Standard Tunneling Configuration

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Standard Tunneling Protocol

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As a member of the Automation Protocols Suite (APS), Standard Tunneling Communications Protocol can be loaded into any of the IAP family of products from Lantronix.

Standard Tunneling is a serial communications protocol used by most Lantronix Device Servers. It can be configured to Ethernet-enable most of the serial devices. Barcode scanners and decoders, weigh scales, electronic operator panels, digital data access devices, alpha numeric displays a, and thousands of intelligent serial devices can be connected to the Ethernet or even the Internet using the Standard Tunneling Protocol coupled with the Lantronix Device Server Technology.

Certain parameters must be configured before the Device Server can be used on a network. The Device Server can be configured locally or remotely using the following procedures:

1   Use a Telnet connection to configure the unit over the network.

2   Use a terminal or terminal emulation program to access the first serial port (CH 1) locally.

3   Use a standard Web browser to access the Device Server's internal Web pages and configure the unit over the network.

4   Use UDP datagrams to configure the unit over the network.

The Device Server's configuration is stored in nonvolatile memory (NVRam) and is retained without power. The configuration can be changed at any time. The Device Server performs a reset after the configuration has been changed and stored.

Network Configuration Using a Web Browser

If your Device Server already has an IP address, you can log into it using a standard Web browser with Java enabled.

1 Type the Device Server's IP address into the Web browser's URL (Address/Location) field.

Figure 0-1: Web Browser Login
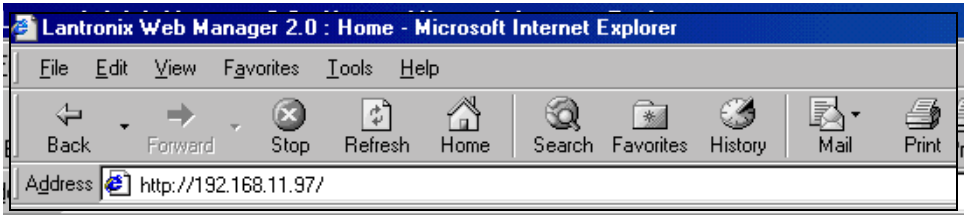
Once you have connected to the Device Server, you will see the Lantronix Web Manager interface.

2 Select **Connect** to log in and gain access to the configuration menu.

3 Use the menu to navigate to subpages where you can configure server settings.

Figure 0-2: Web Manager Interface
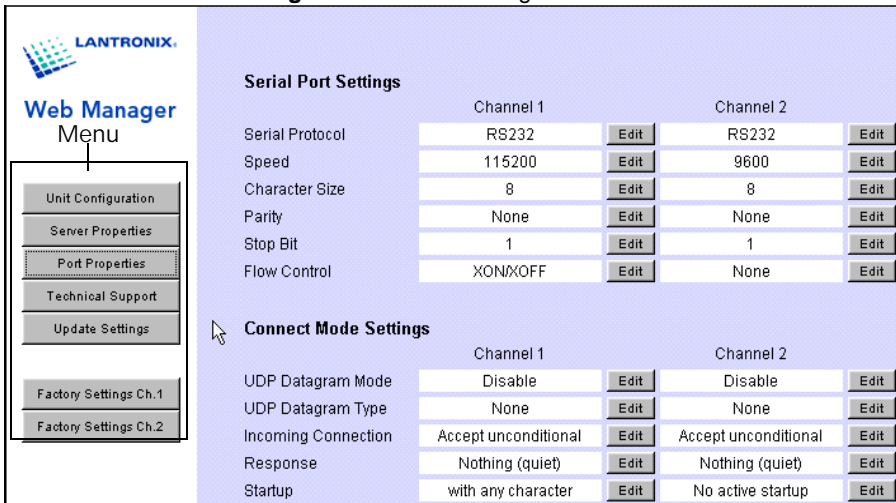
Network Configuration Using a Telnet Connection

To configure the Device Server over the network, establish a Telnet connection to port **9999**. From the Windows Start menu, click **Run** and type the following command, where x.x.x.x is the IP address and 9999 is the Device Server's fixed network configuration port number. Click **OK**.

Figure 0-3: Network Login Using Telnet

```
telnet x.x.x.x 9999
```

Note: *Be sure to include a space between the IP address and 9999.*

Serial Configuration

For local configuration, a terminal or a PC running a terminal emulation program can be connected to the Device Server's first serial port (CH 1). The terminal (or emulation) must be configured for 9600 baud, 8-bit, no parity, and 1 stop bit, no flow control.

To enter Setup (configuration) Mode, cycle the Device Server's power (power off and back on). After power-up, the self-test begins and the Diagnostic and Status LEDs start blinking. You must enter three lowercase "x" characters (**xxx**) within one second after powering up in order to start the configuration mode.

> **Note:** *The easiest way to enter Setup Mode is to hold down the "x" key on your keyboard while powering up the Device Server.*

Configuration Parameters

After entering Setup Mode (confirm by pressing **Enter**), you can configure the parameters by entering one of the numbers on the Change Setup Menu, or you can confirm default values by pressing **Enter**. Be sure to store the new configurations when you are finished. The Device Server will then perform a power reset.

Figure 0-4: Setup (Configuration) Mode Screen

```
*** Lantronix Device Server ***
Serial Number 120216  MAC address 00:20:4A:12:0A:38
Software Version 04.30 (001117)
Press Enter to go into Setup Mode


*** basic parameters
Hardware: Ethernet Autodetect
IP addr 192.168.1.10, gateway 192.168.001.001,netmask
255.255.255.000

**************** Security ****************
Telnet setup is       enabled
TFTP download is      enabled
Port 77FEh is         enabled
Web setup is          enabled
Enhanced password is  disabled
Encryption is         disabled
**************** Channel 1 ****************
Baudrate 9600, I/F Mode 4C, Flow 00
Port 10001
Remote IP Adr: --- none ---, Port 00000
Connect Mode: C0      Disconn Mode: 00
Flush   Mode: 00

**************** Channel 2 ****************
Baudrate 9600, I/F Mode 4C, Flow 00
Port 10002
Remote IP Adr: --- none ---, Port 00000
Connect Mode: C0      Disconn Mode: 00
Flush   Mode: 00


Change Setup:     0 Server configuration
                  1 Channel 1 configuration
                  2 Channel 2 configuration
                  6 Security
                  7 Factory defaults
                  8 Exit without save
                  9 Save and exit           Your choice ?
```

Server Configuration

Select **0** to configure the Device Server's basic parameters.

IP Address

The IP address must be set to a unique value in your network. The Device Server will not connect to the network if the assigned IP address is already in use by another device.

Gateway Address

The gateway address, or router, allows communication to other LAN segments. The gateway address should be the IP address of the default router connected to the same LAN segment as the Device Server.

> **Note:** *The gateway address must be within the local network.*

Subnet Mask

A subnet mask defines the number of bits taken from the IP address that are assigned for the host section.

> **Note:** *Standard Class A: 24 bits; Standard Class B: 16 bits; Standard Class C: 8 bits.*

The Device Server prompts for the number of host bits to be entered, then calculates the subnet mask, which is displayed in standard decimal-dot notation when the saved parameters are displayed (for example, 255.255.255.0).

Telnet Configuration Password

Setting the Telnet configuration password prevents unauthorized access to the setup menu via a Telnet connection to port 9999. The password is limited to 4 characters. An enhanced password setting of 16 characters is available under Security Settings.

> **Note:** *No password is required to access the setup menu via a serial connection.*

DHCP Naming

The DHCP name of the Device Server can be changed. The default name of the Device Server is Cxxxxxx, where xxxxxx is the last 6 digits of the Mac address. This option can be changed to LTXdd, where 0.0.0.dd is the IP address assigned (dd should be a number between 1 and 99). For example, by setting the IP address to 0.0.0.5, the resulting DHCP name is LTX05.

A DHCP name of the customer's own choosing (up to 8 characters) can also be designated. This option can be set in the server configuration menu.

Figure 0-5: Server Configuration Menu

```
Change DHCP device name (LTRX) ? (N) Y
Enter new DHCP device name : LTRXYES
```

Serial Channel (Port) Configuration

Select **1** to configure the Device Server's channel-specific parameters.

Baud Rate

The Device Server and attached serial device, such as a modem, must agree on a speed or baud rate to use for the serial connection. Valid baud rates are 300, 600, 1200, 2400, 4800, 9600 (default), 19200, 38400, 57600, and 115200 bits per second.

Interface Mode

The Interface (I/F) Mode is a bit-coded byte entered in hexadecimal notation. Use the following table to select Interface Mode settings.

Table 0-1: Interface Mode Options

Option	Bit 7	6	5	4	3	2	1	0
RS-232C							0	0
RS-422/485							0	1
RS-485 2-wire							1	1
7 Bit					1	0		
8 Bit					1	1		
No Parity			0	0				
Even Parity			1	1				
Odd Parity			0	1				
1 Stop bit	0	1						
2 Stop bits*	1	1						

*Only the DR1-IAP supports 2-stop bits.

The following table demonstrates how to build some common Interface Mode settings:

Table 0-2: Common Interface Mode Settings

Option	Binary	Hex
RS-232C, 8-bit, No Parity, 1 stop bit	0100 1100	4C
RS-232C, 7-bit, Even Parity, 1 stop bit	0111 1000	78
RS-485 2-Wire, 8-bit, No Parity, 1 stop bit	0100 1111	4F
RS-422, 8-bit, Odd Parity, 2 stop bits*	1101 1101	DD

*Only the DR1-IAP supports 2-stop bits.

Flow Control

Flow control sets the local handshaking for serial input/output. Generally, flow control is not required if the connection is used to pass a blocked protocol with block sizes less than 1k (ACK/NAK) or speeds less than 38400. Use the following table to select Flow Control options.

Table 0-3: Flow Control Options

Option	Hex
No flow control	00
XON/XOFF flow control	01
Hardware handshake with RTS/CTS lines	02
XON/XOFF pass characters to host	05

Port Number

This setting represents the source port number in TCP connections, and is the number used to identify the channel for remotely initiating connections. Range: 1024-65535.

◆ Port numbers 14000-14009 are reserved exclusively for use with the Comm Port Redirector application.

◆ Port number 9999 is reserved exclusively for Telnet setup.

◆ Port number 77FE (Hex) is reserved exclusively for configuration.

If the UDP mode is selected, the port number functions as the UDP source port number for outgoing datagrams. Datagrams sent to the Device Server with this port number are received to this channel.

Connect Mode

Connect Mode defines how the Device Server makes a connection, and how it reacts to incoming connections over the network. Use the following table to select Connect Mode options:

Table 0-4: Connect Mode Options

Option Bit	7	6	5	4	3	2	1	0
Incoming (network) Connection								
Never accept incoming	0	0	0					
Accept incoming with DTR	0	1	0					
Accept unconditional	1	1	0					
Response								
Nothing (quiet)				0				
Character response (C=conn, D=disconn, N=unreachable)				1				
Startup (on serial connection)								
No active startup					0	0	0	0
With any character					0	0	0	1
With active DTR*					0	0	1	0
With CR (0x0D) only					0	0	1	1
Manual connection					0	1	0	0
Autostart					0	1	0	1
Datagram Type								
Directed UDP					1	1	0	0
Modem Mode								
With response				1	0	1	1	0
Without response				0	0	1	1	0

Manual Connection

If manual connection startup is configured (**C** + address/port), only the portion not provided in the command string is used. Any portion not provided with this string will be completed with the preconfigured remote IP and the remote part of the Device Server setup. In manual mode, the last byte of the address must be provided.

For example, if the Device Server's configured remote IP address is 129.1.2.3, and the TCP port number is 1234:

Table 0-5: Manual Connection Address Example

Command String	Result
C121.2.4.5/1	Complete override; connection is started to the host 121.2.4.5, port 1
C5	Connect to 129.1.2.5, port 1234
C28.10/12	Connect to 129.1.28.10, port 12

Autostart (Automatic Connection)

For the serial port, automatic TCP connection to a network node can be configured by setting the remote IP address and the TCP port number parameters. If automatic connection is selected, all parameters must be provided.

Datagram Type

When selecting this option, you will be prompted for the Datagram type. For example, enter **01** for directed UDP.

Modem (Emulation) Mode

In Modem Mode, the Device Server presents a modem interface to the attached serial device. It accepts AT-style modem commands and handles the modem signals correctly.

Normally there is a modem connected to a local PC and a modem connected to a remote machine. A user must dial from the local PC to the remote machine, accumulating phone charges for each connection. Modem Mode allows you to replace modems with Device Servers, and to use an Ethernet connection instead of a phone call, without having to change communications applications and make potentially expensive phone calls.

> **Note:** *If the Device Server is in Modem Mode and the serial port is idle, the Device Server can still accept network TCP connections to the serial port if Connect Mode is set to **C6** or **D6**.*

Modem Mode is selected by setting the connect mode to **06** or **16**.

In Modem Mode, echo refers to the echo of all of the characters entered when there is no network connection to or from the serial port. No echo refers to the Device Server not sending an answer to the commands received or echoing any characters entered.

To enter command mode:

There *must* be 1-second guardtime (no data traffic) before sending +++.

There *cannot* be a break longer that 1 second between +s.

There *must* be another 1 second guardtime after the last + is sent.

The Device Server acknowledges with an OK to indicate that it is in command mode.

Enter AT and press **Enter**. It is echoed if echo is enabled. AT is acknowledged by an OK.

Table 0-6: Modem Mode Commands

Command	Function
ATDTx.x.x.x,pppp or ATDTx.x.x.x/pppp	Makes a connection to an IP address (x.x.x.x) and a remote port number (pppp).
ATDTx.x.x.x	Makes a connection to an IP address (x.x.x.x) and the remote port number defined within the Device Server.
ATD0.0.0.0	Forces the Device Server into monitor mode if a remote IP address and port number are defined within the Device Server.
ATD	Forces the Device Server into monitor mode if a remote IP address and port number **are not** defined within the Device Server and connects if there is an IP and port in the Device Server.
ATDx.x.x.x	Makes a connection to an IP address (x.x.x.x) and the remote port number defined within the Device Server.
ATH	Hangs up the connection (entered as **+++ATH**).

Note: *All other AT commands with Modem Mode set to **16** acknowledge with an OK, but no action is taken. Also, there is no response to any entry other than an AT command.*

Remote IP Address

This is the destination IP address used when the Device Server makes network connection to an IP address.

Remote Port

This parameter defines the port number on the target host to which a connection is attempted.

Note: *To connect an ASCII terminal to a host using the Device Server for login purposes, use the remote port number 23 (Internet standard port number for Telnet services).*

Disconnect Mode

Use the following table to select Disconnect Mode Options:

Table 0-7: Disconnect Mode Options

Option	Bit	7	6	5	4	3	2	1	0
Disconnect with DTR drop[a]		1							
Ignore DTR[a]		0							
Telnet mode and terminal type setup[b]			1						
Channel (port) password[c]					1				
Hard disconnect[d]						0			
Disable hard disconnect						1			
State LED off with connection[e]									1
Disconnect with EOT (^D)[f]				1					

a. DTR is an input signal on a DCE serial port.
b. The CoBox-FL-IAP will send the "Terminal Type" upon an outgoing connection.
c. A password is required for a connection to the serial port from the network.
d. The TCP connection will close even if the remote site does not acknowledge the disconnection.
e. When there is a network connection to or from the serial port, the state LED will turn off instead of blink.
f. When Ctrl D or Hex 04 are detected, the connection is dropped. Both Telnet mode and Disconnect with EOT must be enabled for Disconnect with EOT to function properly. Ctrl D will only be detected going from the serial port to the network.

Flush Mode (Buffer Flushing)

Using this parameter, you can control line handling and network buffers with connection startup and disconnect. You can also select between two different packing algorithms. Use the following table to select Flush Mode options:

Table 0-8: Flush Mode Options

Function	Bit	7	6	5	4	3	2	1	0
Input Buffer (Serial to Network)									
Clear on active connection (from serial)					1				
Clear on passive connection (from network)				1					
Clear at disconnect			1						
Output Buffer (Network to Serial)									
Clear on active connection (from network)									1
Clear on passive connection (from serial)								1	
Clear at disconnect							1		
Alternate Packing Algorithm									
Enabled		1							

Pack Control

Alternate packing algorithm settings are enabled in Flush Mode. Set this value to **00** if specific functions are not needed. Use the following table to select Pack Control options:

Table 0-9: Pack Control Options

Option	Bit 7	6	5	4	3	2	1	0
Idle Time								
Force transmit: 12ms							0	0
Force transmit: 52ms							0	1
Force transmit: 250ms							1	0
Force transmit: 5sec							1	1
Trailing Characters								
None					0	0		
One					0	1		
Two					1	0		
Send Characters								
Sendchars Define 2-Byte Sequence			1					
Send Immediately After Sendchars		1						

Idle Time

Idle time to "Force transmit" defines how long the Device Server will wait between data bytes before sending accumulated characters, regardless of the recognition of send characters.

Trailing Characters

In some applications, CRC, Checksum, or other trailing characters follow the end-of-sequence character; this option helps to adapt frame transmission to the frame boundary.

Send Characters

If "Send Characters Define 2-Byte Sequence" is enabled, the Device Server interprets the sendchars as a 2-byte sequence; if not set, they are interpreted independently.

If "Send Immediately After Send Characters" is **not** set, any characters already in the serial buffer are included in the transmission after a "transmit" condition is found. If set, the Device Server sends the data in the buffer immediately after recognizing the transmit condition (sendchar or timeout).

Inactivity (Disconnect) Timeout

Use this parameter to set an inactivity timeout. The connection is dropped if there is no activity on the serial line before the set time expires. Enter time in the following format: mm:ss, where "m" is the number of minutes and "s" is the number of seconds. To disable the inactivity timeout, enter **00:00**.

Send Characters

You can enter up to two characters in hexadecimal representation in the parameters "sendchar." If a character received on the serial line matches one of these characters, it is sent immediately, along with any awaiting characters, to the TCP connection. This minimizes the response time for specific protocol characters on the serial line (for example, ETX, EOT, etc.). Setting the first sendchar to **00** disables the recognition of the characters.

Alternatively, the two characters can be interpreted as a sequence (see *Pack Control* on page -16).

Telnet Terminal Type

This parameter appears only if the terminal type option is enabled in Disconnect Mode (see *Disconnect Mode* on page -14). If set, you can use the terminal name for the Telnet terminal type. Enter only one name.

If the terminal type option is enabled, the Device Server also reacts to the EOR (end of record) and binary options, which can be used for applications like terminal emulation to IBM hosts.

Note: *The Telnet terminal type password and the channel (port) password cannot be active at the same time.*

Channel (Port) Password

This parameter appears only if the channel (port) password option is enabled in Disconnect Mode (*Disconnect Mode* on page -14). If set, you can set a password on the serial port. The maximum length of the password is 16.

Note: *The Telnet terminal type password and the channel (port) password cannot be active at the same time.*

Security Settings

Note: *We recommend that you set security over the dedicated network or over the serial connection. If you set parameters over the network (Telnet 9999), someone else could monitor the data.*

Select **6** to choose security settings.

Disable Telnet Setup

This setting defaults to the **N** (No) option. The **Y** (Yes) option disables access to this configuration menu by Telnet (port 9999) or similar terminal programs. It only allows access locally on the serial port of the Device Server.

Disable TFTP Firmware Upgrade

This setting defaults to the **N** (No) option. The **Y** (Yes) option disables the use of TFTP to perform network firmware upgrades. With this option, firmware upgrades can be performed only by using a *.hex file over the serial port of the Device Server.

Disable Port 77FE (Hex)

Port 77FE is a setting that allows OEMs and others to configure the Device Server remotely. You may wish to disable this capability for security purposes. (For more information about remote configuration, see the Lantronix Embedded Integration Kit user guide on the Lantronix web site (http://www.lantronix.com).

The default setting is the **N** (No) option, which enables remote configuration. You can configure the Device Server only by using Telnet or serial configuration. The **Y** (Yes) option disables remote configuration.

Note: *The Yes option disables many of the GUI tools for configuring the Device Server, including the embedded Web Page Configuration tool.*

Disable Web Setup

This setting defaults to the **N** (option). The **Y** (Yes) option disables the use of the Web Page Configuration tool that is built into the Device Server.

Enable Encryption

This setting defaults to the **N** (No) option, which completely disables the 128-bit Twofish encryption algorithm. The **Y** (Yes) option enables 128-bit Twofish encryption and a 32-hexadecimal (0-9, A-F) digit encryption string to be set. Only another Device Server configured with an identical encryption string will be able to correctly decode data sent from this Device Server. For more information on the Twofish encryption algorithm, see www.counterpane.com.

> **Note:** *If you select **Y**, you must complete the settings. To escape, complete the settings and exit without saving.*

Enable Enhanced Password

This setting defaults to the **N** (option), which allows you to set a 4-character password that protects the configuration menu. The **Y** (Yes) option allows you to set a 16-character password.

Factory Default Settings

Select **7** to reset the Device Server's serial port to the factory default settings. The server's IP configurations remain unchanged.

Exit Configuration Mode

Select **8** to exit the configuration mode without saving any changes, or select **9** to exit and save all changes. All values are stored in nonvolatile memory, and the Device Server resets.