



*Netmux-2, Netmux-4,  
& Netmux-8 Time Division  
Multiplexers*

*User's Guide*

The products and programs described in this User's Guide are licensed products of Raymar-Telenetics. This User's Guide contains proprietary information protected by copyright, and this User's Guide and all accompanying hardware and documentation are copyrighted.

Raymar-Telenetics does not warrant that the hardware will work properly in all environments and applications, and makes no warranty and representation, either implied or expressed, with respect to the quality, performance, merchantability, or fitness for a particular purpose.

Information in this User's Guide is subject to change without notice and does not represent a commitment on the part of Raymar-Telenetics. Raymar-Telenetics assumes no responsibility for any inaccuracies that may be contained in this User's Guide.

Raymar-Telenetics makes no commitment to update or keep current the information in this User's Guide, and reserves the right to make changes to this User's Guide and/or product without notice.

No part of this manual may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying, recording, or information storage and retrieval systems, for any purpose other than the purchaser's personal use, without the express written permission of Raymar-Telenetics.

© Copyright 2009 Raymar Information Technology, Inc.  
7325 Roseville Road  
Sacramento, California 95842  
Tel: 800-695-1951 Direct: 916-783-1951  
Fax: 916-783-1952  
Web site: [www.raymarinc.com](http://www.raymarinc.com)

# Raymar Information Technology, Inc.

## Limited Warranty

### One Year Limited Hardware Warranty

Raymar Information Technology, Inc., dba Raymar-Telenetics, warrants their products against defects in hardware, material and workmanship under normal use for one (1) year from the date of purchase. Raymar will, at no charge, either repair the product (with new or reconditioned parts), or replace it (with a new or reconditioned product). Repaired replacement products are warranted for either 90 days or the remainder of the original warranty period, whichever is longer. This warranty extends to the original end-user only.

### What This Warranty Does Not Cover

This warranty does not cover: (a) software; (b) installation or service of the product; (c) conditions resulting from consumer damage such as improper maintenance or misuse, abuse, accident or alteration; (d) all plastic surfaces (including display screens) and all other exposed parts that are scratched or damaged due to normal use; (e) operation of our products with equipment not supplied by Raymar (f) products which have had the serial number removed or made illegible; or (g) products rented to others. This warranty applies only to hardware products manufactured by or for Raymar Information Technology, Inc. and identified by the Raymar-Telenetics trademark, trade name or product identification logo affixed to them. Refer to the Service and Support section of the User's Guide for service after the warranty expires. No warranty is made as to coverage availability or grade of service provided by the carrier.

### General Provisions

This warranty sets forth Raymar's entire hardware responsibilities regarding this product. Repair, replacement or refund of the purchase price is at Raymar's discretion. THIS WARRANTY IS GIVEN IN LIEU OF ALL OTHER EXPRESS WARRANTIES, IMPLIED WARRANTIES, INCLUDING WITHOUT LIMITATION IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, AND ARE LIMITED TO THE DURATION OF THIS LIMITED WARRANTY. IN NO EVENT SHALL RAYMAR BE LIABLE FOR DAMAGES IN EXCESS OF THE PURCHASE PRICE OF THE PRODUCT, FOR ANY LOSS OF USE, LOSS OF TIME, INCONVENIENCE, COMMERCIAL LOSS, LOST PROFITS OR SAVINGS, OR OTHER INCIDENTAL, SPECIAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF THE USE OR INABILITY TO USE THIS RAYMAR PRODUCT, TO THE FULL EXTENT SUCH MAY BE DISCLAIMED BY LAW. WITHOUT LIMITING THE FOREGOING, RAYMAR SHALL HAVE NO LIABILITY FOR ANY DATA STORED IN OR USED WITH THE PRODUCT, INCLUDING THE RECOVERY COSTS OF SUCH DATA OR PROGRAMS.

### State Law Rights

SOME STATES DO NOT ALLOW THE EXCLUSION OR LIMITATION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES OR LIMITATIONS ON HOW LONG AN IMPLIED WARRANTY LASTS. THE ABOVE LIMITATIONS OR EXCLUSIONS MAY NOT APPLY TO YOU. This warranty gives you specific legal rights, and you may also have other rights which vary from State to State.

### Provincial Law Rights

SOME PROVINCIAL LAWS DO NOT ALLOW THE EXCLUSION OR LIMITATION OF IMPLIED WARRANTIES, THE EXCLUSION OR LIMITATION OF WARRANTY COVERAGE IN CERTAIN SITUATIONS. SOME OF THE ABOVE LIMITATIONS OR EXCLUSIONS CONTAINED IN THIS LIMITED WARRANTY MAY NOT APPLY TO YOU. This warranty gives you specific rights, and you may have other rights which vary from province to province.

### How To Use Raymar's Limited Warranty Service

To take advantage of this warranty, you must do the following:

- If you are having trouble with your product, contact Raymar service using the appropriate number from the Service and Support section of the User's Guide. If it is determined that your product requires service, you will be issued a Return Materials Authorization (RMA) form.
- Pack the defective product securely for shipping. Include only the units pre-approved by service on your RMA form.
- This warranty is void if the product is damaged in transit, you must insure your shipment.
- Ship the defective product, proof of date of purchase, and the RMA form to the address specified.
- Display your RMA number prominently on the outside of the shipping box. Customer is responsible for freight in, door to door. Raymar is responsible for return shipping costs.
- To ensure prompt service, please write on the RMA form a brief description of the problem you are experiencing with the product.

Raymar Information Technology, Inc.

7325 Roseville Road

Sacramento, CA 95842

Service Hotline (800) 747-1522

<http://support.telenetics.com> or e-mail to [techsupport@raymarinc.com](mailto:techsupport@raymarinc.com)

The United States Government Federal Communications Commission has specified that the following notice be brought to the attention of users of this product:

### **WARNING**

This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the instruction manual, may cause interference with radio communications. It has been tested and found to comply with the limits for a Class A computing device pursuant to Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference in which case the user, at his own expense, will be required to take whatever measure may be required to correct the interference.

In order to ensure FCC compliance, only properly constructed, terminated, and shielded cabling should be used with this product.

### **NOTE:**

This digital apparatus does not exceed the Class A limits for radio noise emissions from digital apparatus as set forth in the radio interference regulations of the Canadian Department of Communications.

# Table of Contents

---

## About This Manual iii

Conventions Used in This Manual.....	iv
--------------------------------------	----

## Chapter One Introduction..... 1

Physical Specifications .....	2
-------------------------------	---

General Description .....	2
---------------------------	---

Physical Description .....	4
----------------------------	---

## Chapter Two Installation..... 5

Unpacking.....	5
----------------	---

Inspection.....	5
-----------------	---

Location Determination .....	6
------------------------------	---

## Chapter Three Connections..... 7

Synchronous Port Pin Designations.....	7
----------------------------------------	---

Asynchronous Port Pin Designations.....	8
-----------------------------------------	---

Wiring Systems.....	8
---------------------	---

Special Cabling Considerations .....	9
--------------------------------------	---

Composite Port .....	10
----------------------	----

Composite RS-232 Signaling.....	11
---------------------------------	----

Composite V.35 Signaling.....	12
-------------------------------	----

<b>Chapter Four Configuration .....</b>	<b>13</b>
Set-up .....	13
New or Factory Configuration – 5 Consecutive ^N’s .....	13
Synchronous Port Selection.....	16
Asynchronous Port Selection .....	16
Old or Previous Configuration – 5 Consecutive ^O’s .....	20
Over-booking.....	21
<b>Chapter Five Operation .....</b>	<b>23</b>
Front Panel LED Status .....	23
Flow Control.....	24
<b>Chapter Six Service .....</b>	<b>26</b>

# About This Manual

---

This manual covers installation, cabling, configuration, and operation of three very similar products: Netmux-2, Netmux-4, and Netmux-8 Time Division Multiplexers. The three are nearly identical in functionality—the difference being the number of ports available for each product.

## **Conventions Used in This Manual**

### **Netmux-2**

A Time Division Multiplexer with two port connectors. This product is capable of operating at a number of composite rates, ranging from 9,600bps to 64,000bps.

### **Netmux-4**

A Time Division Multiplexer with four port connectors. This product is capable of operating at a number of composite rates, ranging from 9,600bps to 64,000bps.

### **Netmux-8**

A Time Division Multiplexer with eight port connectors. This product is capable of operating at a number of composite rates, ranging from 9,600bps to 64,000bps.

### **TDM**

An abbreviation for Time Division Multiplexer.

### **Clear Channel**

This refers to a transmission path that is completely available at all times and does not use flow controls to stop the transmission medium.

# Chapter One

# Introduction

---

The unit is a Time Division Multiplexer or TDM. This product is capable of operating at a number of composite rates, ranging from 9600bps to 64000bps. The composite terminates in both V.35 and RS-232 signaling which is switch selectable from a single DB-25 connector. Either signaling may be used at any synchronous rate.

Each port may be separately designated as to its speed of operation. The total sum of all port speeds may be up to 99% of the composite capacity. Port capacity is calculated for each port during set-up and provided for information to the user as each port is specified. Each port may be specified as synchronous or asynchronous. If specified as asynchronous, selections are provided for 5/6/7/8 data bits, even/odd/no parity, and 1/1.5/2 stop bits. All common data speeds are supported including 300, 600, 1200, 2400, 4800, 9600, 14400, 19200, 28800, and 38400bps. Asynchronous operation will often permit port speed combinations that exceed the synchronous composite.

## Physical Specifications

Terminal/CPU Ports:	Number: Netmux-2 has 2; Netmux-4 has 4; Netmux-8 has 8 Speed: Selectable from 11 permitted speeds Type: V.24/V.28 RS-232C
Character Format:	Synchronous: 8 bit data Asynchronous: 5, 6, 7, 8 bit data 1, 1.5, 2 stop bits No, Odd, Even parity
Composite Link:	Number: 1 Synchronous, full duplex operation Speed: Selectable from 9.6 to 64kbps Interface: V.35 and RS-232 signaling
Power Requirements:	117VAC, 47-63Hz – external transformer
Operating Environment:	Temperature 0-40 degrees Celsius Humidity to 95% non-condensing
Storage Environment:	Temperature 0-70 degrees Celsius Humidity to 95% non-condensing
Altitude:	10K Ft. Operating 40K Ft. Non-Operating
Interface Protection:	Complies: FCC part 15A emissions requirements
Safety:	UL listed CSA approved
Dimensions:	Netmux-2/4/8 8.6: (W) x 8.4” (D) x 1.8” (H)
Approximate Weight	Netmux-2/4/8 2.6 pounds

## General Description

The unit is an advanced technology time division multiplexer or TDM that compliments the digital product group and extends its functions to several unique environments.

This instruction manual provides all of the information needed to install, set-up, and operate a system of multiplexers. The set-up screen details are reproduced in **Chapter 4**. You may find it useful to make notes there of the settings in use, and to refer to this when

planning your specific applications. The current settings of the unit can always be obtained by interrogating the unit itself when offline.

Time Division Multiplexers have always had a place in utilizing a single communications link for two or more data streams, particularly in synchronous environments. The obvious advantages of statistical multiplexing are not normally achievable without adjusting clock rates on the various ports. The unit provides "clear channel" capability for all ports defined, synchronous or asynchronous, allowing separate applications to simultaneously utilize the same composite link without interfering with one another.

With the large number of available port speeds, the unit is suitable for combing remote synchronous controller applications with asynchronous terminal applications operating at speeds of from 300bps to 38,400bps. In addition, digitized voice speeds of 4800, 9600, and 14400bps are also supported in synchronous mode ports.

Electrical requirements are supplied by an external power transformer that accepts 117VAC and supplies 12VAC, 2AMP to the unit. The electrical connection is therefore free from any dangerous voltages on the PC board itself. UL and CSA approvals exist for the power transformer separately from the unit.

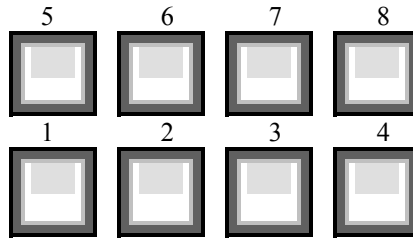
Six LED indicators are provided on the front panel. From left to right they are In Sync, Car Det, Req Send, Clr Send, Send Data, and Recv Data. The In Sync LED is multi-colored and provides multiplexer synchronization information to the user. The remaining LED's provide information as to the operation of the composite link.

The unit may be bench tested by using a suitable synchronous local unit or units such as a modem eliminator or a pair of CSU/DSU's set-up in an LDM mode. To operate successfully, a synchronous clock source must be supplied at the composite interface. An appropriate straight through cable must be connected to either the V.35 or RS-232 signaling on the DB-23 connector.

## Physical Description

The unit is a stand-alone component that is used in a desktop configuration. The front panel is labeled appropriately so that the controls and indicators may be read from a normal viewing position. The case is painted metal and provides adequate electronic shielding from other nearby components.

The front panel contains six LED indicators. The rear panel contains two (Netmux-2), four (Netmux-4), or eight (Netmux-8) RJ-50 port connectors, one DB-25 connector used for connection to the composite link, and a power connection receptacle. Port 1 is used as a control port. Port 1 is only active as a control port when the unit is off-line. In all other conditions, port 1 is totally transparent to all data transmission and may be used like any of the other ports. Ports are numbered as follows:



RJ50 to DB-25 cables are not provided with the unit, however required cables may be ordered separately from ATL. Each port is a DCE interface and only requires straight through cables for all DTE equipment. See Chapter 3 for RJ50 pin assignments.

## Unpacking

The unit is shipped in a corrugated cardboard box. Suitable packing material is used to insure that the unit, together with its power transformer, is secure during transport. Unpacking consists of opening the carton and removing the equipment. It is recommended that the packing material be retained should it ever be necessary to re-transport the equipment. After unpacking, all equipment should be inspected for damage or deficiencies. Any such damage or deficiency should be immediately reported in accordance with the distributor's established procedures.

## Inspection

When the initial inspection has been completed, the equipment should be identified and verified against the accompanying shipping documents. Each item should be checked for the correct model and serial number as indicated on the shipping list; any discrepancies should be reported to your distributor. The rear panel of the chassis bears a label on which the unit's model, serial number, and certification are printed.

## **Location Determination**

It is recommended that a grounded 117VAC, 47-63 Hertz power receptacle be used. The power transformer provides a six foot two conductor cable with the appropriate power connector for the unit. Be sure that the DTE cable is long enough to reach to the rear of the unit. Position the unit within a convenient distance from the CSU/DSU or communications interface that enables the composite cable to be connected without stretching or binding. At this point, do not connect any cables until the unit has been configured through its control port—Port 1.

## Chapter Three      Connections

---

At the rear of the unit are two (Netmux-2), four (Netmux-4), or eight (Netmux-8) RJ50, RS-232 female connectors. These are for synchronous or asynchronous user connections to the multiplexer. Each of the RJ50 connectors are configured as a DCE interface. Almost any equipment that can be connected to a modem or CSU/DSU may be directly connected to the RJ50 multiplexer port. Pins used on the RJ50 connector are:

### Synchronous Port Pin Designations

<b>RJ-50 Pin Number</b>	<b>Abbreviation</b>	<b>Description</b>	<b>DB-25 Pin Number</b>
1	TXC	Transmit Clock	15
2	DSR	Data Set Ready	6
3	DCD	Data Carrier Detect	8
4	DTR	Data Terminal Ready	20
5	Ground	Ground	7
6	RXD	Receive Data	3
7	TXD	Transmit Data	2
8	CTS	Clear To Send	5
9	RTS	Request To Send	4
10	RXC	Receive Clock	17

## Asynchronous Port Pin Designations

<b>RJ-50 Pin Number</b>	<b>Abbreviation</b>	<b>Description</b>	<b>DB-25 Pin Number</b>
1	N/A	Not Used	N/U
2	DSR	Data Set Ready	6
3	DCD	Data Carrier Detect	8
4	DTR	Data Terminal Ready	20
5	Ground	Ground	7
6	RXD	Receive Data	3
7	TXD	Transmit Data	2
8	CTS	Clear To Send	5
9	RTS	Request To Send	4
10	N/A	Not Used	N/U

## Wiring Systems

Asynchronous three wire systems also operate properly on the unit. The pins used are 5, 6, and 7 (receive data, transmit data, and ground). It is necessary to select the appropriate three-wire menu option for three wire systems.

## Special Cabling Considerations

For most applications, the standard ATL supplied cables will operate properly. For synchronous applications, cables that do **NOT** have pins 1 and 10 connected to pins 15 and 17 on a DB-25 connector **WILL NOT OPERATE**. Pins 1 and 10 carry the synchronous transmit and receive clocks.

If a tail circuit is to be used with the unit, there are two considerations which must be observed. First, if the tail circuit can accept external clock as did many synchronous modems, pin 1 should be bridged and connected from the unit to the tail circuit modem's pin 24 to achieve clock synchronization. In all other respects, a tail circuit that connects a DCE to a DCE must have an appropriate cross or null modem cable. Second, if the tail circuit is synchronous, a clock buffer may be required to align the unit's synchronous clock with that of the tail circuit.

Asynchronous connections require additional special considerations. For most applications, pins 2, 3, 4, 5, 6, 7, 8, and 9 are used. Three-wire systems may also use this same cable configuration or may have installed only pins 5, 6, and 7. Many terminal applications use Data Carrier Detect (DCD) on pin 8 to determine if an "On-line" condition has been achieved. The unit uses DCD in conjunction with Request To Send (RTS) on pin 9 to allow hardware flow control (see **Flow Control**). If only one of two terminal units is installed (on the same corresponding port number), then DCD is not raised at either port. It requires both terminals to be connected for an "On-line" condition to be achieved. This is because RTS on one port raises DCD at the remote port and vice-versa.

Asynchronous applications that are installed with full 10-pin RJ50 cables will operate properly at speeds up to 38,400bps or less.

Length of a cable often determines the maximum speed that a cable can support error-free transmission. Shielded cables provide a means to achieve successful error-free transmission at greater cable lengths. Even so, the faster the transmission speed, the shorter the cable must be. A cable length over eight feet for 38,400bps operation is not recommended. A cable length over fifty feet for 9,600bps operation is not recommended.

Cables that are installed should be secured by firmly screwing in the connector screws. Failure to do this often times results in unexplainable errors coming from the multiplexer system. The RJ50 connector should be locked in place via its locking tab. A noticeable “click” can be heard when the RJ50 locking tab is inserted into its female receiver.

## Composite Port

The unit provides the user a choice of one of two composite port signaling connections—V.35 or RS-232. Both are available in the single DB-25 female connector. Located near the DB-25 connector is a slide switch that selects the V.35 or RS-232 signaling. When the slide switch is “out”, signaling is RS-232, when “in”, signaling is V.35. The format of the data appearing on the composite port is synchronous. Synchronous clocking must be provided by the DCE to the unit’s composite port for the multiplexer to operate.

During set-up, a composite speed is selected that must match the DCE that is to be connected to the composite port. Available speeds for the composite port are as follows: 9600, 14400, 19200, 38400, 56000, and 64000 bits per second. Upon selection, the composite port is assigned a specific number of “COM Units.” The number that appears on the set-up screen may appear arbitrary, but is not. COM Units represent the number of eight-bit characters that the COM will transmit and receive in 200 milliseconds at whatever speed is selected. In a sense, COM Units represent the capacity to deliver characters to the remote site per unit of time. The faster the COM speed, the greater the capacity of the multiplexer system.

As ports are defined during set-up, you will see corresponding Port Units adjacent to a specific port configuration. Each port configuration utilizes a portion of the COM Unit capacity. The user may continue to define ports to the TDM as long as COM capacity remains for the desired port configuration. The multiplexer shows the arithmetic of the COM and Port Units as each is defined.

The composite port cable should be secured to the unit with appropriate screws that connect to the provided jack posts.

The pin-out configuration for the DB-25 composite connector is as follows:

## Composite RS-232 Signaling

Pin Number	Abbreviation	Description
1	Chassis Ground	Chassis Ground
2	TXD	Transmit Data
3	RXD	Receive Data
4	RTS	Request To Send
5	CTS	Clear To Send
6	DSR	Data Set Ready
7	Signal Ground	Signal Ground
8	Not Used	--
9	Not Used	--
10	Not Used	--
11	Not Used	--
12	Not Used	--
13	Not Used	--
14	Not Used	--
15	TXC	Transmit Clock
16	Not Used	--
17	RXC	Receive Clock
18	Not Used	--
19	Not Used	--
20	DTR	Data Terminal Ready
21	Not Used	--
22	Not Used	--
23	Not Used	--
24	Not Used	--
25	Not Used	--

## Composite V.35 Signaling

Pin Number	Abbreviation	Description
1	Chassis Ground	Chassis Ground
2	TXD+	Transmit Data Plus
3	RXD+	Receive Data Plus
4	RTS	Request To Send
5	CTS	Clear To Send
6	DSR	Data Set Ready
7	Signal Ground	Signal Ground
8	Not Used	--
9	RXC-	Receive Clock Minus
10	Not Used	--
11	Not Used	--
12	TXC-	Transmit Clock Minus
13	Not Used	--
14	TXD-	Transmit Data Minus
15	TXC+	Transmit Clock Plus
16	RXD-	Receive Data Minus
17	RXC+	Receive Clock Plus
18	Not Used	--
19	Not Used	--
20	DTR	Data Terminal Ready
21	Not Used	--
22	Not Used	--
23	Not Used	--
24	Not Used	--
25	Not Used	--

# Chapter Four Configuration

---

## Set-up

The unit provides a menu screen set-up facility accessed through Port 1. In normal operation, Port 1 is transparent to all data. It is necessary to power down or disconnect the composite interface in order to access the Port 1 set-up facility. In addition, Port 1 will only react to an ASCII terminal set to the following parameters:

*Speed: 9600 bps*  
*Data Bits: 8*  
*Parity: None*  
*Stop Bits: 1*

After the ASCII terminal is set and connected to Port 1 with a straight-through cable (see **Chapter 3**), the following commands may be entered:

**Control “N” - New or Factory Configuration**  
**Control “O” - Old or Previous Configuration**

### **New or Factory Configuration – 5 Consecutive ^N’s**

Upon entering five consecutive Control “N” (^N) characters, the following is presented to the ASCII terminal connected to Port 1:

At this point, the unit is awaiting input from the user before proceeding. The user may now enter one of two keys. Pressing the **SPACEBAR** key changes the current entry to the next option. Pressing the **ENTER** key accepts the current option and displays the next entry.

```
AMERICAN TECHNOLOGY LABS
Netmux-2 TIME-DIVISION MULTIPLEXER

Comm 9600 Bps (Mux Overhead = 1)          COM Units:  240 – Remaining:  239
Port 1 Unassigned
Port 2 Unassigned
Comm 9600BPS
```

**Example of Netmux-2 Configuration**

```
AMERICAN TECHNOLOGY LABS
Netmux-4 TIME-DIVISION MULTIPLEXER

Comm 9600 Bps (Mux Overhead = 1)          COM Units:  240 – Remaining:  239
Port 1 Unassigned
Port 2 Unassigned
Port 3 Unassigned
Port 4 Unassigned
Comm 9600BPS
```

**Example of Netmux-4 Configuration**

```
AMERICAN TECHNOLOGY LABS
Netmux-8 TIME-DIVISION MULTIPLEXER

Comm 9600 Bps (Mux Overhead = 1)          COM Units:  240 – Remaining:  239
Port 1 Unassigned
Port 2 Unassigned
Port 3 Unassigned
Port 4 Unassigned
Port 5 Unassigned
Port 6 Unassigned
Port 7 Unassigned
Port 8 Unassigned
Comm 9600BPS
```

**Example of Netmux-8 Configuration**

### Space Bar – Display Next Option Enter – Accept Current and Display Next

The screen cursor is prompting to accept or change the current value of the composite speed—currently defaulted at 9600bps. If this is the desired speed for the composite, then the Enter key should be depressed. If not, the space bar key displays the next speed option. Speed options available are 9600, 14400, 19200, 38400, 56000, and 64000bps. When the desired speed option is displayed, the Enter key should be pressed. The following shows the response of the unit for a 56000bps selection on the Netmux-2.

```

AMERICAN TECHNOLOGY LABS
Netmux-2 TIME-DIVISION MULTIPLEXER

Comm 9600 Bps (Mux Overhead = 1)      COM Units: 240 – Remaining: 239
Port 1 Unassigned
Port 2 Unassigned
Comm 56 Kbps (Mux Overhead = 1)      COM Units: 1400 – Remaining: 1399
Port 1 Unassigned

```

### Example of Netmux-2 Configuration

The unit is now prompting for Port 1 to either be UnAssigned or Assigned. The space bar key toggles between the two options. If Port 1 is to be in the new port configuration, press **SPACEBAR**. If not, press **ENTER** to display Port 2. If the user does indeed expect to use Port 1, press **SPACEBAR**, followed by **ENTER**. If this is done, the screen entry will appear as follows:

```
Port 1 Assigned .. Sync
```

The unit is now prompting for Port 1 to be either a Sync port or an Async port.

The space bar key toggles between the two options as above. The selection of this option results in different sets of options that follow—specifically for a Sync port and for an Async port.

## Synchronous Port Selection

If the Sync option was selected, the Port 1 screen line appears as follows:

```
Port 1 Assigned ..Sync 4800 Bps
```

At this point, the unit is prompting for a synchronous speed. The initial default speed is 4800 Bps. The space bar can now be used to present the next speed option if 4800 Bps is not the desired speed. Successive depressions of the space bar will provide the following speed options: 9600, 14400, 19200, 28800, 38400, 600, 1200, 2400, and 4800 Bps. The list is circular.

When the desired speed appears, press **ENTER** to select it. As an example, assume that the desired speed is 9600bps. Press **ENTER** after the space bar depressions display 9600. The set-up screen line now appears as follows:

```
Port 1 Assigned ..Sync 9600 Bps Port Units:    240 -  
Remaining: 1159
```

```
Port 2 Un-Assigned _
```

The unit has accepted the synchronous 9600bps selection and provided the user with the information that Port 1 has used 240 units of the composite and the composite has remaining 1159 unused units of capacity. The number “240” is the number of characters that Port 1 will transmit in 200 milliseconds on the COM link. The unit is now prompting for the assignment of Port 2. This process continues until the user has assigned all desired ports.

## Asynchronous Port Selection

If the Async option was selected, the Port 1 screen line appears as follows:

```
Port 1 Assigned ..Async 4800 Bps
```

At this point, the unit is prompting for an asynchronous speed. The initial default speed is 4800 Bps. The spacebar can now be used to present the next speed option if 4800 Bps is not the desired speed. Successive depressions of the space bar will provide the following speed options: 9600, 19200, 38400, 300, 600, 1200, 2400, and 4800 Bps. The list is circular.

When the desired speed appears, press **ENTER** to select it. As an example, assume that the desired speed is 9600bps. Press **ENTER** after the spacebar depressions display 9600. The set-up screen line now appears as follows:

```
Port 1 Assigned ..Async 9600 Bps N_
```

The unit has accepted the asynchronous 9600bps selection and prompted the user for the parity option for Port 1. The initial default is “N” for no parity. If this is the desired option, press **ENTER**.

If not, the space bar will provide the additional options of “E” for even parity, and “O” for odd parity. This list is also circular. When the desired option is displayed, press **ENTER**. As an example, assume that the desired option is “N,” and **ENTER** is pressed. The set-up screen line now appears as follows:

```
Port 1 Assigned ..Async 9600 Bps N,8-8w_
```

At this point, the unit is prompting for the number of data bits per asynchronous character. The initial default number of data bits is “8-8w” (i.e. 8 data bits on an 8 wire interface). The space bar can now be used to present the next option if “8-8w” is not the desired number of data bits/connection wires.

Successive depressions of the space bar will provide the following number of data bits options: 5, 6, 7, and 8 (along with both 8 wire and 3 wire interfaces). The list is circular.

## Configuration

When the desired number of data bits per character/wire connections appears, press **ENTER** to select it. As an example, assume that the desired number of data bits is “8-8w,” and **ENTER** is pressed when the space bar depressions display “8-8w.” The set-up screen line now appears as follows:

```
Port 1 Assigned ..Async 9600 Bps N,8-8w,1_
```

At this point, the unit is prompting for the number of stop bits per asynchronous character. The initial default number of stop bits is “1.” The space bar can now be used to present the next option if “1” is not the desired number of stop bits.

Successive depressions of the space bar will provide the following number of stop bit options: 1.5, 2, and 1. The list is circular. When the desired number of stop bits per character appears, press **ENTER** to select it. As an example, assume that the desired number of stop bits is “1,” and **ENTER** is pressed when the space bar depressions display “1.” The set-up screen line now appears as follows:

```
Port 1 Assigned ..Async 9600 Bps N,8-8w,1 Port  
Units: 225 - Remaining: 1174
```

```
Port 2 Un-Assigned _
```

The unit has accepted the asynchronous 9600bps N,8-8w,1 selection and provided the user with the information that Port 1 has used 225 units of the composite and the composite has remaining 1174 unused units of capacity. The number “225” is the number of characters that Port 1 will transmit in 200 milliseconds on the COM link. The unit is now prompting for the assignment of Port 2. This process continues until the user has assigned all desired ports.

Following the actions taken with respect to Port 8, the unit prompts the user with the following:

```
Change: (Y/N) ..._
```

The unit is prompting the user to confirm the just completed new configuration. The user must now respond with either a “Y” or an “N.” If upon inspection, the just completed new configuration is not what is desired, then press **Y** for yes. If the new configuration is correct as input, then press **N** for no.

If a “Y” is input, the original configuration is displayed and the user must begin again from the top to define the new configuration. If an “N” is input, the unit clears the screen of the terminal and re-displays the just-completed input one more time. Again, the unit will prompt for a second confirmation of the new configuration. The procedure is identical with the “Change? (Y/N) ...” shown above. This time, if the user responds with “N,” for no more changes to the input configuration, the unit accepts the new configuration as the current configuration and will operate with it when the COM link becomes available.

## Old or Previous Configuration – 5 Consecutive ^O's

The multiplexer saves non-volatile RAM, the current configuration from which it operates. This is accessed as the “Old” or previous configuration by typing five consecutive control “O” (^O) characters. The same terminal requirements as described under the New configuration apply. When an ASCII terminal is connected to Port 1, set to 9600 N,8,1, and the unit has a composite link that is either disconnected or powered down, entering five consecutive “^O”'s causes the unit to display the old or previous configuration. As an example:

```

AMERICAN TECHNOLOGY LABS
Netmux-2 TIME-DIVISION MULTIPLEXER

Comm 56Kbps (Mux Overhead = 1)      COM Units: 1400 – Remaining: 1399
Port 1 Assigned ..Sync 19.2 Kbps    Port Units: 480 – Remaining: 919
Port 2 Assigned ..Sync 9600 Bps     Port Units: 240 – Remaining: 679
Change ? (Y/N)...
```

### Example of Netmux-2 Configuration

The unit is prompting the user to confirm the desire to change the old configuration. The user must now respond with either a “Y” or an “N.” If no change is desired after inspection of the “Old” configuration, an “N” causes the unit to exit without any changes made. If upon inspection, the “Old” configuration does need to be changed, then a “Y” should be input.

The unit then displays the “COM” speed and allows the user to initiate changes by stepping through each field using the spacebar and the Enter key. Upon completion of the last port parameters, the unit again prompts with a “Change ? (Y/N)...” prompt. If the changed configuration is correct as input, press N. If a “Y” is input, the original configuration is displayed, and the user must begin again from the top to define the new configuration. If an “N” is input, the unit clears the screen of the terminal, and re-displays the just completed changed input one more time. Again, the unit will prompt for a second confirmation of the new configuration.

The procedure is identical with the “Change? (Y/N) ...” shown above. This time, if the user responds with “N,” for no more changes to the input configuration, the unit accepts the changed configuration as the current configuration and will operate with it when the COM link becomes available.

## Over-booking

It is possible to select a configuration that defines more port capacity than is available on the composite link. By observing the number of units utilized by each port as it is being defined, it is fairly simple to determine if over-booking of the composite link is about to occur. If it does occur, the unit places in the “Remaining” column asterisks—“\*\*\*\*”. If this occurs, at the end of the configuration screen, the unit issues the following message:

```
Error****
Port Units > Comm Capacity
Any key to retry..._
```

The unit now awaits the user response. Following any key being depressed, the unit clears the screen and the user is invited to initiate the changes again. It is non-trivial to compute the number of capacity units to be associated with each speed configuration that a user may select. However, for the user who “wants to know”, the following is the way it is done.

1. Determine the arrival rate of characters at a port—that is, divide the bits per second of a port by the number of bits comprising a character. For synchronous, the bits per character is always 8. For asynchronous data, take the number of bits per character (5, 6, 7, or 8), add 1 for the start bit, and 1 for 1/1.5 stop bits or 2 for 2 stop bits, add 0 if no parity is used or 1 for even or odd parity. If you have done all of the arithmetic correctly, the number of bits for an asynchronous port is in the range of 7-12. Divide this number into the bits per second of the port.
2. Since the unit works with a 200 millisecond table, now divide this number by five. The result is the number of characters received at a port in 200 milliseconds. For synchronous data you are complete.

## *Configuration*

3. For asynchronous data, the unit requires one control byte for each eight characters that are transmitted. Take the number computed in Step 2 and divide by eight and add that to the original number.
4. For asynchronous data, make the number of capacity units for a port slightly above that which is required to service the port. This is necessary since asynchronous clocks vary slightly between different DTE units. This is accomplished by rounding the number computed in Step 3 to the next higher number divisible by eight, or adding eight to the original number if the result of Step 3 was already divisible by eight.

Once a configuration has been entered into a unit, the multiplexer system is ready for operation. The system requires only one multiplexer of the system pair to be updated with a configuration. Upon connection of the composite link to the multiplexer pair, the units will automatically exchange configurations, determine the most recent configuration, and initiate port operations using the current configuration. For all defined ports, corresponding ports will transmit and receive data in the manner determined by the current configuration.

## Front Panel LED Status

The front panel contains six LED's that indicate status of the multiplexer. The LED's are labeled as follows:

<b>In</b>	<b>Car</b>	<b>Req</b>	<b>Clr</b>	<b>Send</b>	<b>Recv</b>
●	●	●	●	●	●
<b>Sync</b>	<b>Det</b>	<b>Send</b>	<b>Send</b>	<b>Data</b>	<b>Data</b>

“In Sync” is In Synchronozation, “Car Det” is Data Carrier Detect, “Req Send” is Request to Send, “Clr Send” is Clear to Send, “Send Data” is Send Data, and “Recv Data” is Receive Data. All LED’s are red except for the In Sync LED, which is bi-color red/green. The right five LED’s are directly connected to the composite link and reflect its status. The left most LED (In Sync) provides multiple indications of status information as follows:

**Solid Red** - Is **NOT** communicating with the remote unit.

**Solid Green** – Is in a **NORMAL** operational mode

**White or not illuminated** – No power, or unit is in process of initialization.

## **Flow Control**

The Netmux product does not support directly any type of flow control. However, by its transparent nature, all software flow controls pass through the Netmux.

Hardware flow control is also supported in a pseudo fashion. This has been implemented through two common leads appearing on most asynchronous systems—Request To Send (RTS) and Data Carrier Detect (DCD). When the unit is presented an RTS lead that is high, the corresponding multiplexer at the remote site has a high DCD. When the RTS lead is low, then the corresponding port at the remote multiplexer has a low DCD. This is done through internal signaling within the unit.

This system of lead level changes is bi-directional. To operate these two leads in a hardware flow control system, attach the lead from the data terminal equipment controlling flow to the RTS lead of the unit. Attach the corresponding lead controlling flow at the remote site to DCD. As an example, assume that you have an asynchronous printer which uses DTR for flow control at a remote site, and the local computer system is programmed to accept CTS. The following cabling should be done to use hardware flow control:

At the Remote Printer:

Cross connect RTS and DTR

At the Central Site:

Cross connect CTS and DCD

One additional observation needs to be made regarding an on-line condition. Many PC's and terminals recognize that they are in an on-line condition when they receive DCD from the DCE interface. The opposite is also true. For the unit to provide DCD at the port interface, the remote terminal must be supplying an RTS signal. Therefore, an on-line condition is achieved only when both corresponding ports have DTE equipment installed and powered on. This would be the normal condition for operation of the system. Three wire systems are by their nature limited to software flow control protocols.

For questions regarding the operation or installation of its products, you should first contact the sales organization from whom you purchased the product. If having done that, you wish to contact American Technology Labs to gain greater clarity on technical questions, you may do so at (800) 695-1951. Please be prepared to provide the name of the sales organization from whom you purchased the product.

American Technology Labs warrants this product against defects in material or workmanship under normal operating conditions for a period of five (5) years from the date of purchase. This warranty covers the product during the warranty period when in the possession of the original consumer purchaser only. In the event service is required, the product must be delivered within the warranty period (prior authorization is required) and transportation prepaid to American Technology Labs along with evidence of date and place of original owner's purchase. The purchaser is responsible for removal and installation of the product.

**LIMITATION OF WARRANTY:** Failures attributable to improper use, storage or maintenance of the product are not covered by this warranty. This warranty shall not apply to manuals or accessories.

**AMERICAN TECHNOLOGY LABS (ATL) AND ITS REPRESENTATIVES OR ITS AGENTS SHALL IN NO EVENT BE LIABLE FOR ANY GENERAL, DIRECT, INDIRECT, OR CONSEQUENTIAL DAMAGES ARISING OUT OF OR CAUSED BY THE USE OF OR THE INABILITY TO USE ANY ATL PRODUCT. THIS WARRANTY IS MADE IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, AND OF ALL OTHER LIABILITIES ON THE PART OF ATL, ALL OTHER WARRANTIES, INCLUDING THE WARRANTY OF MERCHANTABILITY, AND FITNESS FOR A PARTICULAR PURPOSE, ARE HEREBY DISCLAIMED BY ATL AND ITS REPRESENTATIVES.**

# Index

---

## C

### Cabling

Asynchronous port pin designation	8
DB-25	7, 10
Length	9
Synchronous port pin designation	7
V.35	10
Clear Channel	3
COM Units	10

## E

Electrical requirements	3
-------------------------	---

## F

Flow Control	24
--------------	----

## I

Inspection	5
------------	---

## L

LEDs	4, 24
------	-------

## O

Over-booking	21
--------------	----

## P

Physical Specifications	2
-------------------------	---

Port  
  Capacity           1  
  Composite         10  
  Speed              1

**S**

Service             26  
Set-up              10, 13  
Synchronous Clock Source   3, 10

**T**

Time Division Multiplexer (TDM)   1  
Time Division Multiplexers (TDM)   3

**U**

Unpacking           5





**Corporate Office**

1052 Melody Ln. Ste. #210

Roseville, Ca 95678

Voice: (916) 783-1951

Fax: (916) 783-1952

Technical Support: (800) 695-1951

Sales: (800) 695-1951

<http://www.atli.com>