SERIMUX® Series

SERIMUX-TERM-CS-16/8
Terminal Converter with
Console Switch
Installation and Operation Manual

TRADEMARK

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CHANGES

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INTRODUCTION

The SERIMUX-TERM-CS-x (x=8 or 16) combines a 8 or 16 port Console Switch (SERIMUX) and a VT100/ANSI Terminal Converter (TERMINAL) in a single package controlled by a PS/2 keyboard and VGA monitor.   The Console Switch uses menu-driven integrated software.   The SERIMUX-TERM-CS-16 can control of up to 16 serial devices including servers, switches, routers, and telecom gear.   Additional control methods include front panel keypad, LAN or dial-up modem connections. It enables unlimited access to remote network management, providing optimum system performance and availability.

Terminal Converter

The Terminal Converter (TERMINAL) is easy to install and configure for either of the following communication modes:

➢ **RS232 Terminal** (using an RS-232 port for serial console connection). Use this configuration of the Console Terminal with the Console Switch to control multiple servers.

➢ **Telnet Terminal** (using an RJ45 10/100 Base-T network port for Ethernet telnet console connection). The Ethernet connection can be used with any 10/100Mbps-compatible Ethernet host adapter, but is most suited for use with SUN RSC (Remote System Control) Ethernet ports, since these provide the same functionality as serial (ttya) console ports. This connection supports up to 12 telnet sessions to different servers. The state of each server session is preserved by the terminal. Terminal sessions can be switched via hot-keys. When using the Ethernet telnet connection, the Terminal Drawer can be connected to multiple servers via an Ethernet switch. However, it is advisable that the network used to connect the server consoles remains private for security reasons.

Note: Both RS232 serial and Ethernet telnet connections cannot be active at the same time.

The TERMINAL is a general purpose character terminal converter offering full transaction capabilities and is largely pre-configured for most applications. It was designed in conjunction with SUN Microsystems to ensure flawless compatibility with all SUN servers.

Features
- High-quality metal construction (ideal for most industrial and commercial settings)
- Supports RSC capabilities.
- Supports parallel and RS232 serial printers
- Printer server capability.
- Converts the RS232 port of a serial device to PS/2 keyboard and VGA ports so the device can be operated by an NTI KVM switch.
- ASCII text is displayed on the VGA monitor.
- Supports color display functions in 80 and 132 column mode.
- 1RU rackmount case is standard.
- Connects to 10BaseT Ethernet port

Multiple RS-232 Emulations:

- ADDS A2
- PC TERM
- PCG Alpha
- Console ANSI
- TVI910+

- TV1925
- VT52
- VT100
- VT220
- WY-50+

- WY-60
- WY-100
- WY-120
- WY-325

Console Switch

The Console Switch (SERIMUX) includes a text-based menu for easy connection management for administrators.   Using a terminal emulator the menu provides a quick means for user serial connection changes and device control.

The Console Switch (SERIMUX) is a serial port router that allows links (or connections) between multiple pairs of RS-232 asynchronous serial ports. The main purpose of the switch is to enable users to manage several serial devices from local or remote locations (using external modems). Devices include routers, DSU's, servers, switches or any other equipment allowing serial operation using RS232 interface. Users can work locally (using the integral TERMINAL) or from remote locations.

Each SERIMUX port has to be configured for serial communication (baud rate, parity, etc) within the specifications of the attached serial device, but the configurations of the two devices linked by the SERIMUX do not need to match.   Various parameters (communication speed, hardware and/or software flow control, timeout, etc) can be selected for each SERIMUX port. Devices may be either locally connected or connected through attached modems.

Each SERIMUX port can be configured as either a host or user port. Serial hosts (such as servers, switches etc.) are connected to host ports, while serial user devices (such as a terminal or serial console) are connected to user ports.

The SERIMUX Console Switch supports two operator levels: user and administrator. Users login at user ports and connect to serial devices attached at host ports. The administrator (logged in at any user port) and users with administrative privileges can connect to serial devices attached to host ports and see and/or modify various port or user parameters.

Features

The SERIMUX provides secure, flexible management of servers, routers, switches, and other networked devices. Key features include:

- Eliminates the need to connect each device to an ASCII terminal or PC

- Connect up to 16 devices with different baud rates, parity, and character length.

- Provides out-of-band access to network devices (servers, routers, network switches, and any other network devices allowing console operation using RS232)

- No inadvertent "break" signals are generated to cause unintentional rebooting of SUN computers

- Two operator levels (administrator and user)

- Switching is simplified with programmable device names and menu-driven device selection

- Built-in data buffers save the most recent RS232 console output from each connected device, which simplifies troubleshooting failures

- The SERIMUX can be power cycled without halting a SUN host computer

- Gain access to servers without interrupting service to end-users; maintain optimal up-time

- Manage server farms or data centers via serial ports and standard external modems

- Connects to console serial ports using standard CAT5/5e/6 cables and cable adapters.

  o   Maximum cable length is 100 feet.

MATERIALS

Materials Supplied with the NTI SERIMUX-TERM-CS16 Terminal Converter with Console Switch:

IEC Powercord (country specific)

**DB25M-RJ45F-C
Modem Adapter**

**DB9F-RJ45F
Serial Adapter**

**RJ45F-T – DB25M
Console Adapter**

**DB25F- RJ45F
Console Adapter**

**4- #10-32x3/4" screws
and cage nuts**

Manual CD

Materials *Not* Supplied, but *REQUIRED*:

Serial cable with at least one RJ45 male end for connection to the Console Switch from each device to be connected. See "Serial Port Pinouts" on page 69 for cable pinout.

Front and Rear Views of SERIMUX-TERM-CS-16
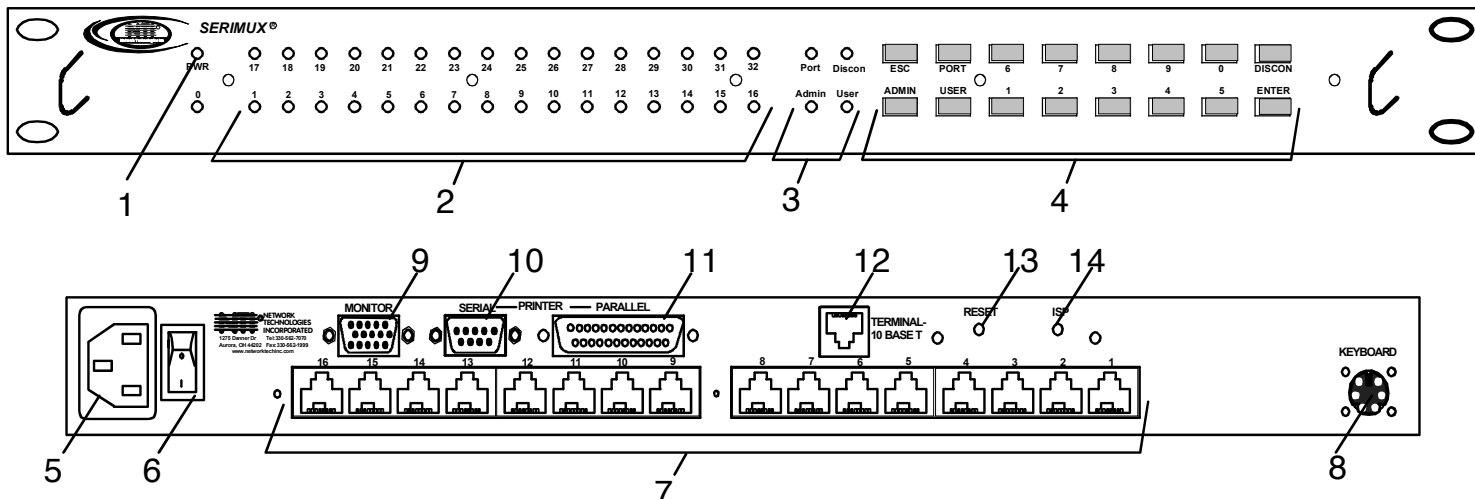
FEATURES AND FUNCTIONS

1. **Power LED**- indicates operation status
   Green=Power-On, Video Input Signal OK
   Red = Suspend / Stand-by, or no Video Input Signal
2. **Port LEDs**- LEDs will illuminate to indicate active administrator port and data traffic; also used to indicate port or user number when entering commands from the keypad.
3. **Command LEDs**- LEDs will illuminate to indicate functions being performed
4. **Keypad**- for manual control of switch functions
5. **Power-** IEC Power Socket- for connection of AC power cord
6. **Switch-** for powering the SERIMUX On/Off
7. **RJ45 Connectors-** for attaching CAT5 cables from serial devices
8. **Keyboard**- for connecting the user keyboard
9. **Monitor**- for connecting the user monitor
10. **Serial** -Male DB9 connector- for attaching a local printer serially
11. **Parallel**- Female DB25 connector- for attaching local printer with parallel printer cable
12. **Terminal-10/100 Base T**-RJ45 Connector for **10/100 Mbps** communications- for TERMINAL connection to Ethernet
13. **System Reset**- button to cycle power to the SERIMUX and TERIMINAL without powering down the SERIMUX
14. **ISP Button**- For use when restoring the firmware in the SERIMUX (**factory use only**)

1. INSTALLATION

1.1 Rack Mounting Instructions

This NTI switch was designed to be directly mounted in a rack and includes a mounting flange to make attachment easy.
Install 4 cage nuts (supplied) to the rack in locations that line up with the holes (or slots) in the mounting flange on the NTI switch.
Then secure the NTI switch to the rack using four #10-32 x3/4" screws (supplied).   Each screw should be of sufficient length to
go completely through the NTI mounting flange, rack frame and fully engage all threads in the captive nut.   Be sure to tighten all
mounting screws securely.
Do not block power supply vents in the NTI switch chassis (if provided).   Be sure to enable adequate airflow in front of and
behind the NTI switch.

Attach all cables securely to the switch and where necessary supply adequate means of strain relief for cables.
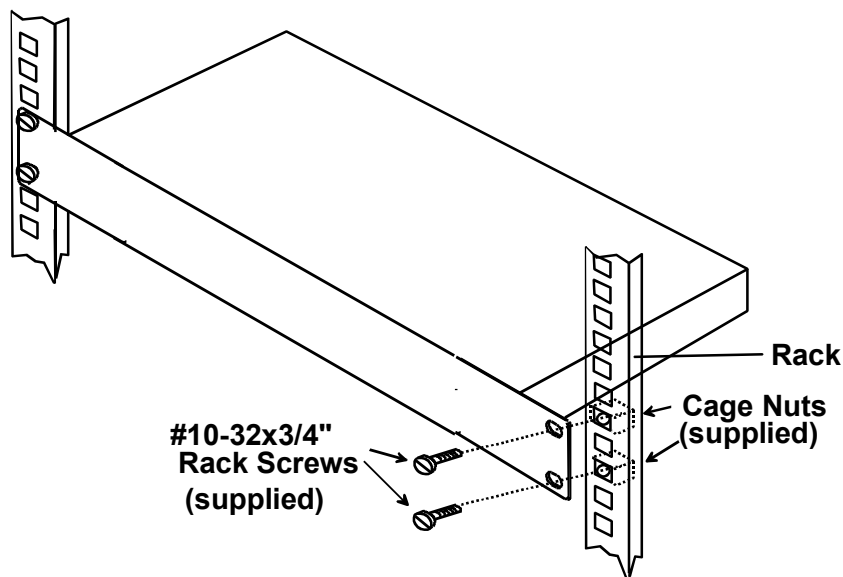
Figure 1- Mount Switch in a Rack

1.2 TERMINAL vs. SERIMUX Cable Connections

The connectors on the rear of the SERIMUX-TERM-CS-16 are split between those for the TERMINAL connections, and those for the SERIMUX connections (see Figure 2).
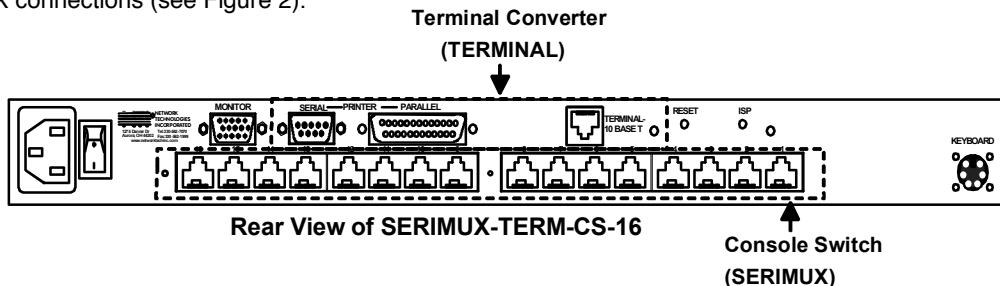
Figure 2- Distinction of connections between TERMINAL and SERIMUX

1.3 Connect Devices, Hosts, and Power

1. Connect each serial device (or host) to be connected by the SERIMUX to any port labeled "1" through "16" using a DTE or DCE type serial cable. It may be necessary to add one of the cable adapters (supplied) detailed in "Cable Adapters" (page 70) between the device port on the serial device (or host) and the RJ45 connector.

Note: There are two types of serial devices, 1) data communication equipment (DCE)(i.e. modem) and 2) data terminal equipment (DTE) (i.e. CPU), each having different connector pin assignments. The cable adapters (see "Materials" on page 3) make the proper connections.

2. If connecting a printer, connect either a serial printer cable to the remaining male DB9 connector or a parallel printer cable to the female DB25 connector (see Figure 3).

3. Connect the powercord to the IEC power connector.
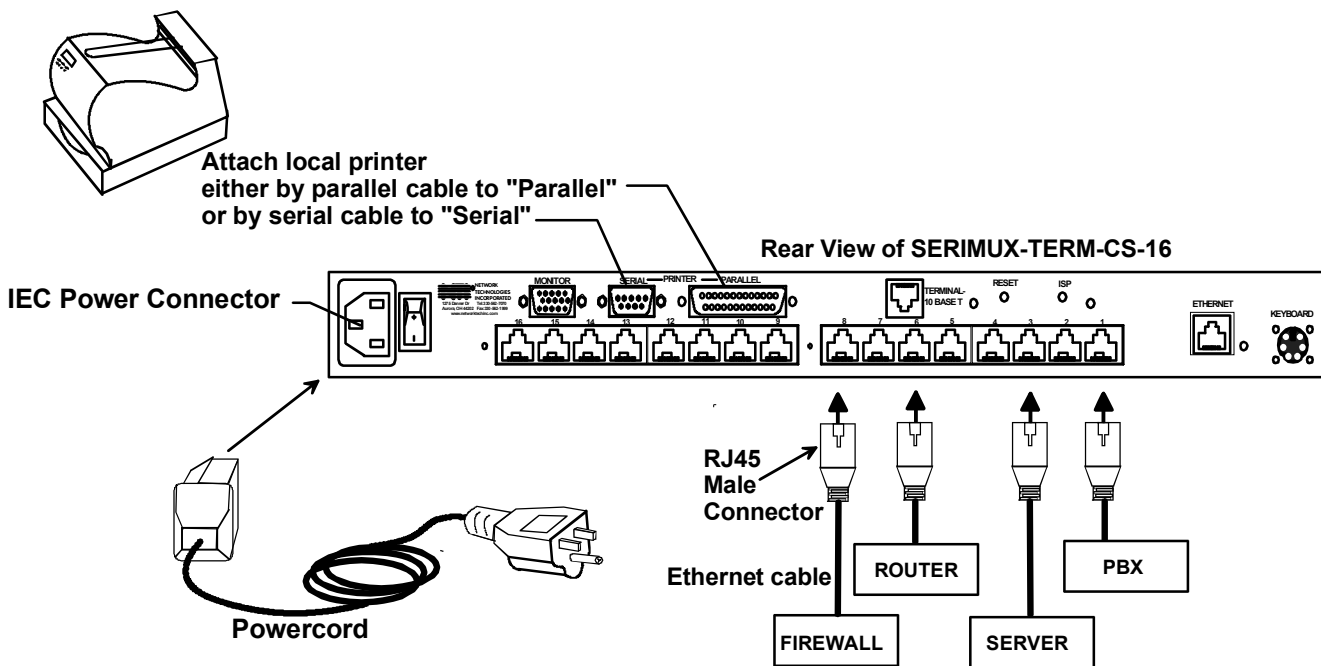
Figure 3- Connect serial devices, printer, and power cord

1.4 Connect the SERIMUX and TERMINAL to a Network

   To control the SERIMUX and TERMINAL through a network connected PC, connect a CAT5 Ethernet network cable to the connector marked "TERMINAL-10 BASE T". Then connect the other end of the Ethernet cable to a Local Area Network (LAN) through a 10/100 BaseT switch or hub (see Figure 4).

Rear View of SERIMUX-TERM-CS-16
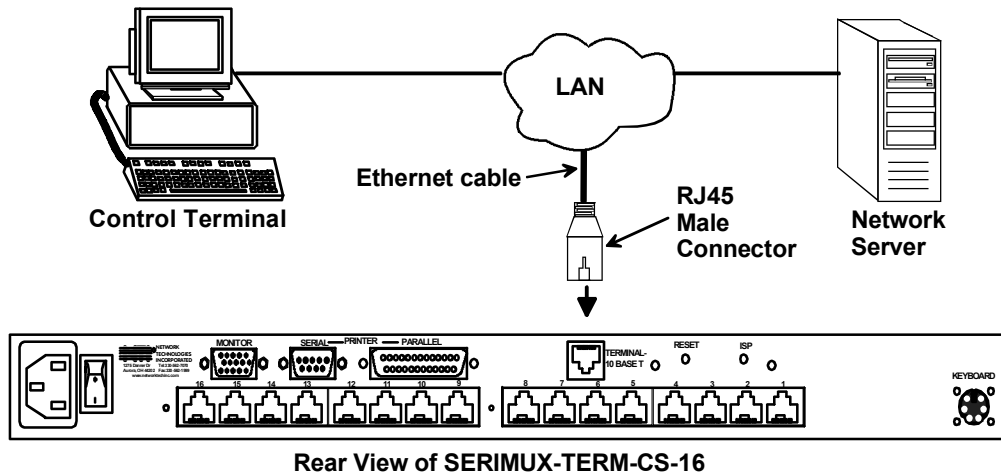
Figure 4- Connect to a Local Area Network (LAN)

Alternatively, the TERMINAL may be directly connected to a PC using a CAT5 Crossover cable.   See page 69 for specifications.

1.5 Connect the Monitor and Keyboard

Connect a VGA monitor and PS/2 keyboard to the connectors marked "MONITOR" and "KEYBOARD".

Rear View of SERIMUX-TERM-CS-16
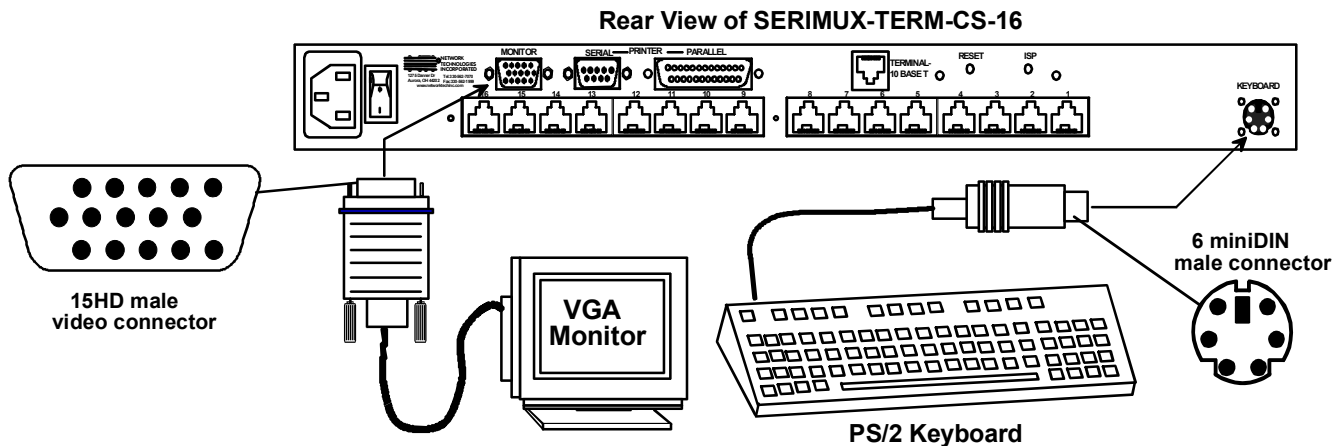
Figure 5- Connect User's Monitor and Keyboard

1.6 Power Up The SERIMUX-TERM-CS-16

1.   Connect the powercord to a power source and power-ON the SERIMUX using the switch on the rear of the
      SERIMUX-TERM-CS-16.

2.   Power-ON the connected VGA monitor.

2. GETTING STARTED

Introduction

This chapter covers basic configuration topics. Included is information on setting up the TERMINAL to control the SERIMUX.
1.   Using the instruction under "Setup The TERMINAL" below (or more detailed instruction on page 37), setup the TERMINAL to make connection to the SERIMUX.   Configure the terminal as follows:
- Ethernet Mode set to OFF (F4 menu)
- Baud rate at 9600 bps (F4 menu)
- 8 bits (F4 menu)
- no parity (F4 menu)
- 1 stop bit (F4 menu)
- no flow control (F4 menu)
- ANSI or VT100 terminal mode (F2 menu).

Within the SERIMUX firmware, the "CONSOLE" port is the internal connection between the TERMINAL and the SERIMUX.   For consistency, when Port 0 is mentioned within this manual, it refers to the connection made by the TERMINAL.

2.1 Setup The TERMINAL

To control the SERIMUX some initial settings must be configured in the TERMINAL.

2.1.1 Entering TERMINAL Setup

Hold down the [`ALT`] key and press the [`Esc`] key to enter Setup mode. When entering Setup, any text on the screen temporarily disappears, and the main SETUP directory appears (See Figure 6). When leaving the Setup mode, the main SETUP directory disappears, and any text that was on the screen will reappear.

2.1.2 Setup Directory

The fields at the bottom of the screen show the various setup menus where the terminal's operating parameters can be changed and the function key to press to immediately display any menu.


```
Setup                                                    Save?
(F1-F11 selects menu; Shift+ESC sets defaults)           (SPACE toggles)
------------------------------------------------------------------------------------------------
                                                            | No |

   F1     F2      F3     F4       F5     F6     F7     F8     F9     F10     F11     F12
 | Disp | Genrl | Keybd | Comm |  Misc | Tabs | Fkeys | Ansbk | Lan | Colr1 | Colr2 | Exit |
```
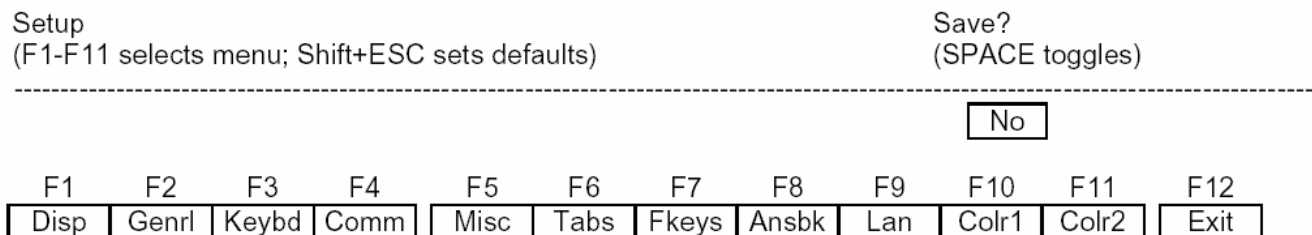
Figure 6- Fields in the Setup menu display which function keys to press for submenus

2.1.3 Changing The TERMINAL Operating Parameters

To select one of the setup menus shown, press the indicated function key.
- The screen for that menu appears with the name highlighted.
- The fields at the middle of the screen indicate the parameters that can be changed in that menu.
- The top line identifies the keys to press to highlight the parameter fields and change the settings.

The procedure is: (1) Use arrow key to highlight the parameter field to be changed.
(2) Use the Spacebar to change the parameter.

Pressing [`F12`> always returns the user to the top menu.

The following lists only what is necessary to connect to SERIMUX.   For a complete list of features, see page 37.

F2- Genrl SETUP Menu

Personality set to Digital Equipment VT-100 or Console ANSI

F4- Comm SETUP Menu

Baud Rate set to 9600

Ethernet Mode set to OFF to set the communication routing by Serial Port.

Data / Stop Bits set to send and receive 8-bits data with one stop bit

Xmt Handshake set to None

Parity set to none

2.1.4 Saving and Exiting Setup

The first menu seen when entering Setup serves as a directory to the other Setup menus. To exit Setup or any submenu, press [**F12**].   Pressing [**F12**] will return the display to the main Setup directory and with another press of [**F12**] the user will exit Setup.

The highlighted field at the right of the screen gives the user the choice of saving or not saving parameter changes into memory before returning the TERMINAL to the normal operating mode.   Settings changed will effect the operating environment until the TERMINAL is powered-down. Setting changes will only be restored at power-up if they are saved before exiting Setup.

Note: If settings are not saved before exiting Setup, any new selections will be lost when the SERIMUX is powered-down.

To save Setup selections, depress the Spacebar to change the save field at the right side of the screen from NO to YES before exiting Setup. (Table 1 describes your options for exiting Setup.)

Press [**F12**] to leave Setup and return to the normal display mode.

Table 1- Main Setup Menu (F12) Exit Functions

Option	Function
No	Returns terminal to normal operating mode without saving parameters changes for power up
Yes	Saves all changes (operating parameter, tabs, key definition, and answerback message); returns terminal To its normal operating mode.
Shift + Esc	Restores all setting (operating parameters, tabs, key definitions, and answerback message) to their factory default values.

For changes to the TERMINAL settings to take effect, the RACKMUX must be power cycled.   Disconnect power from the AC adapter and reconnect.

2.2 Connect to the SERIMUX

1.   Press [**Enter**] on the keyboard to be recognized as the default SERIMUX user. The "Accessible host list" for "User01", logged in at "Port00" will be displayed (see Figure 7). By default, all ports are configured as Host ports and all are accessible.

Note: If the user menu does not display, re-initialize the SERIMUX following the "Reset SERIMUX Console Switch to default settings" instructions on page 36.

2.   To connect to an attached CPU, enter the number of the port the CPU is connected to and press [**Enter**].
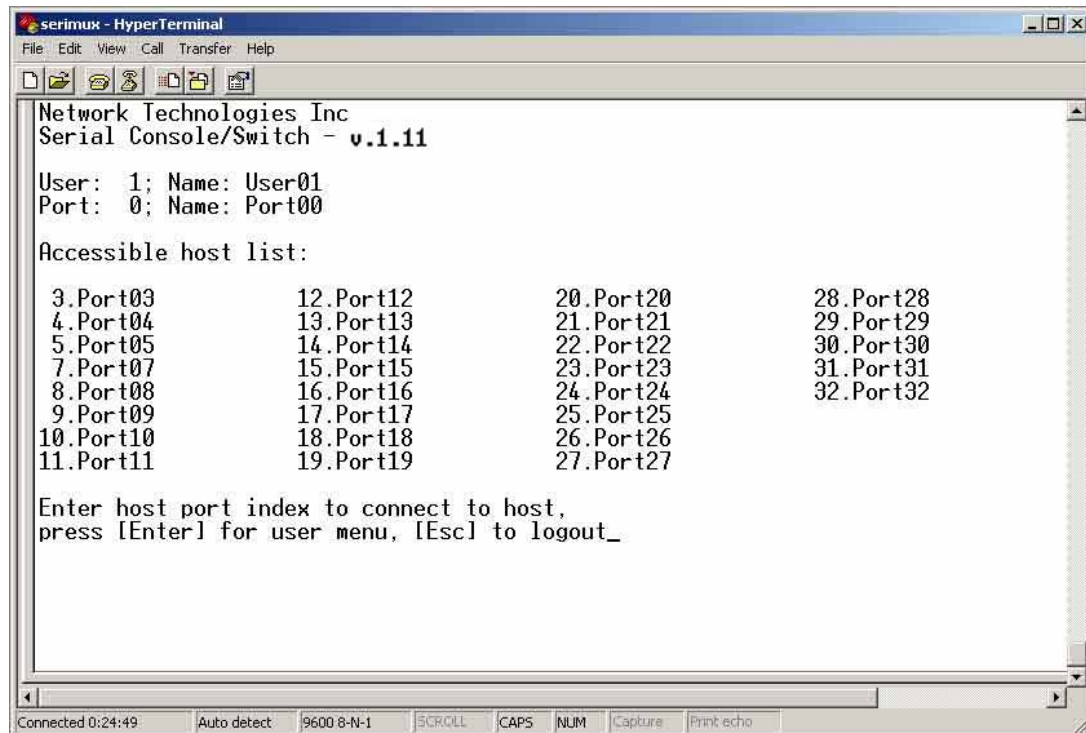
Figure 7- Startup- Accessible host list

3. USING THE SERIMUX CONSOLE SWITCH

The SERIMUX-TERM-CS-16 is controlled using
- Terminal Control- using a connected keyboard, VGA Monitor and the built-in TERMINAL
- Serial Control- from a "dumb" terminal- locally-connected
  - through an external modem from a remote location
- Keypad Control (reduced set of commands)

Terminal Control
The TERMINAL built-in to the SERIMUX-TERM-CS-16 can quickly provide access to the Console Switch (see page 8).

Serial Control
The SERIMUX Console Switch can be easily configured using serial communications from either a locally-connected "dumb" terminal or from a terminal remotely connected through a modem.   Using a keyboard-controlled menu, the user can modify various parameters and options for each port. The administrator menu can be accessed by the administrator for full feature control, or the user menu, by any user, for more restricted control of port connections.

Keypad Control
The keypad has direct control over basic SERIMUX functions.   The keypad can be used to make changes to port connections regardless of any menu control taking place.   Command LEDs on the front panel of the SERIMUX Console Switch indicate the status of the switch and what function is being performed.   For more on Keypad Control, see page 33.

Note: The keypad will only work after first entering the assigned PIN number.   See page 33 for more info.

The default keypad PIN number is 9999.

The SERIMUX can be easily configured using the TERMINAL with a keyboard-controlled menu to modify various parameters and options for each port to be connected to a device. The administrator menu can be accessed by the administrator for full feature control, or the user menu, by any user, for more restricted control of port connections.

The SERIMUX supports 2 operator levels, administrator and user, each with separate password protection for security.
- The administrator logs in using an administrator password (see next page for login procedure)

administrator name : [root] (all lowercase letters)
administrator password : [nti] (all lowercase letters)

- Users login using a password set by the administrator

FYI: Users may be granted administrative access rights by the administrator.

The administrator and any user with administrative rights is able to:
- view / modify port parameters;
- view / modify user parameters and user access rights to ports;
- disconnect ports, logout users etc.
- connect to host ports

The administrator name cannot be changed.

To change the administrator password, see page 23.

3.1 Administrator Controls

3.1.1 Login as the administrator

1. The TERMINAL must first be configured (and is typically delivered preconfigured) as described on page 8 under "Getting Started".
2. Press [**Enter**] on the keyboard, wait three (3) seconds, and the port will open to the "Accessible host list" for "User01", logged in at "Port00".
3. Press [**Esc**] to logout, and [**Y**] to confirm.   A message will be displayed "Disconnecting user now"
4. Press [**Spacebar**] or [**Enter**].   A prompt requesting a Username will appear.
5. Enter [**root**] (all lowercase letters) and press [**Enter**].   A prompt for a password will appear.
6. Enter [**nti**] (all lowercase letters) and press [**Enter**].   The "Administrator main menu" will appear for user ROOT on port 1.

Note: This will only enter the administrator mode if the administrator password has not yet been changed from "nti".
FYI: If SERIMUX is not at initial power-ON, omit steps 2 and 3 above to login.
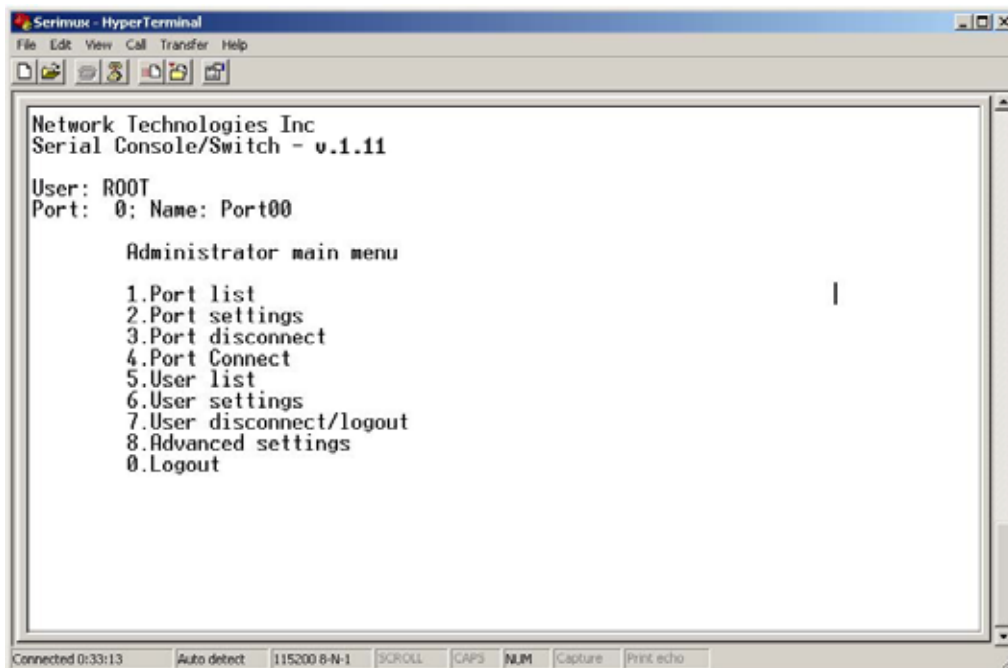
Figure 8- Administrator main menu

FYI: The Administrator main menu will also appear if a user with administrative privileges presses [4] from the User main menu.
From the Administrator main menu, the following options are possible:

Function	Description	Keystroke
Port List	Display the port list	[1]
Port settings	View or modify any port settings	[2]
Port disconnect	Disconnect any port and logout the user logged in or connected to the port	[3] + [port #]
Port Connect	Connect to any port .	[4] + [port #]
User list	Display the user list	[5]
User settings	View or modify user settings	[6]
User disconnect/logout	Disconnect and logout any user connected to a port	[7]
Advanced settings	View or modify advanced administrative settings (pg 17)	[8]
Return to user menu	Leave the administrative menu and return to the User main menu (only listed when a user with administrative rights is logged in)	[9]
Logout	Logout from SERIMUX	[0]

3.1.2 Port List

From the Administrator main menu, press [**1**] to display the Port List.
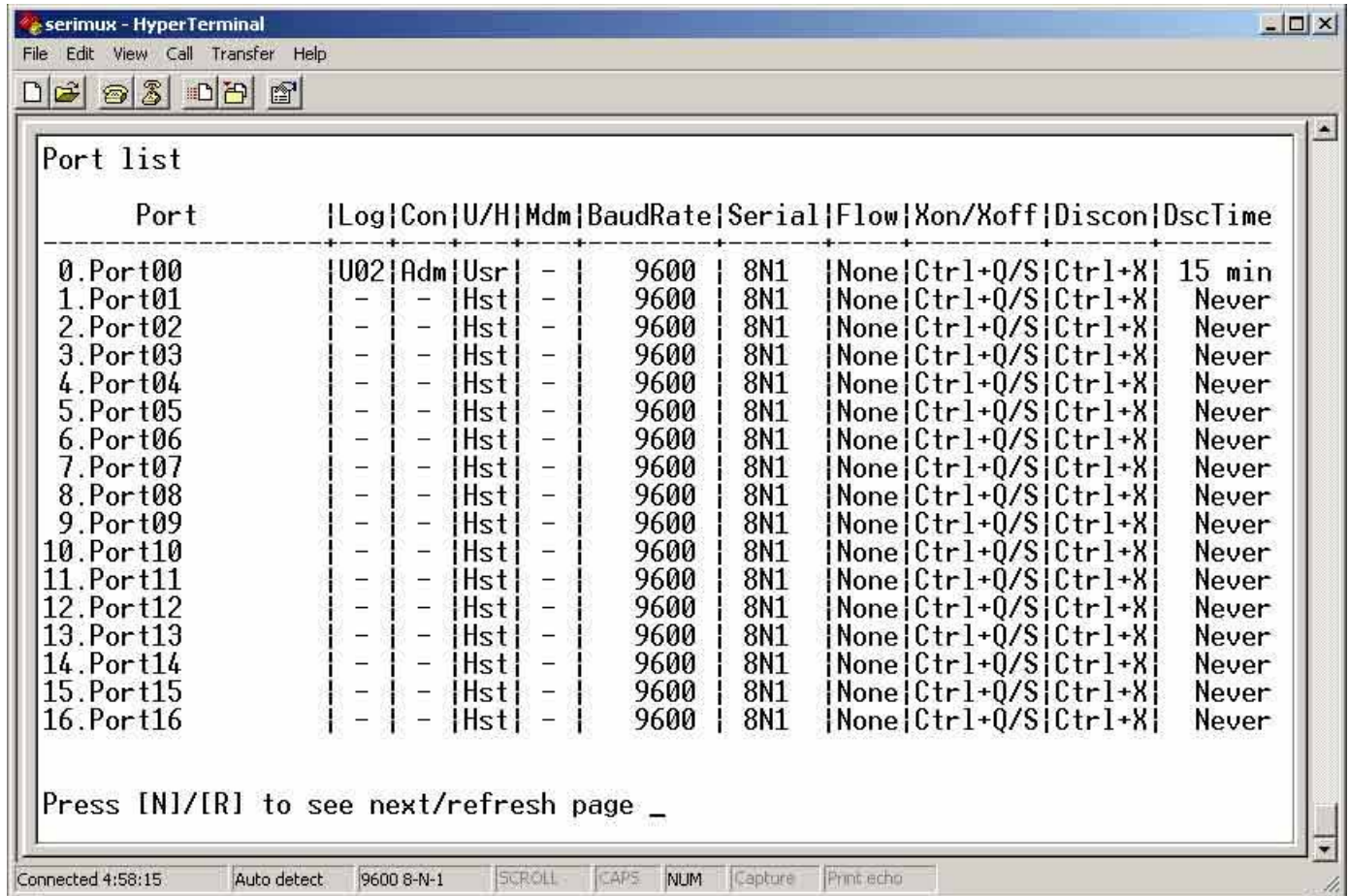
Figure 9- The Port list displays the status of all ports

The Port list displays the following information:

Column Heading	Description
Port	Port number and name
Log	Index number of the user logged in at the port
Con	The number of another port (Pxx) connected to that port . If the administrator is logged in, "Adm" will be displayed
U/H	Port type- User or Host
Mdm	Modem connection status: Y if modem is connected , **-** if not
BaudRate	Port transmitter and receiver speed
Serial	Character size, parity, and stop bit number
Flow	Flow control method- hard (RTS/CTS), soft (Xon/Xoff), both, or none
Xon/Xoff	Special characters used as soft flow control sequence
Discon	In-band disconnect sequence (1 character, 3 character, or none)
DscTime	Remaining time until self-disconnection due to port receiver inactivity (see below)

FYI: RE: DscTime (Disconnect Time)

The value shown in the Port list is derived from various sources depending on the type of connection active at the time.

- *If a user is logged into a port as just a user, the time shown will be the remaining time based on the user's timeout setting.*

- *If a user is logged in with administrative privileges and performing administrative tasks, the time will be based on the administrator's timeout setting, not based on the user's timeout setting.*

- *If two ports are connected to each other, and one port has a lower timeout setting than the other, the lower setting will be shown in the DscTime column and control the connection.*

- Press [**N**] to display port information for ports greater than 16, and then [**P**] to see the previous page.
- Press [**R**] to refresh the information displayed
- Press [**Esc**] or [**Spacebar**] to return to the Administrator main menu

3.1.3 Port Settings

From the Administrator main menu, press [**2**]-[**x**]-[**Enter**]] where x is the number of the port to display the port settings for.
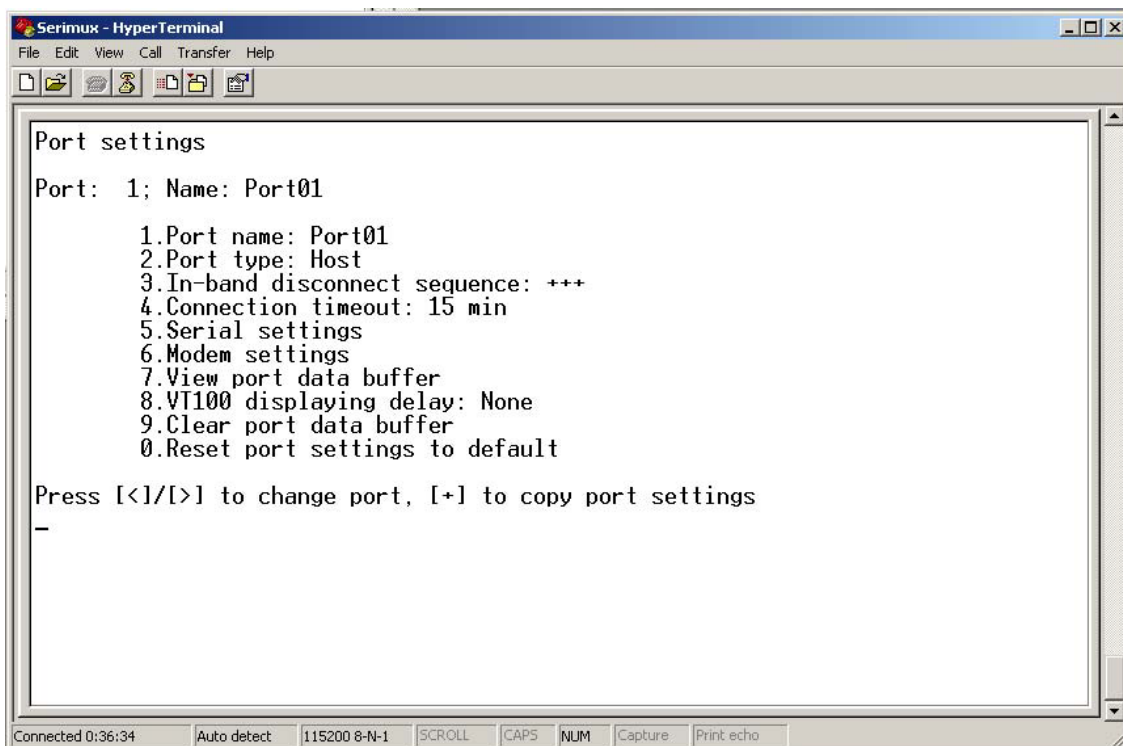
Figure 10- The Port settings menu

From the Port settings menu, the configuration of each port can be viewed and changed.

Setting	Description	Value
Port name	Change the port name	Max. 15 characters
Port type	Host or User	H or U
In-band disconnect sequence	Select characters to use for in-band disconnect sequence	1 + code for 1-character sequence (see Fig. 6 below) 3 + desired characters for 3-character sequence 0- for no disconnect sequence T- display Control code list
Connection Timeout	Time left before connection will be broken due to receiver inactivity	0-90 minutes. If 0 is selected, the connection will never timeout.
Serial settings	Display serial settings menu	N/a
Modem settings	Display modem settings menu	N/a
View port data buffer	View the last 508 characters received and transmitted to/from the port	N/a
Clear port data buffer	Clear the data buffer for the selected port	N/a
VT100 displaying delay	Modify the displaying extra delay	0 = None,1 = normal, 2 = double, or 3 = triple "None" value can be used if the display is faster (i.e. with a terminal emulator, like HyperTerminal, running on a PC); the other values are useful if real terminals or slower serial devices are used as user/administrator consoles.
Reset Port settings to default	Restores factory default port settings	A confirmation "Y" will be required

When [**3**] is pressed to change the in-band disconnect sequence, the choices provided are 0, 1, 3, or T.   Pressing a [**T**] will bring up a Control code list containing key sequences used for 1-character sequences, and the ASCII codes associated with each. (See Fig. 10)   To set a 1-character sequence, press [**1**], then the code from the table associated with the desired sequence.

Note: If the 3-character disconnect sequence is enabled, the string: [CR][LF]<3-char sequence>[CR][LF] has to be received to break the connection (7 characters).   The [CR] and [LF] ASCII characters stand for 13 and 10 decimal codes (ASCII Carriage Return and Line Feed) respectively.

FYI: If the 1-character sequence is selected, the connected device will not receive the disconnect character. If the 3-character sequence is selected, it will be sent to the connected device, prior to breaking the connection.
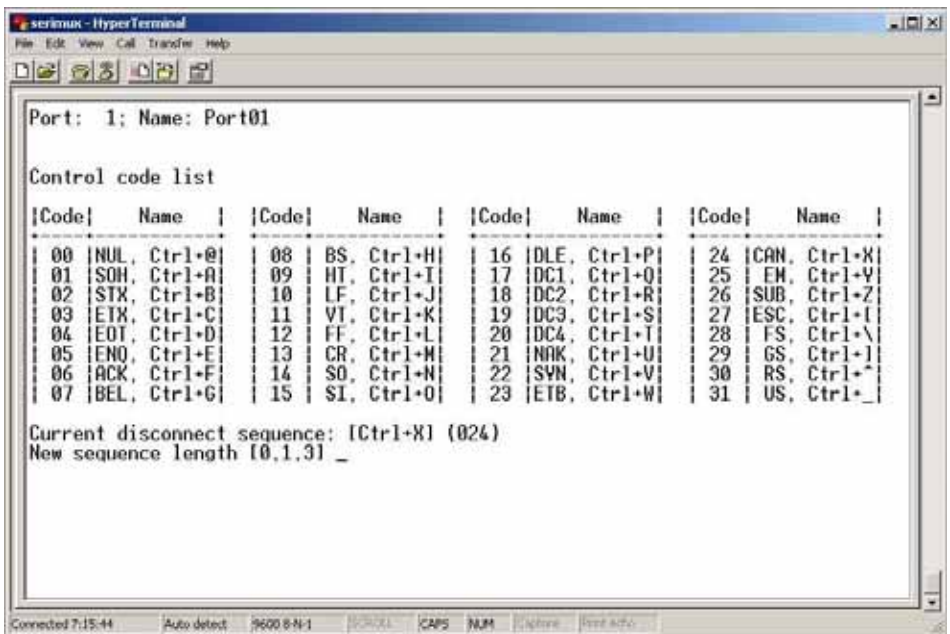
Figure 11- Control Codes for in-band disconnect sequence

- When selecting each new port setting values, press [**Esc**] or [**Spacebar**] to cancel,   or press [**Enter**] to save.
- Press [**>**] (greater than symbol) to display the current settings for the next port.
- Press [**<**] (less than symbol) to display the current settings for the previous port
- Press [**Esc**] or [Spacebar] to return to the "Administrator main menu"

3.1.3.1 Port serial settings

From the "Port settings" menu, press [**5**] to display the "Port serial settings" menu. Using this menu, the administrator can adjust the serial settings of each port, or copy the current port serial settings and paste them to another port or to all ports.
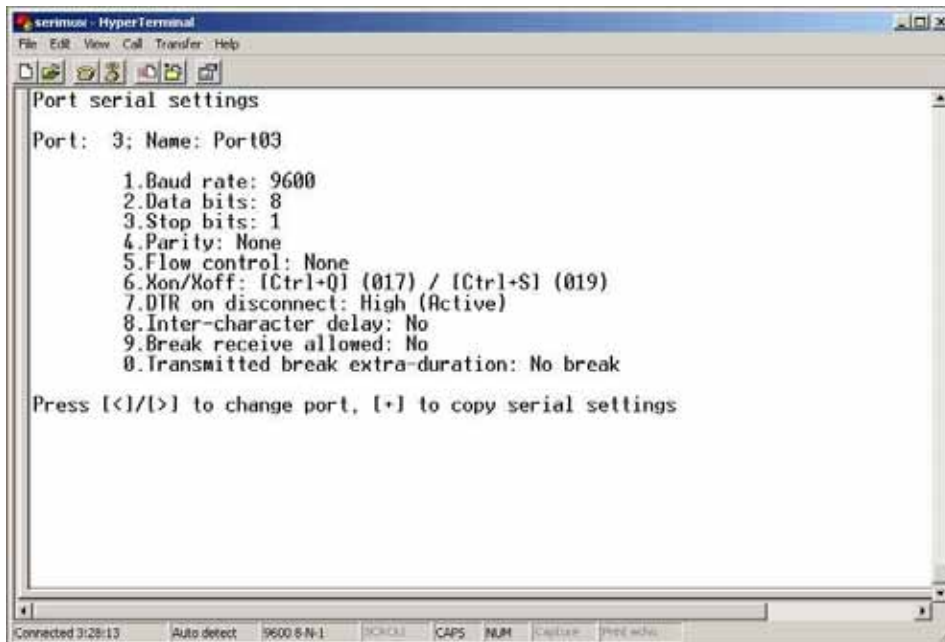
Figure 12- Port serial settings menu

3.1.3.1.1 Baud rate

Any baud rate (serial speed) between 50 bps - 128Kbps can be selected, (except for port 0, between 300 bps - 115.2 Kbps). To modify the port serial speed (baud rate);
  – press [**1**],
  – enter the new value or press [**T**] for a table listing standard baud rates supported,
  – and press [**Enter**].   A confirmation will be required for non-standard baud rate values.

3.1.3.1.2 Data bit

The data bit number can be 5, 6, 7, 8, (except for port 0: 7 or 8).
To modify the data bit number;
  – press [**2**],
  – then the bit number: 5, 6, 7, 8

3.1.3.1.3 Stop Bit

 The stop bit number can be 1, 2, or 1.5, (except for port 0: 1 or 2 stop bits).
 To modify the stop bit number;
  – press [**3**],
  – then [**1**] or [**2**] or [**A**] to select 1, 2, or 1.5 stop bits respectively.
Note: When Data bit is 5/6 the stop bit can be 1 or 1.5, otherwise it can be 1 or 2

3.1.3.1.4 Parity

Parity is set by pressing [**4**], then [**N**] for none, [**E**] for even, or [**O**] for odd.

3.1.3.1.5 Flow Control

The flow control (hand shaking) can be hardware (RTS/CTS or out-band), software (Xon/Xoff or in-band), both or none.
To select the flow control;
  – press [**5**],
  – then [**H**] or [**S**] or [**B**] or [**N**] respectively.

Note: If "N" for "none" is selected, data may be lost when sending large (greater than 1000 byte) data packets.

Note: If a modem is attached to the port, and hardware and/or software flow control is used, the appropriate command may be added to the modem initialization string:

Flow control	Command 1	Command 2
None	–	–
RTS/CTS (hardware)	&K3	\Q3
Xon/Xoff (software)	&K4	\Q1
Both	&K6	
disable flow control (not necessary)	&K0	\Q0

Consult your modem user manual or the modem AT command manual to find the suitable command.

3.1.3.1.6 Xon or Xoff Characters

Any non-printable character (ASCII codes between 0 and 31) can be used as flow control Xon or Xoff character. The software flow control is transparent, so the special character is not passed to the connected device. If the Xon and Xoff characters are equal, a toggle mode is automatically used in the software flow control: whenever the special flow control character is received, the current state of flow control is toggled.

To change the Xon or Xoff character;
  − press [**6**],
  − then [0] for Xoff or [**1**] for Xon,
  − enter the new value,
  − then press [**Enter**] to save it, [**Esc**] or [**Space**] to cancel.

FYI: Press [T] after [6] to display a control codes table.

3.1.3.1.7 DTR line behavior

If a modem is not attached to the serial port, the DTR port line behavior on port disconnection can be selected as follows: the DTR line can be held high (active), low (inactive) or pulsed for 0.5 seconds and then held high. When a modem is attached to the port, the DTR line will be pulsed on port disconnection, disregarding this parameter value.

To modify the DTR line behavior on port disconnection;
  − press [**8**],
  − then [**H**] or [**L**] or [**P**] respectively.

3.1.3.1.8 Inter-character delay

An inter-character delay (1 - 60 ms) may be defined, each time a character sequence is transmitted from the port. Using this command, a minimum pause will appear between transmitted characters; for example, certain types of electro-mechanical devices (like teletype equipment) cannot process received characters continuously at their specified baud rate.

To select an inter-character delay;
  − press [**8**],
  − enter the new value (0 for no delay),
  − and press [**Enter**] to save it, [**Esc**] or [**Space**] to cancel.

FYI: This parameter is not available for port 0.

3.1.3.1.9 Line-break receive or transmit

It is possible to accept the line-break received from a port, and to send it from the connected port. The break condition (when received) is defined as zero data with zero parity and no stop bits.

To allow or not the line-break receive**;**
  − press [**9**],
  − then [**Y**] for allowed,
  − [**Esc**] or [**Space**] to cancel, any other character to deny.

To define the transmitted line-break extra-duration (this is added to the 1-character transmission time);
  − press [**0**],
  − then enter the new value (1 - 999 ms) or 0 to disable it,
  − and press [**Enter**] to save it, [**Esc**] or [**Space**] to cancel.

FYI: These parameters are not available for port 0.

3.1.3.1.10 Copy Port Serial Settings

  – Press [+] to select the current port as source in a port settings copy-paste process (except port 0).
  – Then, press [*] to paste the port settings.
  – Press [Y] to paste the selected port settings to the current port, [A] to paste to all ports, [S] to specify the destination port, or press any other key to cancel.

3.1.3.1.11 Display serial settings for different port number

Press [>] (greater than symbol) to display the next higher port serial settings, or press [<] (less than symbol) to display the previous port serial settings.

Press [Esc] or [Space] to return to the "Port settings" menu.

3.1.3.2 Modem settings

From the "Port settings" menu, press [6] to display the "Modem settings" menu.

Remote connections are possible if modems are used, usually by the users. The remote modem may call in to a local modem attached to a SERIMUX port. A minimum number of port modem settings can be adjusted in the SERIMUX to control the connection (try the default values first; refer to the manual(s) for the modems otherwise).
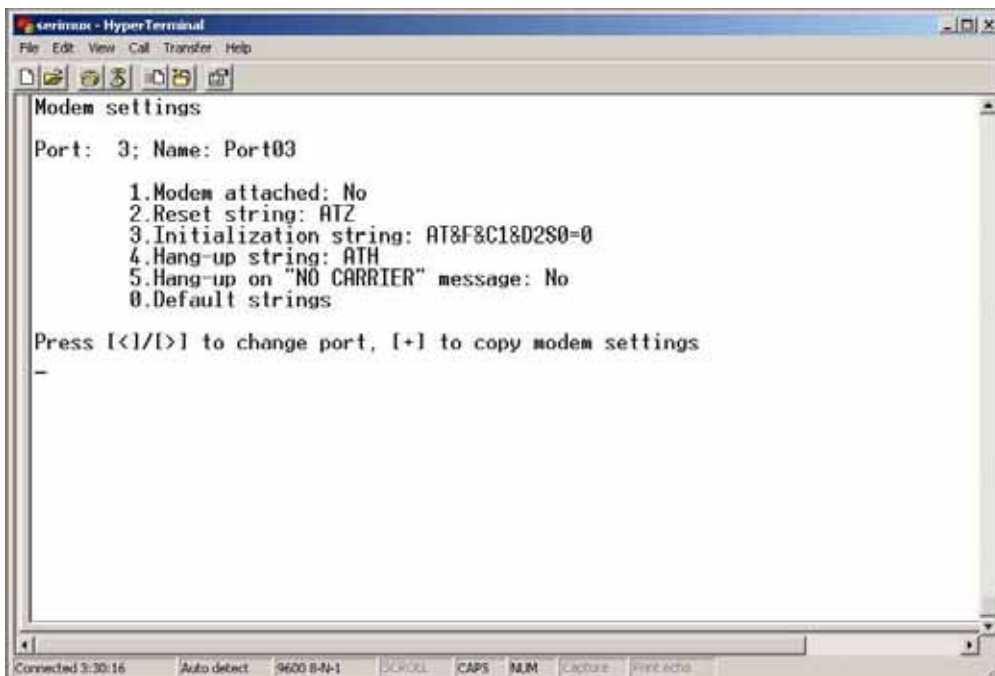
Figure 13- Modem settings menu

The administrator can initialize a modem attached to a SERIMUX port, or disconnect the modem. To control the modem connection from the "Modem settings" menu, the following functions are possible:

Function	Keystroke
Attach and initialize a modem	[1] - [A]
Disconnect a modem	[1] - [D]
Change the modem reset string	[2]
Change the initialization string	[3]
Change the hangup string	[4]
Enable hangup on "NO CARRIER"	[5]
Save the changes	[Enter]
Cancel the command	[Esc]
Reset to default values	[0]-[Y]

FYI: If an old modem is attached to a SERIMUX port, it may be necessary to enable the "Hang-up on "NO CARRIER" message" option, in order to hang-up and disconnect the attached modem when receiving this message. Press [5], then [Y] to enable or any other key to disable this option. Usually, this option should remain disabled.

.

  – Press [+] to select the current port as source in a port modem settings copy-paste process (except port 0).
  – Then, press [*] to paste the port settings.
  – Press [Y] to paste the selected port settings to the current port, [A] to paste to all ports, [S] to specify the destination port, or press any other key to cancel.

Display modem settings for different port number

Press [>] (greater than symbol) to display the next port (next higher port index) modem settings, or press [<] (less than symbol) to display the previous port modem settings.

Press [**Esc**] or [**Space**] to return to the "Port settings " menu.

3.1.3.3 Port data buffer

From the "Port settings" menu, press [**7**] to view the port data buffer.   In this display the administrator can see the last 508 characters received and transmitted to/from any port. This way the administrator can verify that data was transferred properly between ports.

Figure 14- Port data buffer

Press [**P**] to see the previous (older) 128-character page information; press [**N**] to see the next (newer) 128-character page information.

Up to 508 received characters and 508 transmitted characters (4 pages) can be inspected, for each port.
Press [>] (greater than symbol) or [<] (less than symbol) to change the current port.
Press [**Esc**] or [Space] to return to the "Port settings " menu.

FYI: Only the "ROOT" administrator is able to access the port data buffer.

3.1.3.4 Clear Port data buffer

From the "Port settings" menu, press [**9**] to clear the port data buffer.   This selection will clear the entire buffer for data received by or transmitted from the respective port.

3.1.4 User List

From the administrator main menu, press [**4**] to display the User list.
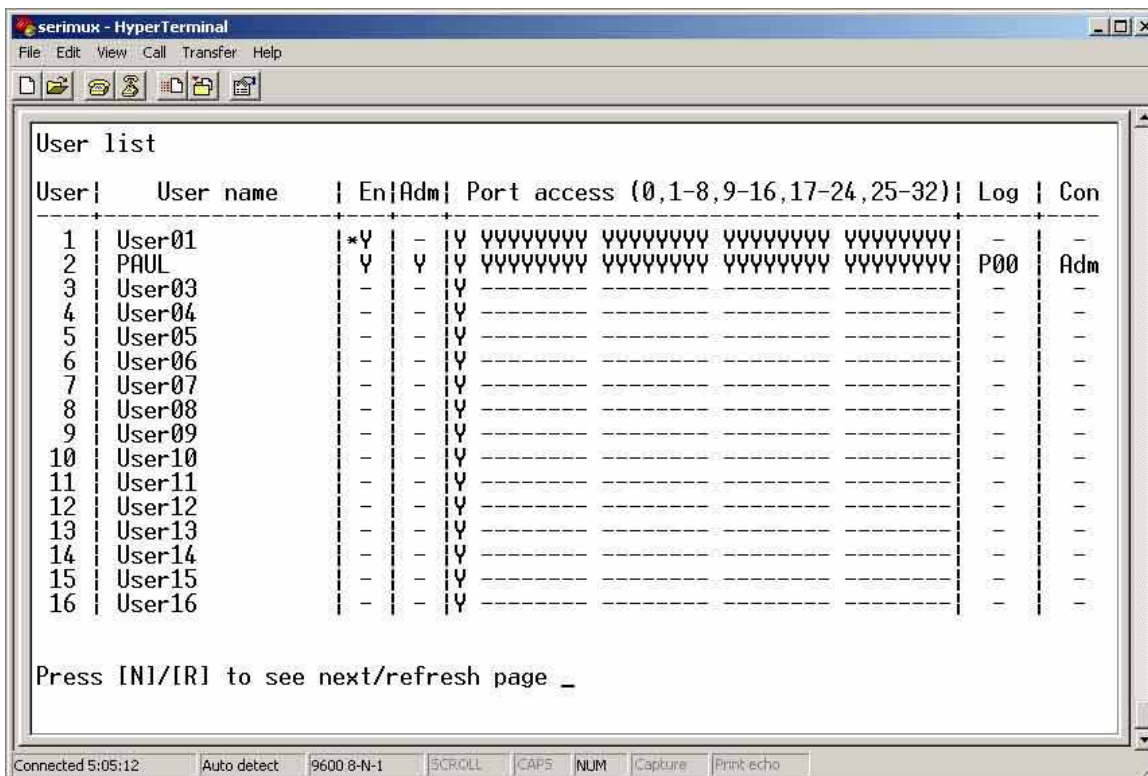
Figure 15- User List

Column Heading	Description
User	User Index number
User Name	User name associated with the index number
En	User status- "Y" = enabled " -" = not enabled
Adm	Displays if user has administrative rights "Y" = yes "-" = no
Port access	Displays what ports the user has access to
Log	Identifies what port the user is logged into, if any
Con	Identifies what port the user is connected to (Pxx) Or if the user is logged in as an administrator (Adm) Or if the user is just logged in (Usr)

- Press [**R**] to refresh the information and repaint the screen.
- Press [**N**] to see the next page; press [**P**] to see the first page.
- Press [**Esc**] or [**Space**] to return to the "Administrator main menu".

3.1.5 User Settings

From the "Administrator main menu", press [**5**], enter the user index number, then press [**Enter**].
The screen will show the current user number and name and the user settings menu:
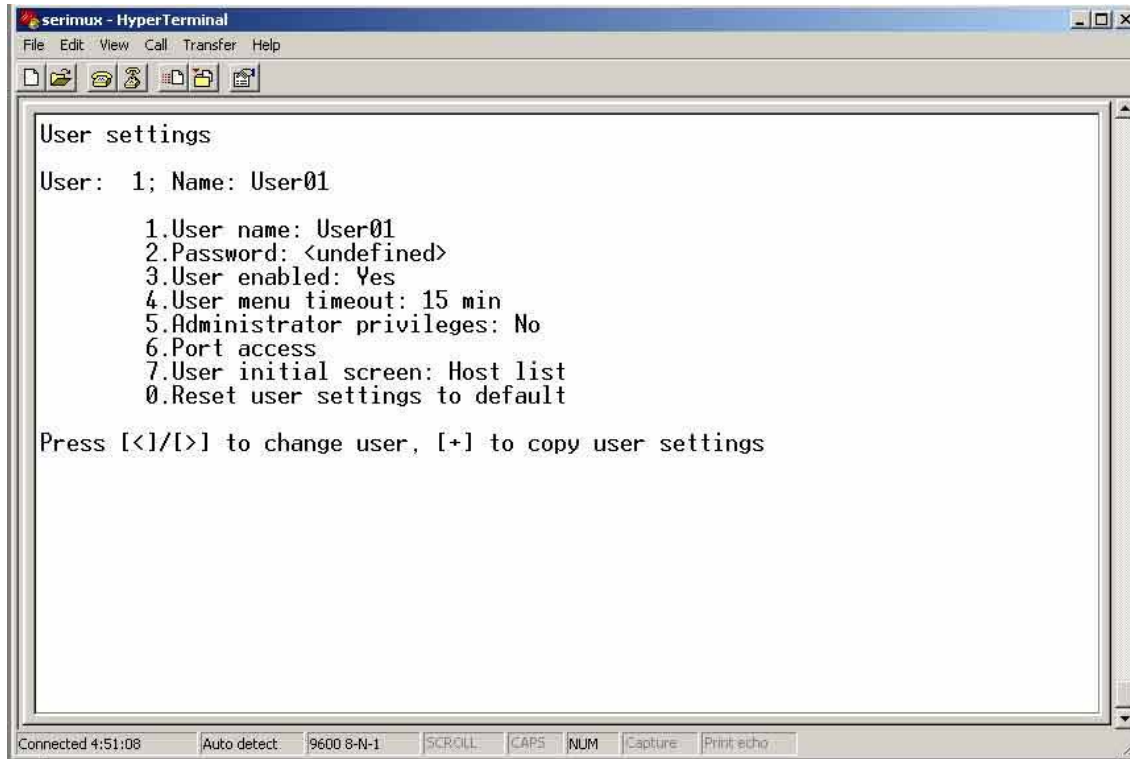
Figure 16- User settings menu

Setting	Description	Value
User name	Change the user name	Max. 15 characters, use backspace to delete
Password	Define the user password, if any	Max. 31 characters, use backspace to delete
User enabled	Enable or disable user	Y to enable, any other character to disable
User menu timeout	Time interval of user inactivity before auto logout of the user will occur	0-90 minutes 0 = never
Administrator privileges	Enable administrative privileges for user	Y to enable, any other character to disable
Port access	Define ports user has access to. Displays user's Port access list (Fig.16)	1 + port number to grant access to a port 0 + port number to deny access to a port < or > to change to different user access list
User initial screen	Select the initial user menu to display upon user login	M = User main menu H = Accessible host list T = Terse mode
Reset user settings to default	Restores factory default user settings	A confirmation "Y" will be required

- When selecting each new user setting values, press [**Esc**] or [Spacebar] to cancel,   or press [Enter] to save.
- Press [>] to display the current settings for the next port.
- Press [<] to display the current settings for the previous port
- Press [**Esc**] or [**Spacebar**] to return to the Administrator main menu
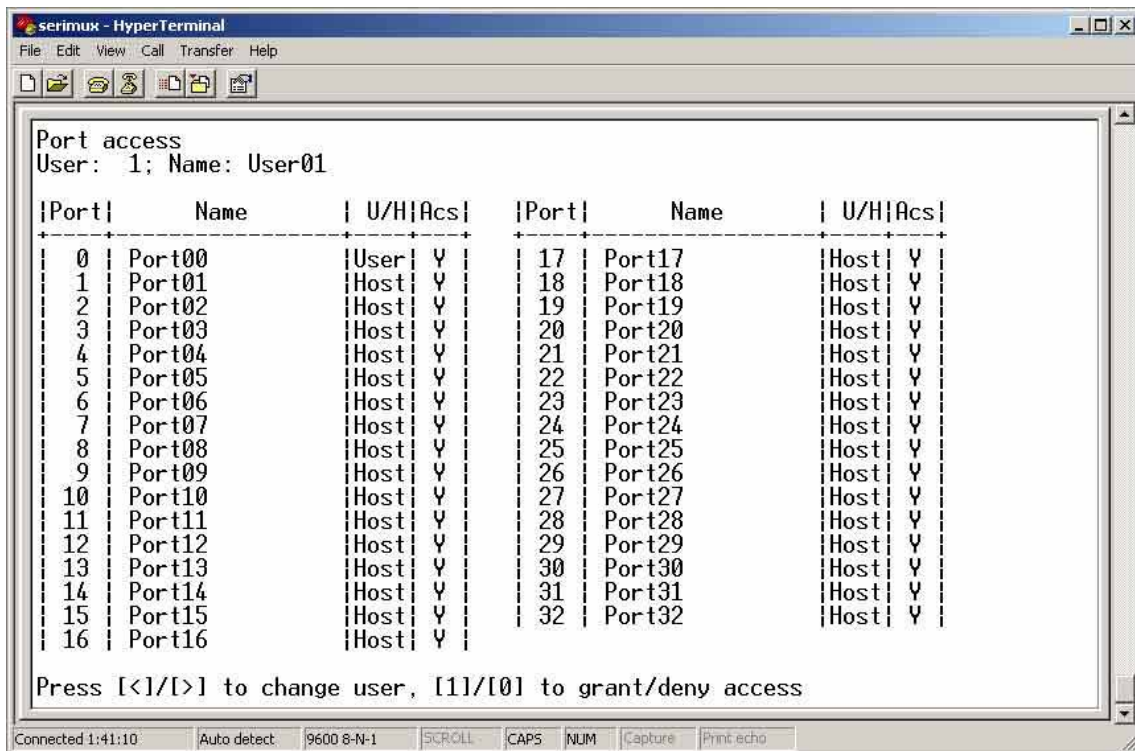
Figure 17- Port access list for User 01

3.1.5.1 Port access

To quickly grant/deny user access to multiple ports, the use of a dash (-) and/or comma may be used in conjunction with the [1] (to grant) or [0] (to deny) command.

i.e.   [1] - [1-4,7,9,15]   will grant access to ports 1 through 4, 7, 9, and 15,   all in one command string

3.1.5.2 Copy User Settings

From the User settings menu,
         press [+] to copy the current user's user settings to memory
         press [*] (asterisk) to start the paste function.   Three options are available:

Option	Description
Y	Apply the settings in memory to the current user shown
A	Apply the user settings in memory to all users
Sxx	where xx is 01-16- apply the user settings in memory to a specific user

The "Y" option is particularly useful if the administrator wants to place a particular user's settings into memory and move around to other users (using the [<] or [>] keys) to review their settings before pasting the settings into memory over them.

The "S" option will allow the administrator to paste settings into memory to a specific user without having to view that user's settings list.

3.1.6 Advanced Settings

From the "Administrator main menu", press [**7**] to display the "Advanced settings" menu.
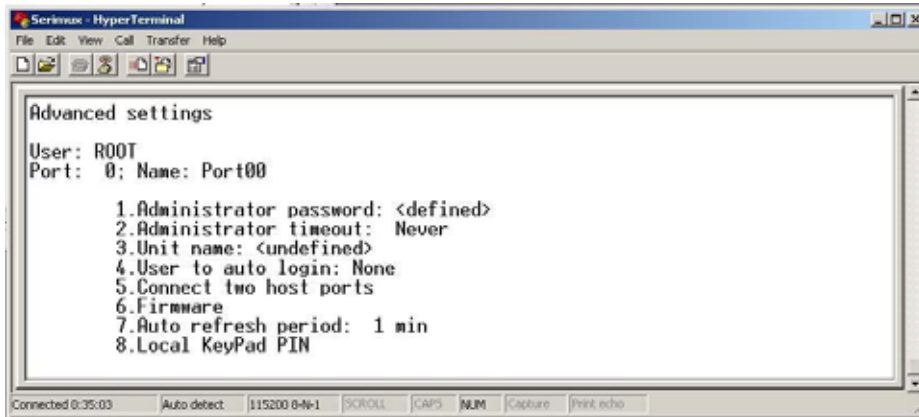
Figure 18- Administrator's Advanced settings menu

From the "Advanced settings" menu the administrator can perform the following functions:

Setting	Description	Value
Administrator Password	Define the password to be used by the administrator	Max. 31 characters. This can only be changed if old password is known. (If SERIMUX is re-initialized (pg 30), the default password ("nti") will be restored)
Administrator Timeout	the time interval of administrator inactivity, prior to logging out.	0-90 minutes 0 = Never
Unit name	Name assigned to the SERIMUX	Max. 40 characters
User to auto login	User assigned to automatically login at power up without a password.	Index number of any enabled user that has access to the port being used for the user port
Connect two host ports	Connect two host ports together	Enter host port index number, press [Enter], second host port index number, and press [Enter] again
Firmware	Display the firmware menu	See pg. 19
Auto Refresh Period	Refreshes the admin screen after xx minutes	0-90
Local KeyPad PIN	**Defines the PIN number for Local keypad**	4 digit value 0000-9999 (default value is 9999)

FYI: If at power up the auto-login user does not have access to port being used, a login by a valid user with access rights will be required.

3.1.6.1 Change administrator password

For security purposes the administrator should change the factory default administrator password to a unique password.   This will prevent unauthorized access to switch functions and CPUs.   The password is needed to log in from any device, connected to any SERIMUX port in buffer mode.

 To change the administrator password, from the Administrator main menu;

- press [**7**] to choose Advanced settings and press [**Enter**].   The Advanced settings menu will appear (Figure 18)
- press [**1**] and a prompt for the old password will appear
- enter the old password (factory default password is "**nti"**) and press [**Enter**]
- enter a new password (maximum 31 ASCII characters), using the [**Backspace**] key to erase any characters entered in error,   and press [**Enter**]
- re-enter the password to confirm it, and press [**Enter**]
- a message "OK" will appear, press any key to return to the Advanced settings menu

Note: The password entered will be case sensitive so be sure to note what characters are used and what case they are in if any are alphabetical. The password characters are displayed as '' (asterisk) characters while entering them.*

Note: If the administrator console password is not known, the administrator must re-initialize the SERIMUX following the "Reset SERIMUX Console Switch to default settings" instructions on page 30.

3.1.6.2 Firmware

From the Advanced settings menu, press [**6**] to display the Firmware menu. (From Administrator main menu press [**7**]-[**6**])
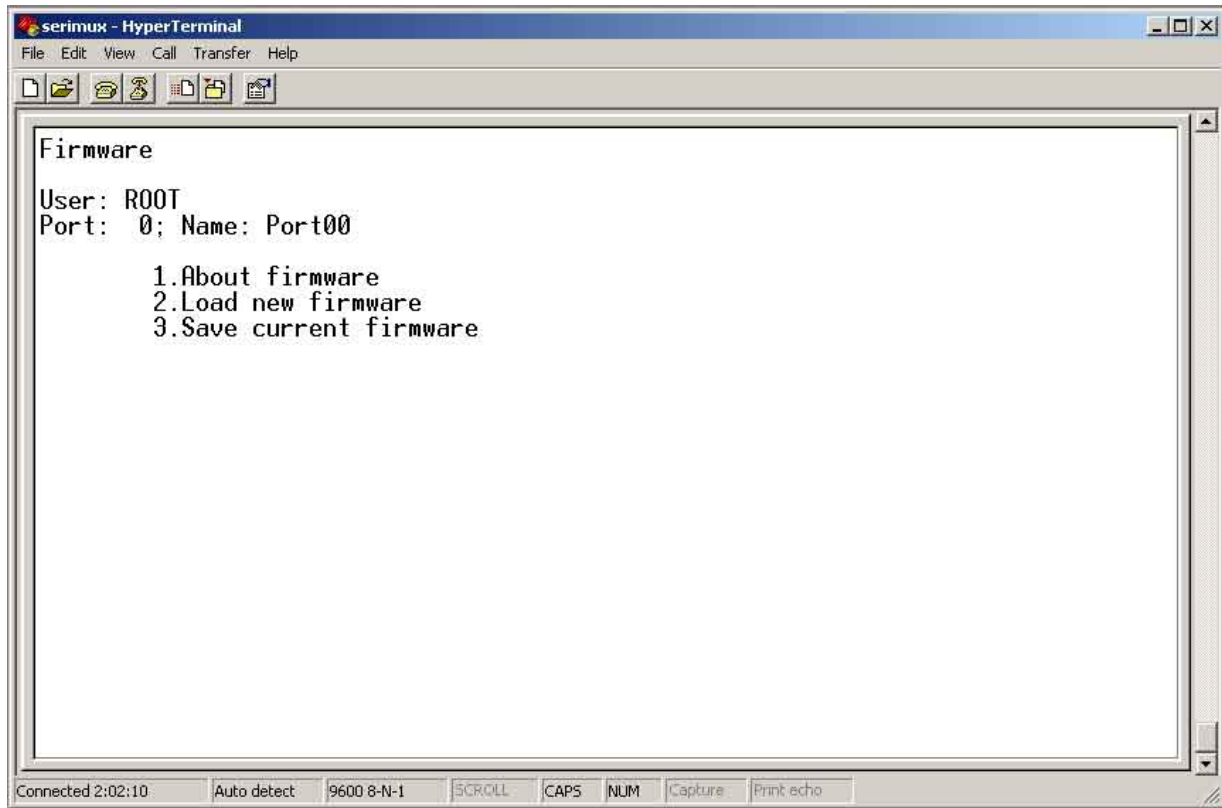
Figure 19- Firmware menu

The Firmware menu has three possible functions:

Function	Description
1. About Firmware	Provides information about SERIMUX including revision number, code length, and CRC
2. Load new firmware	Initiate firmware upgrade (see Firmware Upgrade on page 31)
3. Save current firmware	Save present firmware in SERIMUX to binary file

3.1.6.2.1 Load new firmware

To upgrade the firmware that controls the Console Switch, as soon as improved versions become available, download the firmware file (from the NTI website at www.networktechinc.com) to a local CPU, and follow the instructions under "Firmware Upgrade" on page 31 to install it.

3.1.6.2.2 Save current firmware

In order to save the firmware currently in SERIMUX, perhaps before installing new firmware, from the Firmware menu:

press [**3**] for Save current firmware.   The message shown in Figure 20 will appear.

Note: In order to save the current firmware, the user must be using a CPU connected through port 1 (as described under "Firmware Upgrade" on page 31.
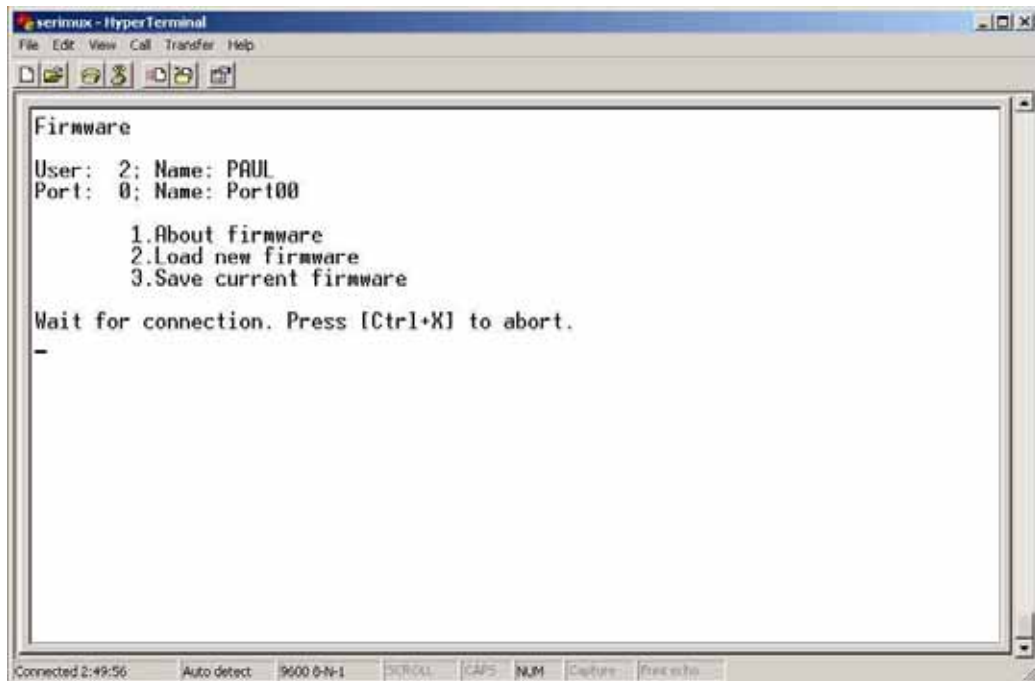
Figure 20- The SERIMUX is waiting to save its firmware

The terminal program in the CPU connected to Port 1 must be configured for Xmodem protocol.

1. Receive the binary file from the SERIMUX (for example, in HyperTerminal for Windows, use the **Transfer -> Receive File** command).
2. When saving the file, choose a directory to place the file in and a name that will identify it with the extension " .bin"   (i.e. SERIMUX1_8.bin).

With the file saved, it can be restored to the SERIMUX at any time if desired.

3.2. User Controls

Users can connect only to accessible ports as defined by the administrator. A list of those ports will be displayed with a successful login. Connection can be made using the TERMINAL, or a serial terminal with an emulator (e.g. Windows HyperTerminal) connected to the SERIMUX at an allowed user port

To login, press the [**Spacebar**] or [**Enter**] key. Users can login by entering a valid name and password, assigned by the administrator. When prompted for a "User name:", type the administrator assigned user name and press [**Enter**]. When prompted for the "Password:", type the administrator assigned password and press [**Enter**].

Note: User names and passwords are case sensitive. It is important to know what characters must be capitalized and what characters must <u>not</u>.

FYI: The administrator may select a user that will automatically login at power up (User 1 is setup by default). In this case, neither name nor password will be required, just press [Spacebar] or [Enter] after powering ON the TERMINAL or opening the connected terminal emulator.

After login, the user may connect to an allowed host port, or view host status and parameters. The user is unable to modify port parameters unless the user has been granted administrative privileges.

3.2.1 User "Accessible host list" screen

After successful login, the "Accessible host list" will be displayed. The administrator may choose another initial screen to be displayed, following user's preferences. The Accessible host list includes:
- user index number and name
- index number and name of the login port
- index numbers and names of accessible hosts
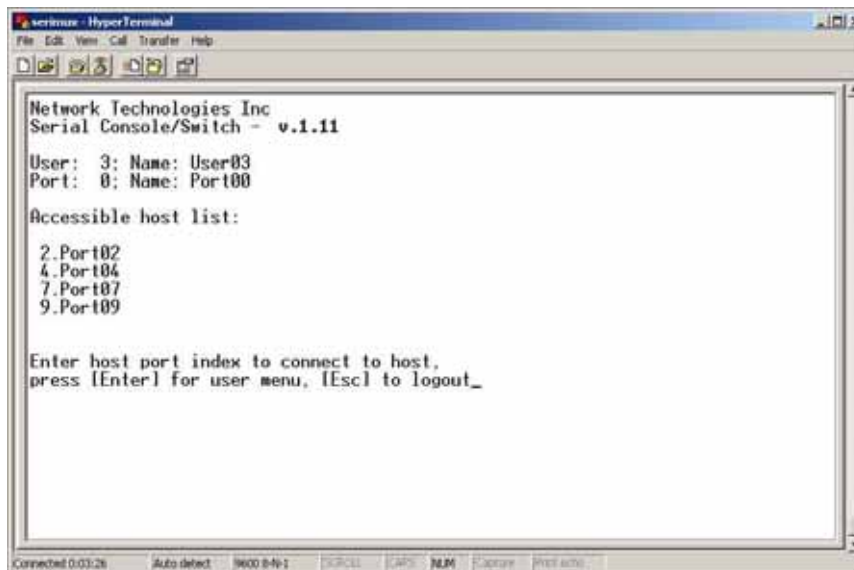
Figure 21- A user with limited host port access

From the "Accessible host list", the user can perform the following functions:

Function	Keystroke
Connect to host	[xx] - [Enter] (where xx is the port index number)
Refresh the screen	[Spacebar]
Logout	[Esc] or [Ctrl]+[X] , then [Y] to confirm

FYI: The port index numbers are 2-digit decimal numbers. If the wrong number is entered, simply enter the correct number. Only the last two numbers entered before the [Enter] key is pressed will be accepted. The [Enter] key validates the command; [Esc] or [Spacebar] cancels it.

3.2.2 User main menu

The User main menu includes:
- user index number and name
- index number and name of the login port
- user command list
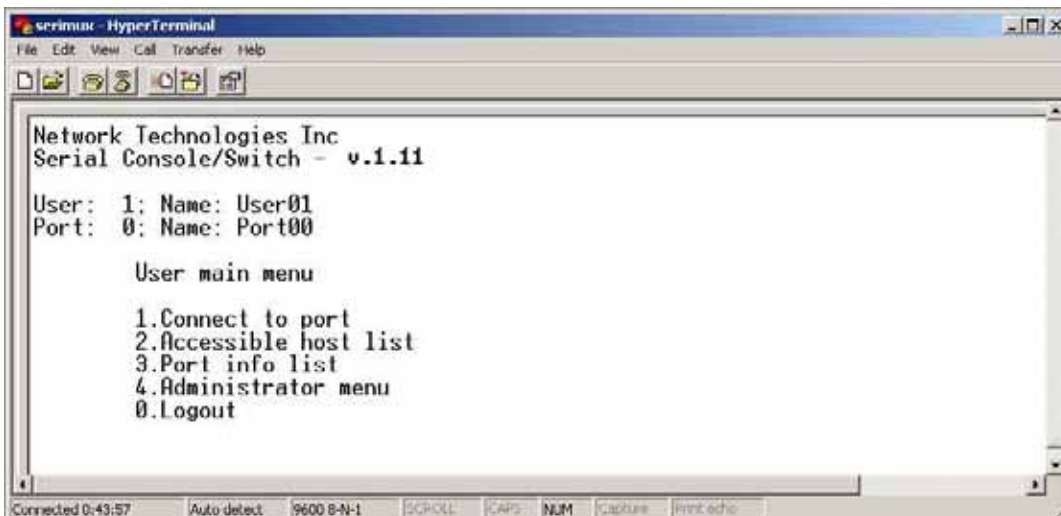
Figure 22- User main menu

From the "User main menu" the following functions are possible:

Function	Keystroke
Connect to host port	[1]-[xx]-[Enter] (where xx is the port index number)
Display Accessible host list	[2]-[Enter]
Display accessible host and user ports and info about each	[3]-[Enter]
Login as administrator	[4]-[Enter] (only works if user has administrative rights)
Logout	[0] then [Y] to confirm
Refresh the screen	[Spacebar]

A user can only connect to the hosts the user has been allowed access to by the administrator.   Press [**2**] to display a list of accessible hosts.

3.2.3 Port List screen

From the "User main menu", press [**3**] to display the list of user accessible ports and information about these ports. Only the administrator can change the communication settings.
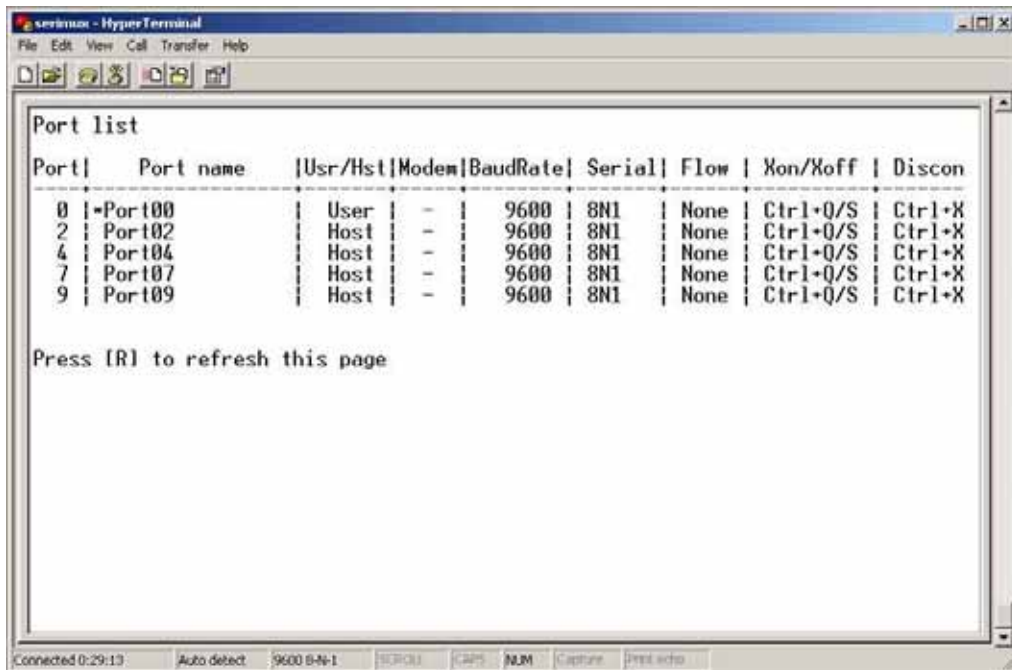
Figure 23- A limited user accessible Port list

On consecutive columns, the following are displayed:

Column	Description
Port	index number of the port
Port Name	Name assigned to the port
Usr/Hst	Port type, user or host
Modem	Yes if modem is attached, - if not
BaudRate	Receiving and transmitting speed of the port
Serial	Character size, parity, and stop bit number
Flow	Defines flow control method • Hard (RTS/CTS or outband) • Soft (Xon/Xoff or inband) • Both • None
Xon/Xoff	Characters used for Xon and Xoff flow control
Discon	In-band disconnect sequence (1-3 characters, or none)

Press [**R**] to refresh and re-display the information on the screen.

If the number of user accessible ports is greater than 17,
    press [**N**] to see the next page,
    press [**P**] to see the first page.

Press [**Esc**] or [**Space**] to return to the "User main menu".

3.2.4 User Terse mode

This mode is especially useful when the SERIMUX is directly controlled by external software from a serial console (as a user without administrative privileges), rather than being controlled by a user from a keyboard interface.

Entering short command strings performs functions similar to the user main menu commands. A [CR] – [LF] sequence ends every string. The commands are not echoed; the SERIMUX returns to the serial console a specific answer if the command is successfully accomplished or an error message otherwise.

Terse mode can be used only if the administrator configures a user port to enter into Terse mode at login (see page 21). If a keyboard-based user logs into a port intended for Terse mode operation, the following image will appear:
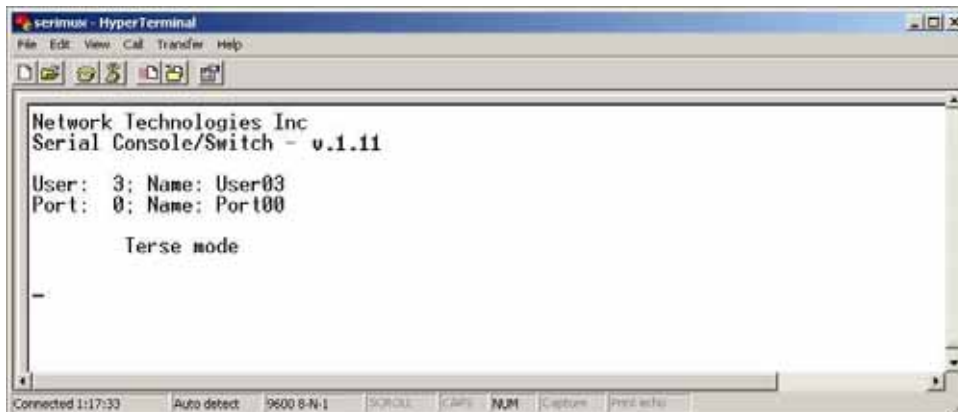
Figure 24- User port in Terse mode

From Terse mode, a limited number of functions are possible;

3.2.4.1 Terse mode commands

➢ **Connect to port**
Send or type in:
  [**C**] *xx* [**Enter**]
where *xx* is the port index number. The answer will be:
  OK [**CR**][**LF**][**LF**][**FF**]
If an error occurs (i.e. the port is not accessible), the answer will be:
  Err [**CR**][**LF**]

➢ **Accessible host list**
Send or type in:
  [**H**] [**Enter**]
The answer may be, for example:
  02,03,04,05,06,07,08,09,10,11,12,13,14,15,16 [CR][LF]
(the accessible hosts, separated by commas)

➢ **Port info**
Send or type in:
  [**P**] *xx* [**Enter**]
where *xx* is the accessible port index number. The answer may be, for example:
  04,H, 9600,8N1 ,N,QS,1X [CR][LF]
where the comma separated fields stand for:
  - port index number;
  - port type: U or H for User or Host;
  - port baud rate;
  - data bits (5..7), parity (N, E, O for None, Even, Odd), stop bits (1, 1.5, 2,);
  - flow control (N, H, S, B for None, Hard, Soft, Both respectively);
  - in-band (soft) flow control Xon and Xoff characters (in this example Xon = [**Ctrl+Q**] and Xoff = [**Ctrl+S**]);
  - disconnect sequence length and sequence (i.e. "0   " for none, "1X " for 1-char [**Ctrl+X**] sequence, "3```" for 3-char ```
  sequence);
If the port is not accessible to the user, the answer will be:
  Err [**CR**][**LF**]

> **Verbose mode**

Send or type in:

[**V**] [**Enter**]

The answer will be:

OK [**CR**][**LF**]

and the Terse mode will be terminated. The "Accessible host list" or the "User main menu" will be displayed.

> **User Logout**

Send or type in:

[**L**] [**Enter**]

The answer will be:

OK [**CR**][**LF**]

With the next login of the same user, Terse mode will resume.

3.2.5 System Reset button

The "System Reset" button, located on the rear of the RACKMUX (see Figure 25), may be pressed at any time to refresh the SERIMUX without powering it OFF.   This might be necessary in the event the SERIMUX should fail to respond to normal commands.

System Reset button

Rear View of SERIMUX-TERM-CS-16
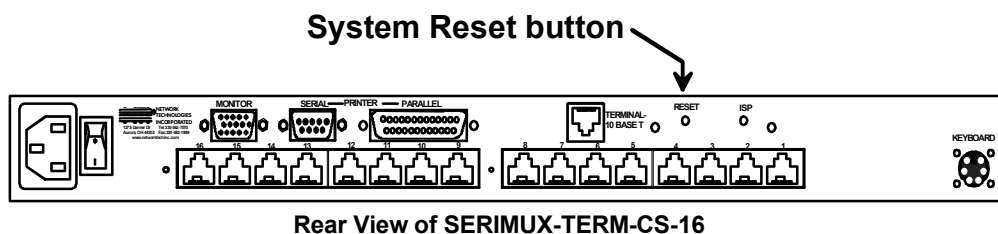
Figure 25- Location of Restore Defaults button

3.3 Firmware Upgrade

It may be desired to upgrade the firmware that controls the SERIMUX as soon as improved versions become available.   Once the firmware file has been downloaded from www.networktechinc.com to a local CPU, follow these instructions to install it.

1. Using a CPU connected to Port 1, start a terminal program (e.g. Windows HyperTerminal) and configure it as follows:
    - •   direct connection (using the appropriate CPU local serial Com port)
    - •   9600 bps
    - •   8 bits
    - •   no parity
    - •   1 stop bit
    - •   no flow control
    - •   ANSI or VT100 terminal mode.

2. Log-in as administrator (page 12).

Note: During the transfer and the internal upgrade, all ports (except the TERMINAL and Port 1) and all users are disconnected.

3. Locate on the local hard disk the binary file containing a valid firmware version (downloaded from the NTI website at www.networktechinc.com).

4. From the "Firmware" menu (pg 24) press [**2**], then [**Y**] to confirm. All other ports will be disconnected and disabled during the firmware update procedure.

.

Figure 26- Firmware upload window

5.   Type [**A**] + [**T**]   "**AT**" (case sensitive, must be uppercase) to activate the SERIMUX auto baud detection.

6.   When prompted, press [**Y**] to confirm, and [**C**] to continue with the procedure.

Note: Proceeding past this point will erase all programming. The firmware upgrade must be completed for the SERIMUX to function.
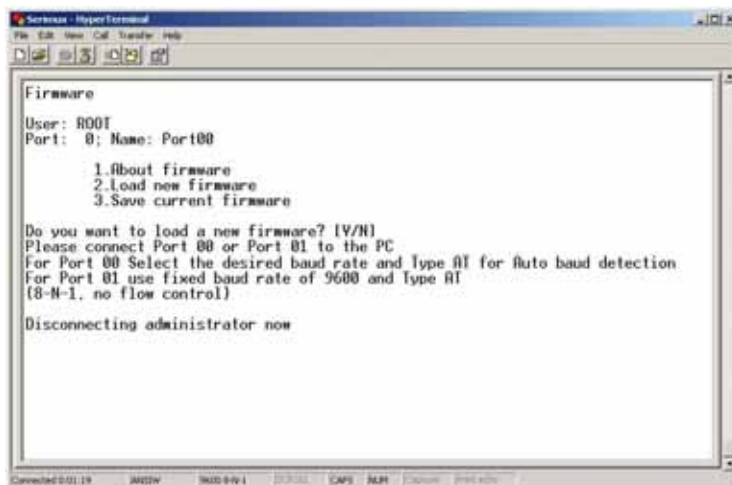
Figure 27- Type "AT" to auto-detect baud rate

Figure 28- Last confirmation before firmware update

7. Using the terminal program, send the binary firmware file using "*1K Xmodem*" protocol.
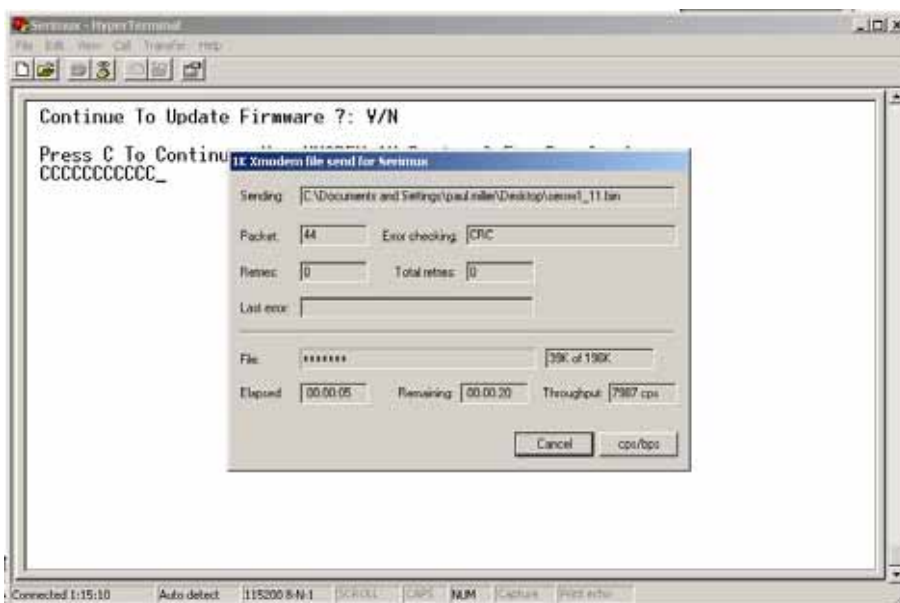
Figure 29- File transfer in progress

8. After successful transmission the SERIMUX will automatically restart after few seconds.   If not, either power down the RACKMUX and power it back ON (or just press the "System Reset" button (page 30)) and press [**Enter**[.

If the firmware update failed or was interrupted for any reason, power cycle the SERIMUX (or see page 30) to reset the SERIMUX to default settings) and repeat the procedure beginning at step 4.

KEYPAD CONTROL

Front View of SERIMUX-TERM-CS-16
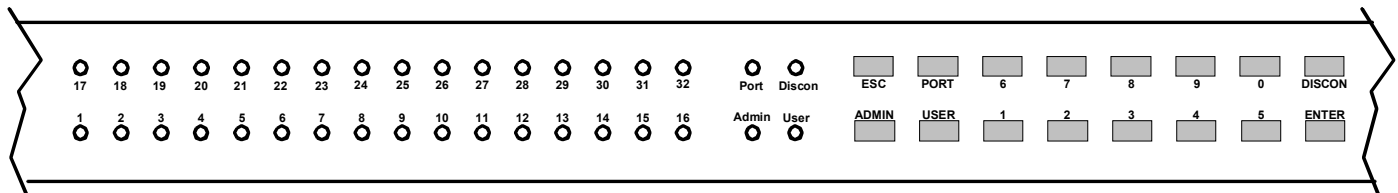
Figure 30- Keypad and LEDs

Functions of the Keypad

During normal operation, the current administrator port number (if any) is displayed on the front panel. The corresponding port LED will be continuously illuminated. The data traffic between connected ports is indicated by the blinking of the corresponding port LEDs.

Using the keypad, anyone with physical access to the SERIMUX can:
- ➢   Login the administrator
- ➢   Logout the administrator
- ➢   Disconnect the administrator or a user with administrative privileges
- ➢   Login a user to the administrator main menu
- ➢   Login a user to a port
- ➢   Login a user and connect the user to a host port
- ➢   Disconnect and logout a user
- ➢   Connect 2 host ports
- ➢   Disconnect 2 ports
- ➢   Connect or disconnect a modem

To enable the keypad, the user must first press the "**Enter**" key on the keypad, enter the PIN on the keypad (default is 9999, see also page 23) and press the "**Enter**" key again. The keypad is disabled again after 30 seconds of inactivity. If the keypad PIN is not entered, the keys will have no effect.   If the PIN is successful, the Port, Discon, Admin, and User LEDs will all illuminate and remain illuminated for up to 30 seconds or until a command is entered.

 FYI: Buttons pressed in sequence on the keypad to enter commands must be pressed within 5 seconds of each other for the SERIMUX to respond.   Otherwise, the sequence will need to be repeated from the beginning.

Login the administrator

Note: In order to login the administrator to a port other than port 0, the administrator must first configure the desired port as a user port (see page 10).   By default, all ports, other than 0, are configured as host ports.

Action (from Keypad)	Reaction of SERIMUX
1. Press ADMIN	- The LED "Admin" will illuminate. The port 0 LED will be illuminated, the other port LEDs will be OFF.
2. Enter port number (00 by Default	- The corresponding port LED will illuminate. The other port LEDs will be OFF.
3. Press ENTER	- If the command is successful the "Admin","Port","Discon".,"User" LEDs will illuminate together. They will turn OFF after 30 seconds or when any other key is pressed.
	- The administrator main menu (Figure 8, page 12) will be displayed on the terminal application running on the administrator port.

The "Administrator main menu" will be displayed on the serial device connected to the specified port if:
– the administrator was not already logged in at a different port;
– the specified port is not otherwise already connected and the port type is "User".

Note: If wrong digits are pressed when entering port numbers, enter the number for the correct port (01, 02, etc) before pressing the "Enter" key.   The Console Switch will acknowledge the last two digits pressed.

Disconnect the administrator or a user with administrative privileges

Action (from Keypad)   **Reaction of SERIMUX**

1. Press DISCON
   - The LED "Discon" will illuminate.
   - The port 0 LED will be illuminated, the other port LEDs will be OFF.
2. Press ADMIN
   - The LED "Admin" will illuminate.
3. Press ENTER
   - If command is successful the "Admin","Port","Discon".,"User" LEDs will illuminate together. They will turn OFF after 30 seconds or when any other key is pressed.
   - The message: "Disconnecting administrator now" will be displayed by the terminal application running on the former administrator port.

Login a user to the administrator main menu

Action (from Keypad)   **Reaction of SERIMUX**

1. Press ADMIN
   - The LED "Admin" will illuminate. The port 0 LED will be illuminated, the other port LEDs will be OFF.
2. Press PORT
   - The LED "Port" will illuminate.
3. Enter port number (00 by default)
   - The corresponding port LED will illuminate, the other port LEDs will be OFF.
4. Press USER
   - The LED "User" will illuminate.
5. Enter user number
   - The corresponding port LED will illuminate
6. Press ENTER
   - If the command is successful the "Admin","Port","Discon".,"User" LEDs will illuminate together. They will turn OFF after 30 seconds or when any other key is pressed.
   - The administrator main menu (Figure 8, page 12) will be displayed on the terminal application running on the administrator port.

The "Administrator main menu" will be displayed on the serial device connected to the specified port if:
– the administrator is not logged in;
– the specified user has administrative privileges, is enabled, and is not logged in;
– the specified port is accessible to the user;
– the specified port is not otherwise already connected and the port type is "User".

Login user to a port

Action (from Keypad)   **Reaction of SERIMUX**

1. Press USER
   - The LED "User" will illuminate.
   - The port 0 LED will be illuminated, the other port LEDs will be OFF.
2. Enter the user number
   - The corresponding port LED will illuminate
3. Press PORT
   - The LED "Port" will illuminate
4. Enter the port number
   - The corresponding port LED will illuminate, the other port LEDs will be OFF.
5. Press ENTER
   - The User main menu will be displayed on the terminal application on the user port: (see Figure 22 on page 27)
   - If the command is successful the "Admin","Port","Discon".,"User" LEDs will illuminate together. They will turn OFF after 30 seconds or when any other key is pressed.

The initial user screen will be displayed on the serial device connected to the specified port if:
– the specified user is enabled, and is not logged in at another port;
– the specified port is accessible to the user;
– the port is not otherwise already connected and the port type is "User".

Login user to a port and connect the user port to a host port

Action (from Keypad)	Reaction of SERIMUX
1. Press USER	- The LED "User" will illuminate.
	- The port 0 LED will be illuminated, the other port LEDs will be OFF.
2. Enter the user number	- The corresponding port LED will illuminate
3. Press PORT	- The LED "Port" will illuminate
4. Enter the user port number	- The corresponding port LED will illuminate. The other port LEDs will be OFF.
5. Press PORT again	- The LED "Port" will illuminate
6. Enter the host port number	- The corresponding port LED will illuminate. The other port LEDs will be OFF.
7. Press ENTER	- The User main menu will be displayed on the terminal application on the user port: (see Figure 22 on page 27)
	- If command is successful the "Admin","Port","Discon".,"User" LEDs will illuminate together. They will turn OFF after 30 seconds or when any other key is pressed.

The user will be connected if:
– the specified user is enabled, and is not logged in;
– the specified ports are accessible to the user;
– the user port is not otherwise already connected and the port type is "User".
– the host port is not otherwise already connected and the port type is "Host".

Disconnect and logout a user

Action (from Keypad)	Reaction of SERIMUX
1. Press DISCON	- The LED "Discon" will illuminate.
2. Press USER	- The LED "User" will illuminate.
3. Enter the user number	- The corresponding port LED will illuminate, the other port LEDs will be OFF
4. Press ENTER	- The LEDs "Port", "Admin", "User", and "Discon" will illuminate briefly.

Connect 2 host ports

Action (from Keypad)	Reaction of SERIMUX
1. Press PORT	- The LED "Port" will illuminate.
	- The port 0 LED will be illuminated. The other port LEDs will be OFF.
2. Enter the first port number	- The corresponding port LED will illuminate, the other port LEDs will be OFF
3. Press PORT again	- The LED "Port" will illuminate. The port 0 LED will be illuminated, the other port LEDs will be OFF.
4. Enter the second port number (to connect the first port number to)	- The corresponding port LED will illuminate. The other port LEDs will be OFF.
5. Press ENTER	- If command is successful the "Admin","Port","Discon".,"User" LEDs will illuminate together. They will turn OFF after 30 seconds or when any other key is pressed.

The two host ports will be connected if:
– the ports are not connected
– the ports type is "Host".

Disconnect 2 ports

Action (from Keypad)	Reaction of SERIMUX
1. Press DISCON	- The LED "Discon" will illuminate.
	- The port 0 LED will be illuminated, the other port LEDs will be OFF.
2. Press PORT	-
3. Enter the port number	- The corresponding port LED will illuminate, the other port LEDs will be OFF.
4. Press ENTER	- If command is successful the "Admin","Port","Discon".,"User" LEDs will illuminate together. They will turn OFF after 30 seconds or when any other key is pressed.

The administrator can view any changes in port connections made from the keypad by opening the terminal program on any terminal connected to a user port and view the "Port list" (see page 13).

Attach or detach a modem

To attach a modem

Action (from Keypad)	Reaction of SERIMUX
1. Press DISCON	- The LED "Discon" will illuminate.
	- The port 0 LED will be illuminated, the other port LEDs will be OFF.
2. Press DISCON again	- The LED "Discon" will illuminate.
	- The port 0 LED will be illuminated, the other port LEDs will be OFF.
3. Press 1	-
4. Press PORT	-
5. Enter the port number	- The corresponding port LED will illuminate. The other port LEDs will be OFF.
6. Press ENTER	- If command is successful the "Admin","Port","Discon".,"User" LEDs will illuminate together. They will turn OFF after 30 seconds or when any other key is pressed.

The modem will be initialized and connected if a modem is connected to the specified port and powered ON. The administrator can verify this by viewing the Port list (see page 13).

To detach a modem

Action (from Keypad)	Reaction of SERIMUX
1. Press DISCON	- The LED "Discon" will illuminate.
	- The port 0 LED will be illuminated, the other port LEDs will be OFF.
2. Press DISCON again	- The LED "Discon" will illuminate.
	- The port 0 LED will be illuminated, the other port LEDs will be OFF.
3. Press 0	-
4. Press PORT	-
5. Enter the port number	- The corresponding port LED will illuminate. The other port LEDs will be OFF.
6. Press ENTER	- If command is successful the "Admin","Port","Discon".,"User" LEDs will illuminate together. They will turn OFF after 30 seconds or when any other key is pressed.

Reset SERIMUX Console Switch to default settings

SERIMUX can be reset to default settings using the Keypad. This procedure is only necessary if the administrator is unable to access the administrator main menu. This should only occur if an administrator password has been set and the password is not known.

The SERIMUX-TERM-CS-16 should be OFF before beginning this procedure.
1. Press and hold both local keypad "ADMIN" and "ESC" buttons.
2. Turn ON the SERIMUX-TERM-CS-16.
3. Wait 3 seconds.
4. Release the buttons.

Caution: During the reset, the customer modified parameter values will be replaced with the factory default values (for default values, see page 73, Appendix A); user names and passwords will return to default values (page 11).

4. USING THE TERMINAL

4.1 How To Setup The TERMINAL

The TERMINAL is compatible with most CPUs and application packages. A menu driven setup system is provided to select and save the settings required by the CPU and application.   To control the CPU, or in this case the SERIMUX, a user must be familiar with the requirements of the SERIMUX in order to setup the TERMINAL.

4.1.1 Entering TERMINAL Setup

Hold down the [`ALT`] key and then depress the [`Esc`] key to enter Setup mode. When entering Setup, any text on the screen temporarily disappears, and the main SETUP directory appears (See Figure 31). When leaving the Setup mode, the main SETUP directory disappears, and any text that was on the screen will reappear.

4.1.2 Saving and Exiting Setup

The first menu seen when entering Setup serves as a directory to the other Setup menus. To exit Setup or any submenu, press [`F12`].   Pressing [`F12`] will return the display to the main Setup directory and with another press of [`F12`] the user will exit Setup.

The highlighted field at the right of the screen gives the user the choice of saving or not saving parameter changes into memory before returning the terminal to the normal operating mode.   Settings changed will effect the operating environment until the TERMINAL is powered-down. Setting changes will only be restored at power-up if they are saved before exiting Setup.

Note: If settings are not saved before exiting Setup, any new selections will be lost when the RACKMUX is powered-down.

To save Setup selections, depress the Spacebar to change the save field at the right side of the screen from NO to YES before exiting Setup. (Table 2 describes your options for exiting Setup.)

Press [`F12`] to leave Setup and return to the normal display mode.

Table 2- Main Setup Menu (F12) Exit Functions

Option	Function
No	Returns terminal to normal operating mode without saving parameters changes for power up
Yes	Saves all changes (operating parameter, tabs, key definition, and answerback message); returns terminal To its normal operating mode.
Shift + Esc	Restores all settings (operating parameters, tabs, key definitions, and answerback message) to their factory default values.

4.1.3 Setup Directory

The fields at the bottom of the screen show the various setup menus where the terminal's operating parameters can be changed and the function key to press to immediately display any menu.
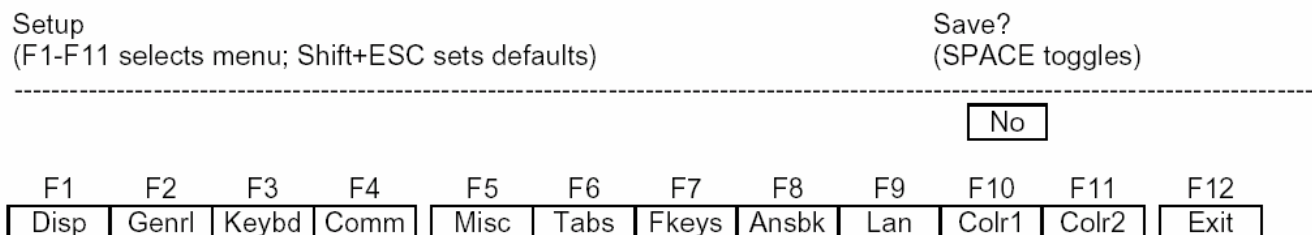
Figure 31- Fields in the Setup menu display which function keys to press for submenus

4.2 Changing The TERMINAL Operating Parameters

To select one of the setup menus shown, press the indicated function key.
- The screen for that menu appears with the name highlighted.
- The fields at the middle of the screen indicate the parameters that can be changed in that menu.
- The top line identifies the keys to press to highlight the parameter fields and change the settings.

The procedure is: (1) Use arrow key to highlight the parameter field to be changed.
(2) Use the Spacebar to change the parameter.

[**F12**] always returns the user to the top menu.

The following tables list the parameters for each menu and explain their settings. Default settings are listed first unless otherwise noted.

F1- Disp SETUP Menu

Columns sets the screen display for 80 columns, 132 columns, or Econ-80 (80 columns with more pages of memory).

Lines sets the screen display for 24, 25, 42, or 43 lines. (24 lines are normally required for VT emulation, 25 lines for PC Term.)

Auto Page on causes a new page of memory to move onto the screen when the cursor reaches the top or bottom of the page.

Display CRT/LCD selects which kind of monitor be used. If LCD monitor is selected, the display columns only support 80 columns on Econ-80 columns. Must be set to LCD.

Cursor sets the cursor display to blink or steady, block or underline.

Background sets the screen display to Dark (light chars. on a dark background) or Light (dark chars. on a light background).

Width Change Clear causes the terminal to clear the screen when executing a command to change the number of columns.

Screen Saver OFF, 1, 2, 3, 4, 5, 6. Sets the screen saver to activate after the specified number of minutes.

Page Length sets the length of a page of display memory to:
- 1 x Lines: Equal to the number of lines selected in the lines parameter (this value must be set when using multiple sessions)
- 2 x Lines: Two times the value of the lines parameter
- 4 x Lines: Four times the value of the lines parameter, or
- *: Equal to the value of the lines parameter, with a second page containing the rest of the lines remaining in memory.

ANSI Reverse OFF/ON. Control function ANSI, VT-100 and VT-220:
- "OFFf" means, when SGR command ESC [3? m and ESC [4? m select background and foreground color change respectively.
- "ON" means, when SGR command ESC [3? m and ESC [4? m select foreground and background color change respectively. (?
- can be 0,1,2,...,7)

F2- Genrl SETUP Menu

Personality sets the terminal's operating mode to Wyse 325, Wyse 120/Wyse 60 (native mode), Wyse 50+ (WY-50, WY-50+, WY-100, ADM 31/5/3a), TeleVideo TVI 925, TVI910+ (includes 910), ADDS A2, Digital Equipment VT-100, VT-220 7 bits, VT-220 8 bits, VT-52, Console ANSI, PC TERM, PCG Alpha.

Scroll Speed sets the display scroll rate to Jump (the rate data is received), Smooth-8 (eight lines per second), Smooth-4, Smooth-2, or Smooth-1.

Rcvd CR causes the cursor to move to the beginning of the current line (CR) or the beginning of the next line (CRLF) when the terminal receives an ASCII CR.

Enhance allows the terminal to recognize an enhanced set of codes when the terminal is not in the native personality.

Auto Scroll causes the data to scroll up a line when the cursor moves past the last line of the page.

Monitor causes the terminal to display symbols for escape sequences and control codes without acting on them (test feature).

Status Line sets the top line of the screen as the status line.

End of Line Wrap causes the cursor to move to the start of the next line when additional characters are entered at the end of a line.

Attribute sets display attributes to be assigned to each character as it is entered (Char), to be active to the end of the line (Line), or to be active to the end of the page (Page).

F3- Keybd SETUP Menu

Keyclick sets the terminal to sound a muted beep each time a key is pressed or repeated.

Margin Bell sets the terminal's bell to ring when the cursor reaches the column where the bell is set (default is column 72 in 80-column mode or 124 in 132-column mode).

NRC ON/OFF determines the communication and keyboard national character set.

DEL Keypad Dot/Del or Comma/Del. Determines whether numlock DEL generates dot or comma.

Key Repeat OFF, 1, ... ,8. Defines key repeat rate after a key has been depressed for about 1/2 second.

Language sets correct terminal operation for the language of the keyboard connected to it: US, UK, Danish, German, Spanish, Swedish, Norwegian, Italian, French, Belgian, Swiss/French, and Swiss/German. Should be set to US.

Bell Volume OFF, 1, 2, 3 (3 different volumes)

Limit Xmt causes the terminal to send data through the HOST port as fast as the baud rate allows (None), or at a maximum rate of 60 cps or 150 cps. In older systems limiting character rate is necessary to prevent loss of data.

Key Code sets the terminal to send normal ASCII characters (ASCII) or PC-type scan codes for every key up / down (Scan). Scan is only required for the PC Term personality.

Num Start ON/OFF. When the terminal powers ON, this field determines whether the numeric pad starts as Numeric (NUM ON) or Function (NUM OFF).

F4- Comm SETUP Menu

Baud Rate sets the host port baud rate to 50, 110, 134.5, 200, 300, 600, 1200, 2400, 4800, 7200, 9600, 19200, 38400, 57600, 76800, or 115200.

Rcv Hndshake allows the terminal to control the receipt of data from a device connected to the SERIAL1 port with no handshaking (None), Xon / Xoff handshaking, DTR handshaking, DTR / Xoff handshaking

XPC Hndshake ON/OFF to set XPC code handshake, only possible when the personality parameter is set to PC Term.

Ethernet Mode ON/OFF to set the communication routing by Ethernet Network / or Serial Port.

Data / Stop Bits through the SERIAL1 port, the terminal to send and receive 8-bits data with one stop bit or two stop bits, or 7-bits data with one stop or two stops bits.

Xmt Handshake causes the terminal, when sending data to a device connected to the SERIAL1 port, to ignore all incoming software handshaking signals (None) or to control data output in responds to Xon/Xoff handshaking.

Printer
Parallel : sends data to a parallel printer connected to the parallel port.
Serial : sends data to a serial printer connected to the serial 2 port.
OFF : ignores the print command.

Auto Connect OFF/ON selects whether a return character is required to establish an Ethernet connection.

Parity sets the terminal send data to the SERIAL1 port with none, odd, mark, even, or space parity.

Comm Mode sets the SERIAL1 port communication mode to full duplex (FDX), block (BLK), half duplex (HDX), or half duplex block (HBLK).

Multiple Sessions defines whether an Ethernet connection supports multiple sessions function.
  ON : indicates the terminal supports multiple sessions. Each session only has one display page. In 80 or 132 column mode, 8 simultaneous sessions are supported. In Econ-80 column mode, 12 simultaneous sessions are supported.
  OFF : indicates the terminal only has single session. In this mode page length greater than one page can be defined.

F5- Misc SETUP Menu

Wprt Intensity sets the write protect attribute: normal, blank, dim, blank/dim.

Block End causes the terminal to send a block of data to the CPU with a line terminator as an ASCII US character and block terminator as an ASCII CR character (US / CR), or with line terminators as ASCII CR and LF characters and the block terminator as an ASCII ETX character (CRLF / ETX).

Ptr Parity causes the terminal to send the data to the SERIAL 2 (printer) port with none, odd, mark, even, or space parity.

Printer RCV ON/OFF

Wprt Reverse sets the write-protected characters to appear in reverse (dark characters on a light background).

Ptr Baud rate sets the SERIAL 2 (printer) port baud rate to 75, 150, 300, 600, 1200, 2400, 4800, 7200, 9600, 19200, 38400, 57600, 76800, 115200, 230400, 460800.

Ptr Rcv Hndshake sets the printer receive handshake through SERIAL 2 to be none, DTR, Xon / Xoff, DTR/Xoff .

Wprt Underline sets the write-protected characters to appear underlined.

Ptr Data/Stop Bits sets the data and stop bits through the SERIAL 2 (printer) port.

Ptr Xmt Hndshake sets the printer handshake to be none, DSR, Xon / Xoff, or Both .

F6-Tabs SET-UP Menu

On the tabs setup menu screen, the terminal's current tab stops are indicated by uppercase T's displayed along a line of periods that mark each column position.
    (1) A tab stop in columns 2 through 78 is shown as a T in the upper line of periods
    (2) A tab stop in columns 79 through 132 is shown as a T in the lower line of periods
The user can easily determine where tabs are set by moving the cursor across the line and reading the column number displayed on the right side of the screen. Clear and set tabs anywhere on the line, as follows:

    (1) To move the cursor across the line, press [→] (right arrow) or [←] (left arrow)
    (2) To either clear or set (toggle) an individual tab stop at the cursor position, press [Spacebar]
    (3) To clear all tabs, press [Home]
    (4) To set tabs to the default setting (every eighth column), press [Backspace]
Note: A tab stop cannot be set to column 1.

F7- FKeys SET-UP Definition Setup Menu

The function keys and many of the editing keys can be redefined to send a unique character string of up to 64 characters. Keys that are not programmed will send a default sequence, which is determined by the personality selected. Table 4 lists the programmable keys.

To redefine a key:
    1. Select the key to be redefined by pressing that key together with [Ctrl]. This highlights the key's definition field.
    2. Press [↑] (up arrow) to select the shifted or unshifted key definition field.
    3. Enter the key definition (up to 62 characters) at the cursor position. Correct errors by pressing [←] (left arrow) to delete characters or [Home] to clear the definition.
    4. If the user wants to change the key's direction, press [Enter] (on the numeric pad) until the desired choice appears. Direction determines where the key data is transmitted:
            - Remote: Sends data to the CPU only, regardless of the terminal's communication mode. (Until redefined, the direction of all the programmable keys is remote.)
            - Local: Sends data to the terminal only, regardless of the terminal's communication mode
            - Normal: Sends data to the CPU and / or the terminal, depending on the terminal's communication mode

Table 3- Programmable Keys

Enhanced PC-Style Keyboard	Enhanced PC-Style Keyboard
F1 through F12	ENTER (Both ENTER keys are programmable)
↑ (UP ARROW)	ESCAPE
↓ (DOWN ARROW)	HOME
← (LEFT ARROW)	INSERT
→ (RIGHT ARROW)	PAGE DOWN
BACKSPACE	PAGE UP
DELETE	PRINT SCREEN
END	TAB

F8- Ansbk SET-UP Menu

A message of up to 20 characters can be programmed to identify the terminal to the CPU.   Enter the message at the cursor position. Correct errors by pressing [←] (left arrow) to delete characters or [Home] to clear the message.
CONCEAL hides the answerback message, so it is not displayed in setup mode.
To save the message in nonvolatile memory, exit Setup mode with the **YES** option.

F9- Lan Setup Menu

This menu configures the terminal for Ethernet communication. Use of Ethernet communications provides the additional ability to open multiple sessions (applications) on one or more CPUs/servers at the same time. Support of these extended features requires the server to be configured to accept telnet connections.

Note: The Ethernet option in the F4 setup menu must be set to ON for the terminal to work in an Ethernet environment.

Local IP Address is the IP address assigned to this terminal. This must be a unique IP address. An example of this address is 200.200.200.10.

Netmask is a value generated by the system based on the IP address. The system administrator would have this information. An example is 255.255.255.0

Gateway This IP address is used to communicate with other networks. If a gateway is not being used this option should be blank.

Remote IP 0...B Address are for any remote CPU, or devices, that the terminal will communicate with for a specific session. These twelve remote IP addresses should all be identical if all communications will be with only one CPU. If Multiple sessions-ON in the F4 menu has been selected, and there is more than one CPU on the system, the user must specify which CPU each session will communicate with. To communicate with a different CPU for a future session, these settings must be changed.

Note 1: The Multiple session option allows 8 separate sessions if any emulation other than ECON-80 is selected. If ECON-80 emulation is selected, the Multiple session option will then allows 12 separate sessions.

Note 2: Port 23 Is the telnet service by default.

Note 3: The terminal must be powered cycled after saving for these parameters to take effect.

Term Type allows definition of the terminal with up to 40 characters. If Term Type is empty the default type is sent to the CPU by the system.

Ethernet Node ID displays the serial number of the hardware Ethernet interface device. This is a default value of the manufacturer of the hardware device and should not be changed.

F10- Colr1 Set-up Menu

Selects the color palette to be used for each screen attribute. A text sample of the selected colored is displayed next to each selection. Attribute selections are listed below.

Normal	Undl.
Dim	Undl. Blank
Blank	Undl. Blink
Blink	Undl. Blink Blank
Blink Blank	Undl. Rev
Rev	Undl. Rev Blank
Rev Blank	Undl. Rev Blink
Rev Blink	Undl. Rev Blink Blank
Rev Blink Blank	

[F11](#)- Colr2 Set-up Menu

The color functionality differs with emulation. In general VT100, VT220 and ANSI Console work with applications, which control the color directly. The remaining personalities associate colors based on existing monochrome video attributes. This section will define parameter selection based on personality selected.

Background = Will determine the color of the background screen under some conditions (16 colors).

Normal F.G. \ Normal B.G. = These fields allow the user to select the character and background color (16 colors) for data entered on the display before the application defines the color display remotely.

Border Color = The color of the border around the edge of the screen.
Cursor = Will select the color of the cursor (16 colors).

Intensity F.G. \ Intensity B.G. = These fields allow the user to select the character and background color (16 colors) for data entered on the display as Dim in ASCII emulation's and Bold in VT\ANSI emulation's before the application defines the color display remotely.

Attribute = Bold/Blink

Color mode = Is automatically selected based on the emulation selected.

Color map = Applies in WY325 mode only and determines if the monochrome attribute Reverse or Blank will be used to map monochrome attributes to color.

Color Association = OFF/ON

Table 4- Color Setup Menu

Option	ASCII (NOT WY325)	WY325 *	VTXXX	ANSI CONSOLE
Background =	The whole data area of the screen will be displayed in this color, when the application hasn't entered character or spaces with the Normal or Intensity B.G. color. Changes in Background color will affect Normal and Intensity B.G. Any clear screen commands will clear to this color.	No Function	Same as ASCII	Same as ASCII
Cursor =	Selects Cursor color	Selects Cursor color	Selects Cursor color	Selects Cursor color
Normal F.G. =	Selects color of Normal F.G.	No Function	Initial color selection at power up	Initial color selection at power up
Normal B.G. =	Selects color of Normal B.G.	No Function	Initial color selection at power up	Initial color selection at power up
Intensity F.G. =	Selects color of Intensity F.G.	No Function	Initial color selection at power up	Initial color selection at power up
Intensity B.G. =	Selects color of Intensity B.G.	No Function	Initial color selection at power up	Initial color selection at power up
Color Mode = Normal/Palette	Automatic	Automatic	Automatic	Automatic
Color Map =	No Function	See Above	No Function	No Function

* When the WY 325 personality is selected holding the Ctrl key down and depressing either the 0, 1, ..., 9 or (.) period keys in the numeric pad change the assignment of color on the screen. Each selection is called a palette and is described in Table 6.

Table 5- Color Palettes

Palette	Display Attribute	Foreground Color	Background Color
0	Normal	Green	Black
	Reverse (or blank)*1	Black	Yellow
	Intensity*2	Blue	Black
	Intensity*2 and reverse (or blank)*1	Black	Blue
	Underline	Cyan	Black
	Underline and reverse(or blank)*1	Black	Cyan
	Underline and intensity*2,*3	Red	Black
	Underline, intensity, *2 and reverse (or blank)*1	Black	Red
1	Normal	Green	Black
	Reverse (or blank)*1	Black	Red
	Intensity*2	Yellow	Black
	Intensity*2 and reverse (or blank)*1	Black	Yellow
	Underline	Cyan	Black
	Underline and reverse (or blank)*1	Black	Cyan
	Underline and intensity*2,*3	White	Black
	Underline, intensity, *2 and reverse (or blank)*1	Black	White
2	Normal	Cyan	Black
	Reverse (or blank)*1	Black	White
	Intensity*2	Red	Black
	Intensity*2 and reverse (or blank)*1	Black	Red
	Underline	Magenta	Black
	Underline and reverse (or blank)*1	Black	Magenta
	Underline and intensity*2,*3	Blue	Black
	Underline, intensity, *2 and reverse (or blank)*1	Black	Blue
3	Normal	Cyan	Black
	Reverse (or blank)*1	Black	Blue
	Intensity*2	White	Black
	Intensity*2 and reverse (or blank)*1	Black	White
	Underline	Magenta	Black
	Underline and reverse (or blank)*1	Black	Magenta
	Underline and intensity*2,*3	Yellow	Black
	Underline, intensity, *2 and reverse (or blank)*1	Black	Yellow
4	Normal	Magenta	Black
	Reverse (or blank)*1	Black	Cyan
	Intensity*2	Blue	Black
	Intensity*2 and reverse (or blank)*1	Black	Blue
	Underline	Green	Black
	Underline and reverse (or blank)*1	Black	Green
	Underline and intensity*2,*3	Red	Black
	Underline, intensity, *2 and reverse (or blank)*1	Black	Red
5	Normal	Magenta	Yellow
	Reverse (or blank)*1	Black	Black
	Intensity*2	White	White
	Intensity*2 and reverse (or blank)*1	Black	Black
	Underline	Green	Green
	Underline and reverse (or blank)*1	Black	Black
	Underline and intensity*2,*3	Cyan	Black
	Underline, intensity, *2 and reverse (or blank)*1	Black	Cyan

Table 5- Color Palettes (Cont'd)

Palette	Display Attribute	Foreground Color	Background Color
6	Normal	Yellow	Black
	Reverse (or blank)*1	Black	Yellow
	Intensity*2	Red	Black
	Intensity*2 and reverse (or blank)*1	Black	Red
	Underline	Cyan	Black
	Underline and reverse (or blank)*1	Black	Cyan
	Underline and intensity*2,*3	Magenta	Black
	Underline, intensity, *2 and reverse (or blank)*1	Black	Magenta
7	Normal	Red	Black
	Reverse (or blank)*1	Yellow	Red
	Intensity*2	Magenta	Black
	Intensity*2 and reverse (or blank) *1	Black	Magenta
	Underline	Cyan	Black
	Underline and reverse (or blank)*1	Black	Cyan
	Underline and intensity*2,*3	Green	Black
	Underline, intensity, *2 and reverse (or blank) *1	Black	Green
8	Normal	White	Black
	Reverse (or blank)*1	Black	White
	Intensity*2	Red	Black
	Intensity*2 and reverse (or blank)*1	Black	Red
	Underline	Yellow	Black
	Underline and reverse (or blank)*1	Black	Yellow
	Underline and intensity*2,*3	Magenta	Black
	Underline, intensity, *2 and reverse (or blank)*1	Black	Magenta
9	Normal	White	Black
	Reverse (or blank)*1	Black	White
	Intensity*2	Yellow	Black
	Intensity*2 and reverse (or blank)*1	Black	Yellow
	Underline	Blue	Black
	Underline and reverse (or blank)*1	Black	Blue
	Underline and intensity*2,*3	Cyan	Black
	Underline, intensity, *2 and reverse (or blank)*1	Black	Cyan
10 (Soft Palette)	Normal	Green	Black
	(soft Reverse (or blank)*1	Black	Yellow
	palette) Intensity*2	Blue	Black
	Intensity*2 and reverse (or blank)*1	Black	Blue
	Underline	Cyan	Black
	Underline and reverse (or blank)*1	Black	Cyan
	Underline and intensity*2,*3	Red	Black
	Underline, intensity, *2 and reverse (or blank)*1	Black	Red

*1. Whether the reverse or blank attribute is mapped to the colors shown depends on an escape sequence or the setting of the Color Map setup parameter on the Attribute menu. The default is *reverse*. When the *blank* attribute is mapped, only the background is visible.

*2. The intensity is *dim* in ASCII personalities and *bold* in ANSI personalities. (The intensity attribute is not supported in the following personalities: Wyse 50+, ADDS A2, TVI 910+, TVI925, and VT52.) The attribute can be disabled by an escape sequence or in setup mode (Intensity Attribute parameter).

*3. In each palette, the status line displays the same foreground and background colors as shown here for the underline-and-intensity attribute.

4.3 Local Keyboard Commands

Table 6 lists local keyboard commands in the terminal's native mode.

Table 6- Local Keyboard Commands in Native Mode

Key Sequence by keyboard Style

Command	Enhanced PC
Toggle CAPS LOCK on/off	CAPS LOCK
Toggle NUM LOCK on/off	NUM LOCK
Put terminal in SETUP mode	ALT ESC
Partially reset terminal, including communication unlock keyboard, turn off all print modes	ALT PAUSE
Send break[*1]	BREAK[*2]
Toggle between block and full-duplex modes	SHIFT BREAK
Print Screen formatted	PRINT SCREEN
Turn auxiliary print mode on/off	SHIFT SYS REQ[*3]
Turn monitor mode on/off	CTRL SHIFT 1 (kpd)
Turn status line display on/off	CTRL
Speed scrolling rate	CTRL SHIFT
Slow scrolling rate	CTRL SHIFT
Home cursor and clear page	CTRL SHIFT HOME
Display page 0	CTRL 0kpd
Display page 1	CTRL 1kpd
Display next page (or active other window) [*4]	PAGE DOWN
Display previous page (or active other window) [*5]	PAGE UP
Toggle between split screen[*5] and full screen format	CTRL SHIFT –kpd
Toggle Session 0[*6]	ALT F1
Toggle Session 1[*6]	ALT F2
Toggle Session 2[*6]	ALT F3
Toggle Session 3[*6]	ALT F4
Toggle Session 4[*6]	ALT F5
Toggle Session 5[*6]	ALT F6
Toggle Session 6[*6]	ALT F7
Toggle Session 7[*6]	ALT F8
Toggle Session 8[*6]	ALT F9
Toggle Session 9[*6]	ALT F10
Toggle Session A[*6]	ALT F11
Toggle Session B[*6]	ALT F12
Close the active Session by Local Terminal[*6]	CTRL SHIFT. Kpd

[*1]. To MODEM port only when configured as data port: has no effect on AUX port.
[*2]. [BREAK] = [PAUSE] pressed together with [CTRL].
[*3]. [SYS REQ] = [PRINT SCREEN] pressed together with [CTRL].
[*4]. If screen is split.
[*5]. Splits screen at line 12.
[*6]. Only active at Ethernet mode ON.

4.4 TERMINAL Command Guide

4.4.1 Commands Supported in ASCII Personalities

Table 8 lists all the ASCII commands recognized by the terminal. The native mode code for the command is given in the second column. (The native mode includes WY-325,WY-120 and WY-60.) The remaining columns show the support for the command in other ASCII personalities according to the following notations:

Same
Same as native code (code is native to other terminal also)

Wyse
Same as native code (Wyse enhancement- code not native to other terminal)

ENH
Same as native code when enhance mode is ON (Wyse enhancement - code not native to other terminal) A code listed under a nonnative personality indicates that the related terminal's native code is supported.

A blank in any column indicates that the command is not supported.

Variables are shown in italics. Their values are listed in alphabetical order at the end of the table.
Footnotes are found at the end of Table 7 on page 52.

Table 7- Commands Supported in ASCII Personalities

FUNCTION	Native Mode	Wyse WY-50+	Command ADDS VP A2	TVI 910+/925	PC Term
Monitor Mode					
Monitor mode on	ESC U	Same		Same	Same
Monitor mode off	ESC u	Same		Same	Same
	or ESC X				Same
Selecting Personalities					
Enhance mode off	ESC ~ SPACE	Same	ENH	ENH	ESC v SPACE
Enhance mode on	ESC ~ !	Same	ENH	ENH	ESC v !
Select WY-50+ mode	ESC ~"	Same	ENH	Wyse	ESC v "
Select TVI 910+ mode	ESC ~ #	Same	ENH	Wyse	ESC v #
Select TVI 925 mode	ESC ~ $	Same	ENH	Wyse	ESC v $
Select ADDS VP A2 mode	ESC ~ %	Same	ENH	Wyse	ESC v %
Select Console ANSI mode	ESC ~ A	Same	ENH	Wyse	ESC v A
Select Native mode	ESC ~ 4	Same	ENH	Wyse	ESC v 4
Select PC Term mode	ESC ~ 5	Same	ENH	Wyse	ESC v 5
Select VT52 mode	ESC ~ 6	Same	ENH	Wyse	ESC v 6
Select VT100 mode	ESC ~ ;	Same	ENH	Wyse	ESC v ;
Select PCGAPHIC mode[*1]	ESC ~ I	Same	ENH	Wyse	ESC v I
Select VT220-7 mode	ESC ~ <	Same	ENH	Wyse	ESC v <
Select VT220-8 mode	ESC ~ =	Same	ENH	Wyse	ESC v =
Select WY-325 mode[*3]	ESC ~ B	Same	ENH	Wyse	ESC v B
Communicating with the computer					
Enable transmission	CTRL Q	Same	Same	Same	Same
Stop transmission Disconnect	CTRL S	Same	Same	Same	Same
Send ACK (if ACK mode on)	CTRL E	Same		Wyse	Same

Table 7- Commands Supported in ASCII Personalities (Cont'd)

FUNCTION	Native Mode	Wyse WY-50+	Command ADDS VP A2	TVI 910+/925	PC Term
ACK mode off	ESC e 6	Same		ENH	
ACK mode on	ESC e 7	Same		ENH	
Full-duplex mode on	ESC C ESC D F	Same		Same	ESC }
Half-duplex mode on	ESC C ESC D H	Same		Same	ESC {
Block mode on	ESC B	Same		Same	Same
Block mode off (conversation)					ESC C
Half-duplex block mode on	ESC D H ESC B	Same		Same	ENH
Set Serial 1 port receive handshaking protocol	ESC c 2 *hndshk*	Same	ENH		
Set Serial 1 port transmit handshaking protocol	ESC c 4 *hndshk*	Same	ENH		
Set maximum data transmission speed for host port	ESC c 6 *max*				
Set Serial 1 port operating parameters	ESC c 0 *baud stop parity word*				
Set Serial 2 port operating parameters	ESC c 1 *baud stop parity word*				
Enable DTR Serial port 1 Handshaking			CTRL N	CTRL N	CTRL N
Enable X-on/X-off Serial port 1			CTRL O	CTRL O	CTRL O
Program answerback message	ESC c; *answer* CTRL Y	Same	ENH		
Conceal answerback message	ESC c =	Same	ENH		
Send answerback message	ESC c <	Same	ENH		
Turn answerback mode off	ESC e SP	Same	ENH		
Turn answerback mode on	ESC e !	Same	ENH		
Controlling the Terminal and Keyboard					
Sound bell	CTRL G	Same	Same	Same	Same
Select *bell volume*	ESC c *volume*	Same	ENH		
Unlock keyboard	CTRL N or ESC"	Same	CTRL B	ESC "	ESC "
Lock keyboard	CTRL O or ESC#	Same	CTRL D	Same	ESC #
CAPS LOCK off	ESC e '	ENH	ENH	ENH	ESC SP M
CAPS LOCK on	ESC e &	ENH	ENH	ENH	ESC SP L
NUM LOCK off	ESC e @	ENH	ENH	ENH	ESC SP K
NUM LOCK on	ESC e A	ENH	ENH	ENH	ESC SP J
SCROLL LOCK off	ESC e B	ENH	ENH	ENH	ESC SP O
SCROLL LOCK on	ESC e C	ENH	ENH	ENH	ESC SP N
Keyclick off	ESC e $	Same	ENH	ESC <	ESC <
Keyclick on	ESC e %	Same	ENH	ESC >	ESC >
Margin bell off	ESC e L	Same	ENH	ENH	ESC n
Margin bell on	ESC e M	Same	ENH	ENH	ESC o
Set margin bell at curs position	ESC ' J	Same	ENH		
Select standard ASCII key code mode	ESC e H	Same	ENH		
Select PC scan code mode	ESC e I	Same	ENH		
Key repeat off	ESC e ,	Same	ENH	ENH	
Key repeat on	ESC e -	Same	ENH	ENH	
Read keyboard status					ESC [
Redefining the keys					
Clear function key definition	ESC z *fkey* DEL	Same			
Clear key direction and definition	ESC Z *dir key/fkey* DEL	Same	ENH		

Table 7- Commands Supported in ASCII Personalities (Cont'd)

FUNCTION	Native Mode	Wyse WY-50+	ADDS VP A2	TVI 910+/925	PC Term
-Program function key definition	ESC z *fkey sequence* DEL	Same	ENH	ENH	
Program key direction and definition	ESC Z *dir key/fkey sequence* DEL	Same		Wyse	ESC I *p1 p2 sequence* CTRL Y
Read key direction and definition	ESC Z ~*key* or ESC Z ~*fkey*	Same			
Screen and Cursor Display					
Screen display off	ESC ` 8	Same	ENH	ESC o	ESC O
Screen display on	ESC ` 9	Same	ENH	ESC n	ESC N
Screen saver off	ESC e P	Same	ENH	ENH	
Screen saver on	ESC e Q	Same	ENH	ENH	
Set reverse screen	ESC ^ 1	Same	ENH	ESC b	
Restore normal screen	ESC ^ 0	Same	ENH	ESC d*4	
Set scrolling speed and type	ESC ` *scroll*	Same	ENH		
Smooth scrolling on				ESC 8*5	
Smooth scrolling off				ESC 9*5	
Set cursor display features	ESC ` *cursor*	Same	ENH	ESC . *cursor1*	ESC.*cursor1*
Cursor display off	ESC ` 0	Same	CTRL W		
Cursor display on	ESC ` 1	Same	CTRL X		
25th line display off				ESC e	
Displaying the Message Fields					
Extended status line on	ESC ` a	Same	ENH		
Standard status line on	ESC ` b	Same	ENH		
Status line off	ESC ` c	Same	ENH		
Program/display CPU message on status line	ESC F *message* CR	Same	ENH		
Program CPU message on unshifted lable line*6	ESC z (*text* CR	Same	ENH	ESC f*5 *text* CR	ESC f *text* CR
Program CPU message on shifted label line	ESC z) *text* CR	Same	ENH		
Turn off shifted label line	ESC z DEL	Same	ENH	ENH	
Clear unshifted label line	ESC z (CR	Same	ENH		
Clear shifted label line	ESC z) CR	Same	ENH	ENH	
Program/display function key label	ESC z *field label* CR	Same	ENH	ENH	
Clear function key label	ESC z *field* CR	Same	ENH	ENH	
Defining the data Area					
Select 80-column display	ESC ` :	Same	ENH		
Select 132-column display	ESC ` ;	Same	ENH		
Economy 80-column mode off	ESC e F	Same	ENH		
Economy 80-column mode on	ESC e G	Same	ENH		
Width-change-clear mode off	ESC e .	Same	ENH		
Width-change-clear mode on	ESC e /	Same	ENH		
Display 24 data lines*7	ESC e (	Same	ENH		
Display 25 data lines*7	ESC e)	Same	ENH		ESC ^

Table 7- Commands Supported in ASCII Personalities (Cont'd)

FUNCTION	Native Mode	Wyse WY-50+	ADDS VP A2	TVI 910+/925	PC Term
Display Memory/Split Screen					
Divide memory into pages	ESC w *length*	Same	ENH		
Display previous page	ESC w B or ESC J*8	Same	ENH	ESC J	
Display next page	ESC w C or ESC K*8	Same	ENH	ESC K	
Display page n	ESC w *page*	Same	ENH		
Split screen horizontally (simple split)	ESC x A *line*	Same			
Split screen horizontally (simple split) and clear pages	ESC x 1 *line*	Same			
Split screen horizontally (adjustable split) and clear pages	ESC x 3 *line*	Same			
Split screen horizontally (adjustable split)	ESC x C *line*	Same			
Activate upper window	ESC]	Same			
Activate lower window	ESC }	Same			
Activates other window (or page *8)	ESC J or ESC K	Same	ESC J*5		
Lower horizontal split	ESC x P	Same			
Raise horizontal split	ESC x R	Same			
Roll window up in page	ESC w E	Same			
Roll window down in page	ESC w F	Same			
Redefine screen as one window	ESC x @	Same			
Redefine screen as one window and clear pages	ESC x 0	Same			
Display Attributes					
Assign display attribute to a message field	ESC A *mf attr*	Same	ESC *4		
Assign character display attribute	ESC G *attr*	Same	ENH	Same	Same
Character attribute mode off	ESC e 0				
Character attribute mode on	ESC e 1				
Page attribute mode on	ESC e 2	Same			
Line attribute mode on	ESC e 3	Same			
Assign write-protected character display attribute	ESC `*wpca*	Same	ESC 0 *wpca1*		
Clear unprotected page to display attribute	ESC !	ENH *attr*	Wyse		
Assign line attribute	ESC G *lattr*	Same	ENH		
Redefine color map values*9	ESC d y *fcolor* *bcolor map*				
Set tag protect attribute			CTRL N		
Reset tag protect attribute			CTRL O		
Select a predefined color palette*9	ESC d z *palette*				
Map blank attribute*9	ESC d {				
Map reverse attribute*9	ESC d l				
Protecting Data					
Write-protect mode off	ESC (	Same	CTRL O	Same	Same
Write-protect mode on	ESC)	Same	CTRL N	Same	Same
Clear cursor column to write-protected spaces	ESC V	Same	ENH	Same	
Protect mode off	ESC ,	Same	ENH	Same	Same
Protect mode on	ESC &	Same	ENH	Wyse	Same

Table 7- Commands Supported in ASCII Personalities (Cont'd)

FUNCTION	Native Mode	Wyse WY-50+	ADDS VP A2	TVI 910+/925	PC Term
Graphics Characters					
Graphics mode on	ESC H	CTRL B	Same	ESC $	ESC $
Graphics mode off	ESC H	CTRL C	Same	ESC %	ESC %
Display graphics character	ESC H *ldraw*	Same			
Controlling the Cursor					
Cursor left (backspace)	CTRL H	Same	Same	Same or CTRL U	Same
Cursor right	CTRL L	Same	CTRL F	Same	Same
Cursor up; no scroll	CTRL K	Same	CTRL Z	Same	Same
Cursor up; scroll (reverse linefeed)	ESC j	Same	ENH	Same*10	Same
Cursor down; no scroll				CTRL V	CTRL V
Cursor down; scroll (Linefeed)	CTRL J	Same	Same	Same	Same
Cursor to start of line	CTRL M	Same	Same	Same	Same
Cursor to start of next line	CTRL _	Same	ENH	Same	Same
Home cursor	ESC { or CTRL ^	Same	ENH or CTRL A	Wyse Same	CTRL ^
Cursor to specific column			CTRL P *col*	ESC] *11	
Cursor to specific line			CTRL K *line*	ESC [	
End-of-line wrap off	ESC d .	Same	ENH		ESC 0
End-of line wrap on	ESC d /	Same	ENH		ESC ~
Received CR mode off	ESC e 4	Same	ENH	ENH	ESC 9
Received CR mode on	ESC e 5	Same	ENH	ENH	ESC 8
Autopage mode off	ESC d *	Same	ENH	ESC w	
Autopage mode on	ESC d +	Same	ENH	ESC v	
Autoscrolling mode off	ESC N	Same	ENH		
Autoscrolling mode on	ESC O	Same	ENH		
Address cursor in current 80-column page	ESC = *line col*	Same	ENH or ESC Y	Same	Same
Address cursor in specific 80-column page	ESC w @ *page line col*	Same	ENH	ESC - *page line col*	
Address cursor in specific 80-column window/page*8	ESC - *wnd/ page line col*	Same	ENH		Same
Address cursor in specific 80/132-column current page	ESC a *lll* R *ccc* C	Same	ENH		Same
Read cursor line and column address in 80-column current page	ESC ?	Same	ENH	Same	Same
Read 80-column page number and cursor address	ESC w☐	Same	ENH		
Read 80-column window/page number and cursor address	ESC /	Same	ENH	Same	Same
Read cursor address in 80/132-column page	ESC b	Same	ENH		
Editing					
Clear all tab stops	ESC 0	Same	ENH	ESC 3	ESC 3
Set tab stop	ESC 1	Same	ENH	Same	Same
Clear tab stop	ESC 2	Same	ENH	Same	Same
Tabulate cursor	ESC i or CTRL I	Same	ENH	CTRL I	CTRL I
Backtab	ESC I	Same	ENH	Same	Same
Field tab				ESC I	ESC i
Insert mode on, replace mode off	ESC q	Same	ENH	ENH	ESC Z
Insert mode off, replace mode on	ESC r	Same	ENH	ENH	Same
Insert space character	ESC Q	Same	ENH	Same	Same

Table 7- Commands Supported in ASCII Personalities (Cont'd)

FUNCTION	Native Mode	Wyse WY-50+	ADDS VP A2	TVI 910+/925	PC Term
Editing (Cont'd)					
Insert line of spaces	ESC E	Same	ENH	Same	Same
Delete cursor character	ESC W	Same	ENH	Same	Same
Delete cursor line	ESC R	Same	ESC l	Same	Same
Clearing Data					
Clear page to nulls	ESC *	Same	ENH	Same	Same
Clear page to spaces	ESC +	Same	ENH		Same
Clear page to write-protected spaces	ESC ,	Same	ENH		Same
Clear unprotected page to spaces	ESC ; or CTRL Z	Same	ESC ; ENH	ESC ; or ESC +	Same
Clear unprotected page to nulls	ESC :	Same	ENH	Same	Same
Clear unprotected page to a specific character	ESC .*char*	Same	ENH		
Clear unprotected page to protected spaces				ESC ,	
Clear unprotected page to display attribute		ESC ! *attr*	ENH	ENH	
Clear unprotected page to spaces from cursor	ESC Y	Same	ESC k	Same	Same
Clear unprotected page to nulls from cursor	ESC y	Same	ENH	Same	Same
Clear unprotected line to spaces from cursor	ESC T	Same	ESC K	Same	Same
Clear unprotected line to nulls from cursor	ESC t	Same	ENH	Same	Same
Fill page with H's					ESC F
Sending data					
Begin print / send at top of page	ESC d'	Same	ENH		
Begin print / send at top of screen	ESC d&	Same	ENH		
Send cursor character	ESC M	Same			
Send line through cursor	ESC 6	Same	Same	ESC 6	
Send unprotected line through cursor	ESC 4	Same	Same	ESC 4	
Send page through cursor	ESC 7	Same	ENH	Same	ESC 7
Send unprotected page through cursor	ESC 5	Same	Same	ESC 5	
Mark block beginning	ESC 8	Same	ENH		
Mark block end	ESC 9	Same	ENH		
Send entire block	ESC s	Same	ENH	Same	Same
Send unprotected	ESC S	Same	ENH	Same	Same
Report terminal status					ESC [
Report attribute under cursor					ESC D

Table 7- Commands Supported in ASCII Personalities (Cont'd)

FUNCTION	Native Mode	Wyse WY-50+	ADDS VP A2	TVI 910+/925	PC Term
Print Functions					
Print formatted page	ESC P	Same	ENH	Same	Same
Print formatted unprotected page	ESC @	Same	ENH		
Print unformatted page	ESC p or ESC L	Same	ESC p	ESC L*11	
Select Parallel printer	ESC d (	Same	Same		
Select Serial printer	ESC d)	Same	Same		
Auxiliary print mode off	CTRL T	Same	Same	ESC A	ESC A
Auxiliary print mode on	CTRL R	Same	Same	ESC @	
Transparent print mode off	CTRL T	Same	ESC 4	ESC a	ESC a
Transparent print mode on	ESC d #	Same	ESC 3	ESC `	ESC `
Bi-directional mode off	ESC d $			CTRL T	CTRL T
Bi-directional mode on	ESC d %			CTRL	CTRL R
Auxiliary receive mode off	ESC d SPACE				
Auxiliary receive mode on	ESC d !				
Set print terminator				ESC p	ESC p
Define delimiters				ESC x	ESC x
Character Sets					
Select primary character set	ESC c D	Same			
Select secondary character set	ESC c E	Same			
Define primary character set	ESC c B *bank*	Same			
Define secondary character set	ESC c C *bank*	Same			
Load font bank with predefined	ESC c @ *bank set*	Same			
Clear font bank	ESC c ? *bank*	Same			
Define and load character	ESC c A *bank pp bb...bb* CTRL Y	Same			

*1. PCG ALPHA in Mono. Text Model machine.
*3. Valid only in Color Model machine.
*4. With enhance mode off.
*5. With enhance mode on.
*6. Automatically display in native mode. May be hidden by assigning blank attribute (ESC A l l).
*7. Screen cleared.
*8. If screen is not split.
*9. In WY-325 only
*10. In TeleVideo 925 only
*11. In TeleVideo 910+ only

4.4.2 Variable Values for Table 7 Commands

answer Up to 20 characters to define answerback message

attr	Display Attributes	*attr*	Display Attributes
SPACE	Space character	p	Dim
0	Normal	q	Dim and invisible
1	Blank	r	Dim and blink
2	Blink	s	Dim, blink, invisible
3	Blink and Blank	t	Dim and reverse
4	Reverse	u	Dim, reverse, invisible
5	Reverse and invisible	v	Dim, reverse, blink
6	Reverse and blink	w	Dim, reverse, blink invisible
7	Reverse, blink, invisible	x	Dim and underline
8	Underline	y	Dim, underline, invisible
9	Underline and invisible	z	Dim, underline, blink
:	Underline and blink	{	Dim, underline, blink invisible
;	Underline, blink, invisible	l	Dim, underline, reverse
<	Underline and reverse	}	Dim, underline, reverse invisible
=	Underline, reverse, invisible	~	Dim, underline, reverse blink
>	Underline, reverse, blink	DEL	Dim, underline, reverse blink, invisible
?	Underline, reverse, blink invisible		

bank	Font Bank*a	*bank*	Font Bank*a
0	Font bank 0	2	Font bank 2
1	Font bank 1	3	Font bank 3

*a Holds predefined character set

baud	Baud Rate	*baud*	Baud Rate	*baud*	Baud Rate	*baud*	Baud Rate
0	115200	4	19200	8	2400	<	200
1	76800	5	9600	9	1200	=	134.5
2	57600	6	7200	:	600	>	110
3	38400	7	4800	:	300	?	50

bb...bb 32-byte character string defining bit pattern of character

bcolor	Background Color	*bcolor*	Background Color
1	Black	5	Red
2	Bue	6	Magenta
3	Green	7	Yellow
4	Cyan	8	White

ccc One-to three-decimal value of column relative to home

char Character that replaces unprotected characters

col See line/col

color	color	*color*	color	*color*	color
1	Black	6	Magenta	D	Dim cyan
2	Bue	7	Yellow	E	Dim red
3	Green	8	White	F	Dim magenta
4	Cyan	B	Dim blue	G	Dim yellow
5	Red	C	Dim green	H	Dim white

cursor	Cursor Display	*cursor*	Cursor Display
0	Cursor display off	3	Blinking line cursor
1	Cursor display on	4	Steady line cursor
2	Steady block cursor	5	Blinking block cursor

dir	Direction
0	Normal
1	Remote
2	Local

Variable Values for Table 7 Commands (Cont'd)

fcolor	Foreground Color	fcolor	Foreground Color
1	Black	5	Red
2	Bue	6	Magenta
3	Green	7	Yellow
4	Cyan	8	White

Function Key	field unshifted	field shifted	Function Key	field unshifted	field shifted
F1	0	P	F7	6	V
F2	1	Q	F8	7	W
F3	2	R	F9	8	X
F4	3	S	F10	9	Y
F5	4	T	F11	:	Z
F6	5	U	F12	;	[

Function Key	fkey unshifted	fkey shifted	Function Key	fkey unshifted	fkey shifted
F1	@	`	F7	F	f
F2	A	a	F8	G	g
F3	B	b	F9	H	h
F4	C	c	F10	I	i
F5	D	d	F11	J	j
F6	E	e	F12	K	k

hndshk	Handshaking Protocol	
	Receive	Transmit
0	None (default)	None (default)
1	XON/XOFF	XON/XOFF
2	DTR	
3	Both	

Keyboard Style

key	Enhanced PC	key	Enhanced PC	key	Enhanced PC
SPACE	ESC	&	SHIFT TAB →	$	RETURN
%	SHIFT ESC	"	← BACKSPACE	)	SHIFT RETURN
!	TAB →	'	SHIFT← BACKSPACE	*	HOME
/	SHIFT HOME	3	SHIFT →	6	SHIFT DELETE
+	↑	s	ENTER kpd	R	PRINT SCREEN
0	SHIFT ↑	4	SHIFT ENTER kpd	X	SHIFT PRINT SCREEN
,	↓	q	INSERT	\	END
1	SHIFT ↓	p	SHIFT INSERT	]	SHIFT END
-	←	r	PAGE DOWN	:	PAGE UP
2	SHIFT ←	w	SHIFT PAGE DOWN	;	SHIFT PAGE UP
.	→	5	DELETE		

label 9 characters (80 columns); 7 characters (132 columns)

lattr	Line Attribute
@	Single-high, single-wide characters
A	Single-high, double-wide characters.
B	Top half of double-high, single-wide characters
C	Bottom half of double-high, single-wide characters
D	Top half of double-high, double-wide characters
E	Bottom half of double-high, double-wide characters

ldraw	Graphics Character	ldraw	Graphics Character	ldraw	Graphics Character	ldraw	Graphics Character
0		4		8		=	
1		5		9		>	
2		6		:		?	
3		7		;			

Variable Values for Table 7 Commands (Cont'd)

length	Multiple	Length of Page
G	1xlines	Equal to the number of data lines
H	2xlines	Double the number of data lines
I*b	4xlines	Four times the number of data lines

*b Available only in WY-50+ personality.

Line/Column	*line/col*c	Line/Column	*line/col*c	Line/Column	*line/col*c	Line/Column	*line/col*c
1	Space	25	8	49	P	73	h
2	!	26	9	50	Q	74	i
3	"	27	:	51	R	75	j
4	#	28	;	52	S	76	k
5	$	29	<	53	T	77	l
6	%	30	=	54	U	78	m
7	&	31	>	55	V	79	n
8	'	32	?	56	W	80	o
9	(	33	@	57	X	81	p
10	)	34	A	58	Y	82	q
11	*	35	B	59	Z	83	r
12	+	36	C	60	[	84	s
13	,	37	D	61	\	85	t
14	-	38	E	62	]	86	u
15	.	39	F	63	^	87	v
16	/	40	G	64	_	88	w
17	0	41	H	65	`	89	x
18	1	42	I	66	a	90	y
19	2	43	J	67	b	91	z
20	3	44	K	68	c	92	{
21	4	45	L	69	d	93	|
22	5	46	M	70	e	94	}
23	6	47	N	71	f	95	~
24	7	48	O	72	g	96	DEL/RUB

*c Native codes also recognized in WY-50+, TVI 910+/925, and PC Term personalities, and in ADDS VP A2 personality absolute cursor addressing.

lll One- to three-decimal value of line relative to home

map	Definition	*map*	Definition
1	Normal	5	Underline
2	Reverse (or blank*d)	6	Underline and reverse (or blank*d)
3	Intensity	7	Underline and intensity
4	Intensity and reverse (or blank*d)	8	Underline, intensity, and reverse (or blank*d)

*d. Colors mapped to reverse or blank depending on the setting of the Color Map setup parameter or the equivalent escape sequences.

Max	Maximum Speed
1	60 characters per second
2	No limit (default)
3	150 characters per second

message 46 characters (80 columns); 98 characters (132 columns)

mf	Screen Area*e	*mf*	Screen Area*e
0	Data area	2	Terminal message field
1	Function key label line	3	Computer message field

*e In native mode, only the reverse attribute can be assigned to the data area.

Variable Values for Table 7 Commands (Cont'd)

p1	Function Key	p1	Function Key
1	F1	6	F6
2	F2	7	F7
3	F3	8	F8
4	F4	9	F8
5	F5	0	F10

P2	Function Key
1	Remote
2	Local
3	Normal

Page	Page	
0	page 0	In the 80 columns mode: There have 4 pages of display memory.
1	page 1	In the 132 columns mode: There have 3 pages of display memory.
2	page 2	In the Econ-80 columns mode: There have 7 pages of display memory.
3	page 3	
4	page 4	
5	page 5	
6	page 6	

Palette	Color Pallette	Palette	Color Pallette	Palette	Color Pallette
0	Palette 0	4	Palette 4	8	Palette 8
1	Palette 1	5	Palette 5	9	Palette 9
2	Palette 2	6	Palette 6	.	Palette 10
3	Palette 3	7	Palette 7		

Parity	Parity Bits	Parity	Parity Bits
0	None	2	Mark
1	Odd	3	Even

pp 2-byte hex value of character position*f.

***f** In the illustrations, DEC = decimal value; HEX = hexadecimal value. Read across, then down.

Scroll	Scrolling Type	Speed (lps)
@	Jump scroll	
<	Smooth scroll	1
=	Smooth scroll	2
>	Smooth scroll	4
?	Smooth scroll	8

sequence Up to 64 bytes to be loaded in function key

Set	Predefined Character Set
@	Native Mode
A	PC Multinational
B	Standard ASCII
D	PC Standard
G	Standard ANSI

Stop	stopbits
0	1
1	2

text 78 characters (80 columns); 130 characters (132 columns)

Volume	BELL Volume	Volume	BELL Volume
#	Loud	!	Low
"	Medium	SP	Off

Variable Values for Table 7 Commands (Cont'd)

wnd/page	Window or Page
0	Page 0 or upper window
1	Page 1 or lower window

Word	Data Word
0	7 bits
1	8 bits

wpca	Write-Protected Display Attribute	*wpca*	Write-Protected Display Attribute
6	Reverse*g	C	Invisible on
7	Dim*g	E	Underline on
A	Normal*g	F	Reverse on
B	Blink on	G	Dim on

*g Clears other write-protected attributes

wpca1	Display Attribute	*wpca1*	Write-Protected Display Attribute
@	Normal	H	Normal
A	Dim	I	Dim
B	Blink	J	Blink
C	Dim/Blink	K	Dim/Blink
D	Invisible	L	Invisible
P	Reverse (Rev)	X	Reverse (Rev)
Q	Rev/Dim	Y	Rev/Dim
R	Rev/Blink	Z	Rev/Blink
S	Rev/Dim/Blink	[	Rev/Dim/Blink
T	Rev/Invisible	\	Rev/Invisible
.	Underline (UL)	h	Underline (UL)
a	UL/Dim	i	UL/Dim
b	UL/Blink	j	UL/Blink
c	UL/Dim/Blink	k	UL/Dim/Blink
p	UL/Rev	x	UL/Rev
q	UL/Rev/Dim	y	UL/Rev/Dim
r	UL/Rev/Blink	z	UL/Rev/Blink
s	UL/Rev/Dim/Blink	{	UL/Rev/Dim/Blink

4.5 ANSI Command Guide

4.5.1 VT100, VT220 and Console ANSI Command Guide

Supported VT100,VT220 and Console ANSI Commands

	Command	
FUNCTION	VT100, VT220	Console ANSI
Controlling Functional modes*1		
Lock keyboard	CSI 2 h	Same
Unlock keyboard	CSI 2 l	Same
Monitor mode on *2	CSI 3 h	Same
Monitor mode off	CSI 3 l	Same
Insert mode on	CSI 4 h	Same
Insert mode off	CSI 4 l	Same
Local echo off	CSI 12 h	Same
Local echo on	CSI 12 l	Same
New line mode on	CSI 20 h	Same
New line mode off	CSI 20 l	Same
Cursor keys send application-dependent codes	CSI ?1 h	Same
Cursor keys send cursor movement codes	CSI ?1 l	Same
VT100 mode on	CSI ?2 h or CSI 61 "p	Same
VT52 mode on	CSI ?2 l	Same
National character set mode on	CSI ?42 h	Same
National character set mode off	CSI ?42 l	Same

Supported VT100, VT220 and Console ANSI Commands, Cont'd

	Command	
FUNCTION	VT100, VT220	Console ANSI
132-column display	CSI ?3 h	Same
80-column display	CSI ?3 l	Same
Smooth scrolling on	CSI ?4 h	Same
Jump scrolling on	CSI ?4 l	Same
Reverse screen video on	CSI ?5 h	Same
Normal screen video on	CSI ?5 l	Same
Line 1 is top of scrolling region	CSI ?6 h	Same
Line 1 is top of display area	CSI ?6 l	Same
Autowrap on	CSI ?7 h	Same
Autowrap off	CSI ?7 l	Same
Autorepeat on	CSI ?8 h	Same
Autorepeat off	CSI ?8 l	Same
Block mode on	CSI ?10 h	Same
Block mode off	CSI ?10 l	Same
Send form feed after print screen operation	CSI ?18 h	Same
No form feed sent after print screen operation	CSI ?18 l	Same
Print full screen	CSI ?19 h	Same
Print scrolling region	CSI ?19 l	Same
Display cursor	CSI ?25 h	Same
Cursor off	CSI ?25 l	Same
Blank screen	CSI 30 h	Same
Display screen	CSI 30 l	Same
Display status line	CSI 31 h	Same
Blank status line	CSI 31 l	Same
Screen saver	CSI 32 h	Same
Screen saver off	CSI 32 l	Same
Cursor steady (nonblinking)	CSI 33 h	Same
Cursor blinking	CSI 33 l	Same
Underline cursor on	CSI 34 h	Same
Block cursor on	CSI 34 l	Same
Don't clear screen after width change	CSI 35 h	Same
Clear screen after width change	CSI 35 l	Same
Send erasable and nonerasable characters	CSI 37 h	Same
Send only erasable characters	CSI 37 l	Same
Send full screen	CSI 38 h	Same
Send scrolling region	CSI 38 l	Same
Turn 25th line on	CSI 40 h	Same
Turn 25th line off	CSI 40 l	Same
Select standard ANSI key codes	CSI 54 h	Same
Select PC scan codes	CSI 54 l	Same
VT220 8-bit mode on	CSI 62;2"p	Same
VT220 7-bit mode on	CSI 62;1"p	Same
8-bit transmission mode on (VT220)	ESC space G	
7-bit transmission mode on (VT220)	ESC space F	
Select next page		CSI U
Select preceding page		CSI V
Select page 0		CSI 0 z
Select page 1		CSI 1 z

Character Set Selection   ESC *Ps final*   **Same**

Ps	Label assigned	*Ps*	Label assigned
(	G0	*	G2 (VT220 only)
)	G1	+	G3 (VT220 only)

Supported VT100, VT220 and Console ANSI Commands (Cont'd)

final	Final character	*final*	Final character
A	Designating UK ANSI character set	<	Designating DEC supplemental(VT220 only)
B	Designating ASCII character set	DSCS	Designating Down-line loadable character set
0	Designating DEC special graphics		

* DSCS can consist of zero, one or two intermediate character and a final character. Intermediate characters are in the range of 2/0 to 2/15. Final characters are in the range of 3/0 to 7/14

	Command	
FUNCTION	**VT100, VT220**	**Console ANSI**
Load G0 character set into GL	CTRL O	Same
Load G1 character set into GL	CTRL N	Same
Load G1 character set into GR	ESC ~	Same
Load G2 character set into GL	ESC n	Same
Load G2 character set into GR	ESC }	Same
Load G3 character set into GL	ESC o	Same
Load G3 character set into GR	ESC l	Same
Shift G2 character set into GL for one character only	ESC N	Same
Shift G3 character set into GL for one character only	ESC O	Same
Controlling Character, Field, and Line Attributes **Define character attributes***3 **Select Graphic Rendition** **(Console ANSI mode only)**	 CSI *Ps* m (see table below)	 **Same** CSI *ps* m (see table below)

Set bold background bit
   Pn = 0: set bit 7 of attribute byte as B/G intensity
         1: set bit 7 of attribute byte as B/G blink
	ESC[=*Pn*E	same

Set normal foreground color	ESC[= *Psn* F (see table,	same
Set normal background color	ESC[= *Psn* G next page)	same
Set reverse foreground color	ESC[= *Psn* H	same
Set reverse background color	ESC[= *Psn* I	same
Set graphic foreground color	ESC[= *Psn* J	same
Set graphic background color	ESC[= *Psn* K	same
Set border color	ESC[= *Psn* A	same

Values for " Ps" (above)

Ps	**Character Attribute**	*Ps*	**Character Attribute**
0	Normal (all attributes off)	33	Brown character (Bold on = Yellow)
1	Bold (blank off)	34	Blue character
4	Underline	35	Magenta character
5	Blink	36	Cyan character
7	Reverse	37	White character
8	Blank (bold off)	40	Black background
22	Normal intensity	41	Red background
24	Underline off	42	Green background
25	Blink off	43	Brown background (Bold on = Yellow)
27	Reverse off	44	Blue background
28	Blank off	45	Magenta background
30	Black character	46	Cyan background
31	Red character	47	White background
32	Green character		

Values for "ps" (above)

ps	**Function**
10	Select Primary Font
11	Select First Alternate Font. Allows ASCII characters less than 32 to be displayed as ROM character.
12	Select Second Alternate Font. Toggles high bit of extended ASCII code before displaying as ROM character.

Supported VT100, VT220 and Console ANSI Commands (Cont'd)

Values for "*Psn*" in table on page 59

Psn	Color	*Psn*	Color	*Psn*	Color	*Psn*	Color
0	Black	4	Red	8	Gray	12	Lt. Red
1	Blue	5	Magenta	9	Lt.Blue	13	Lt. Magenta
2	Green	6	Brown	10	Lt. Green	14	Yellow
3	Cyan	7	White	11	Lt. Cyan	15	Lt. White

	Command	
FUNCTION	**VT100, VT220**	**Console ANSI**
Access alternate graphic set		CSI Png
Define erasable character	CSI 0 "q or CSI 2 "q	Same
Define non-erasable character	CSI 1 "q	Same
Define top half of double-high, double-wide line	ESC # 3	Same
Define bottom half of double-high, double-wide line	ESC # 4	Same
Define single-high, single-wide line	ESC # 5	Same
Define single-high, double-wide line	ESC # 6	Same
Define top half of double-high, single-wide line	ESC # :	Same
Define bottom half of double-high, single-wide line	ESC # ;	Same
Controlling the Cursor		
Display cursor	CSI ?25 h	Same
Cursor off	CSI ?25 l	Same
Cursor steady (nonblinking)	CSI 33 h	Same
Cursor blinking	CSI 33 l	Same
Underline cursor on	CSI 34 h	Same
Block cursor on	CSI 34 l	Same
Cursor keys send application-dependent codes	CSI ?1 h	Same
Cursor keys send cursor movement codes	CSI ?1 l	Same
Move cursor to n column	CSI n G or CSI n `	Same
Move cursor up n lines	CSI n A	Same
Move cursor down n lines	CSI n B or CSI n e	Same
Move cursor right n columns	CSI n C or CSI n a	Same
Move cursor left n columns	CSI n D	Same
Move cursor down cursor n line to column 1	CSI n E	Same
Move cursor up n lines to column 1	CSI n F	Same
Move cursor to line n	CSI n d	Same
Move cursor to line n1, column n2	CSI n1; n2 H	Same
	or CSI n1; n2 f	Same
Move cursor down one line in current column, scroll up if at bottom line	IND	Same
	or ESC D	Same
Move cursor down one line in current column, execute CR if linefeed mode is on	CTRL J	Same
	or CTRL K or CTRL L	Same
Move cursor up one line in current column, scroll down if at top line	RI	Same
	or ESC M	Same
Move cursor down one line to column 1	NEL or ESC E	Same
Save display attributes, cursor position, character sets,wrap flag and origin mode status	ESC 7	Same
	or CSI s	Same
Restore last saved display attributes, cursor position, character set, wrap flag, and origin mode status	ESC 8	Same
	or CSI u	Same
Backspace cursor	CTRL H	Same
Move cursor to next tab stop	CTRL I	Same
Move cursor to column 1 of current line	CTRL M	Same
Editing Functions		
Erase from cursor to end of display	CSI 0 J	Same
Erase from start of display to cursor	CSI 1 J	Same
Erase entire display	CSI 2 J	Same
Erase from cursor to end of line	CSI 0 K	Same
Erase from start of line to cursor	CSI 1 K	Same
Erase entire line	CSI 2 K	Same
Erase erasable characters from cursor to end of display	CSI ?0 J	Same

Supported VT100, VT220 and Console ANSI Commands (Cont'd)

FUNCTION	Command VT100, VT220	Console ANSI
Editing Functions (Cont'd)		
Erase erasable characters from start of display to cursor	CSI ?1 J	Same
Erase erasable characters in entire display	CSI ?2 J	Same
Erase erasable characters from cursor to end of line	CSI ?0 K	Same
Erase erasable characters from start of line to cursor	CSI ?1 K	Same
Erase erasable characters from entire line	CSI ?2 K	Same
Erase n characters beginning at cursor	CSI n X	Same
Insert n blank characters beginning at cursor	CSI n @	Same
Insert n blank lines beginning at cursor line	CSI n L	Same
Delete n line beginning at cursor line	CSI n M	Same
Delete n characters beginning at cursor	CSI n P	Same
Controlling Margins		
Set top/bottom margins of scrolling	**CSI *t;b* r**	**Same**
t: Top line number *b*: Bottom line number (optional; if omitted, treated as bottom screen line)		
Controlling Tabs		
Clear tab stop at cursor	CSI 0 g or CSI 2 W	CSI 2W
Clear all tab stops	CSI 3 g or CSI 5 W	CSI 5W
Set tab stop at cursor	CSI 0 W or ESC H	Same
Set tab stop every 8th column	CSI ?5 W	Same
Move forward n tab stops	CSI n I	Same
Move backward n tab stops	CSI n Z	Same
Move cursor to next tab stop	CTRL I	Same
Controlling Scrolling		
Smooth scrolling on	CSI ?4 h	Same
Jump scrolling on	CSI ?4 l	Same
Set 0 lps smooth scrolling speed	CSI 0 z	
Set 1 lps smooth scrolling speed	CSI 1 z	
Set 2 lps smooth scrolling speed	CSI 2 z	
Set 4 lps smooth scrolling speed	CSI 3 z	
Set 8 lps smooth scrolling speed	CSI 4 z	
Program function keys *(see tables below an on next page for values)*	**DCS *c;kl* |** ***kc/hc* ST**	**ESC Q *Fn*** **"*string*"**

Program function key values in VT100 mode:

c	Clear	kl	Key Lock
0	Clear all key definitions	0	Lock key definitions
1	Clear keys only as they are redefined	1	Don't lock key definitions
kc	**Shifted function key**	**kc**	**Shifted function key**
12	F1	18	F7
13	F2	19	F8
14	F3	20	F9
15	F4	21	F10
16	F5	23	F11
17	F6	24	F12

Supported VT100, VT220 and Console ANSI Commands, Cont'd

kc	Unshifted function key	*kc*	Unshifted function key
6	F1	38	F7
7	F2	39	F8
8	F3	40	F9
9	F4	41	F10
10	F5	43	F11
37	F6	44	F12

hc Hexadecimal representation of character string assigned to the function key.

Note: Multiple function key definitions can be programmed by entering the <kc>/<hc> parameters for each, separated by semicolons (;).

Program function key values (from previous page) in Console ANSI mode:

Redefine keys with string
Function: Define Specific Programmable Function key or Numeric keypad with String.

Format: **ESC Q Fn " string "**

Values of Fn for Programmable Function keys

Fn Value	F Key	*Fn* Value	F Key	*Fn* Value	F Key	*Fn* Value	F Key
0	F1	<	S_F1	H	C_F1	T	C_S_F1
1	F2	=	S_F2	I	C_F2	U	C_S_F2
2	F3	>	S_F3	J	C_F3	V	C_S_F3
3	F4	?	S_F4	K	C_F4	W	C_S_F4
4	F5	@	S_F5	L	C_F5	X	C_S_F5
5	F6	A	S_F6	M	C_F6	Y	C_S_F6
6	F7	B	S_F7	N	C_F7	Z	C_S_F7
7	F8	C	S_F8	O	C_F8	[	C_S_F8
8	F9	D	S_F9	P	C_F9	\	C_S_F9
9	F10	E	S_F10	Q	C_F10	]	C_S_F10
:	F11	F	S_F11	R	C_F11	^	C_S_F11
;	F12	G	S_F12	S	C_F12	_	C_S_F12

Values of Fn for Numeric Keypad keys

Fn Value	Numeric Keypad Key	*Fn* Value	Numeric Keypad Key	*Fn* Value	Numeric Keypad Key	*Fn* Value	Numeric Keypad Key
-	7	c	-	f	6	i	2
a	8	d	4	g	+	j	3
b	9	e	5	h	1	k	0

Notes:
1. The string should not include the delimiter, or unexpected conditions maybe occur.
2. The defined contents of F1 ~F12 will be transmitted out by keying F1~F12.
   The defined contents of S_F1~S_F12 will be transmitted out by multi-keying the Shift and Function key.
   The defined contents of C_F1~C_F12 will be transmitted out by multi-keying the Ctrl and Function key.
   The defined contents of C_S_F1~C_S_F12 will be transmitted out by multi-keying the Ctrl, Shift and Function key.

Example: Define Function Key F1 to the character ABC123: ESC Q 0"ABC123"

Supported VT100, VT220 and Console ANSI Commands (Cont'd)

| | Command | |
FUNCTION	VT100, VT220	Console ANSI
Auxiliary Keypad Modes		
Auxiliary keypad numeric mode on	ESC >	Same
Auxiliary keypad application mode on	ESC =	Same
Transmission/Printer Control		
Transmit through cursor position	CSI 16 h	Same
Transmit to end of line or end of display	CSI 16 l	Same
Send form feed after print screen operation	CSI ?18 h	Same
No form feed sent after print screen operation	CSI ?18 l	Same
Print full screen	CSI ?19 h	Same
Print scrolling region	CSI ?19 l	Same
Print screen	CSI 0 i or CSI i	Same
Send screen	CSI 2 i	Same
Transparent print mode off	CSI 4 i	Same
Transparent print mode on	CSI 5 i	Same
PR port receive mode off	CSI 6 i	Same
PR port receive mode on	CSI 7 i	Same
Select parallel printer	CSI 8 i	Same
Select serial printer	CSI 9 i	Same
Print line	CSI ?1 i	Same
Send line	CSI ?3 i	Same
Copy print mode off	CSI ?4 i	Same
Copy print mode on	CSI ?5 i	Same
Transmit form feed after send screen operation	CSI 1 l	Same
No form feed after send screen operation	CSI 0 l	Same
Send characters at cursor	ESC 5	Same
Send answerback message	CTRL E	Same
Suspend transmission	CTRL S	Same
Resume transmission	CTRL Q	Same
More Terminal Control Commands		
Display screen adjustment pattern	ESC # 8	Same
Sound bell, if enabled	BEL (CTRL G)	Same
Abort escape sequence; no character displayed[*3]	CAN (CTRL X)	Same
Abort escape sequence; display reverse question mark^	SUB (CTRL Z)	Same
Initiate escape sequence	ESC (CTRL [])	Same
Next Page	CSI U	Same
Preceding Page	CSI V	Same
Terminal Resets		
Soft terminal reset	CSI ! p	Same
Hard terminal reset	ESC c	Same
Terminal Status Reports		
Request primary attributes report	CSI 0 c or ESC Z	Same
Request secondary attributes report	CSI > 0 c	Same
Respond with current revision	CSI > 1; 20; 0c	Same
Request terminal status report	CSI 5 n	Same
Respond terminal functioning and ready	CSI 0 n	Same
Request cursor position report	CSI 6 n	Same
Respond cursor at line l, column c	CSI l; c R	Same
Request printer status report	CSI ?15 n	Same
Respond printer ready	CSI ?10 n	Same
Respond printer not ready	CSI ?11 n	Same
Respond printer not connected	CSI ?13 n	Same
Request function key status report	CSI ?25 n	Same
Respond key definitions not locked	CSI ?20 n	Same
Respond key definitions locked	CSI ?21 n	Same

Supported VT100, VT220 and Console ANSI Commands, Cont'd

	Command	
FUNCTION	**VT100, VT220**	**Console ANSI**
Request keyboard status report **Respond with keyboard language** *(see table below for values of "Ps")*	**CSI ? 26 n** **CSI ? 27; *Ps* n**	**Same** **Same**

Values of Ps (above)

Ps	Keyboard Language	*Ps*	Keyboard Language
1	U.S.	6	Spanish
2	U.K.	7	Swedish
3	Danish	8	Norwegian
4	German	9	Italian
5	French		

*1. More than one mode, but less than 17, may be set with one sequence. Enter multiple numeric parameters separated by semicolons (;). However you cannot combine sequences containing "?" with those that don't contain "?", nor can you combine sequences ending with "h" with those ending with "l".
*2. To toggle monitor mode from the keyboard, press CTRL SHIFT 1 (use the 1 on the numeric keypad).
*3. In VT52 or VT100 modes, displays checkerboard character.

4.5.2 VT52 Command Guide

Table 8- VT52 Mode Escape Sequences

Command	VT52
Move cursor up one line	ESC A
Move cursor down one line	ESC B
Move cursor right one column	ESC C
Move cursor left one column	ESC D
Move cursor to home position	ESC H
Move cursor up one line with scroll	ESC I
Move cursor to line *line*, column *col*	ESC Y *line col*
Select graphics character set	ESC F
Select U.S. ASCII character set	ESC G
Erase from cursor to end of display	ESC J
Erase from cursor to end of line	ESC K
Print cursor line	ESC V
Print display	ESC]
Transparent print mode on	ESC W
Transparent print mode off	ESC X
Copy print mode on	ESC ^
Copy print mode off	ESC _
Keypad application mode on	ESC =
Keypad application mode off	ESC >
Enter VT100 mode	ESC <
Identify terminal	ESC Z

4.6 Using Printer Server via Ethernet Connection

Introduction

In order to send print jobs to a network-based printer, the Ethernet Print Terminal function in the TERMINAL must be used. To use this function, the Telnet Terminal communication option described on page 1 is available. For this option to work, an Ethernet cable must be connected as described on page 6.

There are two ways to send the print jobs to a network-connected printer: 1) through LPD protocol, and 2) through TFTP protocol.
- The LPD method is more suitable for printing environments with a large number of users because the LPD protocol has a queue process so print jobs will be kept in the print queues in the CPU.
- TFTP does not implement the print queue concept; if the printer port is not ready for accepting new print jobs, TFTP will be terminated. Consequently, the user must send the print job again. As a result, the TFTP protocol is suitable for printing small jobs, in an environment with a small number of users, or for testing purposes.

LPD is a built-in printing protocol in the BSD type of UNIX and is also available in most other UNIX systems. With LPD, users do not need to install additional software to the CPU to print the jobs. Most implementations of the LPD protocol send out the data file before the control file. However, since Ethernet Print Terminal must print the data file immediately upon receiving it, the print option specified in the control file cannot take affect.

To install the printer server function of Ethernet Print Terminal, the first step is Basic setup. Whichever printing protocol will be used, it is necessary to run basic setup first. If LPD will be used to print jobs, go through the Setup for LPD procedures. If TFTP will be used, go through the Setup for TFTP procedures.

4.6.1 Basic Setup

Because the TCP/IP world uses IP addressing to communicate with each other, the purpose of Basic Setup is to assign an IP address to the Ethernet Print Terminal.

For the purpose of this explanation, assume the following:
(1) Login to the UNIX CPU as root
(2) The Ethernet Print Terminal is on the same network segment that the printer resides.

Step 1. Add the Print Server to /etc/hosts

Create a new entry in the /etc/hosts file on all UNIX CPUs that are slated to work with Ethernet Print Terminal. To create a new entry, add the following line:

IP_Address PS_NAME # comment

where: IP_Address is an IP address.
    PS_NAME is a CPU name of a print server.
    The statement after # is the comment for the new entry.

e.g. 90.3.2.2 ETPS1 # Ethernet Terminal

This example assigns the name ETPS1 to the Ethernet Print Terminal with IP address 90.3.2.2.

Note: The IP address is defined in setup Screen of Ethernet Print Terminal, as a Local IP address. Use the same one.

Step 2. Check to see if above steps are completed

To verify if the IP address of print Server function is installed successfully, issue the following ping command:

ping PS_NAME [Enter]

e.g. ping ETPS1 [Enter]

4.6.2 Setup for LPD

Follow those steps from step 1 to step 2 described in Basic Setup. The following steps are dependent on the operating system. Please refer to the UNIX administration guide. The following illustrated steps are under BSD system.

Step 3. Create a spooling directory

Use mkdir command to create a directory for spooling.

e.g. mkdir/usr/spool/ETPS1

Step 4. Make the directory available to LPD main process

Basically, the method has the following three procedures:

1) Assign the spooling daemon as the owner of this directory.
2) Allow the spooling daemon to be able to read from or write to the directory.
3) Enable the group of LPD main processes to be able to read from or write to the directory.

e.g. If it works on a BSD UNIX host and makes the directory /usr/ spool/ETPS1 (created in step 3) available, then follow these three procedures:
>   chown daemon /usr/spool/ETPS1
>   chmod 775 /usr/spool/ETPS1
>   chgrp daemon /usr/spool/ETPS1

Step 5. Add a remote printer

To add a remote printer, insert a block similar to the following in the /etc/printcap file.

```
Printer_name|Remote Printer on Ethernet Terminal:\
:lp=:\
:rm=PS_NAME:\
:rp=Logic_Printer_name:\
:sd=<full path of spooler directory name>:\
```

e.g. If Ethernet Print Terminal works on a BSD UNIX host, then insert the following block into /etc/printcap file.

```
ETPS1|Remote Printer on Ethernet Terminal:\
:lp=:\
:rm=ETPS1:\
:rp=L1:\
:sd=/usr/spool/ETPS1:\
```

Step 6. Start CPU's print mechanism for BSD version UNIX system

Typing: lpc start printer_name [Enter]

e.g. lpc start ETPS1 [Enter]

Now the Ethernet Print Terminal is configured to accept LPD printing..

4.6.3 LPD printing

LPD protocol is built-in to most of the UNIX system. However, detailed implementation of LPD differs among UNIX systems. Please refer to the UNIX administration guide for reference. The following illustrated printing command is under BSD system or System V version.

For BSD system: lpr -P <printer_name><filename>
For System V version: lp -d <printer_name><filename>

This command is to print selected file to the selected printer.

e.g. lpr -PETPS1 /etc/hosts (BSD version) or lp -dETPS1 /etc/hosts (System V version)
    This example is to print the /etc/hosts file to the Ethernet Print Terminal printer.

4.6.4 Setup for TFTP

When working on the BSD UNIX system, run the setup procedure under Setup for LPD on page 61. Otherwise run the Setup for LPD omitting step 6.

4.6.5 TFTP Printing

Before using TFTP printing, the Ethernet Print Terminal needs to be installed completely by Setup for TFTP (above). TFTP Printing lets the user send print jobs to the printers directory. There are no spooling mechanisms involved. Consequently, if that printer is not ready, the TFTP process will be terminated immediately without sending print jobs to printers. The user must make sure the printer is ready to print before issuing the TFTP command to have a successful result.

Log into the Ethernet Print Terminal with this command:
    tftp <PS_NAME>
and then type:
    put <file Name> Ln
where Ln is a logic printer for L1 to L8

    e.g. tftp ETPS1
        tftp > put /etc/hosts L1

This example prints the /etc/hosts file to the logic printer 1 of Ethernet Print Terminal printer ETPS1.

5. HARDWARE INFORMATION

Introduction

This chapter provides information on hardware specifications, pinouts for the Ethernet cable, pinouts for port connectors, and pinouts for the cable adapters.

5.1 Hardware Specifications: TERMINAL

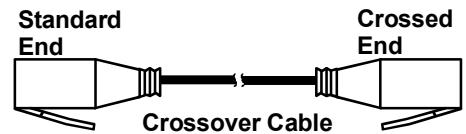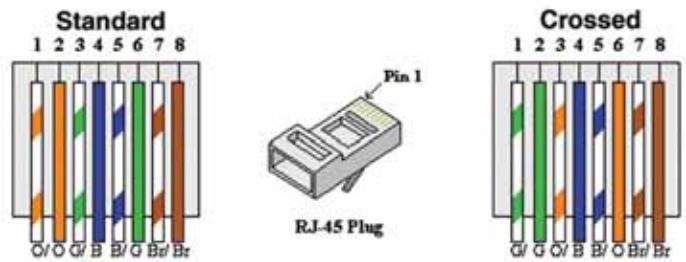| Physical	
Size (In.) WxDxH	19x18.4x1.75
Weight	23.3 lbs.
Temperature	0°~38°C operating, -30°~60°C storage
Humidity	17% to 96% non condensing
Power Supply	Auto -ranging 90-262 VAC, 47-63Hz
Power Consumption	60W (max), <25W (standby)
Cables Included	Powercord (IEC320)
Terminal Emulation	
Emulations	VT52, VT100, VT220, Console ANSI, PC TERM, TVI910+/925, WY-50+, WY-60, WY-100, WY-120, WY-325, PCG Alpha
Character matrix	7x12 dot matrix in 10x16 cell with 3 dot descenders
Screen size	80x25
Page length	1, 2, or 4 screens (multiple screen page length reduces maximum number of possible telnet sessions)
Cursor	Blink or steady, block or underline
Modes	Full duplex, half duplex, block mode, half block mode
Color modes	16 foreground and 16 background colors
Communication Ports	
Network port	One RJ45 10Base-T Ethernet port
Local printer ports	One DB25F Parallel and one DB9M RS232 port
Serial baud rates	50 to 115,200 bps
Data format	7 or 8 data bits with or without parity, 1 or 2 stop bits
Serial handshake	XON/XOFF, XPC, and hardware DTR
Communications options	Single RS232 server connection, or up to 16 Ethernet telnet sessions to predefined IP addresses. Both serial and Ethernet connections can not be used concurrently.

5.2 Hardware Specifications: SERIMUX

Attribute	Value
Operating temperature	40°F to 120°F (5°C to 50°C)
Storage temperature	-20°F to 140°F (-29°C to 60°C)
Humidity	10% to 90% non-condensing
Power supply External	100 - 240VAC, 50/60 Hz, 1.0A (max)
Power consumption	DC input: 0.8A/5VDC, 4.5 W (typical), 8W (max)
Operating system	Linux Hard Hat embedded
SDRAM	64 megabytes
Flash memory	8 megabytes

5.3 CPU-to-RACKMUX Ethernet Crossover Cable

In order to make a direct connection between a CPU and the ETHERNET connector of the RACKMUX, a crossover cable must be used. The cable is made with CAT5 cable terminated with RJ45 connectors and wired according to the chart below.

Pin assignment at Standard End	Wire Color	Pin assignment at Crossed End
1	White/Orange	3
2	Orange	6
3	White/Green	1
4	Blue	4
5	White/Blue	5
6	Green	2
7	White/Brown	7
8	Brown	8

Standard
1 2 3 4 5 6 7 8

Pin 1

RJ-45 Plug

Crossed
1 2 3 4 5 6 7 8

Standard End

Crossed End

Crossover Cable

5.4 Serial Port Cabling

The SERIMUX simplifies cabling. The RJ45 8-pin configuration matches all SUN and Cisco RJ45 console port configurations, enabling CAT 5 cabling without pinout concerns. Three DB25 and one DB9 adapters come in the package. A DB25 male, a DB25 female, and a DB9 adapter support console management applications. A DB25 male adapter provides a modem connection. See the cable adapter information that follows later in this chapter.
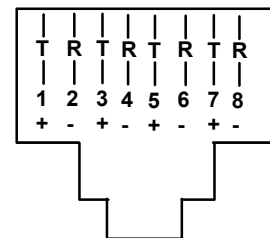
Note: The cable length restrictions common to RS232 cables apply to the SERIMUX serial cable as well.

5.5 Serial Port Pinouts

The SERIMUX uses an RJ45 connector for serial ports. Pin assignments are as follows:

SERIMUX Ports

Pin	Description
1	CTS
2	DSR
3	RxD
4	GND
5	DCD: Note Inbound signal can also be used as a second ground.
6	TxD
7	DTR
8	RTS

T R T R T R T R
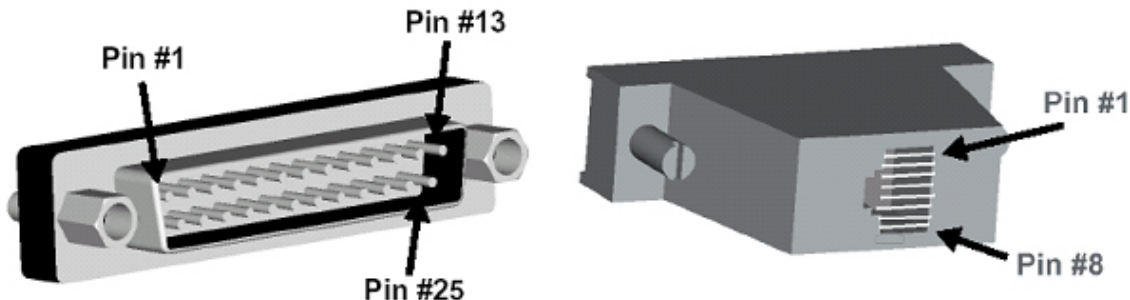1 2 3 4 5 6 7 8
+ - + - + - + -

Mating face of an RJ45 Female

5.6 Cable Adapters

The SERIMUX comes with four cable adapters. The following illustrations show cable adapter pin outs. Additional adapters can be purchased from NTI.
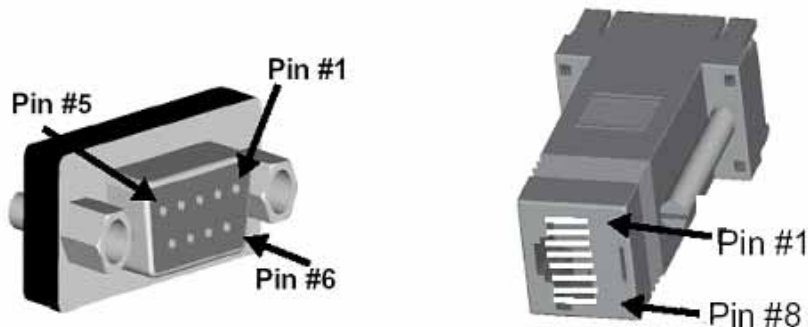
DB25 Male Console Adapter (NTI P/N DB25M-RJ45F-T)

DB25 Male to RJ45 Connector Pin Assignments

RJ45	Signal		DB25M	Signal
1	CTS	Connected to	4	RTS
2	DSR	Connected to	20	DTR
5	DCD			
3	RxD	Connected to	2	TxD
4	GND	Connected to	7	GND
6	TxD	Connected to	3	RxD
7	DTR	Connected to	6	DCD
			8	DSR
8	RTS	Connected to	5	CTS

DB9 Female Console Adapter (NTI P/N DB9F-RJ45F)

DB9 Female to RJ45 Pin Assignments

RJ45	Signal		DB9F	Signal
1	CTS	Connected to	7	RTS
2	DSR	Connected to	4	DTR
5	DCD			
3	RxD	Connected to	3	TxD
4	GND	Connected to	5	GND
6	TxD	Connected to	2	RxD
7	DTR	Connected to	1	DCD
			6	DSR
8	RTS	Connected to	8	CTS

DB25 Female Console Adapter (NTI P/N DB25F-RJ45F)
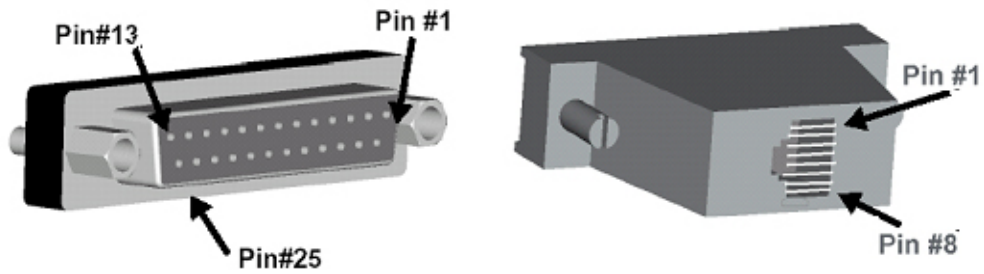
DB25 Female to RJ45 Pin Assignments

RJ45	Signal		DB25F	Signal
1	CTS	Connected to	4	RTS
2	DSR	Connected to	20	DTR
5	DCD			
3	RxD	Connected to	2	TxD
4	GND	Connected to	7	GND
6	TxD	Connected to	3	RxD
7	DTR	Connected to	6	DCD
			8	DSR
8	RTS	Connected to	5	CTS

DB25 Male Modem Adapter (NTI P/N DB25M-RJ45F-C)
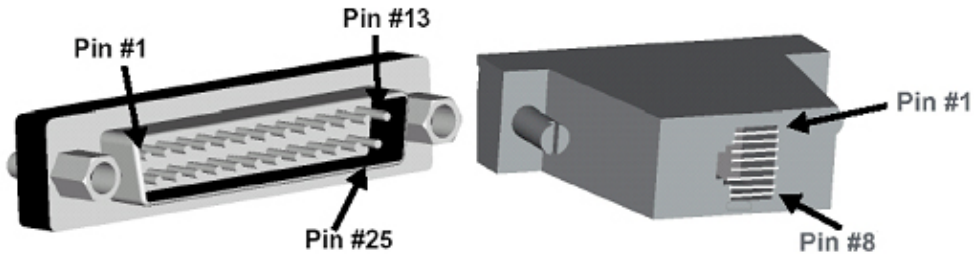
DB25 Male Modem to RJ45 Pin Assignment

RJ45	Signal		DB25M	Signal
1	CTS	Connected to	5	CTS
2	DSR	Connected to	6	DSR
3	RxD	Connected to	3	RxD
4	GND	Connected to	7	GND
5	DCD	Connected to	8	DCD
6	TxD	Connected to	2	TxD
7	DTR	Connected to	20	DTR
8	RTS	Connected to	4	RTS

5.7 TERMINAL Connector Pin Assignments

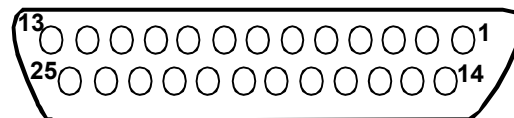**Serial Port (Serial 2) Connector Pin Assignments**
(RS232C 9-pin connector)

Pin	Signal	Mnemonic Direction
1	Data carrier detect	DCD In
2	Receive data	RxD In
3	Transmit data	TxD Out
4	Data terminal ready	DTR Out
5	Signal ground	SGND
6	Data set ready	DSR In
7	Request to send	RTS Out
8	Clear to send	CTS In
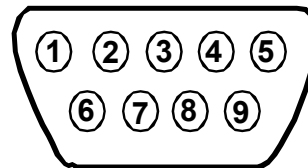
Mating Face
of 9D Male

Printer Port Connector Pin Assignments
**(Compatible with the IBM PC parallel port)**

Pin	Signal	Mnemonic Direction
1	-Strobe	Out
2	Data bit 0	Out
3	Data bit 1	Out
4	Data bit 2	Out
5	Data bit 3	Out
6	Data bit 4	Out
7	Data bit 5	Out
8	Data bit 6	Out
9	Data bit 7	Out
10	-Acknowledge	In
11	Busy	In
12	Paper end	In
13	Slct	In
14	-Auto feed XT	Out
15	-Error	In
16	-Init	Out
17	-Slctn	Out
18-25	Ground	Out

SUB-D 25
female connector

Ethernet Connector Pin Assignments
(RJ45 8 pin female connector)

Pin	Signal	Direction
1	Transmit +	Out
2	Transmit -	Out
3	Receive +	In
6	Receive -	In
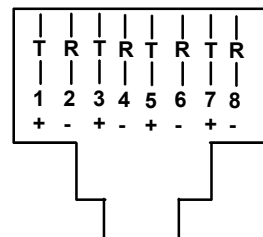
Mating face of an RJ45 Female

Appendix A - SERIMUX Port Characteristics

Every port is defined through the following parameters:

Description	Acceptable Value	Default Value
Number	0-8/16/24/32	Same (not changeable)
Name	Up to 15 characters	"Port00" to "Port32"
Type – port 0	User	User (not changeable)
Type – except port 0	User or Host	Host
Baud rate – port 0	300-115200	9600
Baud rate – except port 0	50-128000	9600
Data bits per character – port 0	7,8	8
Data bits per character – except port 0	5,6,7,8	8
Stop bits – port 0	1, 2	1
Stop bits – except port 0	1, 1-1/2, 2	1
Parity	No parity, even, odd	No parity
Handshake mode (flow control)	Xon / Xoff (or in-band, or software), RTS/CTS (or out-band or hardware), Both, None	None
Xon character	any ASCII nonprintable character (0-31 range)	Ctrl+Q (17)
Xoff character	any ASCII nonprintable character (0-31 range)	Ctrl+S (19)
Inter-character delay – except port 0 (no delay allowed on port 0)	1-60 milliseconds, none	None
Line break receive allowance – except port 0 (no allowance for port 0)	Yes or No	No
Transmitted line break extra duration (added to 1 character transmission time) – except port 0 (no extra duration for port 0)	No break transmitted, 1-999 milliseconds	No break transmitted
In-band disconnect sequence	0 (disabled), 1, or 3 characters sequence	1-char sequence
1 character disconnect sequence	Any ASCII nonprintable character (0-31 range)	Ctrl+X (24)
3 character disconnect sequence	Any 3 ASCII characters	``` (3 back quotes)
Connection timeout	1-90 minutes, never	15 minutes
DTR output upon disconnect	Low, high, or pulsed for 0.5 seconds and then held high	High
Modem Reset string	Up to 41 characters	ATZ
Modem Initialization string	Up to 41 characters	AT&F&C1&D2S0=0
Modem Disconnect string	Up to 41 characters	ATH

Appendix B - SERIMUX User and Administrator Characteristics

The users and the administrator are defined through the following parameters:

Description	Acceptable Value	Default Value
Users:		
User number	1 to 32	Same (not changeable)
User name	Up to 15 characters – case sensitive	"User01" to "User32"
User password	Up to 31 characters – case sensitive	"" (empty string)
User enabled	Yes or No	Not enabled, except User 1: enabled
Administrative privileges	Yes or No	No
Access to ports	Port 0 always; Ports 1-31	Port 0, except User 1: all ports
User menu timeout	1-90 minutes, never	15 minutes
Administrator:		
Administrator name	"root" – case sensitive	Same (not changeable)
Administrator password	Up to 31 characters – case sensitive	"nti"
Administrator menu timeout	1-90 minutes, never	15 minutes
User to auto login	User 1-32, None	User 1

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WARRANTY INFORMATION

The warranty period on this product (parts and labor) is two (2) years from the date of purchase. Please contact Network Technologies Inc at **(800) 742-8324** (800-RGB-TECH) or **(330) 562-7070** or visit our website at http://www.networktechinc.com for information regarding repairs and/or returns. A return authorization number is required for all repairs/returns.

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