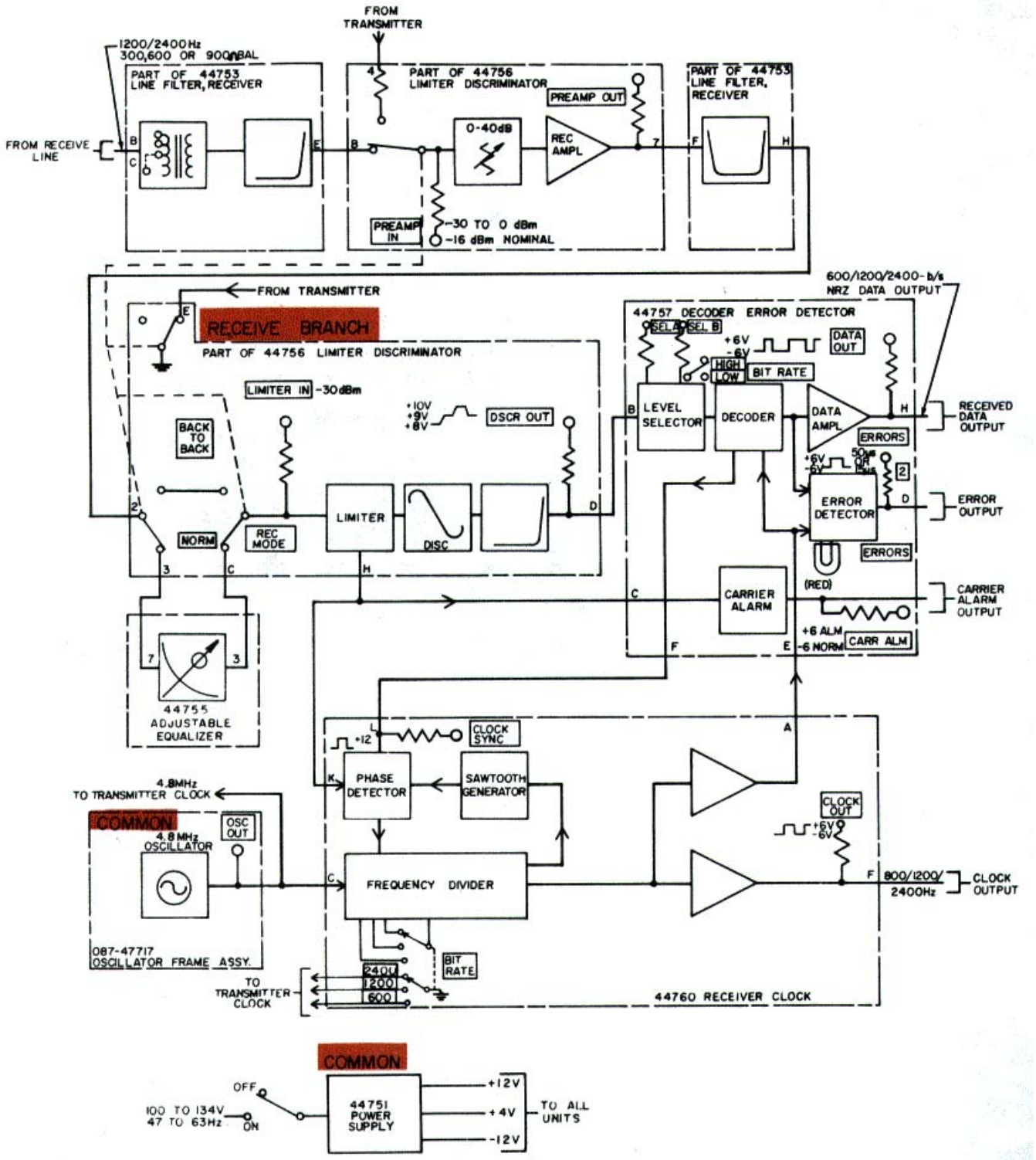
(4) The FSK modulator is controlled by the clock signal. Input signals to this circuit are supplied by the data amplifier for low speed operation, or by the encoder for high speed operation. Whenever the modulator input is a high level, it produces a 1200 Hz output. If the input is low, it allows the positive-going edge of the clock signal to change, this results in a 2400 Hz output. In the duobinary mode, the encoder output for a "0" bit causes the modulator output to alternate between a half cycle of 1200 Hz and a full cycle of 2400 Hz. This results in an average line frequency of 1800 Hz. A "1" bit in the duobinary mode is represented by a line frequency of either 1200 or 2400 Hz.

(5) The amplifier following the FSK modulator amplifies the modulated signal to a level suitable for application to the transmit line and then extends this signal to the low pass filter. The filter passes signal products up to about 4 KHz so that the output resembles a sine wave. The coupling transformer between the filter and the line provides impedance matching from the unbalanced modem output to balanced lines of 300, 600 or 900 ohms. The output signal from the low pass filter also extends to the REC MODE switch in the limiter discriminator.

(6) When the REC MODE switch is operated to the BACK-TO-BACK position the transmitter output is applied to the receiver input. This loop back arrangement enables the receiver output to be compared with a known data pattern at the transmitter input.

b. Receive Branch

(1) The receive branch converts the sine wave signals on the receive line to a serial-by-bit NRZ binary data signal to drive the receiving data processor.



(2) Input signals on the receive line are coupled to an input low pass filter by a matching transformer. The filter output is amplified by the receive amplifier and then applied to the receive band pass filter which performs initial shaping of the duobinary input waveform. Final shaping occurs in the low pass filter at the discriminator output. The bandpass filter output is applied to the limiter through the adjustable equalizer. The limiter produces a square wave output and applies this signal to the discriminator. The discriminator converts the input signal frequency to an 'analog dc voltage which is proportional to the input frequency. For input frequencies of 1200, 1800, and 2400 Hz, the output voltages are respectively 8, 9, and 10 volts.

(3) The level selectors in the decoder and error detector consists of two differential amplifiers which convert the analog output of the discriminator to a square wave form that will activate the decoder. Both selectors are used for duobinary operation in order to recognize the 3-level output of the discriminator. For binary or 1200-bps operation, the bias level of one selector is shifted by an interconnection option so that the selector provides the correct duration output pulses from a 2-level discriminator signal. The decoder combines the separate outputs of the two level selectors to produce a regenerated data pattern that matches the pattern originally applied to the distant transmitter. This pattern is retimed to reduce the affects of jitter that may be introduced into the transmission path.

(4) The received data is retimed by using the transitions to synchronize the receiver clock. The data pulses are differentiated and a resulting short duration pulse is applied to the receiver clock for each data transition. The pulses control a phase comparator in the receiver clock so that the clock oscillator locks to the average bit rate of the received data. A memory circuit in the comparator maintains the oscillator at the correct frequency when no transitions are received for several seconds, and also prevents short term variations in the received data rate from affecting the oscillator frequency. The oscillator amplifier supplies a square wave signal to the decoder and error detector, and also to the clock output amplifier.

(5) Retimed data is obtained by applying the decoder output pulses to the receiver clock signal. Because jitter appears during the transitions of the received data signal, it is eliminated in the retimed output of the data period. The retimed data is amplified by the data amplifier and used in the associated receiving data processor.

(6) The line frequencies for duobinary operation follow a predictable pattern which is useful for detecting errors at the receive terminal. The error detector counts "0" bits and compares the levels of "1" bits. Timing is provided by the digital receiver clock. An error occurs if the same level selector produces an output for two "1" bits that are separated by an odd number of "0" bits, or if different level selectors produce outputs for two "1" bits that are separated by an even number of "0" bits.

(7) The error detector carrier alarm monitors the received signal level and provides an alarm output signal if this level drops 20 db or more below the nominal input of -30 dbm to the limiter. An output amplifier in this circuit supplies an alarm to the data carrier alarm module and to equipment external to the digital data modem. This alarm condition continues until the line carrier signal increases to the predetermined level above the alarm level. This arrangement provides positive alarm action.

c. Data Carrier Alarm

(1) The data carrier alarm monitors transmitted and received data and carrier signals and provides fail-safe individual alarm outputs to alarm equipment external to the digital data modem if trouble occurs in any of the monitored signal paths.

- Transmit Data Alarm monitors the output of the data amplifier in the transmitter, and provides an alarm 5 seconds after transmission stops.
- Transmit Carrier Alarm monitors transmitter output as it is coupled to the transmission line and provides a delay alarm output if the signal falls below a predetermined level.
- Receive Data Alarm monitors the decoder output of the decoder error detector and provides an output if more than 5 seconds elapse between two received data transitions.
- Receive Carrier Alarm monitors carrier alarm output of the decoder error detector and provides an output, two seconds after a loss of receive carrier is detected the data amplifier in the decoder error detector is held in the mark condition until the alarm is cleared.
- Alarm Cut Off Control, an alarm condition in any of the four sections of this unit can be canceled by operating the ALARM CUT OFF switch to the CUT OFF position. When the switch is in the CUT OFF position it clamps the alarm circuits in normal condition, regardless of any alarm signals at the input. In the case of the receive carrier alarm, the switch will cancel the alarm output but not remove the mark hold until the actual trouble is corrected.

(2) All alarms are arranged to actuate at a predetermined level and to reset again after returning to the predetermined threshold level.

(3) Fail-safe feature will always provide an alarm output signal in the event any monitored signal path fails.

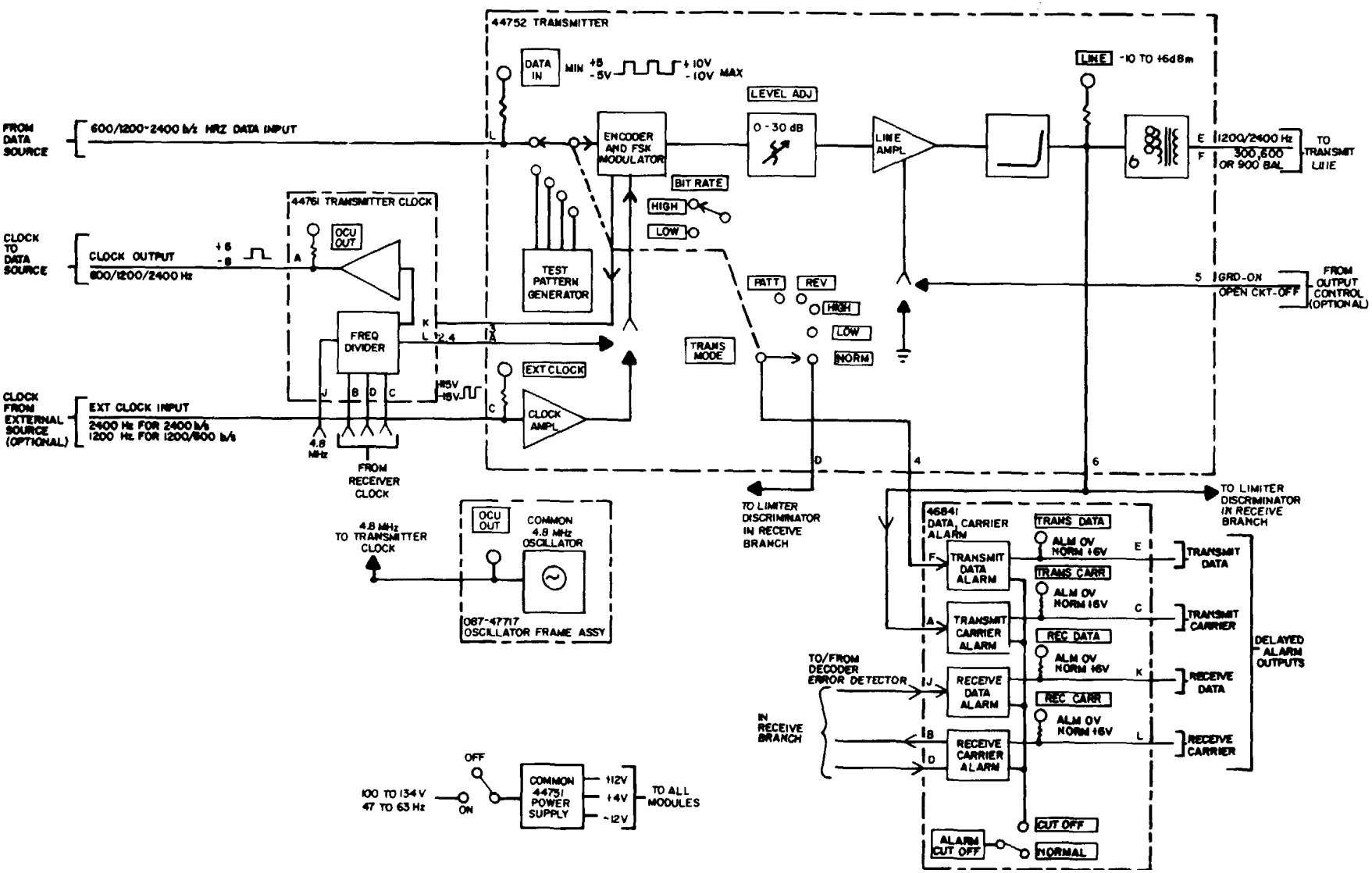
d. RF Oscillator

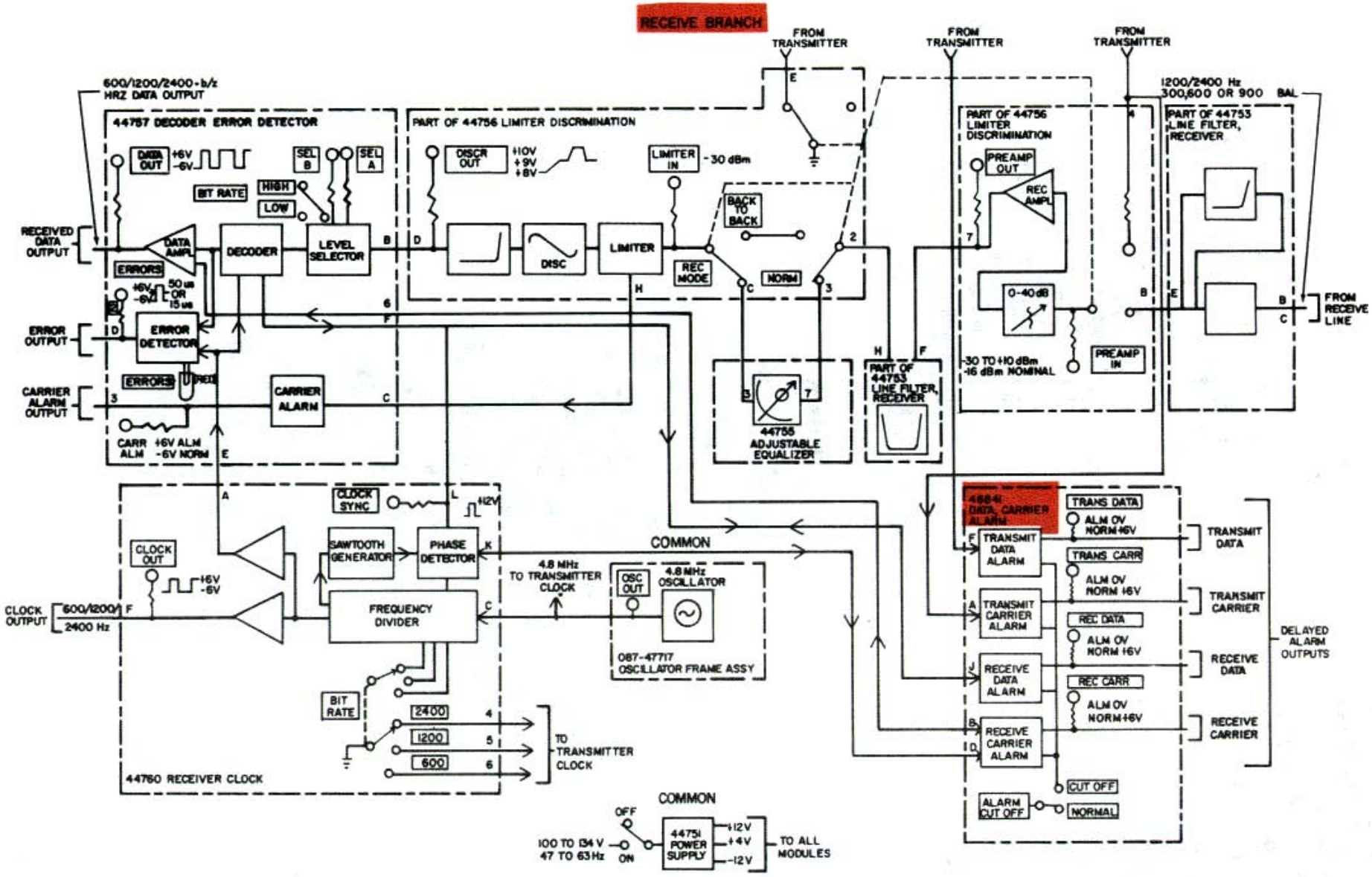
The RF oscillator is common to both transmit and receive branches of the Digital Data Modem MD-701(*)IUY. This unit provides a stable 4.8 MHz sine wave timing signal to transmitter clock and to digital receiver clock.

e. Power Supply

The power supply is common to both transmit and receive branches of the Digital Data Modem MD-701(*)/UY. This unit operates on a 115V 60 Hz (nominal) input line voltage and supplies regulated +12, +4, and -12 volts to the modules. There are three potentiometers on the power supply module for adjusting the supply voltages to the modules. On the front of the chassis is an on-off switch, indicator lamp, and ac line fuse; on the board are three fuses, one for each supply voltage.

TRANSMIT BRANCH




RECEIVE BRANCH
FROM TRANSMITTER
FROM TRANSMITTER
FROM TRANSMITTER
600/1200/2400-b/s HRZ DATA OUTPUT
44757 DECODER ERROR DETECTOR
PART OF 44756 LIMITER DISCRIMINATION
PART OF 44756 LIMITER DISCRIMINATION
PART OF 44753 LINE FILTER, RECEIVER
1200/2400 Hz 300,600 OR 900 BAL
DATA OUT
+6V -6V
SEL B
SEL A
BIT RATE
HIGH
LOW
DISCR OUT
+10V +9V +8V
LIMITER IN
-30 dBm
BACK TO BACK
PREAMP OUT
REC AMPL
RECEIVED DATA OUTPUT
DATA AMPL
DECODER
LEVEL SELECTOR
DISC
LIMITER
REC MODE
NORM
0-40 dB
-30 TO +10 dBm -16 dBm NOMINAL
PREAMP IN
FROM RECEIVE LINE
ERRORS
50 us OR 15 us
ERROR OUTPUT
ERROR DETECTOR
CARRIER ALARM OUTPUT
CARRIER ALARM
CARR ALM +6V ALM -6V NORM
44755 ADJUSTABLE EQUALIZER
PART OF 44753 LINE FILTER, RECEIVER
CLOCK SYNC
+12V
CLOCK OUT
SAWTOOTH GENERATOR
PHASE DETECTOR
COMMON
4.8 MHz TO TRANSMITTER CLOCK
OSC OUT
4.8 MHz OSCILLATOR
CLOCK OUTPUT
600/1200/2400 Hz
+6V -6V
FREQUENCY DIVIDER
087-47717 OSCILLATOR FRAME ASSY
BIT RATE
2400
1200
600
TO TRANSMITTER CLOCK
44760 RECEIVER CLOCK
4684i DATA CARRIER ALARM
TRANS DATA
ALM 0V NORM +6V
TRANSMIT DATA ALARM
TRANS CARR
TRANSMIT CARRIER ALARM
REC DATA
RECEIVE DATA ALARM
REC CARR
RECEIVE CARRIER ALARM
CUT OFF
ALARM CUT OFF
NORMAL
TRANSMIT DATA
TRANSMIT CARRIER
RECEIVE DATA
RECEIVE CARRIER
DELAYED ALARM OUTPUTS
COMMON
OFF
100 TO 134 V 47 TO 63 Hz
ON
4475i POWER SUPPLY
+12V
+4V
-12V
TO ALL MODULES

Section II. MODEM SELF-TEST

4-3. GENERAL

Digital Data Modem MD-701(*)/UY provides a test pattern generator circuit in the transmitter and loopback circuit in the receiver to allow troubles in the modem to be quickly isolated to the modem or local data terminal or to the transmission path.

4-4. TEST PATTERN GENERATOR

By rotating the TRANS MODE switch on the transmitter from the NORM position to LOW, HIGH, REV, or PATT position arranges the transmitter to produce four types of test pattern output signals derived from the test pattern generator. The test patterns are directed into the receiver by use of the loop-back mode, refer to paragraph 4-5. This allows modem troubleshooting without the need for external pattern generating equipment.

- LOW with TRANS MODE switch in this position a 1200 Hz signal is applied to the transmit line.
- HIGH with TRANS MODE switch in this position a 2400 Hz signal is applied to the transmit line.
- REV with TRANS MODE switch in this position, the test pattern generator in the transmitter produces a reversal pattern of alternate ones and zeros. The signal appearing on the transmit line resembles the alternate one and zero data input pattern for the particular data rate applied.
- PATT with TRANS MODE switch in this position, the test pattern generator in the transmitter produces a random data input, which originates from a noise source containing a wide band of signal components; the binary pattern is applied in a random manner and results in a random one and zero output on the transmission line.

4-5. LOOP-BACK MODE

By rotating the REC MODE switch on the limiter discriminator to BACK-TO-BACK, the receive signal path will open and the transmitter output is directed into the receiver. This provides means for monitoring the complete send and receive signal path and enables the technician to pinpoint the trouble to the data terminal or to the transmission path.

CHAPTER 5

ORGANIZATIONAL MAINTENANCE INSTRUCTIONS

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

5-1. COMMON TOOLS AND EQUIPMENT.

For authorized common tools and equipment, refer to the Modified Table of Organization and Equipment (MTOE) applicable to your unit.

5-2. SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT.

No special tools or equipment are required.

5-3. REPAIR PARTS

Repair parts are listed and illustrated in the repair parts and special tools list TM-11-7440-232-20P covering organizational maintenance for this equipment.

Section II. SERVICE UPON RECEIPT

5-4. SERVICE UPON RECEIPT OF MATERIEL

a. Unpacking

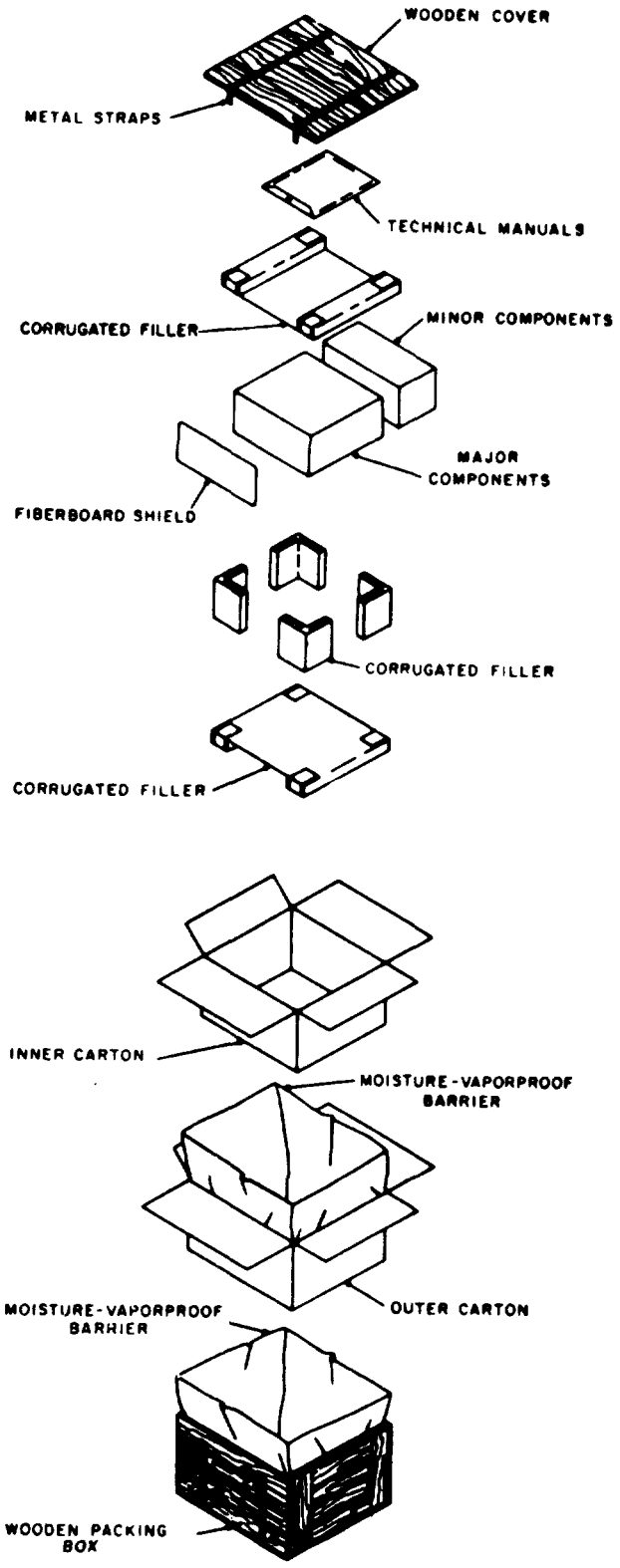
- Do not unpack the digital data modem until the rack mounting position in the system assemblage is installed, wired, and ready (5-5, INSTALLATION).
- Inspect the shipping container of Digital Data Modem MD-701(*)IUY for evidence of damage that may have occurred in transit.
- Open the container according to the instructions on the shipping container.
- When packed for shipment, the components of the MD-701(*)/UY are placed in an inner carton. A moisture-vaporproof barrier is placed around the Inner carton. This package is placed in an outer carton. The outer carton is covered with a second moisture-vaporproof barrier and placed in a wooden packing box. The dimensions of the wooden packing box are 17 inches deep, 13 inches wide, and 93/4 inches high. The weight of the packed equipment is 20 pounds.
- To remove contents:

NOTE

When unpacking equipment that is pocked only in cartons, omit the procedure given in (1) through (3) below.

WARNING

Prevent personal injury when applying or removing steel strapping by wearing heavy gloves and protective eye wear. Do not handle packing cartons by the steel strapping. Don't take chances. Avoid personal injury. MD-701B/UY is heavy—it weighs 50 pounds. Use two men to lift.


WOODEN COVER
METAL STRAPS
TECHNICAL MANUALS
CORRUGATED FILLER
MINOR COMPONENTS
MAJOR COMPONENTS
FIBERBOARD SHIELD
CORRUGATED FILLER
CORRUGATED FILLER
INNER CARTON
MOISTURE-VAPORPROOF BARRIER
OUTER CARTON
MOISTURE-VAPORPROOF BARRIER
WOODEN PACKING BOX

(1) Cut and fold back the metal straps.

CAUTION

Do not pry off the boards. Prying may damage the equipment.

(2) Remove the nails from the top and one side of the wooden packing box with a nailpuller.
(3) Open the moisture-vaporproof barrier that covers the outer carton.
(4) Open the outer carton. Open the second moisture-vaporproof barrier that covers the inner carton.
(5) Remove and open the inner carton.
(6) Remove the corrugated filler.
(7) Remove and open the envelope that contains the technical manuals.
(8) Remove the major and minor components.

b. Checking Unpacked Equipment

- Inspect the equipment for damage incurred during shipment. If the equipment has been damaged, report the damage on SF 364, Report of Discrepancy.

- Check the equipment against the packing slip to see if the shipment is complete. Report all discrepancies in accordance with the instructions of TM 38-750 and DA PAM 738-750. If the packing slip is not available, check the equipment against the components list in Appendix B. Report shortages on Standard Form 361. Shortage of a minor assembly or part that does not affect proper functioning of the equipment should not prevent use of the equipment.

- Check to see whether the equipment has been modified. Equipment that has been modified will have the MWO number on front panel, near the nomenclature plate. Check also to see whether all currently applicable MWO's have been applied. Current MWO's applicable to the equipment are listed in DA PAM 310-1.

5-5. INSTALLATION INSTRUCTIONS

a. Installation

(1) The digital data modem is to be mounted into an equipment rack by general support maintenance as required by the system plan. The location in the rack and connection instructions are included with the system instructions.
(2) If the modules have been shipped in the modem shelf, remove them until all external connections have been made and verified. This will prevent accidental damage to the modules during modem shelf installation.
(3) Check the mounting flange position before attaching the modem shelf in the rack. Move the flanges as necessary to obtain the desired spacing between the rack and the front of the modem. Also make certain that the hinged front cover can be lowered sufficiently to permit removal of the modules.
(4) Attach the modem shelf with mounting screws.

b. Tools And Test Equipment Required For Installation

The tools and test equipment required for installation are given in the Tools and Test Equipment chart in Appendix D.

c. Assembly Of Equipment

(1) Interconnection. Interconnection of the digital data modem to associated equipments in accordance with the system plan will be performed by general support maintenance.
(2) Installation of plug-in items. Modules will be placed into their respective slides and plugged into the ribbon connector jacks by organizational maintenance.

d. Special Applications

Strapping options are available for certain modules. Strapping in accordance with the system plan will be performed by general support maintenance.

5-6. PRELIMINARY SERVICING AND ADJUSTMENT OF EQUIPMENT.

Servicing and adjustment will be performed by general support maintenance.

5-7. CIRCUIT ALIGNMENT

Circuit alignment will be performed by general support maintenance.

a. External Connections External connections will be performed by general support maintenance.
b. Switch Setting, Patch Panel Connections, and Internal Control Settings.

The operator will perform switch setting in accordance with the system plan. General support maintance will perform patch panel connections and internal control settings in accordance with the system plan.

c. Alignment Procedures

Alignment procedures will be performed by general support maintenance. Procedures will be found in TM 11-7440-232-40.

Section III. PREVENTIVE MAINTENANCE CHECKS AND SERVICES (Organizational)

5-8. GENERAL

The purpose of scheduled preventive maintenance checks and services (PMCS) is to prevent trouble, reduce downtime, and assure that the digital data modem remains in operating condition.

5-9. RECORDS AND REPORTS

Records and reports of preventive maintenance checks and services must be made in accordance with the requirements set forth in TM 38-750 and DA PAM 738-750 The Army Maintenance Management System (TAMMS). Use your PMCS TABLE Item No. column to get the number for the TM ITEM NO. column of DA Form 2404 Equipment Inspection and Maintenance Worksheet.

5-10. PMCS TABLE

A PMCS TABLE for the Digital Data Modem MD-701(*)IUY appears at the end of this section.

NOTE

If the equipment MUST be in operation all the time, check and service those items that can be checked and serviced without disturbing operation. Make the complete checks and services when the equipment CAN be shut down.

a. Weekly schedule

- All PMCS listed in the table are required each week.

b. The PMCS can also be used to assist in

- Reestablishing service after shut down.
- Troubleshooting to determine that the transmit or receive branch, or both, can be operated.

c. Routine checks are NOT listed as PMCS checks. They are checks such as the following

- Cleaning
- Dusting
- Checking for frayed cables
- Storing items not in use
- Checking for loose nuts, bolts, and screws
- Checking for loose or broken knobs

Routine checks are things that you should do anytime you see they must be done. If you find a routine check like one of those listed in your PMCS TABLE, it was listed because other personnel reported problems with this item.

d. Procedures in PMCS table are to be done in order of item number.

e. PMCS table column headings

- ITEM NUMBER(s) give the order in which the procedures are to be done. Also, these item numbers are used to identify individual procedures in the PMCS table.
- ITEM TO BE INSPECTED tells what part or function the procedure will check or service.
- PROCEDURE gives details of what is to be done, the required order for doing any steps, and results which are acceptable.

NOTE

WARNINGS and CAUTIONS about electrical shock and bodily harm must be observed when performing PMCS. Refer to warning page in front of this manual.

Table 5-1. ORGANIZATIONAL PREVENTIVE MAINTENANCE CHECKS AND SERVICES WEEKLY SCHEDULE

Item No.	Item to be inspected	Procedures
1	Controls, screws, bolts	Inspect all controls and mechanical assemblies for loose or missing knobs, screws, bolts, and nuts.
2	Connectors fuse holder fuses	Inspect all connectors, sockets, and receptacles including the fuses, fuse holder, for looseness and damage.
3	Modules	Visually inspect exterior and component side of modules for scorched parts or broken connections or blown fuses.
4	Finish	Inspect case (or chassis) for damage, missing parts, and condition of finish and panel lettering. Painted external surfaces do not show bare metal. Panel lettering legible.
5	**Transmit Branch**	On transmitter, set BIT RATE switch to LOW position and TRANS MODE switch to PATT position. On limiter discriminator, set REC MODE switch to NORM position. Set POWER switch on power supply to ON position; Allow a 30-minute warm-up of digital data modem. Connect a VTVM between GRD (TP4) and Line (TP3) test points on transmitter. Observe VTVM output level indication. POWER lamp lights. The VTVM will indicate between -10 and +6 dbm (unless otherwise specified) and will provide a signal at the distant terminal that will be between -30 and +10 dbm (as measured at limiter input). **NOTE** **On telephone company lines, the transmit level is usually -8 dbm. On private communication facilities, the level is generally 0 dbm to open wire or cable lines, or 10 dbm below test tone level to carrier or microwave equipment.**

Table 5-1. ORGANIZATIONAL PREVENTIVE MAINTENANCE CHECKS AND SERVICES WEEKLY SCHEDULE (Continued)

Item No.	Item to be inspected	Procedures
6	Receive Branch	On transmitter at distant terminal, set TRANS MODE switch to PATT position and BIT RATE switch to LOW position. Connect VTVM Between GRD (TP5) and PREAMP OUT(TP2) testpoints on limiter discriminator. Observe VTVM output level indication. Preamp output level will be -30 dbm.

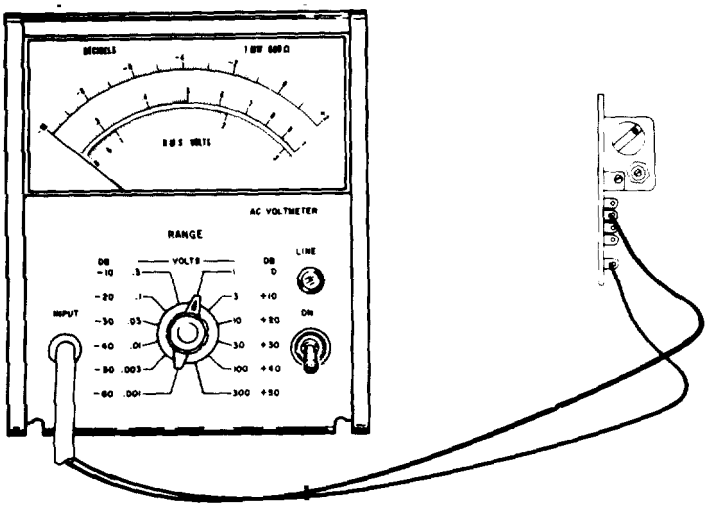


Table 5-1. ORGANIZATIONAL PREVENTIVE MAINTENANCE CHECKS AND SERVICES WEEKLY SCHEDULE (Continued)

Item No.	Item to be inspected	Procedures
7	Receive Branch	Connect an oscilloscope vertical input between DISCR OUT (TP4) and a ground jack (TP5) on limiter discriminator. Connect the trigger input to CLOCK PIT testpoint (TP2) on digital receive clock. Observe the oscilloscope display.

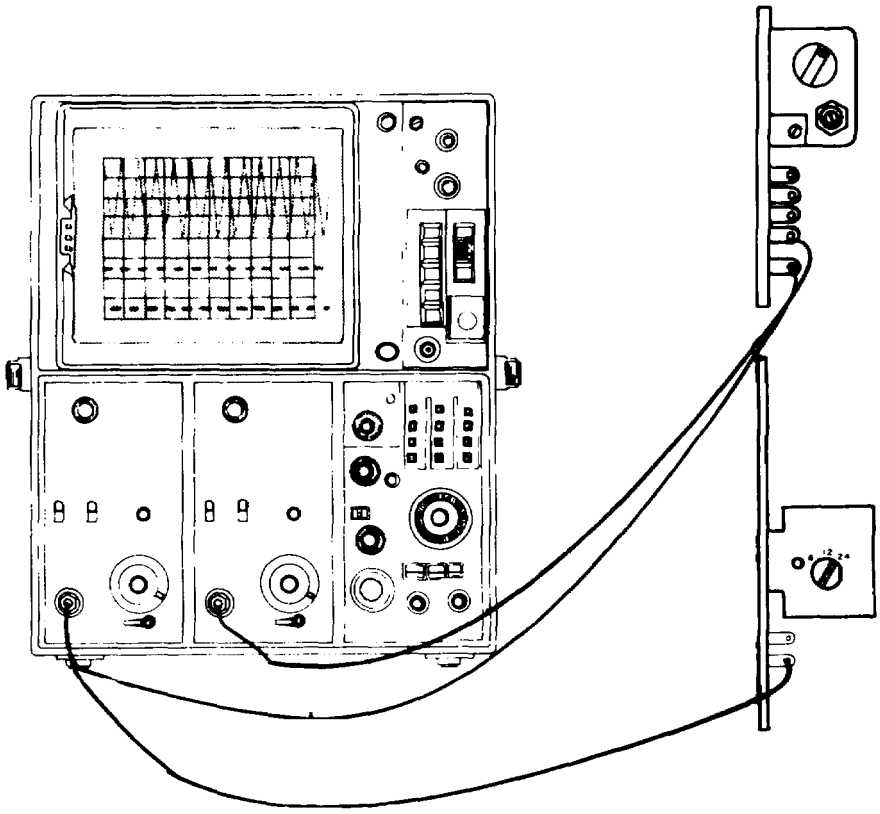
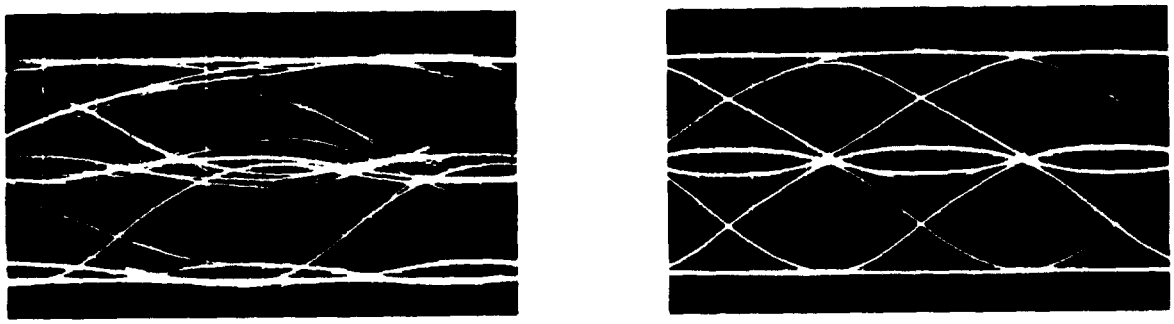


Table 5-1. ORGANIZATIONAL PREVENTIVE MAINTENANCE CHECKS AND SERVICES WEEKLY SCHEDULE (Continued)

Item No.	Item to be inspected	Procedures
7		Oscilloscope display pattern matches "CORRECT" (Cont'd) portion of figure below.

INCORRECT CORRECT

A. BINARY PATTERNS



INCORRECT CORRECT

B. DUOBINARY PATTERNS

Table 5-1. ORGANIZATIONAL PREVENTIVE MAINTENANCE CHECKS AND SERVICES WEEKLY SCHEDULE (Continued)

Item No.	Item to be inspected	Procedures
8		At duplex terminals, set TRANS MODE switch on transmitter to REV position and REC MODE switch on limiter-discriminator to BACK-TO-BACK position. Connect the oscilloscope vertical input to SEL A testpoint (TP1) on error detector decoder. Observe (TP2) on digital receiver clock and ground. Display pattern matches “CORRECT” portion of figure below.

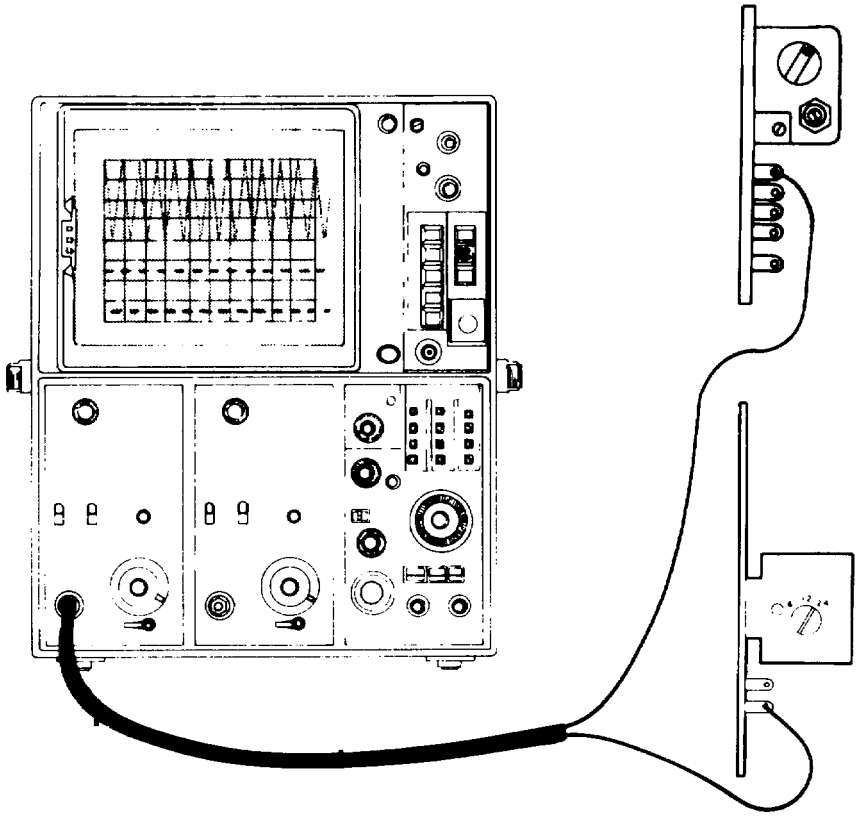
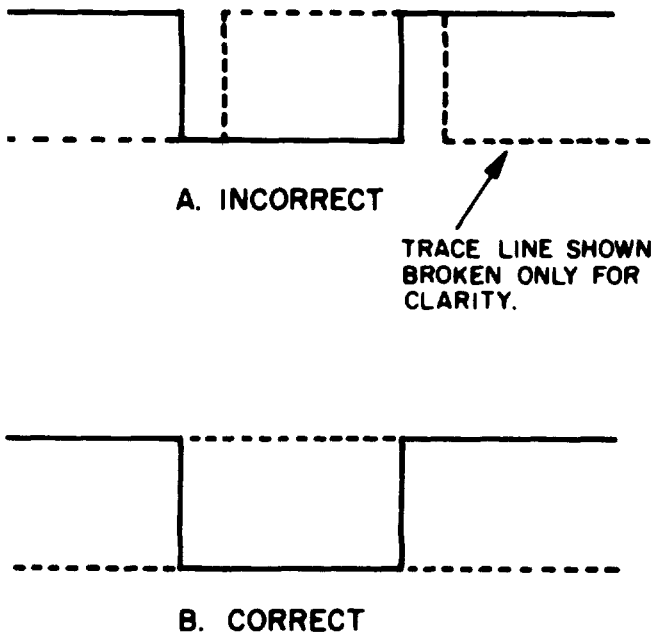


Table 5-1. ORGANIZATIONAL PREVENTIVE MAINTENANCE CHECKS AND SERVICES WEEKLY SCHEDULE (Continued)

Item No.	Item to be inspected	Procedures
8 (Cont'd)		Display pattern matches "CORRECT" portion of figure below. 

Section IV. TROUBLESHOOTING

5-11. TROUBLESHOOTING PROCEDURES

The Digital Data Modem MD-701(*)/UY is provided with alarms and other malfunction indicators. Usually an alarm will be the first sign of trouble. The Modem Components and Test Equipment Table 5-2 will be used in conjunction with the troubleshooting charts.

To begin troubleshooting, you select the correct malfunction description (para. 5-17) and go directly to that chart. You should then perform the first test or inspection step listed under the malfunction. Depending upon your results, your next action is given in the indication column. Often you will be directed to an additional test or inspection in the remarks column. A series of tests and inspections may be required to identify and correct the trouble.

5-12. USE OF PMCS TABLE

The PMCS Table in Section III of this chapter, may be used in troubleshooting the digital data modem, or in reestablishing service after a shut-down.

5-13. ERRORS LIGHT

ERRORS light, will flicker intermittently in normal operation. Increased flickering over a period of time is an indication of reduction in performance. To determine whether performance is adequate, use the PMCS table.

When the ERRORS light remains lit, the receive branch is not working and an alarm will be given.

5-14. ADDITIONAL TROUBLES

This manual cannot cover all the troubles that may occur, nor all tests or inspections and corrective actions. If a trouble is not listed or it cannot be corrected by performing the corrective action, refer to higher level maintenance.

5-15. MODEL DIFFERENCES

Numerous differences exist between the models of the MD-701(*)/UY. Take care to observe the differences noted in many instructions in the troubleshooting chart.

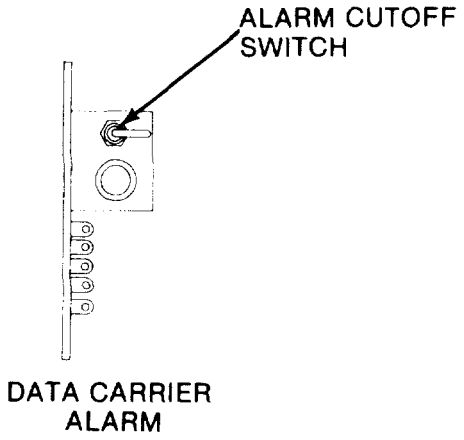
Also, sound and sight alarms and some indicators are not included in all models of the digital data modem and may or may not be provided in peripheral components of the system in which the modem is used.

5-16. ALARM CUTOFF

NOTE

This paragraph applies to models MD-701AIUY and MD-701BIUY only.

During troubleshooting, you may want to silence any audible alarms. Turn ALARM CUT OFF switch to CUT OFF position. Be sure to return switch to NORMAL when operation is resumed.



5-17. TROUBLESHOOTING CHARTS

Troubleshooting procedures to quickly isolate the trouble associated with a major malfunction are given below. Refer to Troubleshooting Charts 1 through 5 to aid you in performing the correct troubleshooting steps in order to locate and correct the trouble.

Trouble-shooting Chart No.	Troubleshooting Symptom or Malfunction	Page
1	Alarm sounds with POWER switch on and POWER lamp does not light.	5-18
2	Alarm sounds with POWER switch on and POWER lamp lights.	5-23
3	No Alarm. POWER switch on. POWER lamp lights. No transmission or o reception, or both.	5-30
4	Transmitter inoperative. No data output to distant terminal with TRANS MODE switch in any position.	5-31
5	No transmission in receive branch direction. Transmit branch and power supply operating correctly.	5-38

Table 5-2. MODEM COMPONENTS AND TEST EQUIPMENT USED WITH TROUBLESHOOTING CHARTS

Troubleshooting Chart and Step No.	MD-701/UY and MD-701A/UY Shelf	MD-701B/UY RFI Shelf	Power Supply	Transmitter	Transmitter Clock	Receiver Line Filter	Limiter Discriminator	Decoder Error Detector	Receiver Clock	Data Carrier Alarm	Module Extender	Transmitter	Limiter Discriminator	Multimeter	Voltmeter	Oscilloscope
1-1			X											X		
1-2			X											X		
1-3	X	X												X		
1-4																
1-5			X								X			X		
1-6			X													
2-1							X		X							
2-2																
2-3							X		X							
2-4			X											X		
2-5			X											X		
2-6			X													
2-7	X	X	X											X		
3-1							X		X							
4-1				X											X	
4-2	X	X		X							X			X		
4-3	X	X		X							X			X		
4-4				X											X	X

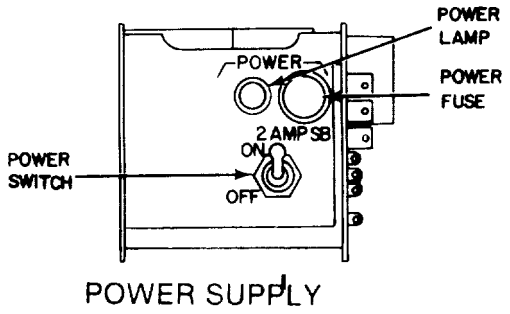
Table 5-2. MODEM COMPONENTS AND TEST EQUIPMENT USED WITH TROUBLESHOOTING CHARTS-Continued

Troubleshooting Chart and Step No.	MD-701/UY and MD-701A/UY Shelf	MD-701B/UY RFI Shelf	Power Supply	Transmitter	Transmitter Clock	Receiver Line Filter	Limiter Discriminator	Decoder Error Detector	Receiver Clock	Data Carrier Alarm	Module Extender	Transmitter	Limiter Discriminator	Multimeter	Voltmeter	Oscilloscope
4-5	X	X														X
4-6				X	X											
4-7				X												
5-1							X	X						X		
5-2							X	X						X		
5-3							X	X						X		
5-4							X	X						X		
5-5							X							X		
5-6				X												
5-7						X		X						X		
5-8								X								
5-9			X					X								
5-10								X								X
5-11							X		X							X
5-12							X		X							
5-13								X	X							
5-14							X								X	
5-15							X								X	

Table 5-2. MODEM COMPONENTS AND TEST EQUIPMENT USED WITH TROUBLESHOOTING CHARTS -Continued

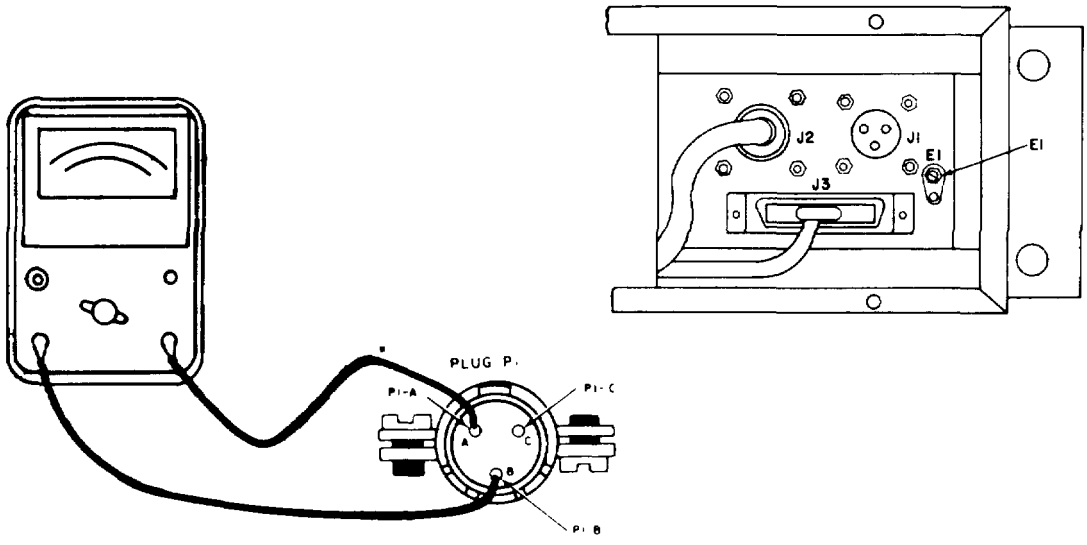
Troubleshooting Chart and Step No.	MD-701/UY and MD-701A/UY Shelf	MD-701B/UY RFI Shelf	Power Supply	Transmitter	Transmitter Clock	Receiver Line Filter	Limiter Discriminator	Decoder Error Detector	Receiver Clock	Data Carrier Alarm	Module Extender	Transmitter	Limiter Discriminator	Multimeter	Voltmeter	Oscilloscope
5-16							X							X		
5-17						X		X								
5-18						X										
5-19	X	X									X			X		
5-20																X

Trouble Symptom: Alarm Sounds with POWER Switch On and POWER Lamp Does Not Light.

STEP	INSTRUCTION	INDICATION	YES	NO	REMARKS
1	Turn POWER switch off. Replace POWER fuse. Turn POWER switch on.	POWER lamp lights Alarm sounds	X	X	Resume operation
		POWER lamp lights Alarm sounds	X X		Go to Trouble shooting Chart No. 2.
		POWER lamp lights Alarm sounds	X	X	Continue Trouble-shooting
	NOTE **If the POWER lamp remains out, check continuity of fuse with multimeter. If good, return to spares.**				
	 POWER SUPPLY				
2	Turn POWER switch off. Remove POWER lamp and replace with another lamp known to be good. Turn POWER switch on.	POWER lamp lights	X		Go to Troubleshooting Chart No. 2.

TROUBLESHOOTING CHART NO. 1 (cont'd)

STEP	INSTRUCTION	INDICATION	YES	NO	REMARKS
2 (cont'd)		POWER lamp lights		X	Continue Troubleshooting
		NOTE **If POWER lamp remains out, check continuity of fuse with multimeter. If good, return to spares.** **For Models MD-701/UY and MD-701A/UY** **NOTE** **Plugs P2 and P3 may be temporarily disconnected, if necessary, to disconnect plug P1.**			
3	Disconnect plug P1 and check for 115 V ac between pins A and B using the test hookup shown below.				

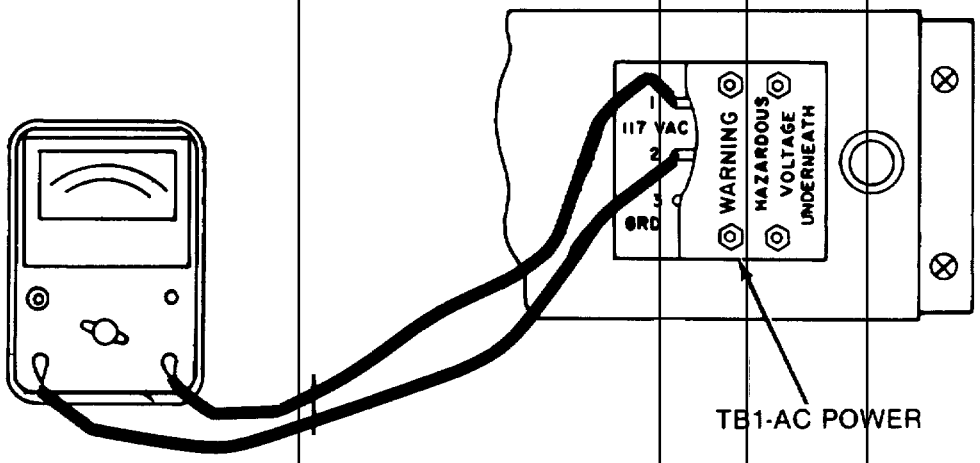


P1-AC POWER CONNECTOR DISCONNECTED AND MOVED ASIDE FOR TEST

MD-701/UY AND MD701A/UY

TROUBLESHOOTING CHART NO. 1 (cont'd)

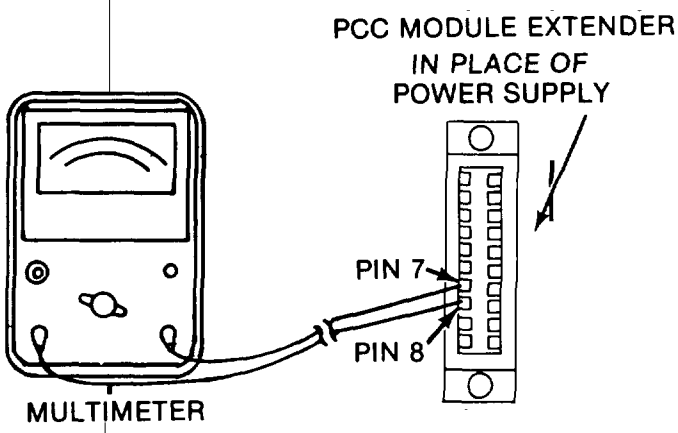
STEP	INSTRUCTION	INDICATION	YES	NO	REMARKS
3 Cont.	**For Model MD-701B/UY** Check for 115 V ac on terminal board TB1, terminals 1 and 2, using test hookup shown below.				



	MD-701B/UY			
SYSTEM NOMINAL LINE VOLTAGE (For All Models)	ACCEPTABLE RESULT			
112V ac	100-123V	X		Go to Step 5
117V ac	105-129V	X		Go to Step 5
122V ac	110-134V	X		Go to Step 5
If result is not acceptable, trouble is outside the digital data modem				Go to Step 4
On models MD-701/UY and MD-701AA/UY, reconnect plug P1, and, if unplugged, plugs P2 and P3.				

TROUBLESHOOTING CHART NO. 1 (cont'd)

STEP	INSTRUCTION	INDICATION	YES	NO	REMARKS
4	Check ac power distribution circuits, especially fuses, circuit breakers, switches and plug connections. Refer to technical manual that applies to the system in which the digital data modem is being used. Check that 115V ac is reaching the power supply connector using the following test procedure: (1) Turn POWER switch off. (2) Remove power supply. (3) Plug in PCC module extender. Do not plug power supply into module extender. (4) Turn POWER switch on and read voltage between pins 7 and 8 on the module extender as shown below:				Repair trouble is found. If not, refer to next higher level of Maintenance.
5	SYSTEM NOMINAL LINE VOLTAGE 112V ac 117V ac 122V ac If result is not acceptable.....	ACCEPTABLE RESULT 100-123V 105-129V 110-134	 X X X		 Go to Step 6. Go to Step 6. Go to Step 6. Go to Step 7.



TROUBLESHOOTING CHART NO. 1 (cont'd)

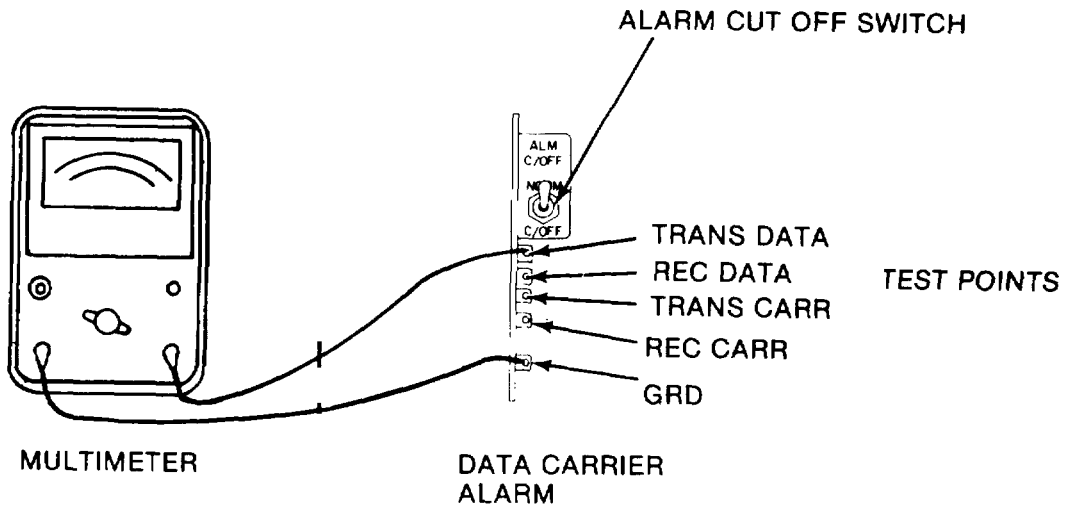
STEP	INSTRUCTION	INDICATION	YES	NO	REMARKS
	(5) Turn POWER switch off and remove module extender.				
6	Turn POWER switch off on known good power supply and install it. Turn POWER switch on.	Power lamp lights. Alarm sounds.	X	X	Resume operation.
		Power lamp lights. Alarm sounds.	X X		Go to Trouble-shooting Chart No. 2.
		Power lamp lights. Alarm sounds.	X X or	X	Refer to next higher level of maintenance.
7	Replace digital data modem. Turn POWER switch on.	Same INDICATIONS as in Step 6.			Same REMARKS as in Step 6.

End of Troubleshooting Chart No. 1. Next page is 5-23 Troubleshooting Chart No. 2, "Alarm Sounds with POWER switch On and Power Lamp Lights".

TROUBLESHOOTING CHART NO. 2

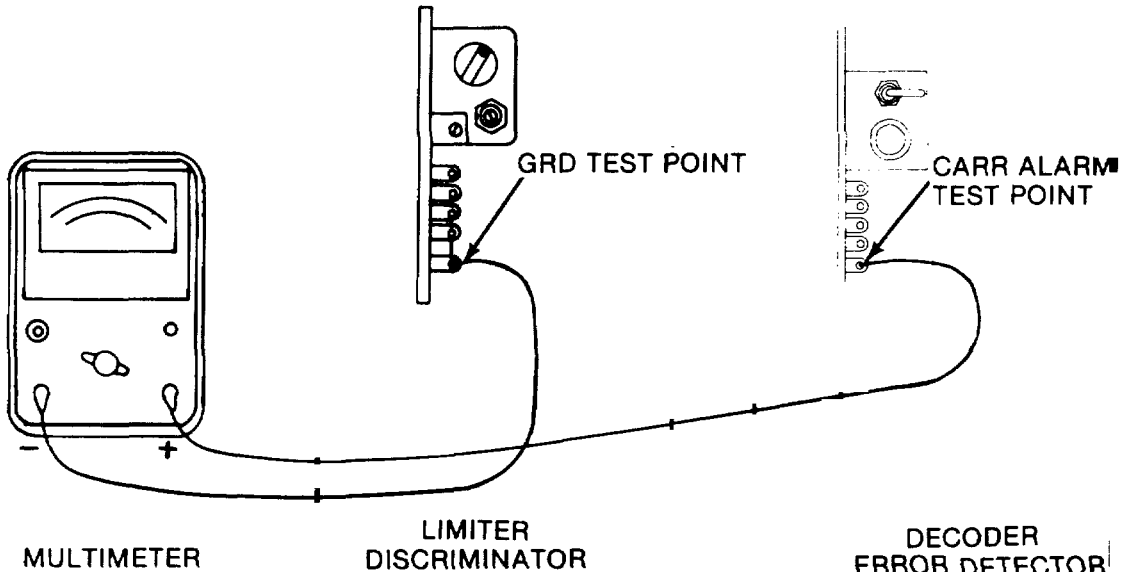
Trouble Symptom: Alarm sounds with POWER switch ON and POWER lamp lights.

STEP	INSTRUCTION	INDICATION	YES	NO	REMARKS
1	**For Models MD-701A/UY and MD-701B/UY** Check for missing signals from the following test points on the data carrier alarm to ground in sequence as shown below. TRANS DATA (TP1) REC DATA (TP2) TRANS CARR (TP3) REC CARR (TP4) TO GROUND (TP5)	+6 vdc at all test	X		Continue troubleshooting.
		Voltage missing at TP1 or TP3.	X		Go to Trouble-Shooting Chart No. 4
		Voltage missing at TP2 or TP4	X		Go to Trouble-shooting Chart No. 5



TROUBLESHOOTING CHART NO. 2 (cont'd)

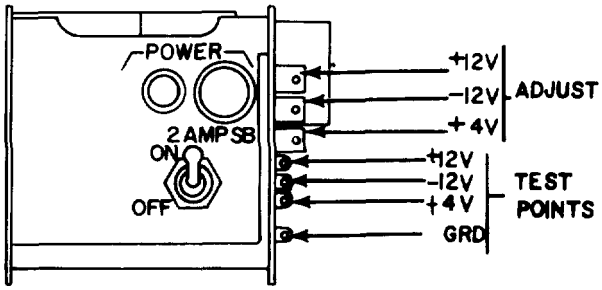
STEP	INSTRUCTION	INDICATION	YES	NO	REMARKS
1 (cont.)	**For Model MD-701/UY** Check for missing signal from the decoder error detector CARR ALARM (TP5) to GROUND (TP5) on limiter discriminator as shown below.				
		+6vdc	X		Continue trouble-shooting
		+6bdc		X	Go to step 3.
2	Check alarm monitoring equipment, wiring and plug connections. Refer to technical manual that applies to the system in which the digital data modem is being used.				Repair trouble if found. If not, refer to next higher level of maintenance.



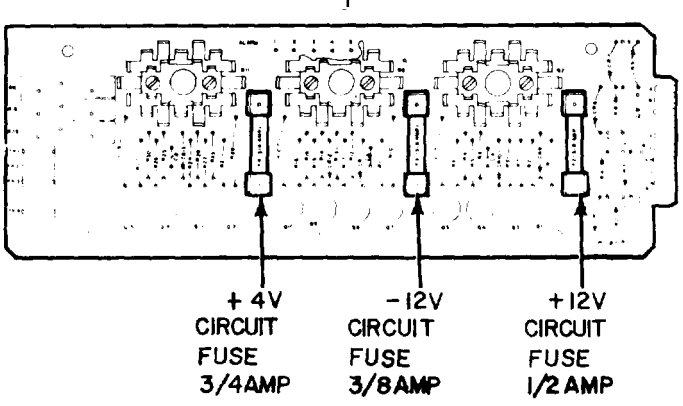
TROUBLESHOOTING CHART NO. 2 (cont'd)

STEP	INSTRUCTION	INDICATION	YES	NO	REMARKS
3	**For Models MD-701A/UY and MD-701B/UY.** (1) Turn POWER switch off. (2) Replace data carrier alarm. (3) Turn Power switch on.	Alarm	X		Go to step 4.
		Alarm		X	Resume operation.
	For Model MD-701/UY (1) Turn POWER switch off. (2) Replace decoder error detector. (3) Turn power switch on.	Alarm	X		Go to step 4.
		Alarm		X	Resume operations.
4	Set multimeter to dc scale. Check power supply outputs in sequence. +12V (TP1) -12V (TP2) + 4V (TP3) to GROUND (TP4)	within +0.5V within +0.5V within +0.2V			Read or adjust to read voltage with specified ranges.

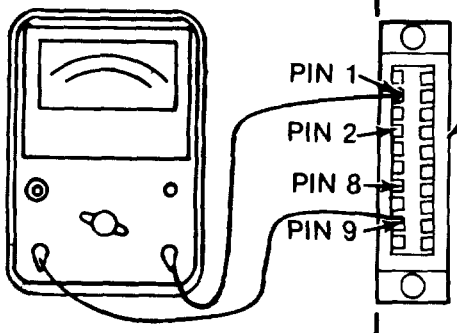
TROUBLESHOOTING CHART NO. 2 (cont'd)

STEP	INSTRUCTION	INDICATION	YES	NO	REMARKS
4 (cont)	 **POWER SUPPLY- OUTPUT VOLTAGE ADJUSTMENTS**	All voltages correct	X		Go to step 7.
		All voltages correct		X	Go to step 5.
5	Check power supply fuses. Turn POWER off. Remove and check continuity of fuses with multimeter.	Continuity	X		Go to step 6.
		Continuity		X	Replace defective fuses and recheck power supply in accordance with step 4.

TROUBLESHOOTING CHART NO. 2 (cont'd)

STEP	INSTRUCTION	INDICATION	YES	NO	REMARKS
5 (cont)	 **POWER SUPPLY- PRINTED CIRCUIT CARD** **POWER SUPPLY - PRINTED CIRCUIT CARD**				
6	Install known good power supply. Turn POWER on.	Alarm		X	Resume operation.
		Alarm	X		If fuses have blown replace modem. If not, continue trouble-shooting.
7	Check that power supply voltages are present at shelf position A7 using the following procedures. (1) Turn POWER switch off. (2) Remove decoder error detector.				

TROUBLESHOOTING CHART NO. 2 (cont'd)

STEP	INSTRUCTION	INDICATION	YES	NO	REMARKS
	(3) Plug in PCC module extender. Do not plug decoder error detector into module extender. (4) Turn POWER switch on and read voltages between the following PINS. PIN 1 to PIN 9 (ground) PIN 8 to PIN 9 PIN 2 to PIN 9  	+12 ±0.5vdc -12 ±0.5vdc +4 ±0.2vdc			
7 (cont)	**For Models MD-701A/UY and MD-701B/UY**	All voltages correct	X		Replace data carrier alarm and repeat step 3.
		All voltages correct		X	Replace modem shelf.
	For Model MD-701/UY	All voltages correct	X		Go to trouble-shooting chart No. 4.

TROUBLESHOOTING CHART NO. 2 (cont'd)

STEP	INSTRUCTION	INDICATION	YES	NO	REMARKS
7 (cont)	(5) Turn POWER switch off. (6) Remove module extender and reinstall decoder error detector.	All voltages correct		X	Replace modem shelf.

End of Troubleshooting Chart No. 2. Next page is 5-30. Troubleshooting Chart No. 3, "No Alarm. Power Switch On. POWER Lamp Lights. No Transmission or No Reception or Both."

TROUBLESHOOTING CHART NO. 3

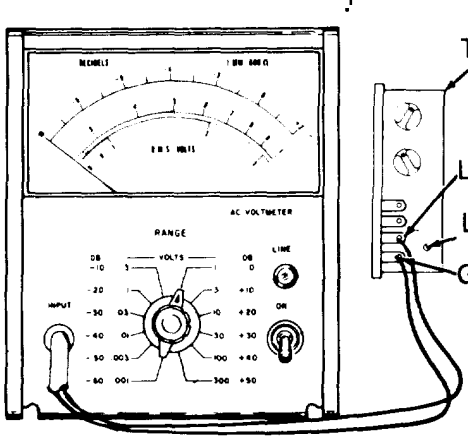
Trouble Symptom: No Alarm Power Switch On, Power Lamp Lights. No Transmission or No Reception or Both.

STEP	INSTRUCTION	INDICATION	YES	NO	REMARKS
	For Models MD-701A/UY and MD-701B/UY (1) Check ALARM CUT-OFF switch, make sure ALARM CUTOFF switch is in the NORMAL position. (2) Check data carrier alarm, perform tests in accordance with troubleshooting chart No. 2, step 1. **For Model MD-701/UY** Check decoder error detector, perform tests in accordance with Trouble-shooting Chart No. 2, step. 1.				Trouble-shooting Chart No. 2 specifies each test to be performed in accordance with malfunc-tion or problems encountered.

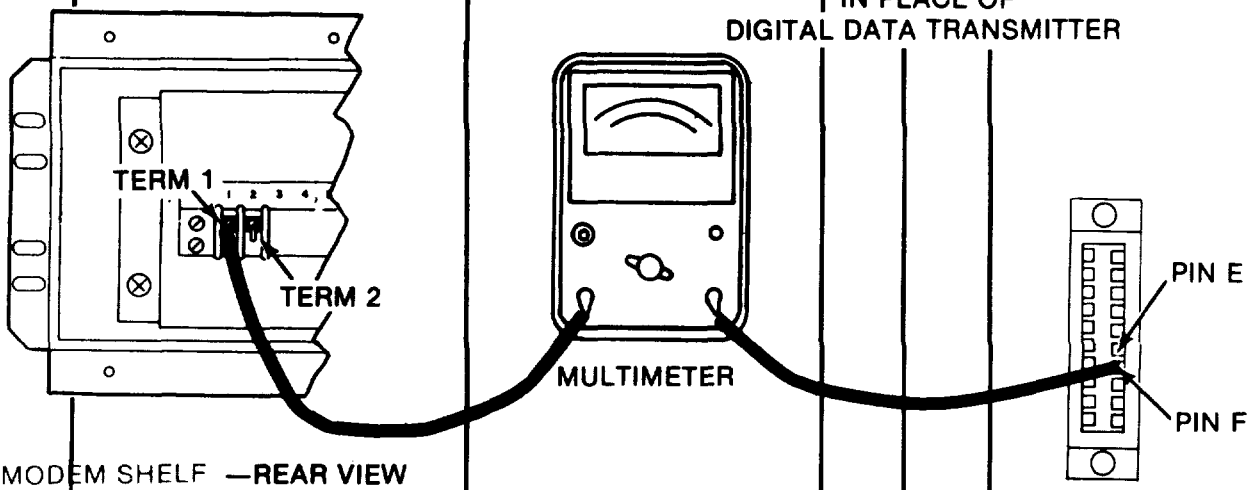
End of Troubleshooting Chart No. 3. Next page is 5-31.
Troubleshooting Chart No. 4, "Transmitter Inoperative. No Data Output to Distant Terminal with TRANS MODE Switch in Any Position.

TROUBLESHOOTING CHART NO. 4

Trouble Symptom: Transmitter Inoperative. No Data Output to Distant Terminal with TRANS MODE Switch in Any Position.

STEP	INSTRUCTION	INDICATION	YES	NO	REMARKS
1	Check and adjust, if adjustment necessary transmitter output level as shown below.  ELECTRONIC VOLTMETER (1) Connect voltmeter between LINE (TP3) and Ground (TP4)	-10 to +6dbm	X		Continue trouble-shooting
		-10 to +6dbm		X	Go to step 4.
2	Check modem shelf continuity using the following test procedures. (1) Turn POWER switch off. (2) Remove transmitter. (3) Plug in PCC module extender. Do not plug transmitter into module extender. (4) Set multimeter to low ohm scale.				

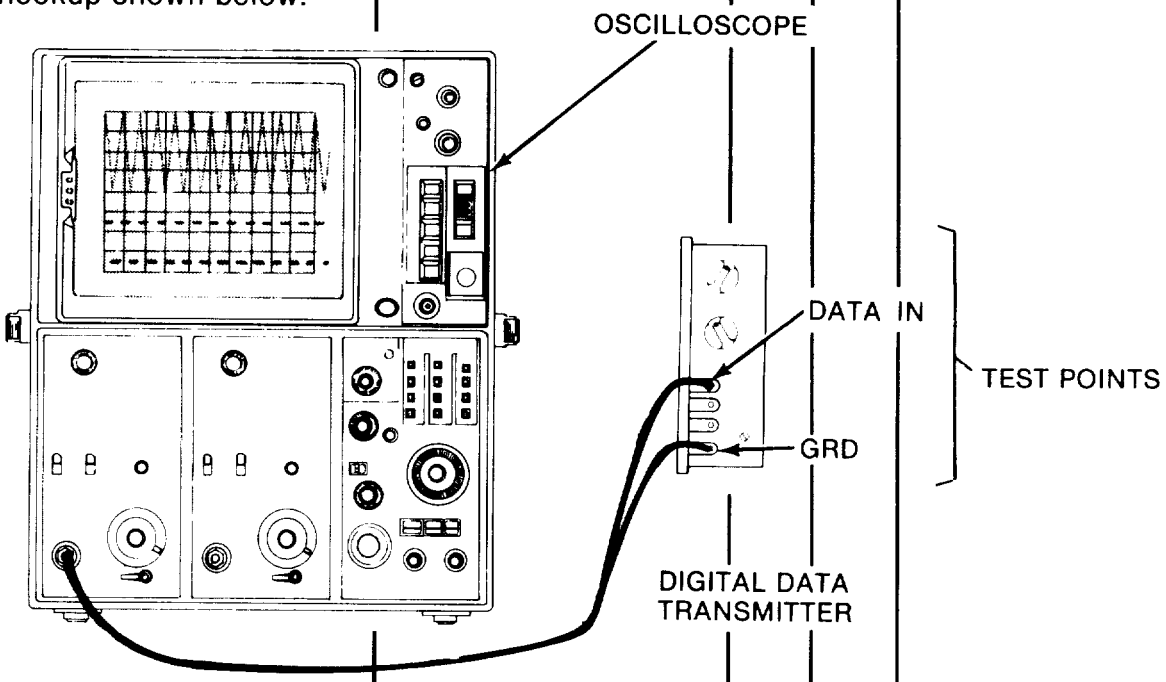
TROUBLESHOOTING CHART NO. 4 (cont'd)

STEP	INSTRUCTION	INDICATION	YES	NO	REMARKS
2 (cont)	 MODEM SHELF —REAR VIEW COVER REMOVED For Model MD-701B/UY TB2 TERM 1 TO TERM 2 TO **For Models MD-701/UY and MD-701A/UY** TB1 TERM 1 TO TERM 2 TO	PCC MODULE EXTENDER IN PLACE OF DIGITAL DATA TRANSMITTER Module Connector PIN F PIN E PIN F PIN E ACCEPTABLE RESULT Continuity for all Models	X		Go to step 3.
	If result not acceptable . . .	. . . . .			Replace modem shelf.

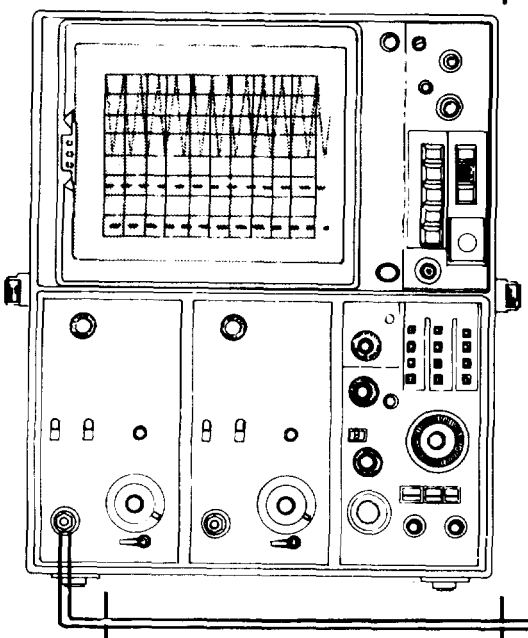
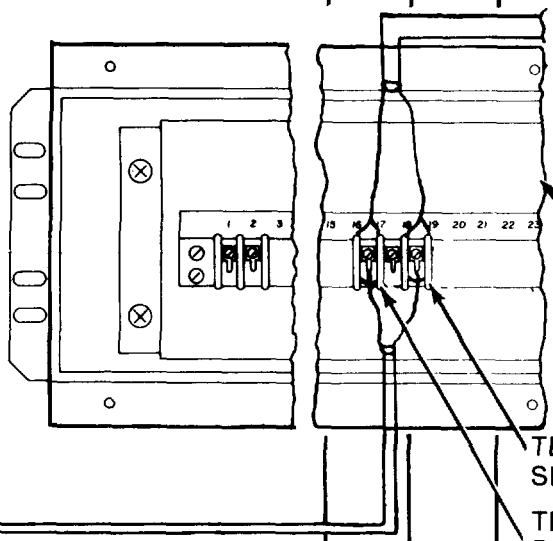
TROUBLESHOOTING CHART NO. 4 (cont'd)

STEP	INSTRUCTION	INDICATION	YES	NO	REMARKS
3	Modem shelf position A2 continuity check. (1) Same test hookup as shown in step 2. (2) Move meter leads as described below. **For Model MD-701BIUY** TB TERM 17 to PIN L TERM 19 to PIN 9 **For Models MD-701IUY and MD-701AIUY** TB1 TERM 17 to PIN L TERM 19 to PIN 9 **NOTE** **Numbered terminals 1-10 are on the solder side of the PCC module extender. Lettered terminals A-L are on the component side.**	ALL MODELS Continuity		X	Go to step 4.
	If results not acceptable	.....	.....	.....	Replace modem shelf, resume operation.
	(3) Remove module extender and reinstall transmitter.				

TROUBLESHOOTING CHART NO. 4 (cont'd)

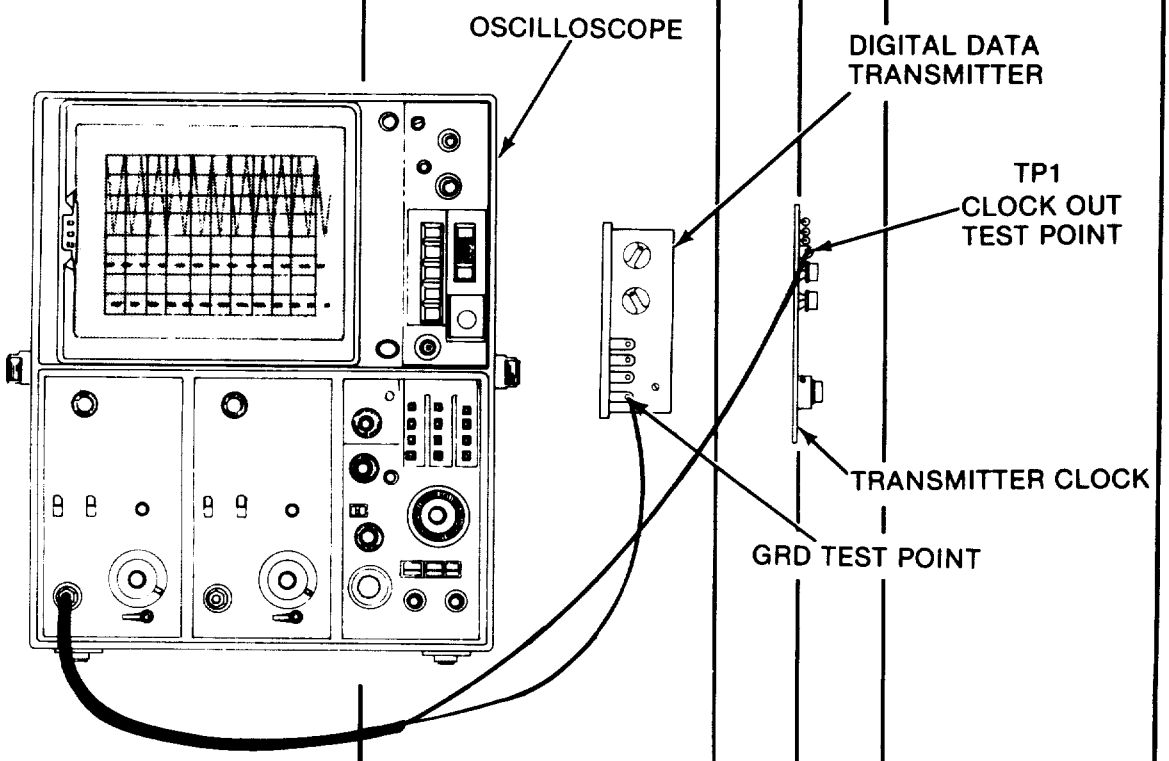
STEP	INSTRUCTION	INDICATION	YES	NO	REMARKS
4	Check external data input level using test hookup shown below. 	1 ±0.5V to 20 ±10V	X		Go to step 6.
		1 ±0.5V to 20 ±10V		X	Go to step 5.
5	Check for data present at the source using test hookup shown below.				

TROUBLESHOOTING CHART NO. 4 (cont'd)

STEP	INSTRUCTION	INDICATION	YES	NO	REMARKS
5 (cont)	 OSCILLOSCOPE ALL MODELS Oscilloscope to terminals 17 and 19.	 MODEM SHELF-REAR VIEW COVER REMOVED			
		Same INDICATIONS as step 4.			*Go to step 6.*
	If result not acceptable . . .	. . . . .			Transmission line may be faulty. Refer to TM that applies to the system the digital data modem is used.

TROUBLESHOOTING CHART NO. 4 (cont'd)

STEP	INSTRUCTION	INDICATION	YES	NO	REMARKS
6	Check transmitter clock pulse output using test hookup.				
	Read voltage between transmitter clock and ground.	Waveform 1 ±0.5V	X		Go to step 7.
	If results not acceptable . .	. . . . .	. . . .	. . . .	Replace transmitter clock and perform test in accordance with step 1.



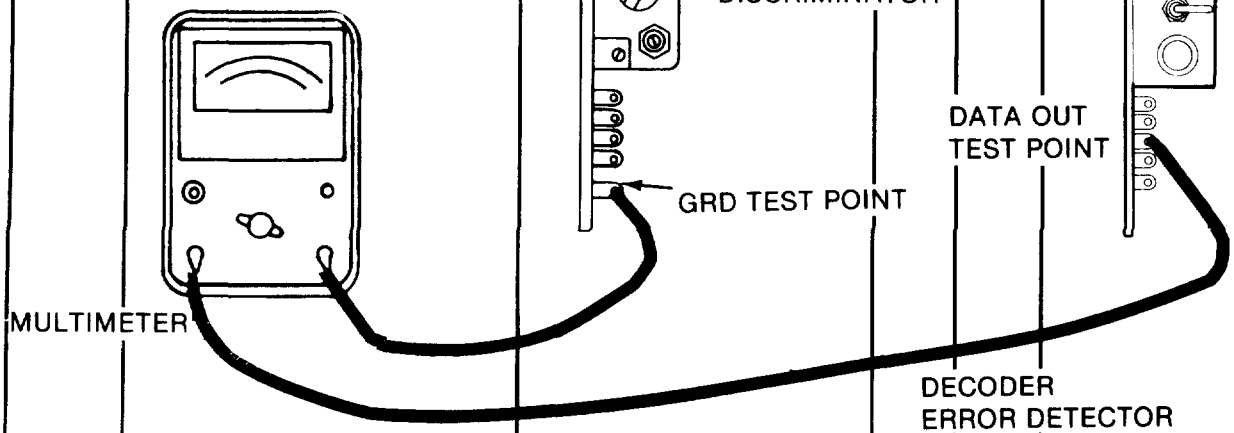
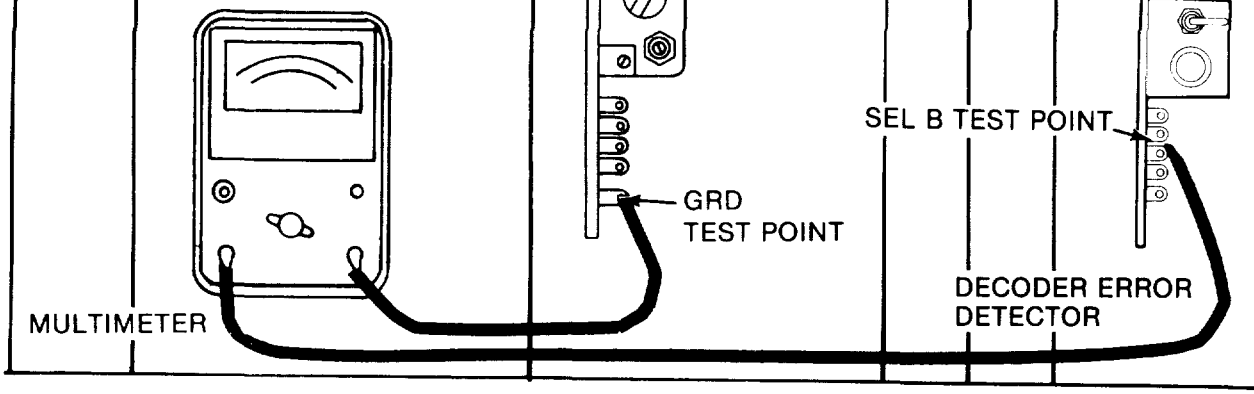
TROUBLESHOOTING CHART NO. 4 (cont'd)

STEP	INSTRUCTION	INDICATION	YES	NO	REMARKS
	Replace transmitter with known good transmitter, perform test in accordance with step 1.	Same INDICATION as step 1.	X		Transmit branch functioning correctly.
7		Same INDICATION as step 1.		X X	Troubleshoot receive branch as instructed in Troubleshooting Chart No. 5.

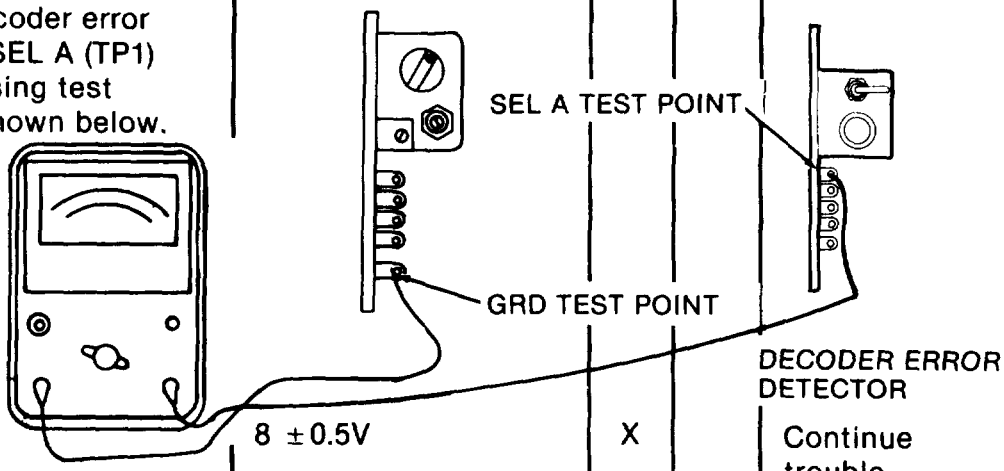
End of Troubleshooting Chart No. 4. Next page is 5-38.
Troubleshooting Chart No. 5, "No Transmission in Receive Branch Direction. Transmit Branch and Power Supply Operating Correctly."

TROUBLESHOOTING CHART NO. 5

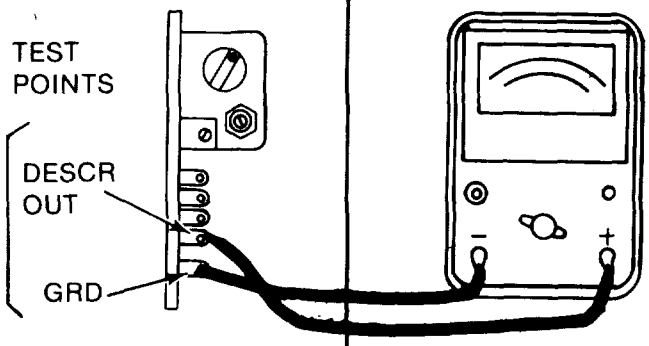
Trouble Symptom: No transmission in receive branch direction. Transmit branch and Power Supply operating correctly.

STEP	INSTRUCTION	INDICATION	YES	NO	REMARKS
	Check data output using test hookup shown below. 				
	(1) Set transmitter TRANS MODE switch to HIGH. (2) Set Limiter discriminator REC MODE switch to BACK-TO-BACK.	+6vdc	X		Go to step 3.
		+6vdc		X	Go to step 2.
	Check decoder error detector SEL B (TP2) voltage using test hookup shown below. 				

TROUBLESHOOTING CHART NO. 5 (cont'd)

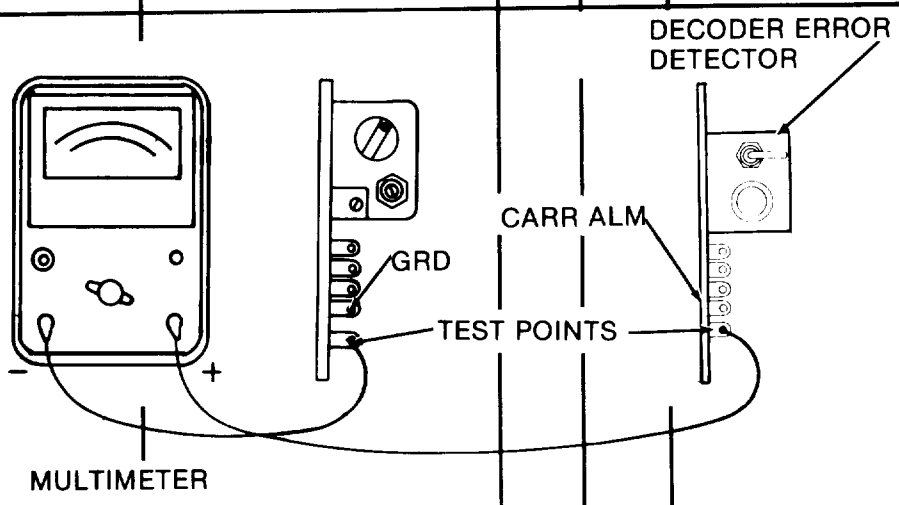
STEP	INSTRUCTION	INDICATION	YES	NO	REMARKS
2 (cont)		10 ±0.5V	X		Go to step 3.
		10 ±0.5V		X	Go to step 7.
3	Using test hookup shown in step 1, set transmitter TRANS MODE switch to LOW. Observe that polarity reverses.	-6vdc	X		Go to step 5.
		-6vdc		X	Go to step 4.
4	Check decoder error detector SEL A (TP1) voltage using test hookup shown below. 	8 ±0.5V	X		Continue trouble-shooting.
		8 ±0.5V		X	Replace decoder error detector, repeat step 1.
5	Check limiter discriminator output using test hookup shown below.				

TROUBLESHOOTING CHART NO. 5 (cont'd)

STEP	INSTRUCTION	INDICATION	YES	NO	REMARKS
5 (cont)	LIMITER DISCRIMINATOR  MULTIMETER	8 ±0.5V	X		Replace decoder error detector and repeat step 1.
		8 ±0.5V		X	Go to step 16.
6	Set transmitter TRANS MODE switch to HIGH. Same test hookup as shown in step 5.	10 ±0.5V	X		Replace decoder error detector and repeat step 1.
		10 ±0.5V		X	Replace limiter discriminator and repeat step 1.
7	Check decoder error detector alarm operation using test hookup shown below. (1) Remove receiver line filter.				

TROUBLESHOOTING CHART NO. 5 (cont'd)

STEP	INSTRUCTION	INDICATION	YES	NO	REMARKS
7 (cont)	(2) Reinstall receiver line filter. (3) Disconnect multimeter.	0 vdc	X		Go to step 8.
		0 vdc		X	Replace decoder error detector and repeat this step.

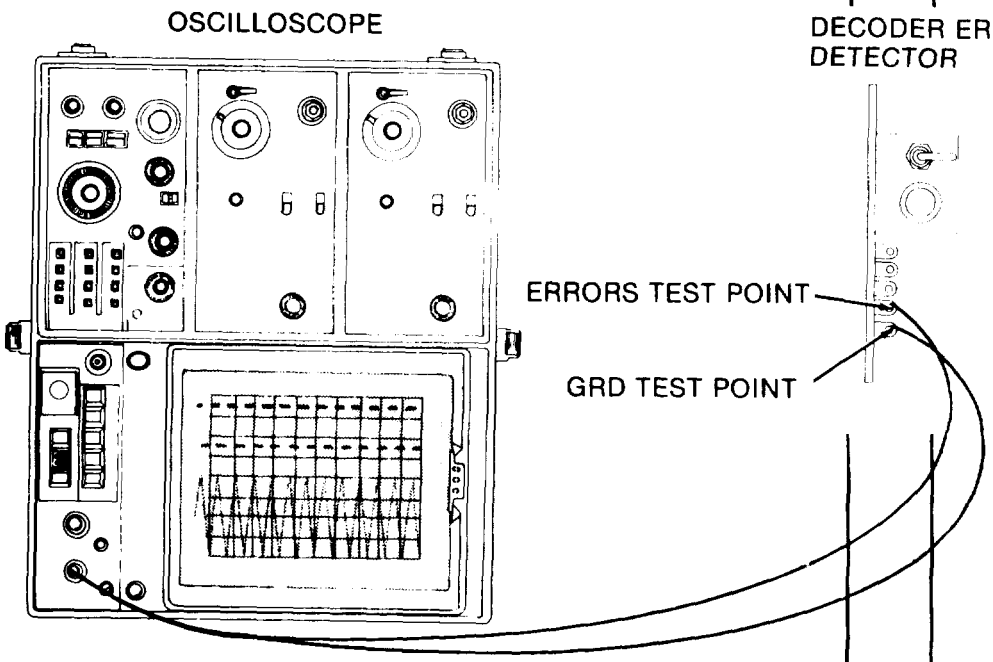


TROUBLESHOOTING CHART NO. 5 (cont'd)

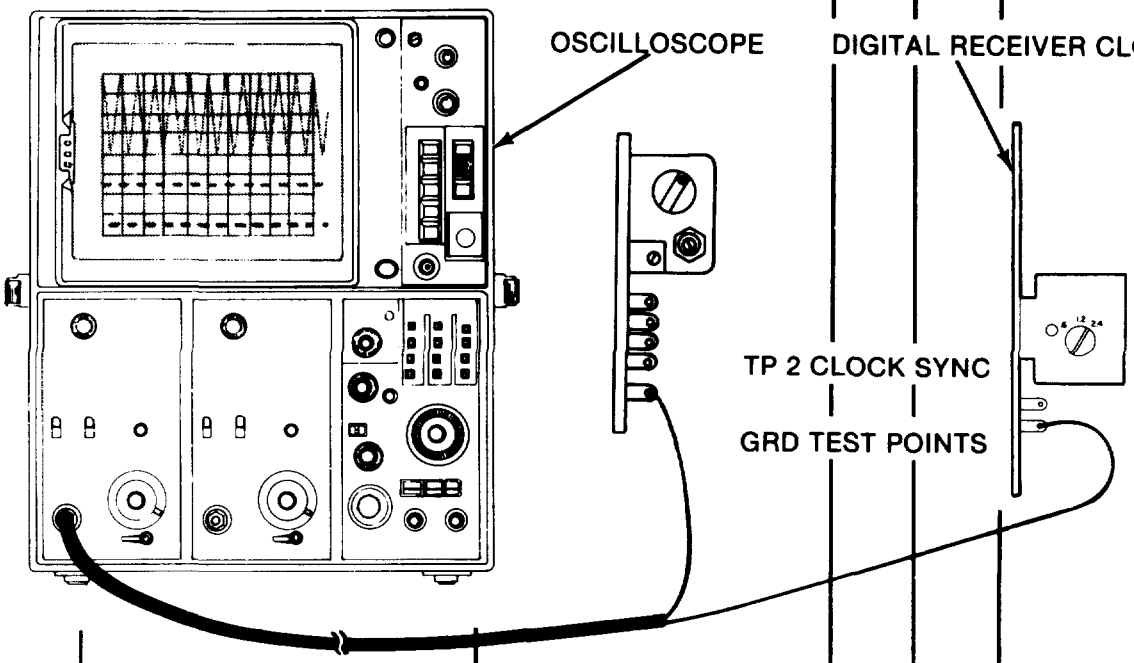
STEP	INSTRUCTION	INDICATION	YES	NO	REMARKS
8	Check decoder error detector lamp operation. (1) Set transmitter TRANS MODE switch to REV. (2) Remove transmitter clock.	ERRORS lamp lights	X		Go to step 10.
		ERRORS lamp lights		X	Go to step 9.
	Turn POWER switch off. Remove decoder error detector lamp and replace with lamp known to be good. Turn POWER switch on.	ERRORS lamp lights	X		Reinstall trans-mitter clock, go to step 12.
		ERRORS lamp lights		X	Go to step 10.
	NOTE **If decoder error detector lamp remains out check continuity of lamp with multimeter. If good, return to spares.**				

TROUBLESHOOTING CHART NO. 5 (cont'd)

STEP	INSTRUCTION	INDICATION	YES	NO	REMARKS
10	Check decoder error detector for random pulses using test hook.				
		Random pulses	X		Go to step 11.
		Random pulses		X	Replace decoder error detector and go back to step 1.
11	Check digital receiver clock sync pulse waveform using test hookup shown below.				



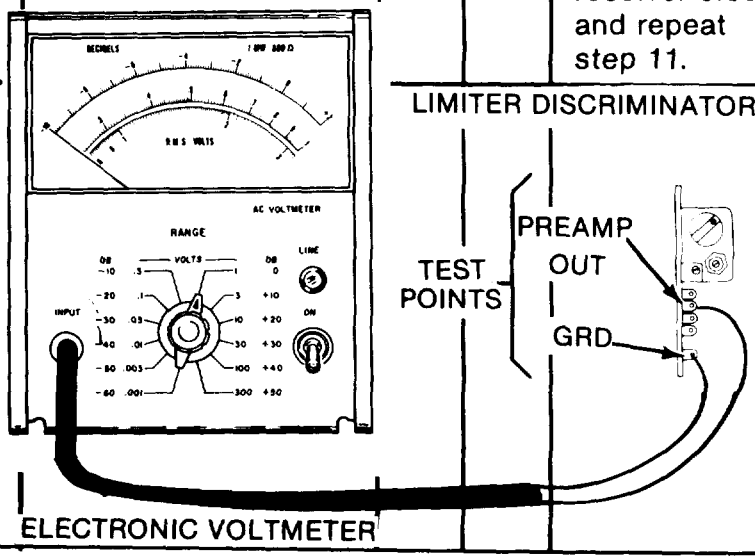
TROUBLESHOOTING CHART NO. 5 (cont'd)



STEP	INSTRUCTION	INDICATION	YES	NO	REMARKS
	FOR GROUND-USE TEST POINT (GRD) ON LIMITER DISCRIMINATOR				
11 (cont)		Waveform not greater than 15 microseconds wide at an amplitude of -6 ±0.5V to +6 ±0.5V	X		Continue trouble-shooting.
	If result not acceptable .	.....	....	....	Replace decoder error detector and go back to step 1.
12	Check digital receiver clock pulse output level using test hookup shown in step 11. Move oscilloscope probe from TP2 to TP1.				

TROUBLESHOOTING CHART NO. 5 (cont'd)

STEP	INSTRUCTION	INDICATION	YES	NO	REMARKS
12 (cont)		Same INDICATIONS as in step 11.	X X		Go to step 13. Go to step 13.
	If result not acceptable . . .	. . . . .	. . . .	. . . .	*Replace digital* receiver clock and repeat step 11.
13	Check digital receiver clock affect on ERRORS light. (1) Remove receiver clock.	ERRORS lamp lights. If ERRORS lamp was lighting intermittently lighting intervals will increase.	X		Decoder error detector and digital receiver clock functioning correctly.
		ERRORS lamp lights.		X	Replace digital *receiver clock* and repeat step 11.
14	Check limiter discriminator preamp output level using test hookup shown below.				



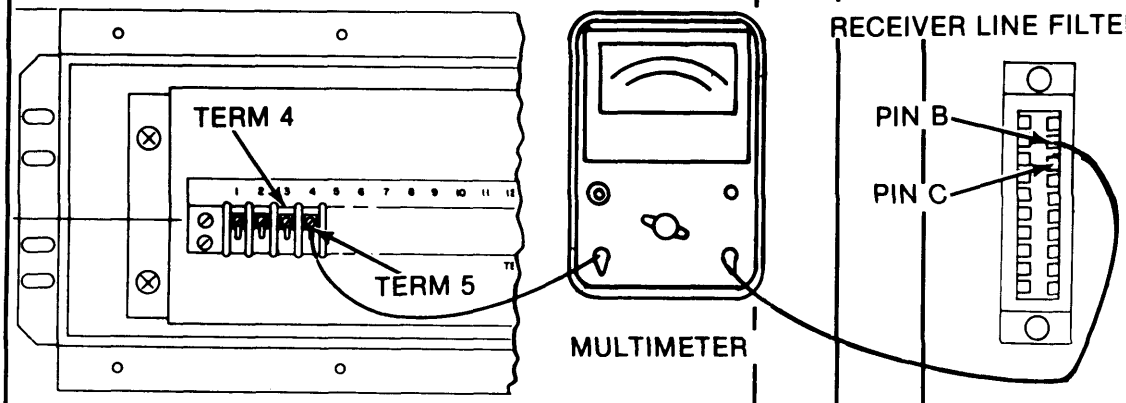
TROUBLESHOOTING CHART NO. 5 (cont'd)

STEP	INSTRUCTION	INDICATION	YES	NO	REMARKS
14 (cont)		-30 dbm	X		Go to step 16.
		-30 dbm		X	Go to step 15.
15	Check limiter discriminator preamp input level using test hookup in step 14. Move electronic voltmeter lead to PREAMP IN (TP1).	-16 dbm nominal	X		Go to step 18.
		-16 dbm nominal		X	Go to step 16.
16	Recheck limiter discriminator output using test hookup and procedures as outlined in step 5 of this troubleshooting chart.	Same INDICATIONS as in step 5.	X		Limiter discriminator is functioning correctly. Go to step 17.
		Same INDICATIONS as in step 5.		X	Replace limiter discriminator and continue troubleshooting.
17	Check operation of bandpass filter section of receiver line filter. Set transmitter TRANS MODE switch to PATT. Set limiter discriminator REC MODE switch to BACK-TO-BACK.	ERRORS lamp lights intermittently	X		Go to step 18.
		ERRORS lamp lights intermittently		X	Replace receiver line filter and repeat this step.

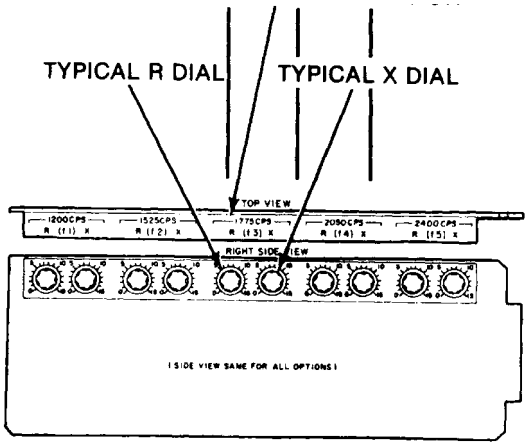
TROUBLESHOOTING CHART NO. 5 (cont'd)

STEP	INSTRUCTION	INDICATION	YES	NO	REMARKS
18	Check operation of receiver line filter. Set limiter discriminator REC MODE switch to NORM. Ask distant terminal to transmit random pattern. step. If result not acceptable, go to step 19.	ERRORS lamp lights intermittently ERRORS lamp lights intermittently and repeat this	X	 X	Go to step 20. Replace receiver line filter
19	Check that signal input wiring is continuous through modem shelf from the digital data modem input-output terminal board to the receiver line filter connector using test hookup shown below. (1) Turn POWER switch off. (2) Remove receiver line filter. (3) Plug in PCC module extender. Do not plug receiver line filter into extender. (4) Set multimeter to low ohm scale and connect as follows.				

TROUBLESHOOTING CHART NO. 5 (cont'd)

STEP	INSTRUCTION	INDICATION	YES	NO	REMARKS
19 (cont)	 MODEM SHELF —REAR VIEW **For Model MD-701B/UY** TERMINAL BOARD TB 2 TERM 4 TO TERM 5 TO **For Models MD-701/UY** TB 1 TERM 4 TO TERM 5 TO	MODULE CONNECTOR PIN B PIN C PIN B PIN C FOR ALL MODELS Continuity	X		Trouble is outside the digital data modem.
	If result not acceptable . .	. . . . .	. . . .	. . . .	Replace modem shelf.

TROUBLESHOOTING CHART NO. 5 (cont'd)

STEP	INSTRUCTION	INDICATION	YES	NO	REMARKS
20	Check operation of adjustable equalizer, following test procedure below. (1) Turn POWER switch off. (2) Remove adjustable equalizer. (3) Record all settings of R and X controls. (4) Set all R controls to 15. (5) Set all X controls to 0. (6) Reinstall adjustable equalizer. (7) Turn POWER switch ON.	**TYPICAL FREQUENCY IDENTIFICATION**  **ADJUSTABLE EQUALIZER CONTROLS**			
		ERRORS lamp lights intermittently	X		Go to step 21.
		ERRORS light lights intermittently		X	Replace adjustable equalizer, resume operation.
21	Turn POWER switch off. Remove adjustable equalizer and reset all control (R and X) to setting recorded in step 20. Reinstall adjustable equalizer and turn POWER switch on.	ERRORS lamp lights intermittently		X	Resume operation.
		ERRORS lamp lights intermittently		X	Notify next higher level of maintenance.

End of Troubleshooting Chart No. 5. Next page is 5-50, Section V., Maintenance Procedures.

Section V. MAINTENANCE PROCEDURES

5-18. OPERATIONAL CHECK AND INSPECTION - INSTALLED ITEMS

Do PMCS. The PMCS table, Section III in this chapter, provides an operational check of the digital data modem and inspection of installed items.

5-19. REMOVAL

a. Plug-in components listed

SHELF POSITION	NAME	SHELF POSITION	NAME
A1	Power Supply	A6	Limiter Discriminator
A2	Digital Data Transmitter	A7	Decoder Error Detector
A3	Transmitter Clock	A8	Digital Receiver Clock
A4	Receiver Line Filter	A9	Module Extender
A5	Adjustable Equalizer	A10	Data Carrier Alarm

A11 RF Oscillator - removal procedure different from other plug-ins.

b. REMOVAL OF PLUG-IN UNITS

EQUIPMENT CONDITIONS

- Power off
- Front cover open, and lowered on hinge to stop with no interference.
- Clear front workspace -- enough to handle plug-ins units which are about 10 inches deep.

PROCEDURES -- except RF oscillator

NOTE

The power supply is larger and heavier than the other plug-in units and includes a metal chassis. Nevertheless, it is securely attached to its printed circuit card and plugs in and out of the modem shelf like all the regular plug-ins.

CAUTION

Do not use any tools. The module you will handle has an exposed printed circuit card which can be broken easily or scratched through. Any difficulty in removal should be referred to higher level maintenance. Provide a clear and cushioned place to set the module down after removal.

1. **Grasp with your hand, front edge of module.**
2. **Pull gently forward until connector release is felt or for about 1 inch.**
3. **Reposition grip and place other hand to hold back end at removal.**
4. **Pull gently to complete removal.**

PROCEDURE -- RF oscillator

1. Remove plug-in modules located at the left and right side of the RF oscillator, following procedures above. This will make a suitable working space for you.
2. Remove cover plate and two attaching screws.
3. Grasp RF oscillator and pull it forward out of its socket.
4. Reinstall modules you removed in step 1, following reassembly procedure --paragraph 5-22. Be sure each module is put back in its own shelf position.

5-20. CLEANING

WARNING

The fumes of trichlorotrifluorethane are toxic. Refer to WARNING page in front of this manual for precautions to follow when using trichlorotrifluorethane.

a. Use a dry, clean, lint-free cloth or brush to remove dust or dirt. If necessary, moisten the cloth or brush with trichlorotrifluorethene. After cleaning, wipe dry with a clean cloth. (Item 2, App. E.)

WARNING

Compressed air is dangerous and can cause bodily harm. Refer to WARNING page in front of this manual for precautions to follow when using compressed air.

b. Dry, compressed air, not to exceed 29 psi, may be used to remove dirt and dust from inaccessible places, but not air filters.

5-21. REPAIR OR REPLACEMENT

a. Repair by replacement of plug in components.

- Remove defective plug component, following procedure in paragraph 5-19, Removal.
- Install serviceable plug, following procedure in paragraph 5-22, Reassembly.

b. Replacement of POWER fuse.

- Power off
- Push in cap of holder, turning counterclockwise to release.
- Remove cap and fuse.
- Replace fuse in cap and reinstall.

c. Replacement of power supply dc circuit fuses.

- Remove power supply, following procedure in paragraph 5-19, Removal. Fuses can be readily seen on printed circuit card.

CAUTION

Do not pry out fuse. Use your fingers or a fuse puller only. The PCC is easily damaged.

- Using a fuse puller or your fingers pull the defective fuse from its clips.
- Install serviceable fuse, pressing it into the clips with your thumb.

d. Replacement of indicator lights.

- Unscrew retainer ring around lamp and remove ring.
- Pull lamp straight out.
- Push in serviceable lamp and replace ring.

5-22. REASSEMBLY

EQUIPMENT CONDITIONS

- Power off
- Front cover open and lowered on hinge to stop with no interference.

PROCEDURE -- all plug-in components except RF oscillator

CAUTION

Any difficulty in sliding the modules in and out should be referred to higher level maintenance. Modules should slide freely. Use no force, tools or lubricants.

1. Insert module into guides at top and bottom. The power supply has two upper and two lower guides. Other modules have only one.
2. Slide module back until entering connector is flat.
3. Push with your thumb to seat in connector.
4. Check that modules are fully seated and will not prevent cover being raised to its closed position.
5. Close and fasten access cover.

PROCEDURE -- RF oscillator

1. Observe alignment of keyway in octal socket at back of RF oscillator position.
2. Note key position on oscillator and plug oscillator into shelf.
3. Replace cover plate and fasten with its two mounting screws.

5-23. PAINTING AND REFINISHING

a. General

Refinishing processes should restore equipment surfaces to original appearance and as-new standards. Minor damage to finishes, such as small scratches, require touchup painting of the affected areas only.

b. Touchup Procedures

(1) Remove all rust and corrosion by lightly sanding the affected areas with fine sandpaper (item 3, App. E) (NSN 5350-00-235-0124). Clean with solvent and allow to dry.
(2) Apply chemical film as directed in MIL-C-5541 using small camel's hair brush. Allow to dry.
(3) Apply zinc chromate primer 0.0004 to 0.0006-inch thick, as directed in Federal Specification TT-P-1757, over the chemical film using small camel's hair brush. Allow to dry.
(4) Apply one coat of lusterless enamel paint, as directed in Federal Specification TTE-526, over the affected area. Allow to dry.

5-24. FINAL INSPECTION PROCEDURE

The final inspection procedures ascertain that all maintenance functions contained in this technical manual have been complied with before the equipment is returned to service.

a. Modification - Be sure that all MWO's listed in DA PAM 310-1 have been accomplished.

b. PMCS - Assure that the PMCS in Section III have been accomplished.

c. Completeness - Inspect the modem for completeness. Refer to Appendix B and TM 11-7440-232-20P for a list of components and accessories.

(1) Be sure all items listed in the basic issue items list are on hand.
(2) Check to see that each item is correctly stock-numbered.
(3) Be sure that the correct quantity is in each package.

d. Final Performance Check - The components of the modem shall meet the requirements of Section V before operating, packaging, or storage. If the operation check, PMCS, or Final Performance Check cannot be satisfactorily performed, contact the next level of maintenance.

e. Storage - Be sure that the components of the modem are marked, packaged, and packed as directed in Section VI.

5-25. RADIO INTERFERENCE SUPPRESSION

Digital Data Modem MD 701B/UY is supplied with radio frequency interference (RFI) shielded shelf. MD 701/UY and MD 701A/UY are not supplied with an RFI shelf.

5-26. PLACING IN SERVICE

If equipment is repairable by organizational maintenance, organizational maintenance personnel will insure that the digital data modem is in a serviceable condition before turning the equipment over to operating personnel. Replacement parts will be requisitioned through normal supply channels.

Section VI. SHIPMENT AND LIMITED STORAGE

5-27. DISASSEMBLY OF EQUIPMENT

Perform the following procedure to disassemble the MD-701(*)/UY.

- Turn power switch on power supply to OFF.
- Disconnect cabling at rear termination panel.
- Remove screws at the front flanges of the modem shelf.
- Slide the modem shelf out of the rack.

5-28. REPACKING FOR SHIPMENT OR LIMITED STORAGE

Repackaging of the MD-701(*)/UY for shipment or limited storage normally will be performed at a packaging facility or by a packaging team. If emergency packaging is required, select materials for those listed in SB 38-100. Package the MD-701(*)/UY in accordance with the original packaging as far as possible with available materials.

APPENDIX A

REFERENCES

This appendix lists forms and publications that are referenced in this manual or that contain information applicable to the operation and maintenance of the Digital Data Modem MD-701 (*)/UY.

AR 55-38	Reporting of Transportation Discrepancies in Shipments.
DA Form 2028-2	Recommended Changes to Equipment Technical Manuals.
DA Form 2404	Equipment Inspection and Maintenance Worksheet.
DA PAM 310-1	Consolidated Index of Army Publications and Blank Forms.
DA PAM 738-750	The Army Maintenance Management System (TAMMS).
SB 11-573	Painting and Preservation Supplies Available for Field Use or Electronics Command Equipment.
SB 38-100	Preservation, Packaging, Packing and Marking Materials, Supplies and Equipment Used by the Army.
SF 361	Discrepancy in Shipment Report.
SF 364	Report of Packaging and Handling Deficiencies.
SF 368	Quality Deficiency Report.
TB 385-4	Safety Precautions for Maintenance of Electrical/Electronic Equipment.
TM 11-7440-232-12-HR	Hand Receipt Covering Contents of End Item (COEI), Basic Issue Items (BII), and Additional Authorization List (AAL) for Modem, Digital Data MD-701/UY, MD-701A/UY, and MD-701 B/UY.
TM 11-7440-232-20P	Organizational Maintenance Repair Parts and Special Tools List Modems, Digital Data MD-701/UY, MD-701A/UY, MD-701 B/UY.
TM 11-7440-232-40	General Support Maintenance Manual Modem, Digital Data MD-701/UY, MD-701A/UY, MD-701B/UY.
TM 11-7440-232-40P	General Support Maintenance Repair Parts and Special Tools List (Including Depot Maintenance Repair Parts and Special Tools) for Modem, Digital Data MD-701/UY, MD-701A/UY, and MD-701B/UY.
TM 38-750	The Army Maintenance Management System (TAMMS).
TM 740-90-1	Administrative Storage of Equipment.
TM 750-244-2	Procedures for Destruction of Electronics Materiel to Prevent Enemy Use (Electronics Command).

APPENDIX B

COMPONENTS OF END ITEM AND BASIC ISSUE ITEMS LIST

Section I. INTRODUCTION

B-1. SCOPE

This appendix lists components of end item and basic issue items for the MD-701(*)/UY 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 MD-701(*)/UY in operation, to operate it, and to perform emergency repairs. Although shipped separately packaged BII must be with the MD-701(*)/UY 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 item.

B-3. EXPLANATION OF COLUMNS

a. Illustration. This column is divided as follows:

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

(2) Item number. The number used to identify item called out in the illustration.

b. National Stock Number. Indicates the National stock number assigned to the item and which will be used for requisitioning.

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

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

e. Usable on Code. Not applicable.

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

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

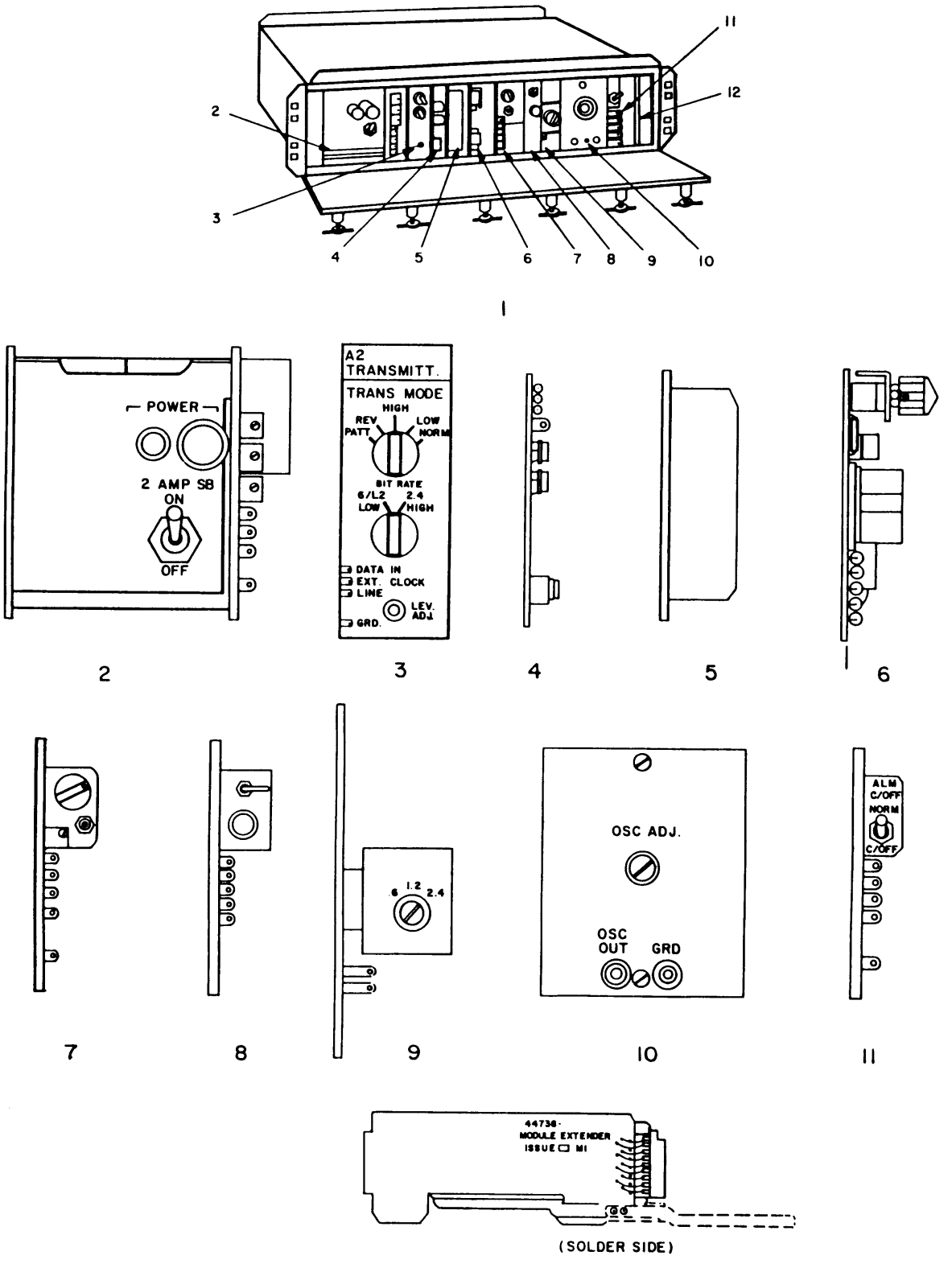


Figure B-1. Components of end item - MODEM MD-701(*)/UY.

SECTION II INTEGRAL COMPONENTS OF END ITEM

(1) ILLUSTRATION (a) FIGURE NO.	(1) ILLUSTRATION (b) ITEM NO.	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION PART NUMBER (FSCM)	(4) LOCATION	(5) USABLE ON CODE	(6) QTY REQ'D	(7) QUANTITY RCVD	(7) QUANTITY DATE
B-1	1 - 12	7025-00-999-9289	MODEM, DIGITAL DATA MD-701/UY (26C1-30006-2A)					
B-1	2	6130-00-990-9555	POWER SUPPLY ASSY 900-44751-01			1		
B-1	3	7035-00-938-8289	DIGITAL DATA XMTR 900-44572-01			1		
B-1	4	7025-00-725-8944	CLOCK, TRANSMITTER 900-44761-01			1		
B-1	5	5820-00-089-1901	LINE FILTER, RECEIVER 900-44753-01			1		
B-1	6	5820-00-938-1697	EQUALIZER ASSEMBLY 900-44755-01			1		
B-1	7	5820-00-938-8284	LIMITER/DISCRIMINATOR 900-44756-01			1		
B-1	8	5820-00-938-8285	ERROR DETECTOR/DECODER 900-44757-01, modified by MK-2-44757-01			1		
B-1	9	6645-00-938-1700	DIGITAL RECEIVER CLOCK 900-44760-01			1		
B-1	12	7040-00-938-8287	EXTENDER UNIT 900-44763-01			1		
B-1	1 & 10		TR SHELF, CODE AB 911-46880-01			1		
B-1	1 - 12	7025-00-878-8317	MODEM, DIGITAL DATA MD-701A/UY (26C1-30006-03AC)					
B-1	2		POWER SUPPLY ASSY 900-44571-01 modified by MK-2-44571-01			1		
B-1	3		DIGITAL DATA XMTR 900-44572-01 modified by MK-1-44752-01			1		
B-1	4	7025-00-725-8944	CLOCK, TRANSMITTER 900-44761-01			1		
B-1	5	5820-00-089-1901	LINE FILTER, RECEIVER 900-44753-01			1		
B-1	6	5820-00-938-1697	EQUALIZER ASSEMBLY 900-44755-01			1		
B-1	7	5820-00-938-8284	LIMITER/DISCRIMINATOR 900-44756-01			1		
B-1	8	5820-00-938-8285	DECODER 900-44757-01 modified by MK-2-44757-01			1		
B-1	9	6645-00-938-1700	DIGITAL RECEIVER CLOCK 900-44760-02			1		
B-1	11		DATA CARRIER ALARM 900-46841-01			1		
B-1	12	7040-00-938-8287	EXTENDER UNIT 900-44763-01			1		
B-1	1 & 10		TR SHELF, CODE AB 911-46880-01 modified by MK-1-46880-01			1		
B-1	1 - 12	7025-00-878-8316	MODEM, DIGITAL DATA MD-701B/UY (26C1-30006-04AC)					
B-1	2		POWER SUPPLY ASSY 900-44571-01 modified by MK-2-44571-01			1		
B-1	3		DIGITAL DATA XMTR 900-44572-01 modified by MK-1-44572-01			1		
B-1	4	7025-00-725-8944	CLOCK, TRANSMITTER 900-44761-01			1		
B-1	5	5820-00-089-1901	LINE FILTER, RECEIVER 900-44753-01			1		
B-1	6	5820-00-938-1697	EQUALIZER ASSEMBLY 900-44755-01			1		
B-1	7	5820-00-938-8284	LIMITER/DISCRIMINATOR 900-44756-01			1		
B-1	8	5820-00-938-8285	DECODER 900-44757-01 modified by MK-2-44757-01			1		
B-1	9	6645-00-938-1700	DIGITAL RECEIVER CLOCK 900-44760-02			1		
B-1	11		DATA CARRIER ALARM 900-46841-01			1		
B-1	12	7040-00-938-8287	EXTENDER UNIT 900-44763-01			1		
B-1	1 & 10		TR SHELF, CODE A 911-46870-01			1		

SECTION III BASIC ISSUE ITEMS

(1) ILLUSTRATION (a) FIGURE NO.	(1) ILLUSTRATION (b) ITEM NO.	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION PART NUMBER (FSCM)	(4) LOCATION	(5) USABLE ON CODE	(6) QTY REQ'D	(7) QUANTITY RCVD	(7) QUANTITY DATE
			TECHNICAL MANUAL, TM 11-7440-232-12			1		
		5920-00-284-9494	FUSE: AGC3-4			1		
		5920-00-933-5439	FUSE, CATRIDCGE: AGC1-2			1		
		5920-00-184-1437	FUSE, CATRIDGE: 0.2 amp					
		6240-00-949-8325	LAMP CATRIDGE INCANDESCENT: CFP12-12A2			1		
		6240-00-672-2662	LAMP CATRIDGE INCANDESCENT: 39-10-1431			1		

APPENDIX C

ADDITIONAL AUTHORIZATION LIST

NOTE

Not applicable to Modem, Digital Data MD-701(*)/UY.

APPENDIX D

MAINTENANCE ALLOCATION CHART

Section I. INTRODUCTION

D-1. GENERAL

This appendix provides a summary of the maintenance operations for Modem, Digital Data MD-701(*)/UY. It authorizes categories of maintenance for specific 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.

D-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 of an item and comparing those characteristics with prescribed standards.

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, and item, part, module (component or assembly) in a manner to allow the proper functioning of the equipment or system.

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

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

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

k. Rebuild. Consists of those services/actions necessary for the restoration of unserviceable equipment to a like new condition in accordance with original manufacturing standards. Rebuild is the highest degree of material 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.

D-3. Column Entries.

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

b. Column 2 - Component/Assembly. Column 2 contains the noun names of components, assemblies, subassemblies, and modules for which maintenance is authorized.

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

d. Column 4 - Maintenance Category. Column 4 specifies, by the listing of a "worktime" figure in the appropriate subcolumn(s), the lowest level of maintenance authorized to perform the function listed in column 3. This figure represents the active time required to perform that maintenance function at the indicated category of maintenance. If the number or complexity of the tasks within the listed maintenance function vary at different maintenance categories, appropriate "worktime" figures will be shown for each category. The number of task-hours specified by the "worktime" figure represents the average time (hr.) 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	**H** - General Support
O - Organizational	**D** - Depot
F - Direct Support	**L** - Specialized Repair Activity: (L)

e. Column 5 - Tools and Equipment. Column 5 specifies by code, those common tool sets (not individual tools), and special tools, test, and support equipment required to perform the designated functions.

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.

D-4. Tool and Test Equipment Requirements (Section 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.

D-5. Remarks (Section 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
MODEM, DIGITAL DATA MD-701/UY, MD-701A/UY, and MD-701B/UY

(1) Group Number	(2) Component/ Assembly	(3) Maintenance Function	(4) Maintenance Category C	O	F	H	D	(5) Tools and Equipment	(6) Remarks
00	MODEM, DIGITAL DATA MD-701/UY (26C1-30006-2A),	Inspect		0.5					
	MD-701A/UY (26C1-30006-03AC), and	Test		1.0				1-6	
	MD-701B/UY (26CI-30006-04AG)	Test				1.5		2-8	
		Service		1.0					
		Replace		0.3				1,2	
		Repair		0.5				1,2	1
		Repair				2.0		2,7	
		Adjust					1.0	2-5, 11	
		Overhaul					15.0	2-30	
01	POWER SUPPLY ASSEMBLY, A1 (900-44751-01, and	Test		0.5				1-6	
	900-44751-01 modified by MK2-44751-01)	Test				1.0		2-7	
		Replace		0.3					
		Repair					1.0	2,3,7,12	2
								14,21	
02	DIGITAL DATA TRANSMITTER, A2 (900-44752-01, and	Test		0.5				1-6	
	900-44752-01 modified by MK1-44752-01)	Test				1.0		2-7	
		Replace		0.3					3
		Repair					1.0	2-5,12,	
								13,16,21	
								25	
03	TRANSMITTER CLOCK, A3	Test		0.5				1-6	
	(900-44761-01)	Teat				1.0		2-7	
		Replace		0.3					
		Repair					1.0	2,4,5,7,	
								12,16,18,	
								21,25	
04	ELECTRONIC NOISE LIMITER, RECEIVER LINE FILTER,	Test		0.5				1-6	
	A4 (900-44753-01)	Test				1.0		2-7	
		Replace		0.3					
		Repair					1.0	2,3,7,11,	
								16,21	
05	EOUALIZER ASSEMBLY, A5	Test		0.5				1-6	
	(900-44755-01)	Test				1.0		2-7	
		Replace		0.3					
		Repair					1.0	3,7,1n-	
								12,15,16,	
								21,24,25	

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SECTION II MAINTENANCE ALLOCATION CHART
FOR
MODEM, DIGITAL DATA MD-701/UY, MD-701A/UY, AND MD-701B/UY

(1) Group Number	(2) Component/ Assembly	(3) Maintenance Function	(4) Maintenance Category C	O	F	H	D	(5) Tools and Equipment	(6) Remarks
05	EQUALIZER ASSEMBLY, A5	Test		0.5				1-6	
	(900-44755-01)	Test				1.0		2-7	
		Replace		0.3					
		Repair					1.0	3,7,10-12, 15,16,21, 24,25	
06	LIMITER/DISCRIMINATOR, A6	Test		0.5				1-6	
	(900-44756-01)	Test				1.0		2-7	
		Replace		0.3					
		Repair					1.0	2-5,7,11, 12,16,17, 21,25	
07	DECODER, ERROR DETECTOR, A7	Test		0.5				1-6	
	(900-44757-01 modified by MK-2-44757-01)	Test				1.0		2-7	
		Replace		0.3					
		Repair					1.0	2-5,7,11, 12,16,21, 22,25	
08	DIGITAL RECEIVER CLOCK,A8	Test		0.5				1-6	
	(900-44760-01 and 900-44760-02)	Test				1.0		2-7	
		Replace		0.3					4
		Repair				1.0		2,4,5,7, 12,18,21, 25	
09	EXTENDER UNIT	Replace		0.3					
	(900-44763-01)	Repair				.5		2,7	
10	DATA CARRIER ALARM ASSEMBLY, All	Test		0.5				1-6	
	(090-46841-01)	Test				1.0		2-7	
		Replace		0.3					5
		Repair					1.0	3,5,7,10. 12,13,16 17,21,25	
11	TRANSMITTER RECEIVER SHELF, CODE AB (911-46880-01	Replace		0.3				1	
	and 911-46880-01 modified by MK1-46880-01) and	Repair				1.0		1,2,4,5,	6
	TRANSMITTER RECEIVER SHELF, CODE A(911-46870-01'							7,8	
1101	OSCILLATOR, RADIO FREQUENCY: PLUG-IN UNIT,	Replace		0.3				1	
	4.8 MHz A9 (190-47861-01)	Test					2.0	2,4,5,7, 19,26	

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SECTION III TOOL AND TEST EQUIPMENT REQUIREMENTS FOR MODEM, DIGITAL DATA MD-701/UY, MD-701A/UY, AND MD-701B/UY

Tool or Test Equipment Ref Code	Maintenance Category	Nomenclature	National/NATO Stock Number	Tool Number
1	O	TOOL KIT, ELECTRONIC EQUIPMENT TK-101/G	5180-00-605-0079	
2	O,H,D	MULTIMETER AN/USM-223	6625-00-999-7465	
3	O,H,D	VOLTMETER, ELECTRONIC ME-459/U	6625-00-229-0457	400EL (24840)
4	O,H,D	OSCILLOSCOPE AN/USM-281C	6625-00-106-9622	7603N11S (80009)
5	O,H,D	CART, OSCILLOSCOPE	6625-01-030-5401	NO. 3 (80009)
6	O,H,D	EXTENDER, MODULE	7040-00-938-8287	900-4473 (83744)
7	H,D	TOOL KIT, ELECTRONIC EOUIPMENT TK-105/G	5180-00-610-8177	
8	H,D	TEST SET, SEMICONDUCTOR TS-1836D/U	6625-00-138-7320	
9	D	DECADE, CAPACITOR	6625-01-041-4522	4440A (28480)
10	D	DECADE, RESISTOR ZM-16()/U	6625-00-669-0266	
11	D	GENERATOR, SIGNAL AN/URM-127	6625-00-783-5965	204C (28480)
12	D	VOLTMETER TS-2843/U	6625-00-965-8304	883AB (89536)
13	D	GENERATOR, FUNCTION	6625-00-466-0586	3310A (28480)
14	D	TRANSFORMER, VARIABLE	5950-00-617-9242	W5MT3 (28569)
15	D	ANALYZER, SPECTRUM TS-3628(V)1/U	6625-00-359-1927	3580A (28480)
16	D	COUNTER, ELECTRICAL, DIGITAL CP-772A/U	6625-00-973-4837	5245LC15 (28480)
17	D	ATTENUATOR, VARIABLE CN-1000/G	6625-00-215-4931	350D (28480)
18	D	OSCILLATOR, TEST SG-1128/U	6625-00-450-7590	654A (28480)
19	D	STANDARD, FREQUENCY	6625-00-480-8675	105A (28480)
20	D	GENERATOR, NOISE SG-827/U	6625-00-799-8999	
21	D	JIG, TEST (3 ea reqd)	*	738 (83744)
22	D	OSCILLATOR, CLOCK	*	790-44758 (83744)
23	D	ADAPTER, TEST	*	826 (83744)
24	D	FILTER, LOW PASS, 3.4 KHz	5915-00-021-5561	FI-2721 (83744)
25	D	POWER SUPPLY ASSEMBLY	6130-00-990-9555	900-44751-01 (83744)
26	D	POWER SUPPLY, DIRECT CURRENT	6130-00-812-1886	711A (28480)
27	D	TRANSFORMER, ISOLATION	*	GIS-500 (72983)
28	D	TRANSFORMER, VY HYBRID	*	948A (83744)
29	D	RELAY, MERCURY	5945-00-103-7540	HGS-1089 (04761)
30	D	MULTIMETER ME-303A/U	6625-00-999-4572	410C (28480)

* THE NATIONAL STOCK NUMBERS THAT ARE MISSING FROM THIS LIST HAVE BEEN REOUESTED AND WILL BE ADDED BY A CHANGE TO THIS LIST UPON RECEIPT.

NOTE

EQUIVALENT TOOLS OR TEST EQUIPMENT MAY BE SUBSTITUTED FOR THE ABOVE.

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SECTION IV. REMARKS

Reference Code	Remarks
1	Organizational test is limited to equipment operation and those test using the limited test equipment indicated in the Tool And Test Equipment Requirements. Organizational repair is limited to replacement of lamps, fuses, and assemblies as indicated.
2	MD-701A/UY and MD-701B/UY use the modified version.
3	MD-701A/UY and MD-701B/UY use the modified version.
4	MD-701A/UY and MD-701B/UY use the 900-44760-02.
5	Data Carrier Alarm Assembly furnished as part of Modification MK-1-46880-01 and is used by MD-701A/UY and MD-701B/UY.
6	Transmitter Receiver Shelf 911-46880-01, 911-46880-01 modified by MK1-46880-01, and 911-46870-01 are used in MD-701/UY, MD-701A/UY and MD-701B/UY respectively.

APPENDIX E

EXPENDABLE SUPPLIES AND MATERIALS LIST

Section I. INTRODUCTION

E-1. SCOPE

This appendix lists expendable supplies and materials you will need to operate and maintain the MD-701(*)/UY. There are authorized to you by CTA 50-970, Expendable Items (Except Medical, Class V, Repair Parts, and Heraldic Items).

E-2. EXPLANATION OF COLUMNS

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

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

C - Operator/Crew
O - Organizational Maintenance
F - Direct Support Maintenance
H - General Support Maintenance

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

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

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

Section II. EXPENDABLE SUPPLIES AND MATERIALS LIST

(1) Item Number	(2) Level	(3) National Stock Number	(4) Description	(5) U/M
1	0	6850-00-105-3084	TRICHLOROTRIFLUOROETHANE	16 oz.
2	0	7920-00-924-5700	CLOTH, CLEANING	EA
3	0	5350-00-235-0124	SANDPAPER, FINE	PG

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T (cont)

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