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OPERATIONS MANUAL

DIGITAL MIXING MODULE

DMM-X21

14 March 1997

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East Coast Datacom, Inc.

PT # 719006-A
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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PUBLICATION NOTICE

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CHAPTER 1 - INTRODUCTION

1.1 FUNCTIONAL DESCRIPTION

The Digital Mixing Module (DMM-X21) is a network expansion device for X.21 modem sharing or port sharing applications in broadcast, polled or contention environments. The DMM-X21 allows up to four X.21 devices to share a modem or computer port. Any combination of terminals and modems may be used in a network environment. Each port of the DMM-X21 conforms to the ITU X.21 standard and may be selected as a DCE or DTE interface.

Ideal for either synchronous or asynchronous network environments, the DMM-X21 is protocol transparent at data rates up to 1.024Mbps. The DMM-X21 has several user defined modes to configure clocking for the network and also provides fallback clocking. To prevent or minimize data transmission errors caused by clock differences throughout the network, 512bit optional FIFO buffers are provided for each channel. In applications where the master port and the selected port provide their own clocks, data is clocked into the buffer at the receive clock rate of the active port and clocked out using the master port transmit clock.

The Control(C) and Indicate(I) leads may be individually selected to follow the modem or forced active on a per port basis. Fallback timing circuitry is also provided in the DMM-X21.

The DMM-X21 provides optional Anti-Streaming circuitry. Once enabled, Anti-Streaming will automatically remove a defective terminal or modem from service if the Data / Control criteria is present for the user predefined selection period.

Housed in a sturdy rack mount metal enclosure and equipped with a 110/220 VAC switch selectable linear power supply, the DMM-X21 will provide in excess of 100,000 hours of reliable service.

TYPICAL APPLICATION

Figure 1.1
1.2 THEORY OF OPERATION

The DMM-X21 allows up to four DCEs or DTEs to share one DCE or DTE communications link. In a broadcast, polled or contention environment, the typical Polled Network DMM-X21 operation is as follows:

Data arriving at the DMM-X21's master port is continually broadcast to all subchannel ports. When one of the DCE or DTE devices answers a poll from the host site, that device will raise Control (C) or Indicate (I). When (C) is raised, the DMM-X21 will lock on to that port and allow that DTE device to talk to the modem link. The DMM-X21 will remain locked onto that port until (C) is dropped. After (C) has dropped, the DMM-X21 will automatically begin scanning the ports until another port raises (C) or (I).

CHAPTER 2 - BASIC OPERATION

2.1 FRONT PANEL INDICATORS AND SWITCHES

A Green LED illuminates when AC Power has been applied. Two adjacent Green LEDs illuminate in union with individual Green subchannel port activity LEDs and identify Transmit and Receive data transmissions. Yellow LEDs provide the user with a visual indication of a streaming DTE (ref. 2.6) Positive latching switches are provided for each DTE port for isolating or removing a streaming terminal. Each DTE port has its own switch and operates independently. To disable a subchannel, simply push the switch. A channel is disabled when the switch is in the outer most position.

2.2 REAR PANEL CONNECTORS AND FUSES

Set the 110/220 volt select switch for your power requirement. The supplied power cord plugs into the IEC receptacle. The 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 320ma Fuses. For 220 VAC +/- 10% operation the unit is equipped with slow blow 160ma Fuses. Additionally, you will find the Master and Subchannel female DB-15 connectors.

2.3 CLOCKING MODES

Clocking may be set as Master Channel (Set to DTE) or Channel 4 (Set to DTE) from the attached DCE. Internal Timing will facilitate user defined operational speeds from 48Khz to 256Khz. Fallback Timing may also be used when the Master Port is connected to a Front End Processor (FEP) or other DTE device. In this mode, connect Port 1 to the main clock source. If Port 1 clock fails, fallback to Port 2 clock source will occur. If Port 2 clock source fails, fallback to internal clock will occur. If Port 1 or 2 clock returns, the DMM-X21 will fall forward to the active DCE clock source with Port 1 having the highest priority.
2.4 ELECTRICAL INTERFACE

The DMM-X21 is ITU V.11, X.21 compliant, utilizing female DB-15 connectors. Refer to the interface chart in the Appendix for detailed interface information.

2.5 SUBCHANNEL SERVICE MODES

The DMM-X21 incorporates circuitry that enables the user to scan each sub-channel port. An option is also provided for forcing sub-channel 4 constantly active. In the forced active mode, data will continue to be broadcast to ports 1, 2 and 3.

2.5.1 SUBCHANNEL SCANNING

Subchannel Scanning will allow equal access to the communications link for all connected DCE or DTE devices. The subchannels are scanned in sequence (1 - 2 - 3 - 4) and the attached subchannel that raises Control (C) or Indicate (I) will have access to the communications link. After dropping (C) or (I) the DMM-X21 will continue scanning in sequential order.

2.5.2 SUBCHANNEL CONTROL(C) TO INDICATE(I) DELAY

Control to Indicate delays of 0, 6.5, 13 and 26ms are user selectable.

2.6 ANTI-STREAMING

2.6.1 AUTOMATIC REMOVAL

The DMM-X21 incorporates circuitry that will (when enabled) automatically remove a streaming DCE or DTE from service. A streaming terminal is defined as a terminal that has Control (C) 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. Each channel has a Green and a Yellow LED to indicate subchannel activity. Green indicates an active subchannel and Yellow indicates a streaming subchannel. Once a terminal has gone into the streaming condition (Control continually high) the DTE will automatically be removed from service until the DTE fault has been corrected by the user. All other DTE’s will continue to be serviced.

2.7 INTERNAL CLOCK SELECTION

The DMM-X21 incorporates circuitry that allows the user to select Internal Clocks. The selectable rates are 48Khz, 56Khz, 64Khz, 128Khz, 192Khz and 256Khz. Though X.21 is externally timed by the telco provider, the internal clock rates are very useful for testing and diagnostic purposes.
2.8 MANUAL DTE/DCE REMOVAL

The DMM-X21 incorporates circuitry that will (when enabled) manually remove a streaming terminal from service. A streaming terminal is defined as a terminal that has Control (C) continually high. With Anti-streaming disabled, the associated streaming DTE will NOT illuminate a Yellow LED on the front of the DMM-X21. If the automatic anti-streaming circuitry is disabled and a streaming condition occurs, the other DTE devices will be blocked from accessing the communications link. To correct this condition, simply push the associated push-button switch for the subchannel that is streaming. All other DTE’s will now continue to be serviced by the DMM-X21. However, you still need to fix the offending DTE or DCE device that has Control (C) or Indicate (I) continually raised.

2.9 FALL BACK TIMING

The DMM-X21 incorporates circuitry that allows the user to provide Fall Back Timing to the network. The circuitry allows the user to enable or disable this function via Dip Switch. To enable fall back Timing, go to the dip switch marked S11 and move position 8 to ON. This will provide Port 1 as the main timing source. If Port 1 clock fails, the unit will automatically switch to Port 2 as the timing source. If Port 2 fails, the unit will automatically fall back to internal clock as the timing source. If Port 1 clock returns to service, the unit will automatically switch back to Port 1 timing.

2.10 CASCADING OR CONCATENATION

The DMM-X21 supports cascading by utilizing DB-15 Male-to-Male straight through shielded cables. Subchannel Port 1 should be used as the concatenation port.
2.11 INDICATE (I) LEAD

The DMM-X21 has internal jumpers for the Indicate (I) Lead. This option will allow Indicate(I) to follow Control(C) or to be forced active when the port is set to DCE.

2.12 CONTROL (C) LEAD

The DMM-X21 has internal jumpers for Normal or Forced Control (C). This option will allow Control(C) to operate normally or to be forced inactive when the port is set to DTE.

2.13 DCE / DTE SWITCHES

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

When set to DCE, the port MUST connect to a DTE device.
When set to a DTE, the port MUST connect to a DCE device.

2.14 FIFO GENERAL OPERATION (J15)

This option allows the user to set the internal buffers to operate in two(2) modes; Mode A) FIFOs nearly fill after underrun and nearly empty after overflow (for asynchronous clocks) Mode B) FIFOs self-center after overrun or overflow (for isochronous clocks)

2.15 MASTER CHANNEL FIFO (J14)

This option allows the user to set the internal buffers to operate in two(2) modes; Mode A) FIFO (If present) and ring buffer data path is enabled. Mode B) fifo and ring buffer are bypassed (for synchronous clocks) or overflow (for isochronous clocks)

2.16 SUB-BHANDEL PORT FIFO OPERATION (J16 - J19)

This option allows the user to set the internal buffers to operate in two(2) modes; Mode A) FIFO data path is enabled. Mode B) FIFO data path is bypassed (for synchronous clocks or if no FIFO chip is present.
CHAPTER 3 - INSTALLATION

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 320ma (315ma) Fuses. For 220 VAC +/- 10% operation the unit is equipped with slow blow 5 x 20mm 160ma Fuses. Spare fuses may be purchased by calling East Coast Datacom or by calling the fuse manufacturer; Shurter, Inc. at (707) 778-6311 or email: 73024.2314@compuserve.com

Shurter, Inc. Part #'s are: 315ma = 034.3112 and 160ma = 034.3109

3.3 POWER CONNECTION

Before connecting the DMM-X21 to an AC power source the top cover should be installed with the supplied #8-32 screws. AC power is supplied to the DMM-X21 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 DMM-X21 Warranty will be void.

Power Connection
Figure 3-1

3.4 DEFAULT CONFIGURATION SWITCH SETTINGS
The DMM-X21 is configured prior to shipping with the Internal Switches set as follows:

1) Master Port - *DCE*
2) Sub-channel Ports - *DTE*
3) Timing - *External*
4) Control (C), Ports 1 through 4 - *Enabled*
5) Indicate (I), Ports 1 through 4 - *Enabled*
6) Control (C) to Indicate (I) Delay - *0ms*
7) Anti-Streaming - *Disabled*
8) Clock Select - *128Khz*
9) Fallback Timing - *Disabled*
10) Port 4 Mode - *Disabled* (all ports active)

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 DMM-X21. Remove the AC Power source or Disconnect the AC Power 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 MODEM (DCE) AND TERMINAL (DTE) CONNECTION

Before applying AC Power to the unit, the DCE and DTE cabling should be connected. Straight through Male-to-Male DB-15 shielded cables should be used. No crossover cables are required as each port on the unit is DCE/DTE selectable.
## 4.0 - APPENDIX

### 4.1 X.21 INTERFACE CHART

**ITU X.21 INTERFACE CHART (DB-15 CONNECTOR)**

<table>
<thead>
<tr>
<th>PIN NUMBER</th>
<th>PIN NAME</th>
<th>FROM DCE</th>
<th>FROM DTE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>SHIELD</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2</td>
<td>TRANSMIT (A+)</td>
<td>-</td>
<td>X</td>
</tr>
<tr>
<td>3</td>
<td>CONTROL (A+)</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>4</td>
<td>RECEIVE (A+)</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>INDICATE (A+)</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>SIGNAL TIMING (A+)</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>7</td>
<td>BYTE TIMING (A+)</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>8</td>
<td>GROUND</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>9</td>
<td>TRANSMIT (B-)</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>10</td>
<td>CONTROL (B-)</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>11</td>
<td>RECEIVE (B-)</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>INDICATE (B-)</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>SIGNAL TIMING (B-)</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>14</td>
<td>BYTE TIMING (B-)</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>15</td>
<td>NOT USED</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

![DB-15 Connector Diagram](DB-15_Female.png)
4.3 ADDRESSES OF STANDARDS ORGANIZATIONS

ISO
Outside the United States
International Organization for Standardization
Central Secretariat
1 rue de Varembe
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

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
5.0 - TECHNICAL SPECIFICATIONS

Application
Multiple X.21 Synchronous DCE or DTE devices contending in a polled environment, to share one Digital DCE or DTE interface

Capacity
One to Four ITU X.21 devices

Interface
ITU X.21, V.11 using DB-15 female connectors

Data Rates
Up to 1.024Mbps

Data Format
Data transparent at all data rates

Timing
From Composite (Master) Port or Sub-channel Port 1

Buffer
Up to 512 bits, FIFO principle with automatic re-centering

Anti-Streaming
Automatic…Selecteble time out intervals Disable…….Selecteble via dip switch

Front Panel
Indicators….Power, Send/Receive Data, Channel Active, Channel Stream Switches…..Enable/Disable of each Subchannel

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….32º to 122º F (0º to 50º C)
Relative Humidity…………5 to 95%
Non-Condensing
Altitude……………………..0 to 10,000 feet

Dimensions
Height ……. 1.75 inches (4.44 cm)
Width ……. 13.35 inches (33.09 cm)
Length ……. 9.00 inches (22.86 cm)

Weight
4.5 pounds (2.1Kg)

Warranty
Three Years, Return To Factory

ORDERING INFORMATION
Model: DMM-X11
Description: 4 Port Digital Sharing Device W/512bit buffers

INCLUDED WITH EACH UNIT:
1) Operations Manual
2) U.S.A. Grounded Power Cord, Part # 713015
3) Optional Power Cords
   A) United Kingdom, Part # 713016
   B) Continental Europe, Part # 713017
   C) Other: Specify Country on Purchase Order

OPTIONAL ACCESSORIES
1) Spare Data Center Fuses
   A) 160ma Fuse, Qty (2)
   B) 315ma Fuse, Qty (2)