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OPERATIONS MANUAL

DIGITAL MULTIDROP EXTENDER

DME

February 12, 1996

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U.S.A.

PT # 719003-B

SAFETY WARNING

Always observe standard safety precautions during installation, operation and maintenance of this product. To avoid the possibility of electrical shock, be sure to disconnect the power cord from the power source before you remove the IEC power fuses or perform any repairs.

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CHAPTER 1 - INTRODUCTION

1.1 FUNCTIONAL DESCRIPTION

The Digital Multidrop Extender (DME) utilizes state of the art digital CMOS technology to provide a feature filled product at a very affordable price. The DME transmits and receives data bi-directionally at data rates up to 64kbps. The unit is designed for synchronous Point-to-Point or Multi-point operation.

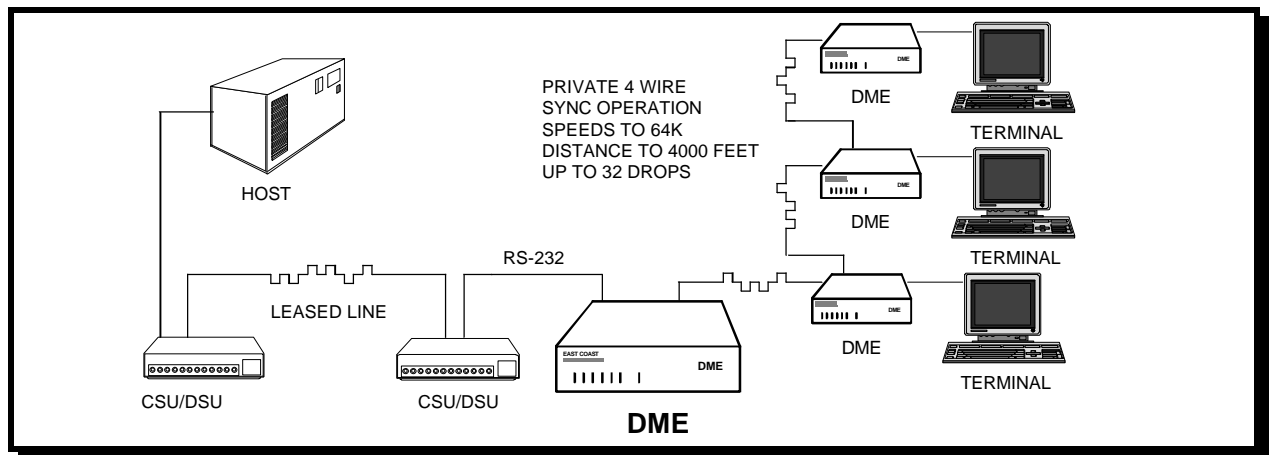
Applications that benefit from the DME are Polled / Contention networks operating on Switched or Constant Carrier Operation. The DME allows the user to set up a fully digital multipoint network over a campus environment by connecting directly to the back of a CSU/DSU. In this scenario, clocking is provided by the DDS while the DME transmits digital data bi-directionally while the DTE devices are polled from the Host site.

Substantial cost savings are derived by eliminating the need for a Time Division Multiplexer (TDM) or Digital Sharing Device (DSD) behind the CSU/DSU. Additionally, analog Line Drivers are no longer required from the subchannel ports of the TDM or DSD to remote DTE devices.

Installation is fast and simple by setting the internal DCE/DTE switch, Clocking, Constant or Switched Carrier Operation and the Contention Mode of RTS or Data.

The DME provides optional Anti-Streaming circuitry. Once enabled, Anti-Streaming will automatically remove a defective DTE from service if the Data / Control criteria is present for the user defined clock selection period.

The DME is housed in a sturdy metal enclosure and operates on 110/220VAC.



1.2 THEORY OF OPERATION

The DME allows up to 32 Data Terminal Equipment (DTE's) to share one modem link. In a polled or contention environment the typical DME operation has one *MASTER* DME and corresponding *SLAVE* DME's. A multidrop polled operation is as follows:

Data arriving at the Local Site Modem (From the Host) is passed through the RS-232 port to the first *MASTER* DME. The *MASTER* DME continually transmits to all of the corresponding *SLAVE* DME's. When one of the DTE devices answers the poll from the host site, that DTE device will raise RTS (Request To Send) to a *SLAVE* DME. When RTS is raised, the *SLAVE* DME turns on its transmitter to the *MASTER* DME. The *MASTER* DME, seeing active data, will transmit through the RS-232 port to the Local Modem. The Local Modem will in turn transmit data back to the host site.

CHAPTER 2 - BASIC OPERATION

2.1 FRONT PANEL INDICATORS AND SWITCHES

A *Green* LED illuminates when AC Power has been applied. Five adjacent *Green* LEDs illuminate when the appropriate control signals are active. A *Yellow* LED is provided to provide the user with a visual indication of a streaming DTE (ref. 2.6)

2.2 REAR PANEL CONNECTORS AND FUSES

Located on the back or rear of the product is an IEC Power receptacle. The supplied power cord plugs into this receptacle. This receptacle also contains a fuse drawer. Two (2) fuses are located in this compartment. For 110 VAC +/- 10% operation the unit is equipped with slow blow 160ma Fuses, Part # 714000. For 220 VAC +/- 10% operation the unit is equipped with slow blow 80ma Fuses, Part # 714001. Additionally, you will find the RS-232 DCE/DTE port for connection to a DCE (Modem) or DTE (Terminal) type device, two (2) RJ-45's and a 4-position terminal block.

2.3 CLOCKING

Internal clock rates up to 64Kbps are generated by the DME. External clocking, via the External Transmit Lead (Pin 24) or Slave Clocking through the system may also be utilized.

2.4 RS-232 ELECTRICAL INTERFACE

The DME is EIA RS-232 (CCITT V.24) compliant using a female DB-25 connector. Refer to the interface chart in the Appendix for detailed interface information.

2.5 4-WIRE ELECTRICAL INTERFACE

The DME transmits data via 4-Wire private wire (unloaded with no bridge taps), full or Half duplex. The 4-Wire drivers and receivers are EMI reduced RS-485 transceivers. These specialized transceivers are deliberately slow rate limited to reduce high frequency electromagnetic emissions while providing improved signal fidelity by reducing reflections due to any misterminated cables in the users environment.

2.6 RTS TO CTS DELAY

Variable RTS to CTS delays settings are selectable via an internal Dip Switch.

2.7 ANTI-STREAMING

2.7.1 AUTOMATIC DTE REMOVAL

The DME incorporates circuitry that will (when enabled) *automatically* remove a streaming terminal from service. A streaming terminal is defined as a terminal that has RTS (Or Data Transitions) *HIGH* longer than the user predefined anti-stream timer has been set. Upon installation, the user can set or actually fine tune the timer to your network requirements. A Yellow LED is provided on the front panel of the DME to indicate when a DTE device is streaming. Once a terminal has gone into the streaming condition (RTS continually high) or continually spacing data, the DTE will automatically be removed from service until the DTE fault has been corrected by the user. All other DTEs will continue to be serviced by the **MASTER** DME and their corresponding **SLAVE** DME's.

2.8 CARRIER - CONSTANT OR SWITCHED

The DME has an internal Dip Switch for **CONSTANT** or **SWITCHED CARRIER** operation. This must be set to your network requirement for the DMEs to function.

2.9 CONTENTION - RTS OR DATA

The DME has an internal Dip Switch for **CONTENTION** on **RTS** or **DATA** Transitions. The DTE's (Terminals) typically switch on **RTS**. For DTE's that do not respond to **RTS** and **CTS**, a **Switch On Data** mode is provided. The **Switch On Data** mode is also usually used at the **MASTER** DME for multidrop networks.

2.10 DCE/DTE SWITCHES

Located internally are two slide switches that allow the RS-232 port to be set as a **DTE** or **DCE** interface.

CHAPTER 3 - INSTALLATION

CAUTION: Disconnect Power Before Servicing
ATTENTION: Couper Le Courant Avant l' Entretien
VORSICHT: Befor Deckung Abnehmen Mach Strom Zu

3.1 VOLTAGE SELECTION

It is very important to check that the unit is set to the correct voltage setting for your application before applying AC power. Located on the rear of the unit you will find a rotary 110/220 VAC switch. Using a coin or small screwdriver, *gently* turn the switch to the appropriate power position as required for your installation (110 or 220 VAC).

3.2 VOLTAGE SELECTION FUSES

Located on the back or rear of the product you will find an IEC Power receptacle. This receptacle contains a fuse drawer. Two (2) fuses are located in this compartment. For 110 VAC +/- 10% operation the unit is equipped with slow blow 5 x 20mm 160ma Fuses, E.C.D. Part # 714000. For 220 VAC +/- 10% operation the unit is equipped with slow blow 5 x 20mm 80ma Fuses, E.C.D. Part # 714001. Spare fuses may be purchased by calling East Coast Datacom or by calling the fuse manufacturer: Little Fuse at (312) 824-3024 or Shurter, Inc. at (707) 778-6311

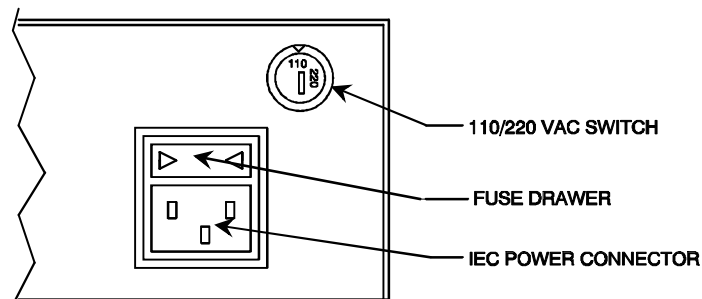
Little Fuse Part #'s are: 160ma = 218.160 and 80ma = 218.080

Shurter, Inc. Part #'s are: 160ma = 034.3109 and 80ma = 034.3106

3.3 POWER CONNECTION

Before connecting the DMEs to an AC power source the top cover should be installed with the supplied #4-40 screws. AC power is supplied to the DMEs through a 2.3m (6.6 ft) cord terminated by a grounded 3-prong plug. Select an appropriate location accessible to and within four to five feet of an AC outlet. The AC Power source **MUST** be grounded or the DME's warranty will be void.

Power Connection
Figure 3-1



3.4 DEFAULT CONFIGURATION SWITCH SETTINGS

The DME is configured prior to shipping with following default settings:

- 1) DCE/DTE Mode - *DCE*
- 2) Baud Rate - *9600*
- 3) Transmit Timing - *Internal*
- 4) Clock Mode - *Slave*
- 5) Carrier Mode - *Switched*
- 6) Contention - *RTS*
- 7) Termination Resistor - *Disabled*
- 8) RTS to CTS Delay - *5ms (None)*
- 9) Anti-Stream - *Enabled @ 5 Seconds*
- 10) Chassis to Signal Ground - *Disabled*

If your system application requires one or more of the default settings to be changed, it will be necessary to remove the top cover of the DME. It is recommended to, *Disconnect the AC Power Cord before servicing the unit.* Removal of the top cover is accomplished by using a small Philips screwdriver and removing the four outside screws. After setting the switches, replace the top cover before applying AC power.

3.5 INTERNAL SWITCH SETTINGS

3.5.1 DIP SWITCHES

The DME has two internal *Dip Switches* that are accessible by removing the Top Cover. Located safely inside the unit, you will find a eight (8) position Dip Switch labeled **SW1** and an four (4) position Dip Switch labeled **SW2** . These switches provide configuration for the following: Baud Rate, Transmit Timing, Clock Mode, Carrier Mode, Contention Mode, RTS/CTS Delay and Anti-Stream. To change the settings, you may use your finger tip or a small non-conductive instrument. It is recommended *NOT* to use metal objects to push on the *Dip Switches*, as you may slip and damage a component trace.

3.5.2 DIP SWITCH, **SW1** - POSITIONS 1,2,3

The **BAUD RATES** are selected via Dip Switch **SW1**, positions **1**, **2**, and **3**. Please refer to the appendix at the end of this manual for the settings Chart.

3.5.3 DIP SWITCH, **SW1** - POSITION 4

The **TRANSMIT TIMING SOURCE** is selected via Dip Switch **SW1**, position **4**. The unit is selectable for either **Internal** or **External** clocking. Please refer to the appendix at the end of this manual for the settings Chart.

3.5.4 DIP SWITCH, **SW1** - POSITION 5

The **CLOCK MODE** is selected via Dip Switch **SW1**, position **5**. In a multidrop network, the DME units *MUST* have one unit set as the **MASTER** and the corresponding units set to **SLAVE**. Please refer to the appendix at the end of this manual for the settings Chart.

3.5.5 DIP SWITCH, **SW1** - POSITION 6

The **CARRIER MODE** is selected via Dip Switch **SW1**, position **6**. The unit is selectable for **Constant Carrier** for Full Duplex operation or **Switched Carrier** for Half Duplex operation. Please refer to the appendix at the end of this manual for the settings Chart.

3.5.6 DIP SWITCH, **SW1** - POSITION 7

The **CONTENTION MODE** is selected via Dip Switch **SW1**, position **7**. The unit is selectable for **RTS** or **DATA**. When either mode is selected, after the DME senses the presence of either RTS (Pin 4) or DATA (Pin 2), the Carrier is turned On and Off as the control signals are raised and lowed. Please refer to the appendix at the end of this manual for the settings Chart.

3.5.7 DIP SWITCH, **SW1** - POSITION 8 (NOT USED - RESERVED FOR FUTURE USE)

3.5.8 DIP SWITCH, **SW2** - POSITION 1

The **RTS TO CTS DELAY** is selected via Dip Switch **SW2**, position **1**. This mode has two functions of operation depending upon how the CONTENTION MODE has been set. When set to contend on RTS, the RTS to CTS delay operates as Constant, or up to 15ms delay. When set to contend on DATA, Carrier will be removed based upon the number of bits. Please refer to the appendix at the end of this manual for the settings Chart.

3.5.9 DIP SWITCH, **SW2** - POSITION 2

The **ANTI-STREAMING** is selected via Dip Switch **SW2**, position **2**. Anti-Streaming may be disabled or set as required for the user's network environment. Please refer to the appendix at the end of this manual for the settings Chart.

3.5.10 CHASSIS TO SIGNAL GROUND

The DME has an internal *Jumper Option* (3 position stick header) labeled **JP1** for CHASSIS to SIGNAL GROUND connection. Please refer to the appendix at the end of this manual for the settings Chart.

3.5.11 TERMINATION RESISTOR

The DME has an internal *Jumper Option* (3 position stick header) labeled **JP2**. When connecting the DME *SLAVE* units in a multidrop network, the furthest device should have the Termination Resistor **ENABLED** for maximum driving distance to all multidrop DME *SLAVE* units. Please refer to the appendix at the end of this manual for the settings Chart.

3.5.12 DCE / DTE SWITCHES

Located internally are two (2) DCE/DTE slide switches directly in front of the RS-232 port labeled **SW3** and **SW4**. Silkscreened on the Printed Wiring Board are **DCE** and **DTE**. Slide *BOTH* switches to the same position to configure the RS-232 port as a DTE or a DCE interface.

When set to DCE, the RS-232 port *MUST* connect to a DTE device.

When set to a DTE, the RS-232 port *MUST* connect to a DCE device.

3.5.13 RS-232 DATA PORT CONNECTION

It is recommended to *DISCONNECT* the *AC POWER* before installing cabling. The unit is supplied with a standard DB-25 female connector, labeled **RS-232 DCE/DTE**. Cabling may be accomplished using straight through DB-25 shielded cables, no longer than 50 feet in any direction. The Pin Out of the DB-25 port is listed in the appendix of this manual.

3.5.14 4-WIRE DATA CONNECTION

It is recommended to *DISCONNECT* the *AC POWER* before installing cabling. The DME **MUST** be used with 4-Wire private line, unloaded and with no bridge taps. The unit is supplied with two (2) standard RJ-45's and a 4-PIN Header connector. All three (3) connectors are in parallel with each other. The connectors may be used for a Star or Chain network configuration. The Pin Out on the RJ-45's and the 4-PIN Header are listed in the appendix of this manual along with a **WIRING GUIDE** illustration.

CAUTION:

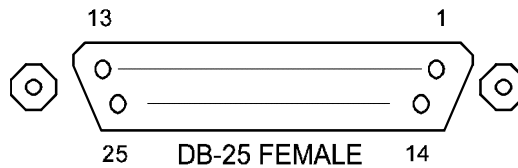
DO NOT CONNECT THE DME TO A PUBLIC SWITCHED TELEPHONE NETWORK

4.0 APPENDIX

4.1 EIA INTERFACE CHART

EIA RS-232-D INTERFACE CHART (DB-25 CONNECTOR)

Pin No.	CCITT Circuit No.	Circuit Name	Signal Description	To DTE	To DCE
1	---	---	Shield	---	---
2	103	BA	Send Data		X
3	104	BB	Receive Data	X	
4	105	CA	Request To Send		X
5	106	CB	Clear To Send	X	
6	107	CC	DCE Ready	X	
7	102	AB	Signal Ground	---	---
8	109	CF	Receive Line Detector	X	
15	114	DB	Send Timing	X	
17	115	DD	Receive Timing	X	
20	108.2	CD	Terminal Ready		X
24	113	DA	External Timing		X



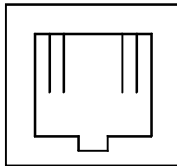
4.2 RJ-45 CHART

EMI REDUCED RS-485 (RJ-45 CONNECTOR)

PIN NUMBER	SIGNAL OUTPUT	INPUT / OUTPUT	LEVEL TYPE	FUNCTION
1	Transmit (+)	Output	Digital	Connection to line, transmit side
2	Transmit (-)	Output	Digital	Connection to line, transmit side
3	N/A	N/A	N/A	N/A
4	N/A	N/A	N/A	N/A
5	N/A	N/A	N/A	N/A
6	N/A	N/A	N/A	N/A
7	Receive (-)	Input	Digital	Connection to line, receive side
8	Receive (+)	Input	Digital	Connection to line, receive side

PINS

TX RX
 +- -+
12 3456 78



RJ-45
(REAR VIEW)

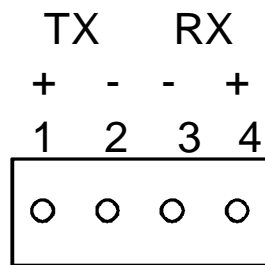
NOTE: The two RJ-45 and 4-position terminal block are all in parallel with each other. Data arriving at the RS-232 port is transmitted and received by all three ports

4.3 4 PIN HEADER

EMI REDUCED RS-485 (4-PIN HEADER)

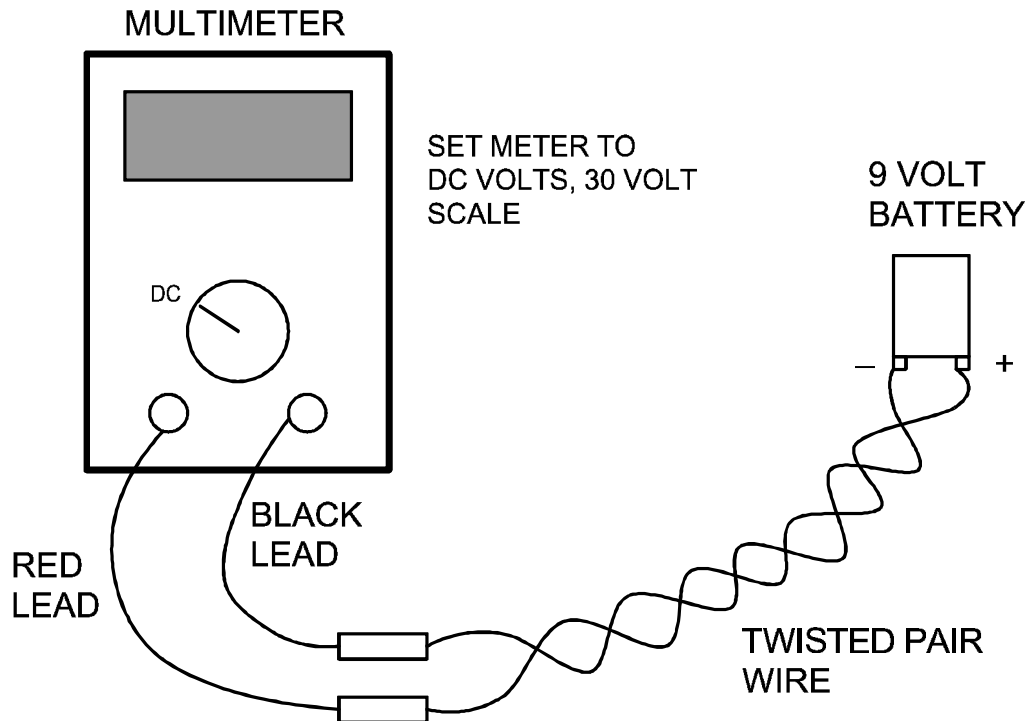
PIN NUMBER	SIGNAL OUTPUT	INPUT / OUTPUT	LEVEL TYPE	FUNCTION
1	Transmit (+)	Output	Digital	Connection to line, transmit side
2	Transmit (-)	Output	Digital	Connection to line, transmit side
3	Receive (-)	Input	Digital	Connection to line, receive side
4	Receive (+)	Input	Digital	Connection to line, receive side

PINS



4-PIN HEADER
(REAR VIEW)

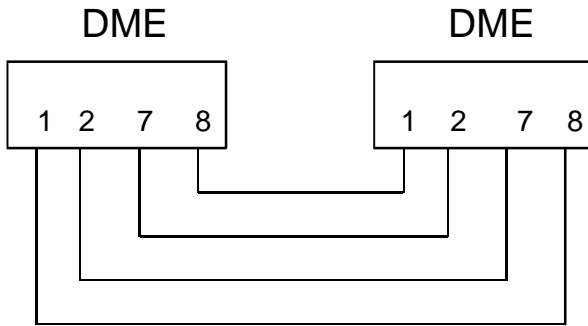
4.4 WIRE POLARITY CHECK



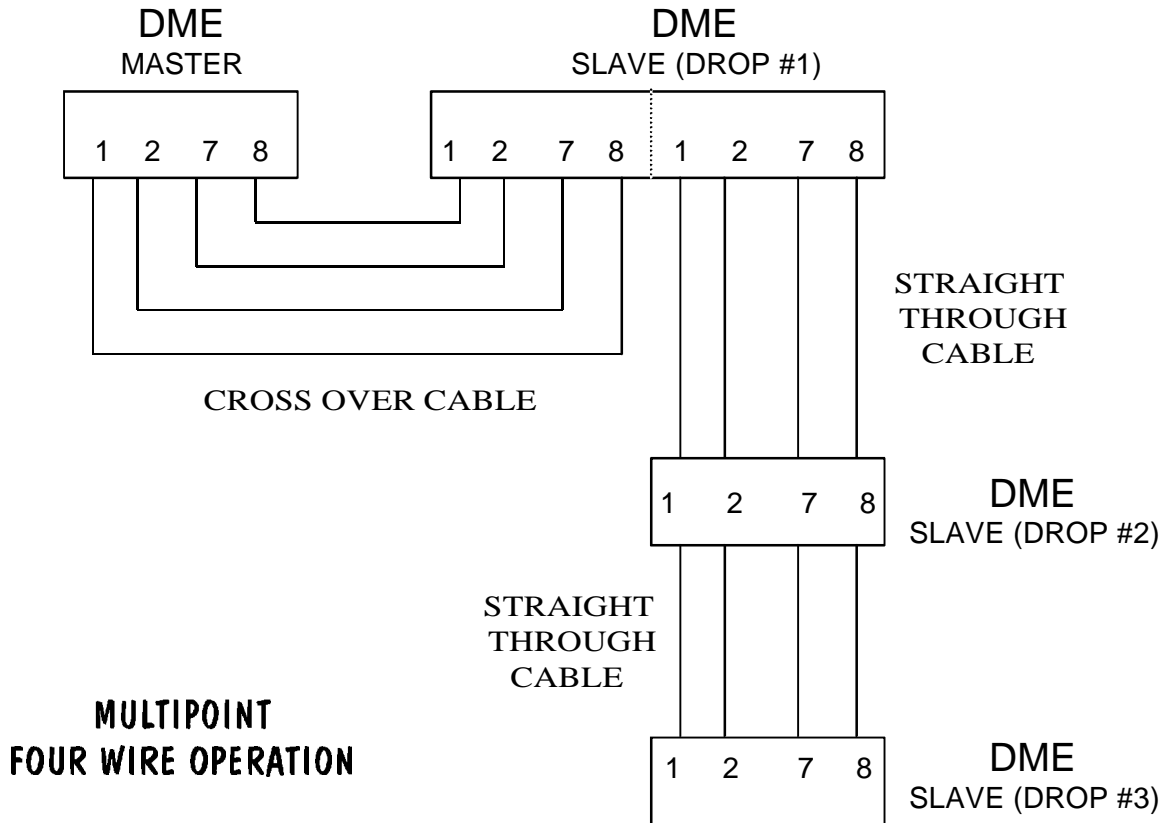
PROCEDURE FOR DETERMINING WIRE POLARITY

- 1) CONNECT RED LEAD OF MULTIMETER TO ONE WIRE OF TWISTED PAIR
(CALL THAT WIRE TRANSMIT +)
- 2) CONNECT BLACK LEAD OF MULTIMETER TO OTHER WIRE OF TWISTED PAIR
(CALL THAT WIRE TRANSMIT-)
- 3) HOOK UP BATTERY TO OTHER END OF TWISTED PAIR
(ANY 9 VOLT BATTERY IS FINE)
- 4) IF MULTIMETER READS + 9 VOLTS, THEN THE WIRE ON THE + SIDE OF THE BATTERY IS TRANSMIT +
- 5) IF MULTIMETER READS - 9 VOLTS, THEN THE WIRE ON THE - SIDE OF THE BATTERY IS TRANSMIT -

4.5 WIRING GUIDE- SHOWN USING RJ-45 CONNECTORS

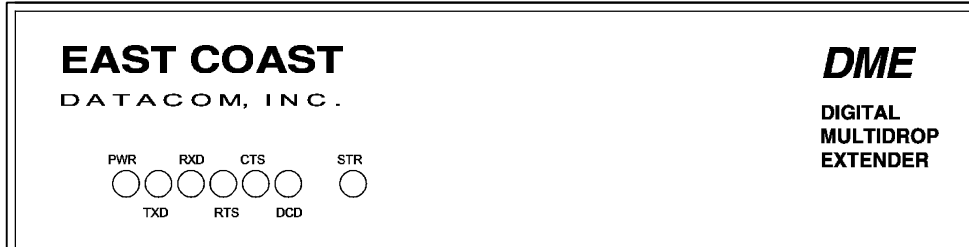


**POINT-TO-POINT
FOUR WIRE OPERATION**

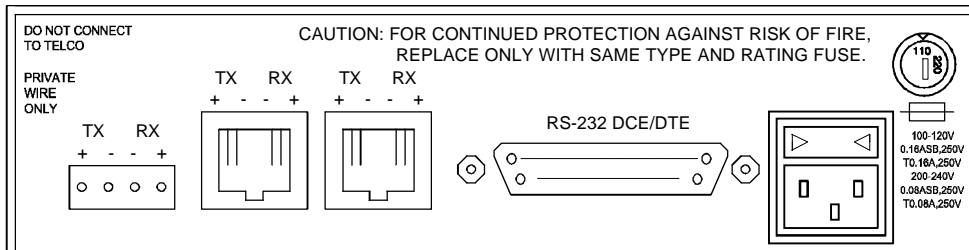


**MULTIPOINT
FOUR WIRE OPERATION**

4.6 FRONT AND REAR VIEWS

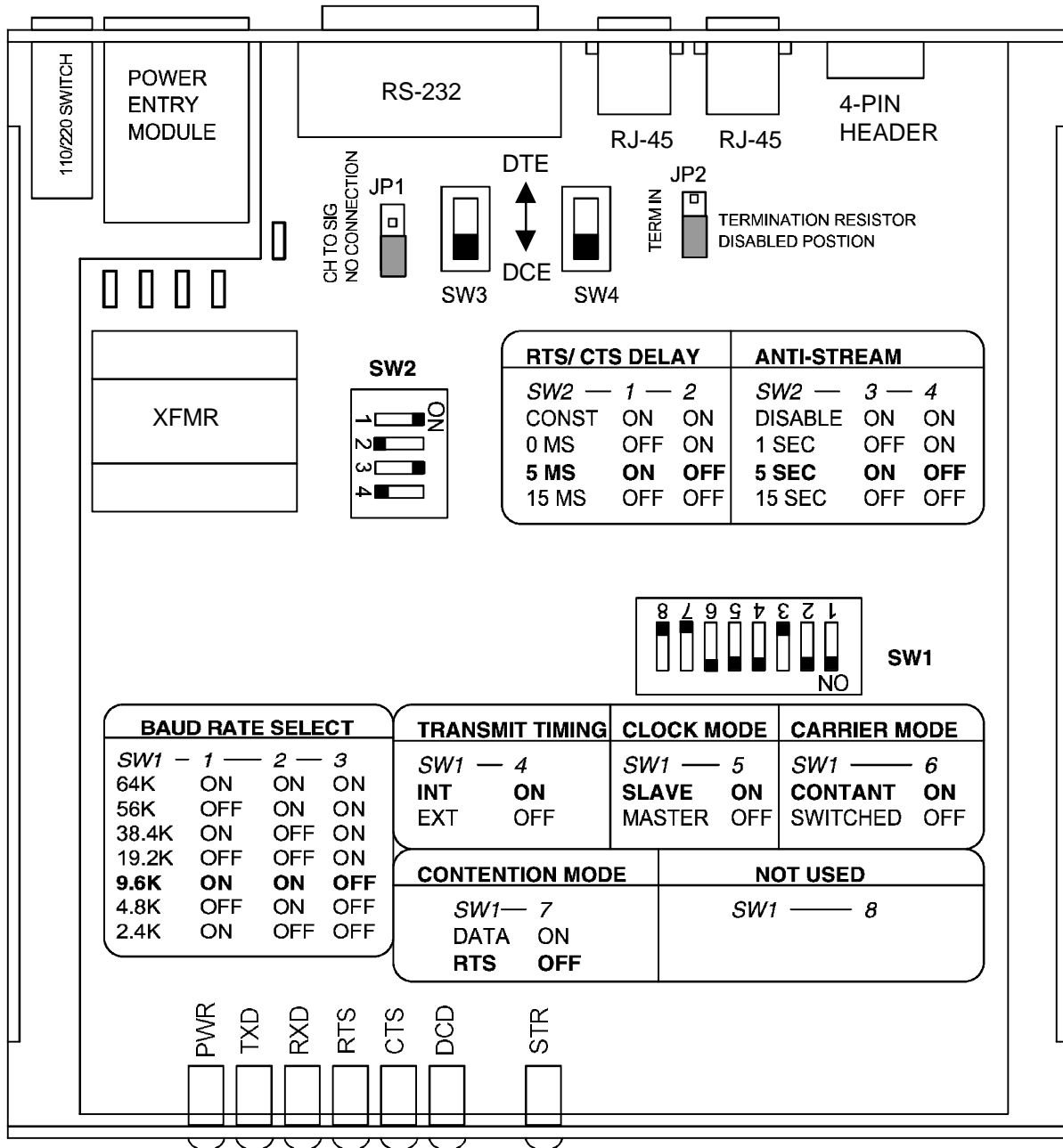


FRONT VIEW OF DME



REAR VIEW OF DME

4.7 PRINTED WIRING BOARD / STRAP CHART (SLAVE UNIT)



4.8 REFERENCE INFORMATION

ANSI

American National Standards Institute
1430 Broadway
New York, NY 10018
Telephone: (212) 354-3300

EIA

Electronic Industries Association
2001 Eye Street, N.W.
Washington, DC 20006
Telephone: (202) 457-4966

FED-STD

General Services Administration
Specification Distribution Branch
Building 197
Washington Navy Yard
Washington, DC 20407
Telephone: (202) 472-1082

FIPS

U.S. Department of Commerce
National Technical Information Service
5285 Port Royal Road
Springfield, VA 22161
Telephone: (703) 487-4650

CCITT

Outside the United States
General Secretariat
International Telecommunications Union
Place des Nations
1121 Geneva 20, Switzerland
Telephone +41 22 995111

In the United States

United States Department of Commerce
National Technical Information Service
5285 Port Royal Road
Springfield, VA 22161
Telephone: (703) 487-4650

ISO

Outside the United States
International Organization for Standardization
Central Secretariat
1 rue de Varembé
CH-1211 Geneva, Switzerland
Telephone +41 22 34-12-40

Inside the United States

American National Standards Institute
1430 Broadway
New York, NY 10018
Telephone: (212) 354-3300

IEEE

The Institute of Electrical and Electronics
Engineers, Inc.
345 East 47th Street
New York, NY 10017
Telephone: (212) 705-7900

NBS

National Bureau of Standards
Institute for Computer Sciences and
Technology
Technology Building, Room B-253
Gaithersburg, MD 20899
Telephone: (301) 921-2731

CCITT documents may be reached by calling
(800) 553-6847

V.35 is a CCITT specification and is
implemented per ISO 2593

The ISO documents are attainable by calling
(212) 354-3300

AT&T Bell Publications documents may be
reached by calling (800) 344-0223 or (800)
432-6600

4.9 TECHNICAL SPECIFICATIONS

Application

Full Duplex Synchronous Point-to-Point or Multi-point Digital Data Transmission

Capacity

Up to 32 drops per site

Interface

RS-232 and 4-Wire EMI reduced RS-485

Data Rates

Up to 64Kbps

Driving Distance

Dependent on data rate and wire gauge

Switches

DCE/DTE for RS-232 port

RS-232 Physical Interface

Female DB-25 Connector

4-Wire Physical Interface

two (2) RJ-45's and 4-Pin Terminal Block

Line Requirements

Four Wire private, unloaded with no bridge taps

Surge Protection

4-Wire interface and power supply

Power Source

100-120 to 200-220VAC @10%, 50/60Hz, 0.16/0.08A, external 110/220 volt select switch, IEC Power Inlet, (2) 5mm Fuses

Environmental

Operating Temperature....32° to 122° F (0° to 50° C)

Relative Humidity.....5 to 95%

Non-Condensing

Altitude.....0 to 10,000 feet

Dimensions

Height 1.75 inches (4.44 cm)

Width 7.90 inches (20.07 cm)

Length 9.00 inches (22.86 cm)

Weight

2 pounds (0.914Kg)

Warranty

Three Years, Return To Factory

Approvals

Emissions: FCC Class A

Safety: UL (1950), CSA (C22.2)

ORDERING INFORMATION

Model: DME

Description: Digital Multidrop Extender

INCLUDED WITH EACH UNIT:

1) Operations Manual

2) 6 foot Power Cord

For further detailed technical information on this product, contact East Coast Datacom Technical Assistance toll free at (800) 240-7948

OTHER EAST COAST DATACOM PRODUCTS

MODEM AND PORT SHARING DEVICES

RS-232 TO V.35 CONVERTERS

SIGNAL REGENERATORS