DL4500

User Manual

Revision 2.04 – May 23, 2013

Contents

1   General Operation and Applications

The DL4500 hardware platform was designed to be a gateway which interfaces your Ethernet TCP/IP or to AB's Data Highway Plus (DH+), or DH-485 networks. Thus extending the life of existing Allen-Bradley PLC's and SLC's without Ethernet Interfaces. It comes in a DC powered Din-Rail Mountable compact cabinet for ease of portability and installation.   The DL4500 combines the Lantronix Ethernet Microprocessor with our proven A-B interface.

The DL4500 comes with a RJ-45 Connector for the 10 Base-T Ethernet link, and a 3 pin Phoenix plug for connection to A-B networks. Power is supplied via a 2 pin Phoenix type plug which allows for 9-27 Volts DC to be connected. Included is a RS232 DB9 Configuration Port for access to the BIOS and Flash Burn Utilities.

Configuration of the operating parameters is done quickly and easily via the Ethernet Link by Telnet or the supplied Lantronix Device Installer software.   Serial port encapsulation of the DF1 protocol over TCP/IP is handled by the supplied COM Port

Redirector software also supplied by Lantronix. Current releases of the software can be obtained from Lantronix's Website.

There is also the option of RAW tunneling of DF1 using other Ethernet TCP/IP drivers such as Kepware.

2   Hardware Specifications and Layout

The DL4500 Hardware Platform has the following specifications.

2.1   Operating Specifications

Our DH+ versions A-B Channel allows Synchronous Transformer Coupled SDLC connection to Allen Bradley DH+. Speeds of 57.6K, 115.2K and 230.4K Baud are available in both networks.

Our DH-485 versions A-B Channel allows for Isolated DH-485 (RS485) connection to Allen Bradley DH-485 network. Speeds of 4800, 9600 and 19.2K (default) Baud are available.

Ethernet Channel allows 10 Base-T connections to TCP/IP and other Ethernet networks.

Currently Full and Half Duplex DF1 protocol with BCC error checking is tunneled over the Ethernet TCP/IP link. Modbus TCP makes use of our proven Modbus to AB network interoperability.

Simple Parameter Configuration using menu driven Windows based Programs via Ethernet 10 Base-T.

Configuration and Reset Pushbuttons go into BIOS features and Flash Setup and do a full Hardware Reset.

Operating Parameters are stored in Non-Volatile Serial EEPROM.

The DL4500 uses FLASH upgradeable firmware from either the supplied DL32 configuration program or once can use a HyperTerminal type program set to 9600,N,8,1 and XON/XOFF flow control.

Bi-Color (Green/Red) LED's for Ethernet and A-B Channels indicates activity and status. Green POWER LED indicates power on.
Green LED's for Ethernet Link and Tunneling Status.

Red LED for Ethernet Diagnostic Status.

2.2   Physical Specifications

Dimensions: 1.2" H x 4.75" D x 3.2" W (30.4 x 120.7 x 81.3 mm) - Weight 0.56 Lbs (0.2 Kg)
Installation: Metal Enclosure; Desktop, # 8 Bolts, or Din Rail Mounting
Operating Environment: 32 to 122 °F (0 to 50 °C)
Storage: -40 to 185°F (-40 to 85°C)
Humidity: 5% to 95% non-condensing
Power: 9-27V DC - 1.8 Watts

2.3   Hardware Layout

This Section contains information of the physical position and purpose of the components of the DL4500.

The top row contains the following connectors. Going left to right.
- 2 pin Power Connector
- A-B Network 3 pin Screw terminal (Phoenix Type)

The LED's on the left side going from top to bottom.
- Ethernet Activity (TX/RX)
- A-B Network Status
- DL4500 Operating Mode and Status.

The LED's on the right side going from top to bottom.
- Ethernet Activity (Port TX/RX)
- Lantronix COBOX Diagnostic LED.
- 10 Base-T Ethernet Link Status

The RESET pushbutton is on the left side, the Configure pushbutton is on the right side.

The bottom side of the DL4500 has the following connectors: Going Left to Right.
- 9 Pin DM9M connector for Configuring the BIOS and Firmware
- RJ-45 connector for 10 Base-T Ethernet communications

3   Mode of Operation

3.1 Online Mode of Operation

Online Mode is the normal operating Mode of the DL4500. In this mode the Channels are now configured as they are defined by the A-B Network and Configuration. The DL4500 is ready to interface your equipment.

The Reset pushbutton automatically puts the DL4500 into Online mode.

3.2 Offline Mode

Once the Configure Pushbutton is pressed the Offline BIOS Manager is started. Using either the DL32 configuration software and the "DL Offline Manager" option or a Windows Hyper Terminal type program with com port settings of 9600 Baud, 8,N,1 and Xon/Xoff flow control.

```
BIOS MANAGER for DL4500-ENET- Revision 2.00 Dec 10, 04
     (c) Equustek Solutions Inc. 2004

          MAIN MENU

  1 - Restore EEPROM to Factory settings
  2 - WRITE new Firmware

  3 - Memory DUMP
  4 - OFF-LINE Diagnostics
  5 - DEBUG Mode

  6 - FIRMWARE Version
  7 – ONLINE
  8 – CONFIGURE Model Parameters

  MAKE SELECTION (1-8) -
```

3.2.1 BIOS Manager Options

Restore EEPROM to factory settings

Once pressed you will be asked "Restore EEPROM to defaults (Y/N)?" If the answer is "Y"es then the Online parameters will be reset to defaults of Address 1, and settings of 9600,N,8,1 on the communication Channel to the COBOX.

Write New Firmware

Once pressed the message "This *WILL* overwrite DATALINK system code enter (Y/N) to proceed" will be displayed. Hit "Y" and the next message will appear telling you that it is alright to send the new firmware to the Flash;

ERASING FLASH, PLEASE WAIT...

SEND FIRMWARE TEXT FILE NOW...

Once the message to send the firmware appears then either click on the "Burn Flash System File" button to select the .txt file to send, or send the Text File under HyperTerminal.
Wait for an "*A-OK* BURN COMPLETE!" message to appear.

Memory Dump

This is used to display the RAM memory of the DL4500. This should only be done after contacting Equustek Solutions to debug problems.

Off-Line Diagnostics

Starts a series of tests to test the DL4500's hardware and should only be done if instructed so by a trained person.

Debug Mode

Starts up a DL4500 internal Debug mode that can be used by trained personnel to debug problems and check hardware configuration and operation.

Firmware Version

Once selected the current DL4500 model and version numbers will be displayed. Can be used to check the correct firmware was burnt into the Flash or if the DL4500 has the most up to date firmware in the Flash.

Online

Does a soft "software" reset of the unit to put it online. This will NOT reset the COBOX (Ethernet) hardware.

4 Switch and LED Indicator Functions

4.1 Switch Functions

Reset Pushbutton

The Reset pushbutton will perform a complete hardware reset of the DL4500. It is identical to a complete power cycle and will cause the DL4500 to go through its LED start-up sequence as defined in Section 5.2.1. **A complete hardware reset is needed on changing any online operating parameters.**

Configure Pushbutton

The Configure pushbutton takes the DL4500 out of On-Line operation mode and puts it in the BIOS Manager mode. When this mode has been entered the Ethernet and Status will be RED and A-B Network will be out. To put the unit back On-line it is necessary to either press the Reset or cycle the DC power supplied to the DL4500.

4.2   Indicator Functions

4.2.1   Power-Up and Reset Sequence

On Power-up or after the Reset button has been pressed the DL4500 executes a self diagnostic check-up or the ram and flash firmware. The correct LED indicator sequence to show the DL4500 is functioning properly is as follows: After all LEDS go out.

LED	Status
Power	Green Continuously
Status	Green for 0.5 seconds
A-B Network	Green for 0.5 seconds
Ethernet	Green for 3 seconds

After this sequence the DL4500 goes into the On-line mode of Operation. The LED indicators will behave in the certain way defined by the DL4500 model used. Most likely the A-B Network will be solid or flashing depending on the A-B Network used.

4.2.2   Normal On-line Operation

The following is a description of the normal operation of the LED's on the DL4500.

LEFT LED's	Description of Operation
Power	Green Indicates Power is being supplied to the DL4500.
Ethernet	Flashes GREEN for 0.5 seconds when a character is Received or Transmitted. If Characters are being received of transmitted faster than this then it might appear the LED is on SOLID. Flashes RED for 0.5 seconds if a NAK is received or transmitted. Will also flash if all serial communication buffers are full.
A-B Network	**(DH+)** On Hardware Reset will flash GREEN and RED until a valid DH+ network is detected. This is the AUTO BAUD Rate detection mode, the DL4500 will automatically connect at the DH+ speeds of 57.6K, 115.2K and 230.4K Baud. LED will switch to on solid

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once the DL4500 is on the DH+ network as a valid node address. LED will flash GREEN when the DH+ is set to a certain Baud rate but is not on network.

(DH-485)
On Hardware reset the A-B Network will flash GREEN at a 1 second rate when the DH-485 is not on network. Once a valid network is running the LED will flash GREEN much more rapidly (approx. every 0.1 seconds), the rate depends on how busy the network is.

Status   Used for Determining Operating Mode and DL4500 Status

RIGHT LED's   Description of Operation

TX/RX   Lights Solid green to indicate an Ethernet socket is idle. Blinks green to indicate an Ethernet socket has been established and active.

Diagnostic   Blinks or lights solid red in combination with TX/RX led to indicate diagnostics and error detection.

Link   Lights Solid Green to indicate Ethernet Port is connected to the 10Base-T network.

4.2.3 On-Line, Power-Up and Reset Errors

The following table describes the meaning of LED patterns if the internal diagnostic tests detect an error on Reset/Power-Up.

LED Pattern	Description of Problem
Ethernet, A-B Network, and Status Flashing RED	The flash has not be burnt properly and the A-OK was not transmitted. Please reburn the flash with the correct text file. Contact Customer Support for help.
Ethernet, A-B Network, and Status Solid RED	The BIOS has been corrupted. A new Flash Chip has to be supplied by the factory. Please contact Customer support.
Start-up Sequence keeps repeating	The DL4500 EEPROM is corrupt.. Please Restore to Factory Settings (See Section 4.3) and then reconfigure the unit.
A-B Network Flashing RED	There is a duplicate node on the A-B network. The DL4500 has been assigned a node address that is already in use.

Right TX/RX and Diagnostic	Red solid, green (TX/RX) blinking:
	    1x:EEPROM checksum error
	    2x:RAM error
	    3x:Network controller error
	    4x:EEPROM checksum error
	    5x:Duplicate IP address on the Ethernet Network
	    6x:Software does not match hardware
	
	Red blinking. Green (TX/RX) blinking:
	    4x: Faulty Ethernet connection
	    5x:No DHCP response received

4.2.4 Off-Line Modes

The following table describes the meaning of LED patterns in the different Off-Line modes of operation.

LED Pattern	Description of Operation
Ethernet & Status Solid RED	BIOS Manager
Ethernet & Status Solid Green A-B Network Solid Red	Offline Hardware Diagnostics Testing Mode
Ethernet Solid Red A-B Network & Status Solid Green	Offline Debug Mode

5   Configuration

The following sections describe how to setup and configure your DL4500 for the desired online operating parameters. To configure your DL4500, the following software will be needed.

Configuration Software
- Device Installer   -   Used to assign IP address and update Lantronix daughter board firmware.
- ComPort Redirector   -   Creates a virtual COM port and redirects it to the PC's Ethernet port.
- DL32 Configuration   -   Used to reburn the firmware for the DL4500 when upgrading or changing from Multi Master to Standard Tunnel or vice versa.

After the IP address of the DL4500 is assigned, you must then telnet to the DL4500 to setup the internal communications between the Lantronix daughter board and the DL4500 motherboard. These settings are reset every time an IP address is assigned.

5.1   Device Installer

The Device Installer is used to configure the IP address of the DL4500 as well as configure the internal communication settings between the Lantronix daughter board and the DL4500 mother board. The most recent version of Device Installer is *Device Installer 3.6.*
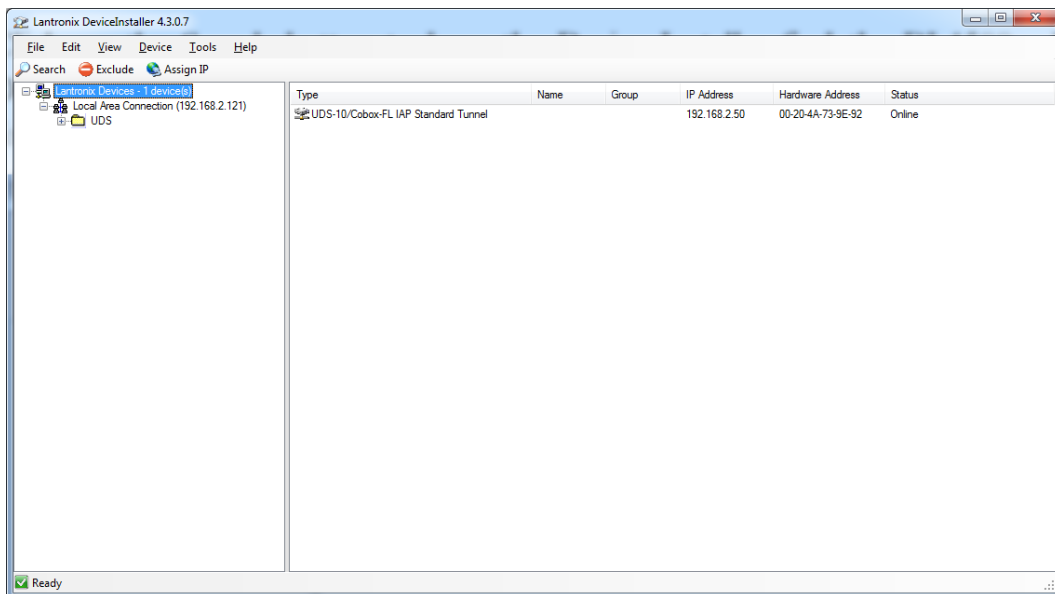
5.1.1 IP Address

To assign an IP address to the DL4500, open the Device Installer Software. You will then see a screen as shown below.
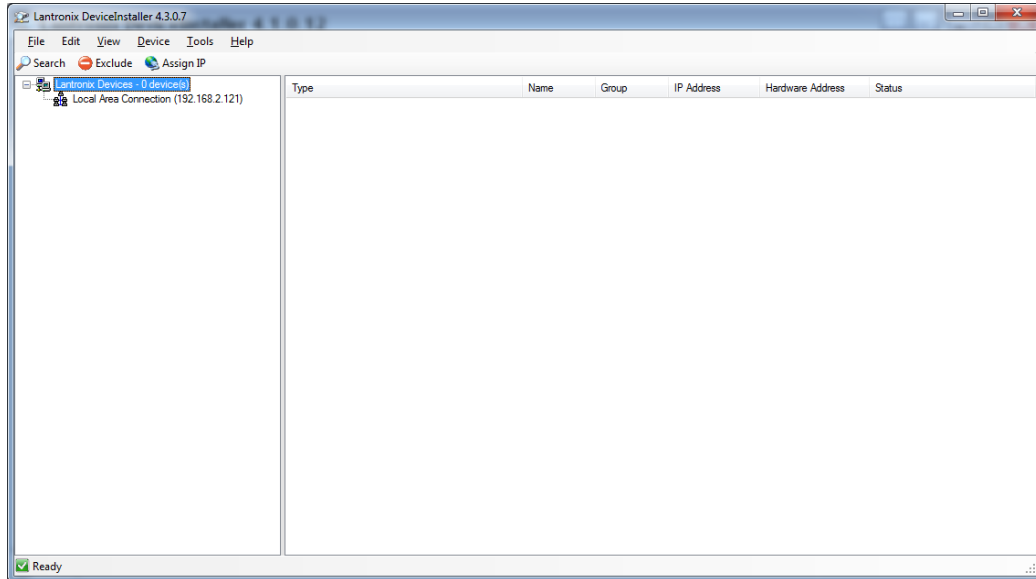
The following steps are used to assign an IP address to the DL4500.

1. Click on the Search button to have the Device Installer find the DL4500. If the Device Installer finds the DL4500, the device should appear. If the device cannot be found then follow the instructions at the end of the *IP Address* section.


2. Highlight the device and click on the Assign IP button. Choose the "*Assign a specific IP address*" option and click Next. The following window will appear.
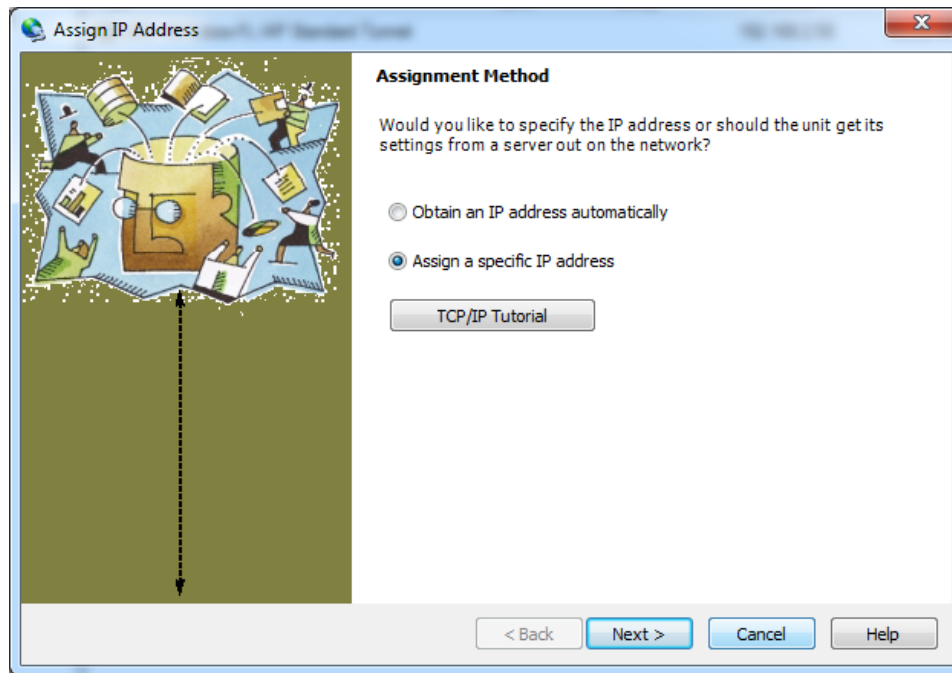
3. Enter the desired IP address, subnet mask, and default gateway (if required) and click Next.


4. To assign the chosen IP address to the DL4500, click the Assign button. When the IP address is assigned, a message stating that the IP address was successfully assigned should appear. Click the Finish button to close the screen and go back to the main menu.
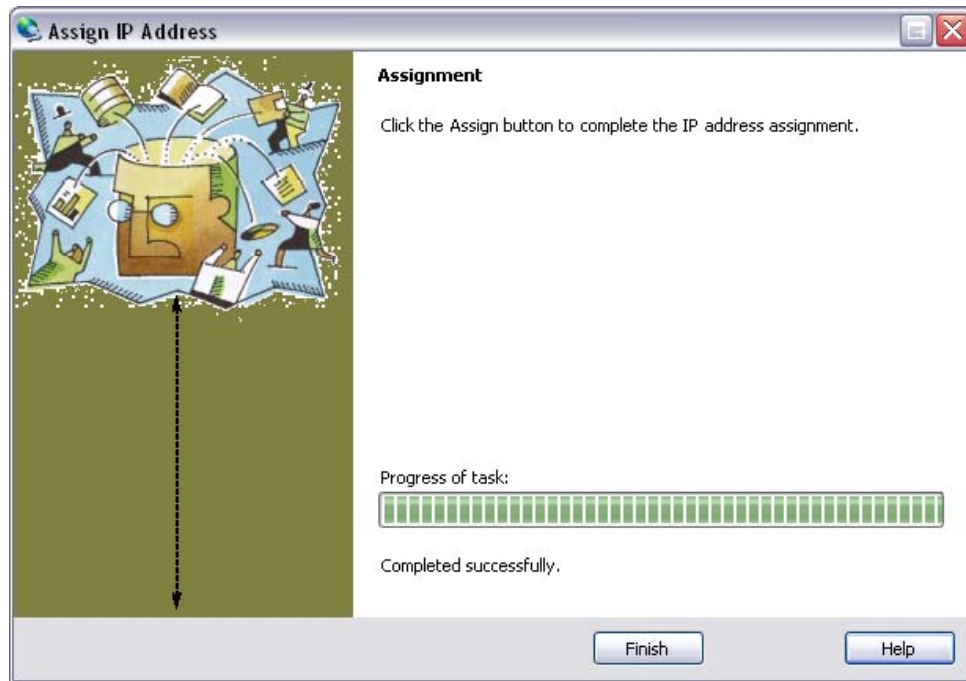
Device Not Found

If for some reason the Device Installer cannot find the DL4500 on the Ethernet network, follow the steps below.

1. Click the Assign IP button and the following screen will appear.
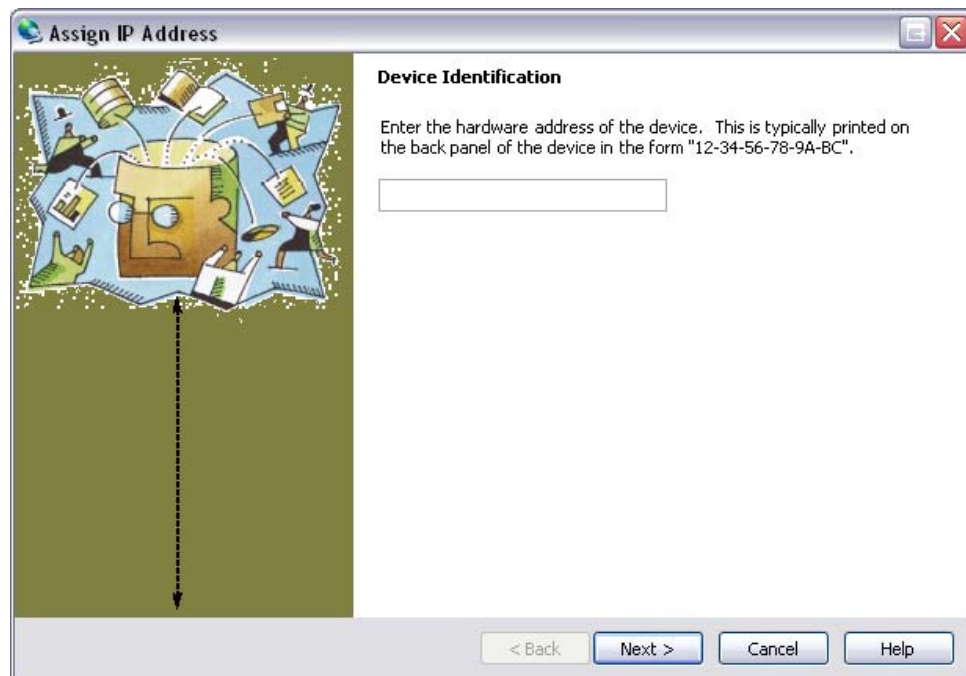
2. Enter MAC address of the DL4500 and click Next. This can be found on the bottom of the DL4500. The Device Installer should now find the device. Now follow the steps at the beginning of the *IP Address* section to assign an IP address. If for some reason the device still cannot be found, see section 9.1 Device Installer Cannot Find the DL4500.

5.1.2 Telnet

After the IP address of the DL4500 is assigned, the internal communication parameters that the Lantronix daughter board uses to communicate with the DL4500 motherboard must be configured. Depending on the model of DL4500 that is being used, there are different Telnet settings that must be set. The Telnet settings for each model of DL4500 are shown below in the following order: *DF1 MultiMaster*, *Standard Tunnel*, and *Modbus TCP*.

To start a telnet session, there are two ways that can be used. The first method uses the Device Installer while the second uses a DOS command prompt.

<u>Telnet using Device Installer</u>
Open Device Installer and click search to find the DL4500. Once the device is found, double click on the device and three tabs will appear on the right window frame. Select the *Telnet Configuration* tab and the following should appear.
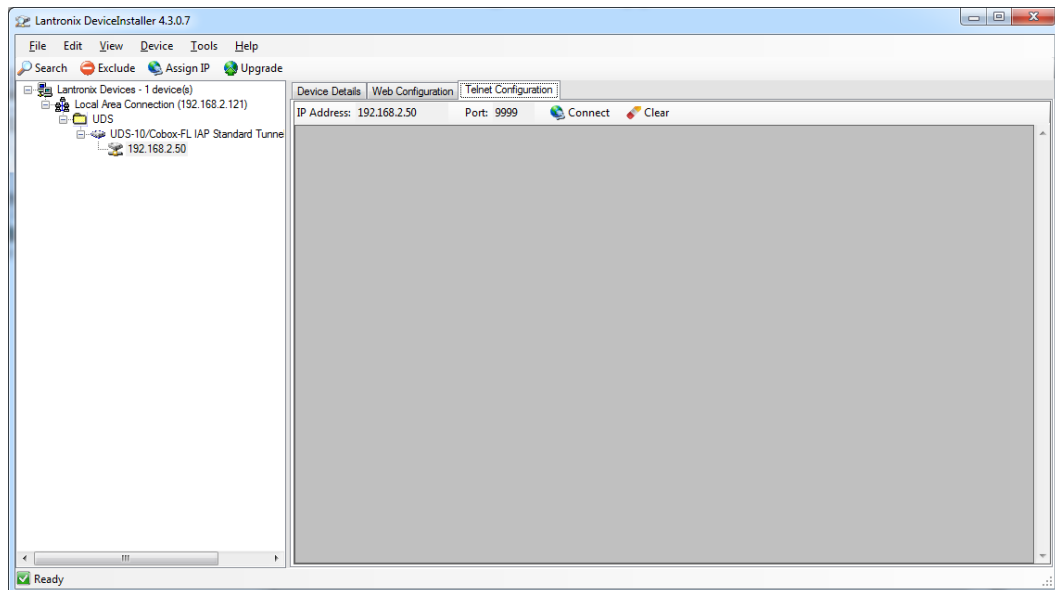
Make sure port 9999 is entered and click Connect to begin the Telnet session.

Telnet using the DOS Command Prompt

Open a DOS command prompt window to begin. At the prompt, type *telnet* then a space, the IP address of the unit then a space, and then the port 9999. After this is entered, press Enter to begin a telnet session. The following is an example of how to begin a telnet session from the command prompt.

C:\>telnet 192.168.2.2 9999

On the following pages are the Telnet settings for the different DL4500 models. After starting a telnet session, you must press the **Enter** key to bring up the main menu.

DF1 MultiMaster

The following menu will appear after starting a telnet session.

```
Multi-Master DF1
1) TCP/IP Network Settings:
   Ethernet Autodetect
   IP addr 192.168.2.2, no gateway set, netmask 255.255.255.000
2) DF1 Settings:
   Protocol ................ DF1 Full-Duplex
   Serial Interface ......... RS232 19200,8,N,1
   Check Sum ................ CRC (16-bit)
   Redirector Sockets ....... 2 (port:03001)
   Raw Tunneled Sockets ..... 2 (port:10001)
3) MSG Block Remote IP Routing Table:
    (* None Defined *)
R)eset all to factory Defaults
S)ave all to EEPROM and Quit
Q)uit without saving

Select Command or parameter set (1,2,R,S,Q) to change:
```

To set the proper Telnet settings, follow the steps below:

1. Press R to restore Factory Defaults.

2. Press 2 to configure the *DF1 Settings*. Input the values so that they match what is shown below. The values shown in the parentheses are the current settings. To keep the current settings, press Enter.

```
Interface Type (1=RS232 2=RS422/RS485+4-wire 3=RS485+2-wire) (00001) ?
Enter serial parameters (19200,8,N,1) 115200,8,n,1
Use DF1 16-bit CRC CheckSum? (Y) N

You have 4 total incoming sockets:
  Number to use for Lantronix Redirector (00002) ? 0
  Number to use for Raw DF1 in TCP 4
  TCP port to use for Raw DF1  (10001) ?
```

When asked about the incoming sockets, enter 0 for *Number to use for Lantronix Redirector*. This will allow up to 4 connections to be used on port 10001. The default for this setting is 2.

Note that the DL4500 only supports BCC error checking at this time.

3. Press S to save the new settings and end the telnet session.

4. Press the reset button on the DL4500 to put it online.

<u>*Standard Tunnel*</u>

The following menu will appear after starting a telnet session.

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

To set the proper Telnet settings, follow the steps below:

1. Press 7 and then Enter to restore Factory Defaults.

2. Press 1 and then Enter to configure the *Channel 1 configuration*. Input the values so that they match what is shown below. The values shown in the parentheses are the current settings. To keep the current settings, press Enter. The only value that needs to be changed is the baud rate.

```
Baudrate (9600) ? 115200
I/F Mode (4C) ?
Flow (00) ?
Port No (10001) ?
ConnectMode (C0) ?
Remote IP Address : (000) .(000) .(000) .(000)
Remote Port  (0) ?
DisConnMode (00) ?
FlushMode   (00) ?
DisConnTime (00:00) ?:
SendChar 1  (00) ?
SendChar 2  (00) ?
```

3. Press 9 and then Enter save the new settings and end the telnet session.

4. Press the reset button on the DL4500 to put it online.

5.2   ComPort Redirector

The ComPort Redirector is used to redirect a virtual COM port to the Ethernet port. This software is needed since RSLinx does not offer an Ethernet DF1 driver. Therefore an RS-232 serial driver is used and the ComPort Redirector redirects the data to the Ethernet port.

5.2.1 Configuration

To begin configuring the ComPort Redirector, open the software and the following screen will appear under tolls click on lunch CPR manager.
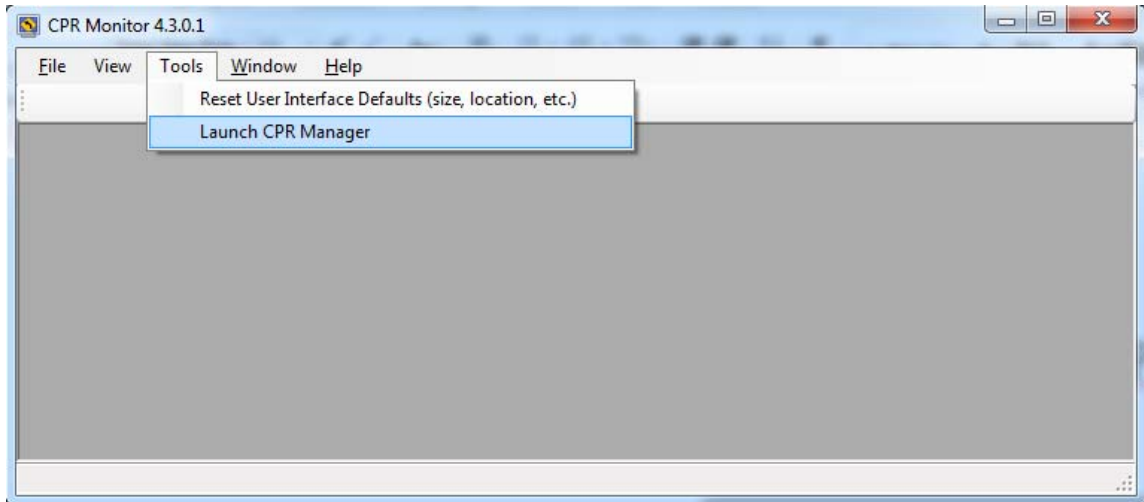

To configure the ComPort Redirector, use the following steps.
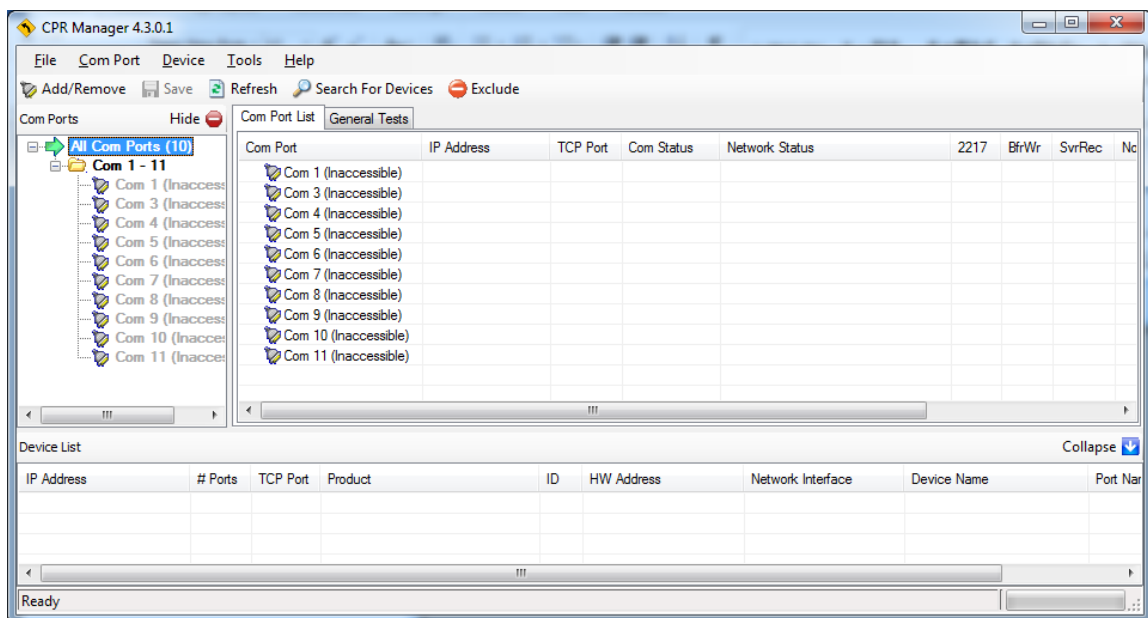
1. Click the *Add/Remove* button to add a virtual COM port to be redirected. The following screen will appear, inaccessible comports will be different depending on what ports are being used on each computer.
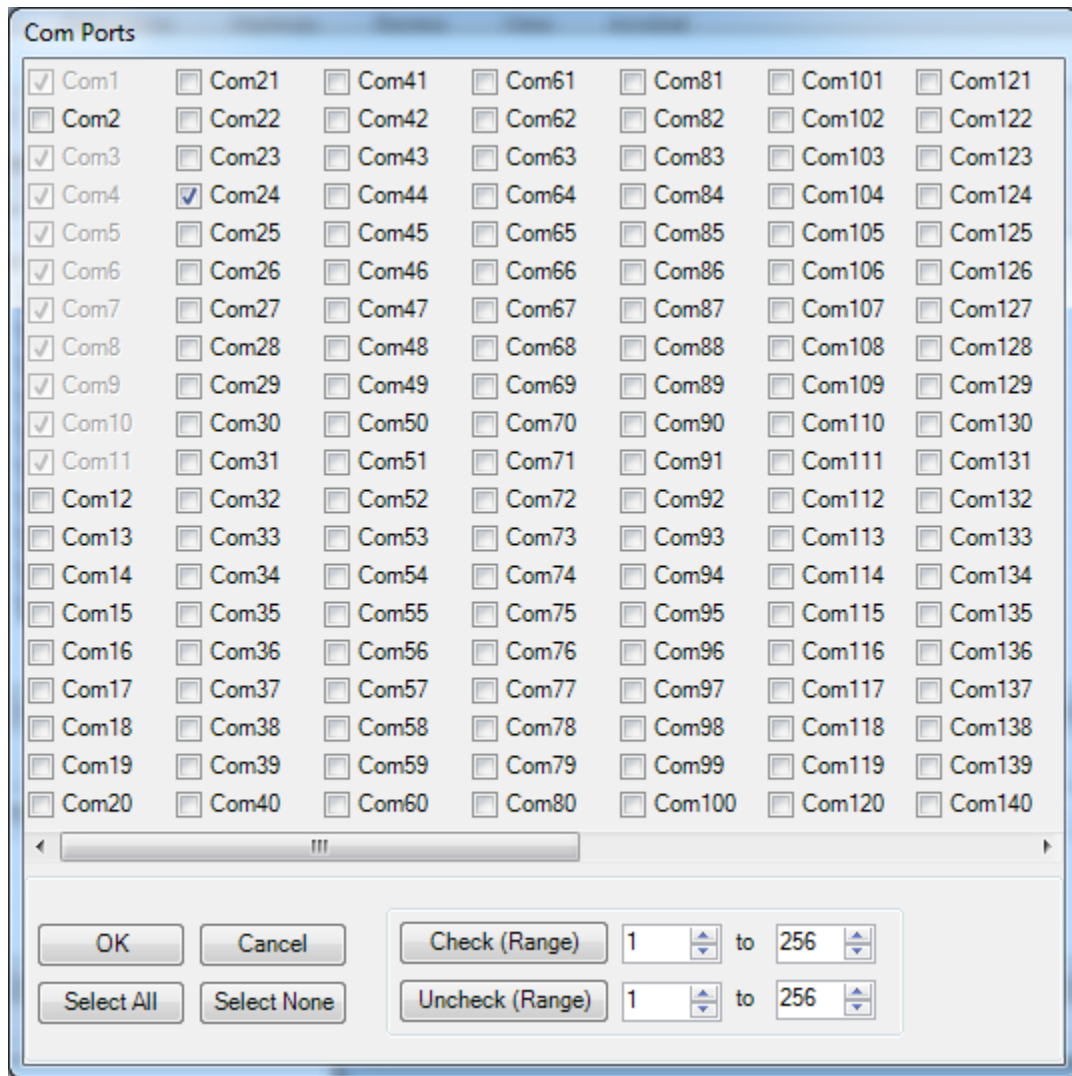
2. Select the COM port that you want to use a virtual COM port and click OK. You will then be returned to the first screen. Whenever a COM port is added or removed, you may need to reboot your PC before the COM port can be used. The PC can be rebooted after the ComPort Redirector has been configured and saved.
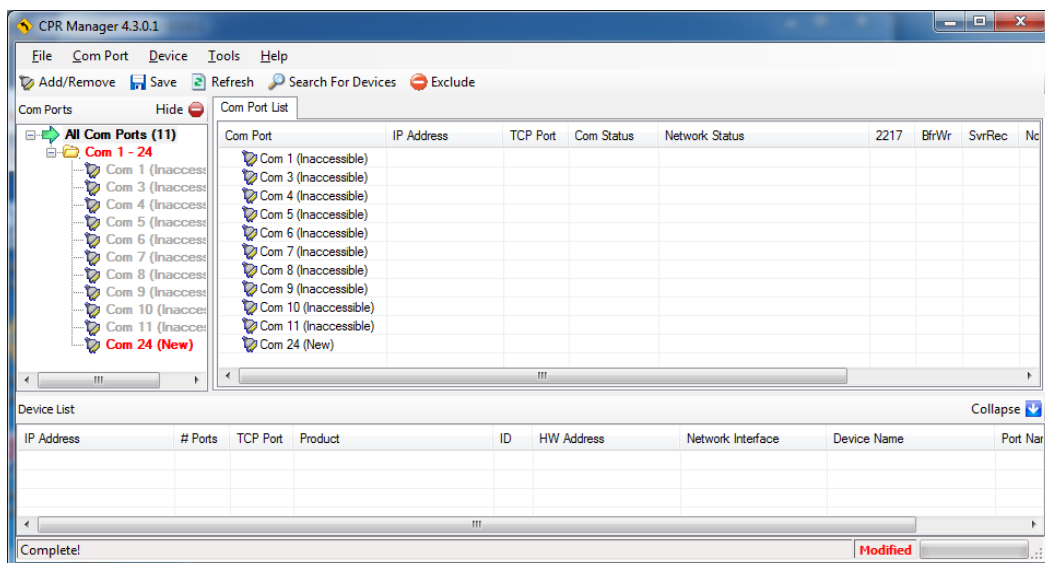
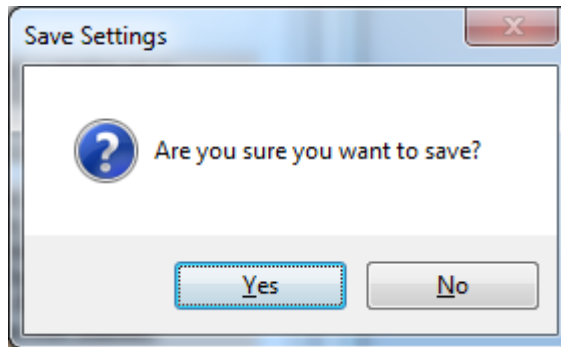3. From the main screen, click on the new COM port that you want to configure.
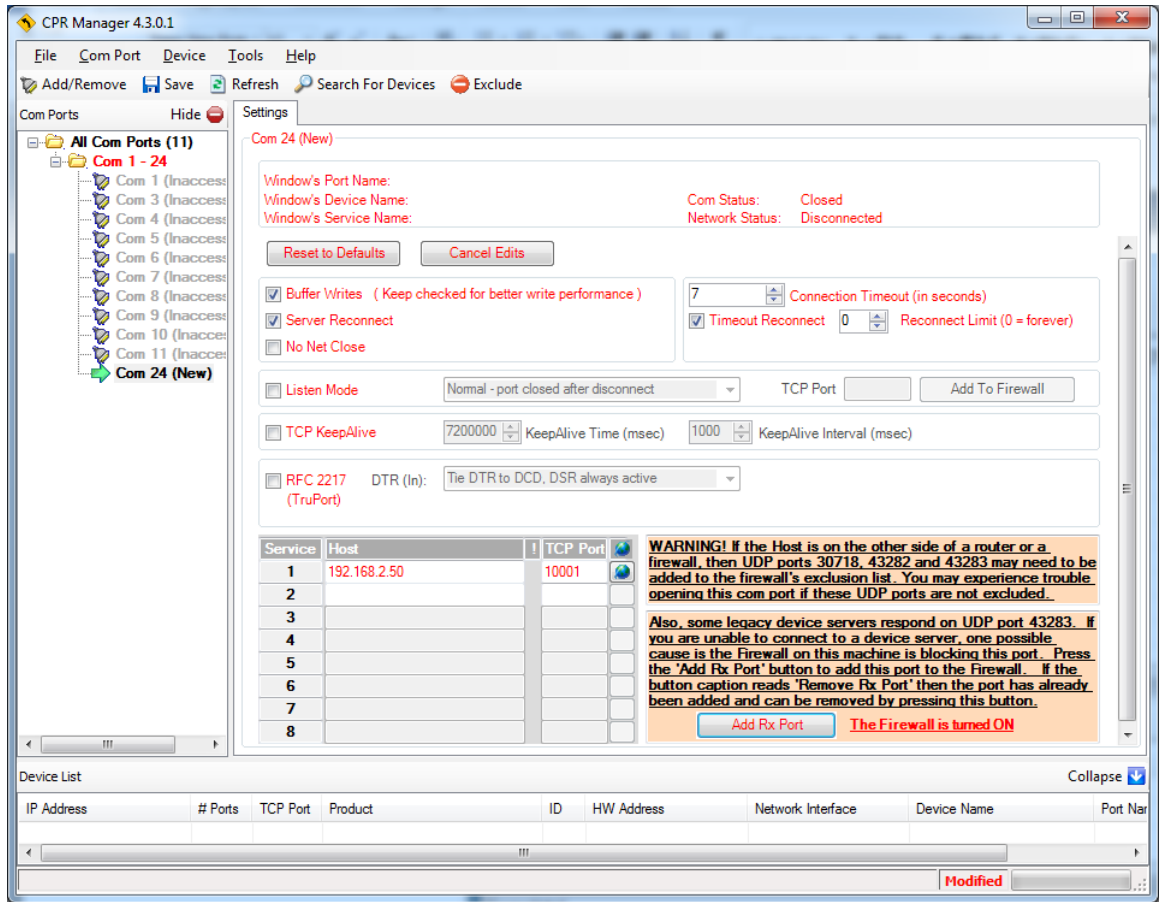
4. Enter an IP address and TCP port to where that COM port will be redirected to. The IP address will be the address assigned to the DL4500, Put a checkmark beside *Timeout Reconnect, Server Reconnect* more details in sec port settings 5.2.2, then click on Save.

5. Confirm save, click on Yes to finalize the setup

6. CPR manager windows will be as shown after save.
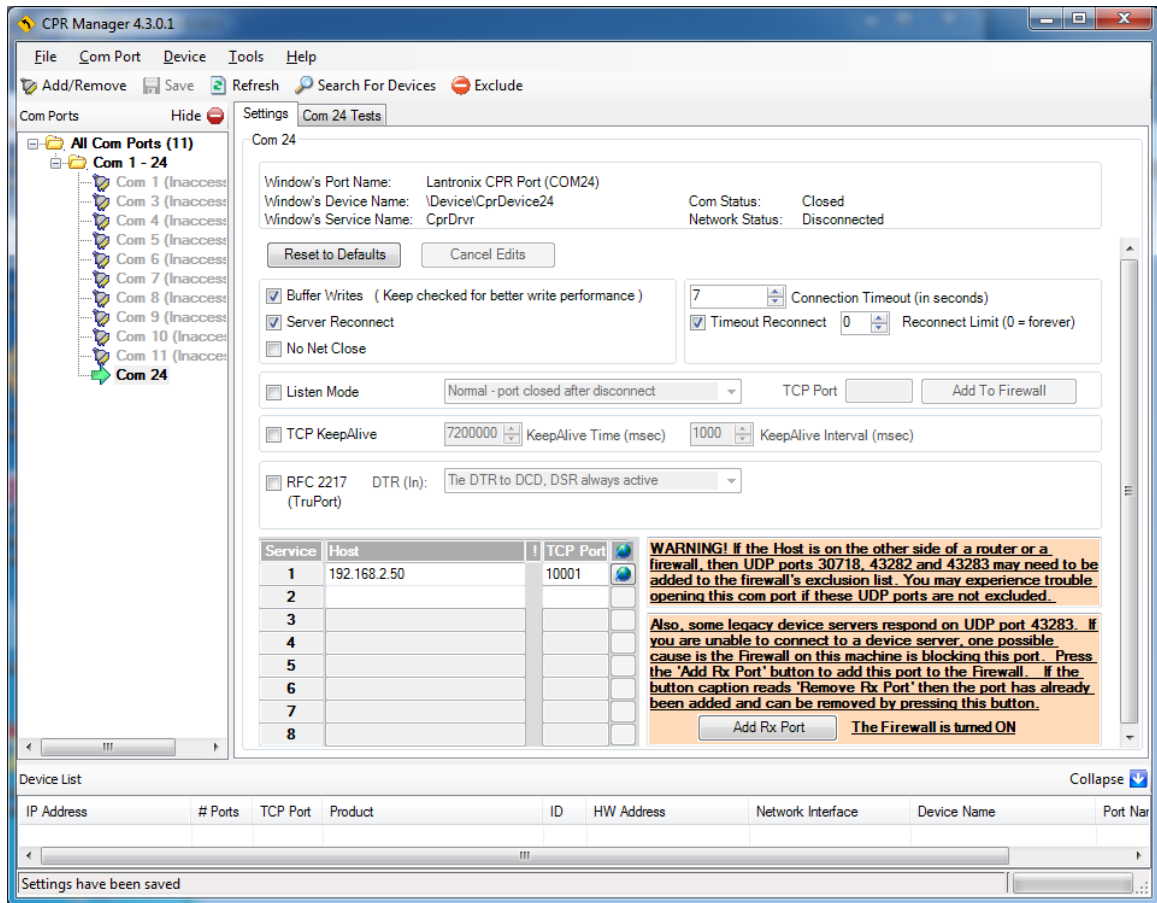
7. Close CPR window, it is recommended to reboot your computer at this point.

5.2.2 Port Settings

The follow section provides more details about the different port settings available with the ComPort Redirector software. This information was obtained from the Lantronix ComPort Redirector User Manual.

Buffer Writes: If selected, when an application opens a COM port and starts Writing to that port, CPR will buffer those writes and try to send as many as possible in a single TCP packet (speeds processing).

Server Reconnect: If selected, enables the com port to reconnect to the device server after the device server disconnects from CPR.

No Net Close: If selected, when an application closes the com port, CPR does not close the network connection. To disconnect CPR from the device server, right-click the com port in the com port tree view on the left or in the Com Port List on the right, or select Disconnect on the Com Port menu.

Connection Timeout (in seconds): Number of seconds the com port should wait before attempting to connect to the next device server in the list, or before aborting the connection attempt.

Timeout Reconnect: If selected, CPR re-establishes the connection if the connection times out. When auto-reconnecting, CPR tries to reconnect until the connection succeeds or the number of tries reaches the value in Reconnect Limit

5.3   DL32 Configuration Software

The DL32 software is *only* required when updating the firmware of DL4500.

5.4   Allan-Bradley Network Configuration

The DH+ or DH-485 requires that every station on the network has its own node address. This section describes the configuration of the DL4500 for the desired A-B network.

5.4.1   DH+ Node Address

The DH+ network allows up to 64 nodes on a network with addresses ranging from 0 to 63 decimal. The DL4500 DH+ node address is determined from the last octet of the IP address assigned to the unit. The following table shows how the DH+ node address is determined from the last octet of the IP address.

Node Address	Last Octet of IP address
0-63	0-63
0-63	64-127
0-63	128-191
0-63	192-255

If the last octet of the IP address is larger than 63, subtract 64 from the value until it falls within the range of 0 to 63. This will be the DH+ node address in decimal. Since DH+ uses octal notation, a conversion decimal to octal will be needed.

Ex.   DL4500 with IP Address 192.168.2.170

Solution
Take the last octet and subtract and keep subtracting 64 until the value falls within the range of 0 to 63.

$$170 - 64 - 64 = 42$$

The DH+ node address is 42 decimal or 52 octal.

5.4.2 DH+ Baud Rate

The DH+ Baud rate on the DL4500 is auto detecting; whatever the existing network is set to the DL4500 will use that baud rate. Valid rates of 57.6K, 115.2K and 230.4K Baud are supported.

On Hardware Reset the A-B Network LED will flash GREEN and RED until a valid DH+ network is detected. This is the AUTO BAUD Rate detection Mode and the DL4500 will stay in this mode until a valid network is connected to the A-B Network Connector. The A-B Network LED will then switch to on solid once the DL4500 is on the DH+ network as a valid node address.

5.4.3 DH-485 Node Address

The DH-485 network allows up to 32 nodes on a network with addresses ranging from 0 to 31 decimal. The DL4500 DH-485 node address is determined from the last octet of the IP address assigned to the unit. The following table shows how the DH-485 node address is determined from the last octet of the IP address.

Node Address	Last Octet of IP address
0-31	0-31
0-31	32-63
0-31	64-95
0-31	96-127
0-31	128-159
0-31	160-191
0-31	192-223
0-31	224-255

If the last octet of the IP address is larger than 31, subtract 32 from the value until it falls within the range of 0 to 31. This will be the DH-485 node address in decimal.

Ex.   DL4500 with IP Address 192.168.2.170

Solution
Take the last octet and subtract and keep subtracting 32 until the value falls within the range of 0 to31.

$$170 - 32 - 32 - 32 - 32 - 32 = 10$$

The DH-485 node address is 10 decimal.

5.4.4 DH-485 Baud Rate

The DH-485 Baud rate will set itself to 19.2K if the Serial Interface was set to 19200 or Higher. Otherwise it will use 9600 for a 9600 baud and 4800 for 4800 baud.

| Serial Interface Speed	DH-485 Speed
19200-115200 Baud	19.2K Baud
9600 Baud	9600 Buad
4800 Baud	4800 Buad

6   Firmware Upgrade

There may be times when the firmware in the DL4500 needs to be upgraded. Some of theses times include installing newer firmware or switching from DF1 MultiMaster to Standard Tunnel or vice versa.

The DL4500 has two different types of firmware that need to be upgraded. Depending on what needs to be upgraded, one or both firmware may need to be upgraded. If switching the firmware in the DL4500 from one model to another, then both of the firmwares will need to be upgraded (ie. changing from DF1 MultiMaster to Standard Tunnel).

To upgrade the firmware in the DL4500, follow the procedure outlined below.

6.1   Device Installer

The Device Installer is used to upgrade the Ethernet firmware. To upgrade the Ethernet firmware open the Device Installer and follow the procedures outlined below. You will see the following window when the Device Installer is opened.
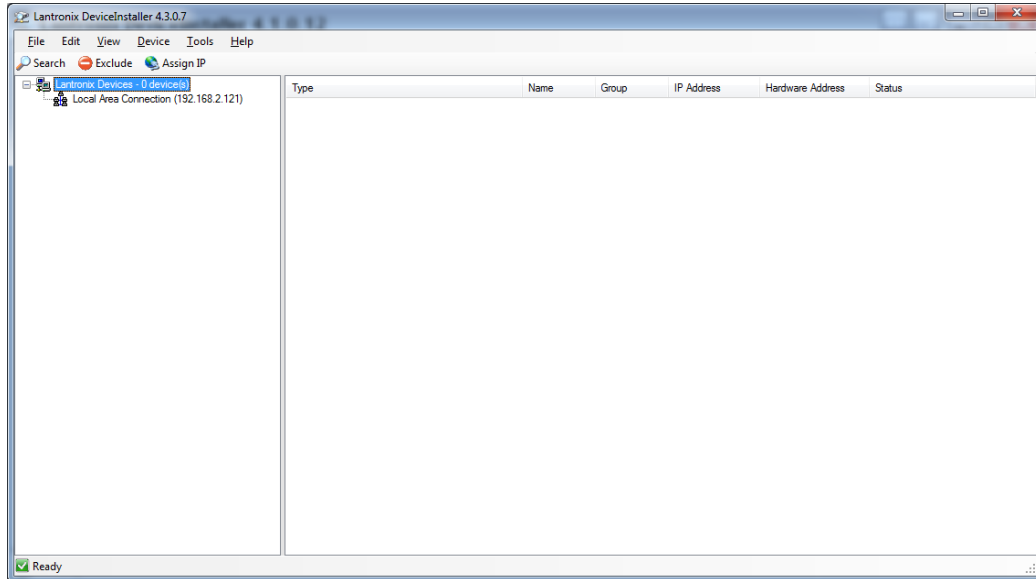
1. After opening the Device Installer, click the *Search* button. The Device Installer should find the DL4500. If successful, the device should show up on the screen.

2. Highlight the device by clicking on it and press the *Upgrade* button to install new firmware. The following window will appear after pressing the *Upgrade* button.


3. Select the option *Create a custom installation by specifying individual files* as shown above and click Next.

4. Select the firmware to be installed by clicking the browse button and choosing the appropriate firmware file. After this is done, click Next.
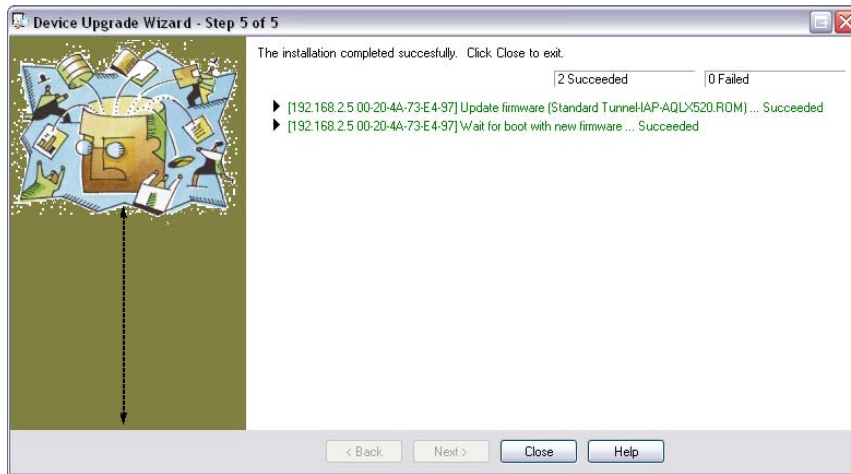
5. Select the *No other files to install* option and click Next to proceed.
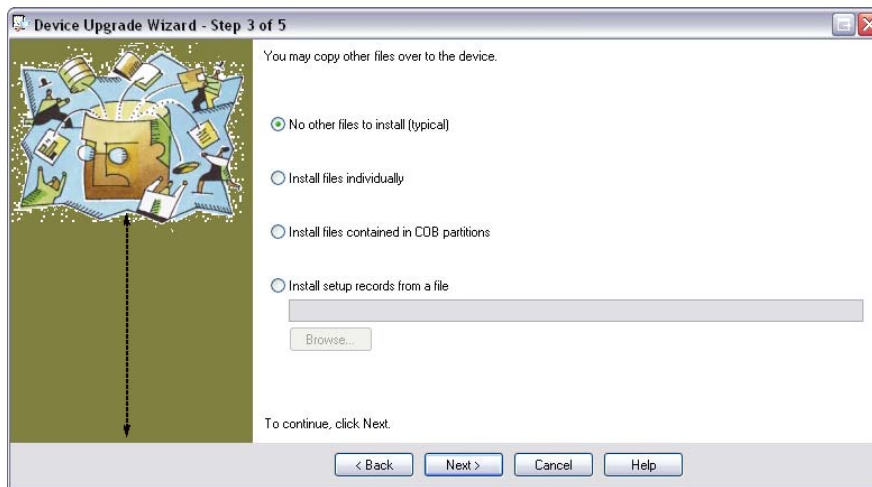
6. To begin the firmware upgrade click Next.
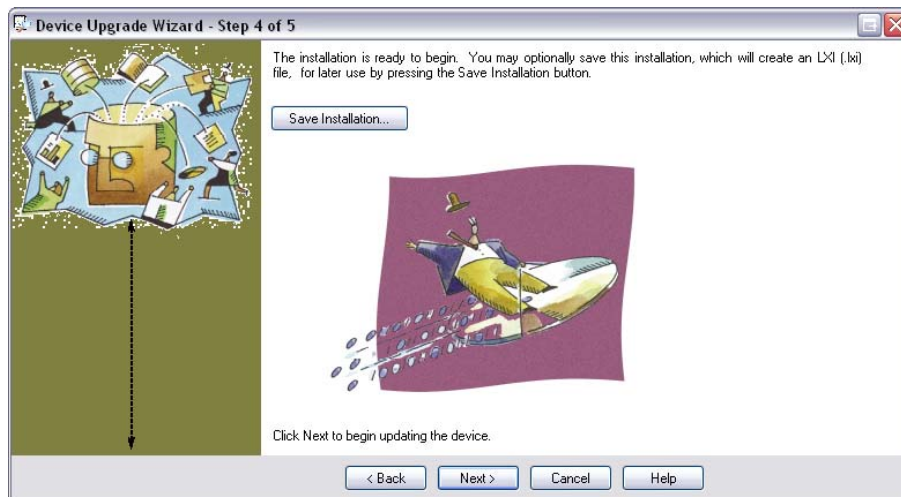
7. If the firmware has been successfully installed, you will see the following screen. The Device Installer can now be closed.
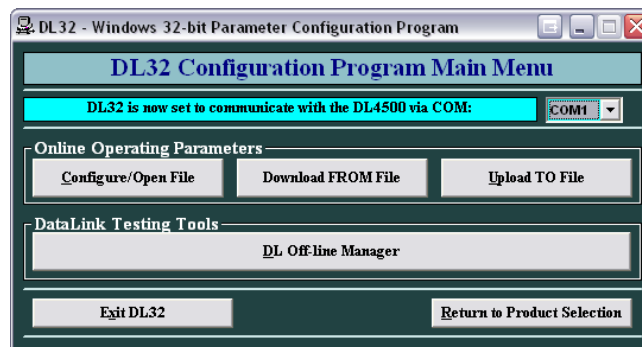
6.2   DL32 Configuration Software

The DL32 Configuration Software is used to upgrade the firmware on the DL4500 motherboard. This firmware is responsible for the DH+ and DH-485 networks.

In order to upgrade the DL4500 firmware, follow the procedure below.

1. Open the DL32 Configuration and select *DL4500 Models*. You will see the following screen.

2. Select the COM port attached to the DL4500 and click the *DL Offline Manager* button. You will be prompted to press the configure button on the DL4500. The following Menu will be shown in a new window.

```
BIOS MANAGER for DL4500-ENET- Revision 2.00 Dec 10, 04
     (c) Equustek Solutions Inc. 2004

          MAIN MENU

  1 - Restore EEPROM to Factory settings
  2 - WRITE new Firmware

  3 - Memory DUMP
  4 - OFF-LINE Diagnostics
  5 - DEBUG Mode

  6 - FIRMWARE Version
  7 – ONLINE
  8 – CONFIGURE Model Parameters

  MAKE SELECTION (1-8) -
```

3. Press 2 to upgrade the firmware. A message will appear notifying that this will overwrite the existing system code. Press Y to continue.

> This *WILL* overwrite DATALINK system code enter (Y/N) to proceed Y
> ERASING FLASH, PLEASE WAIT...
>
> SEND FIRMWARE TEXT FILE NOW...

4. After the message *Send firmware text file now* appears, press the button *Select Flash System File* located in the top left corner of the window.
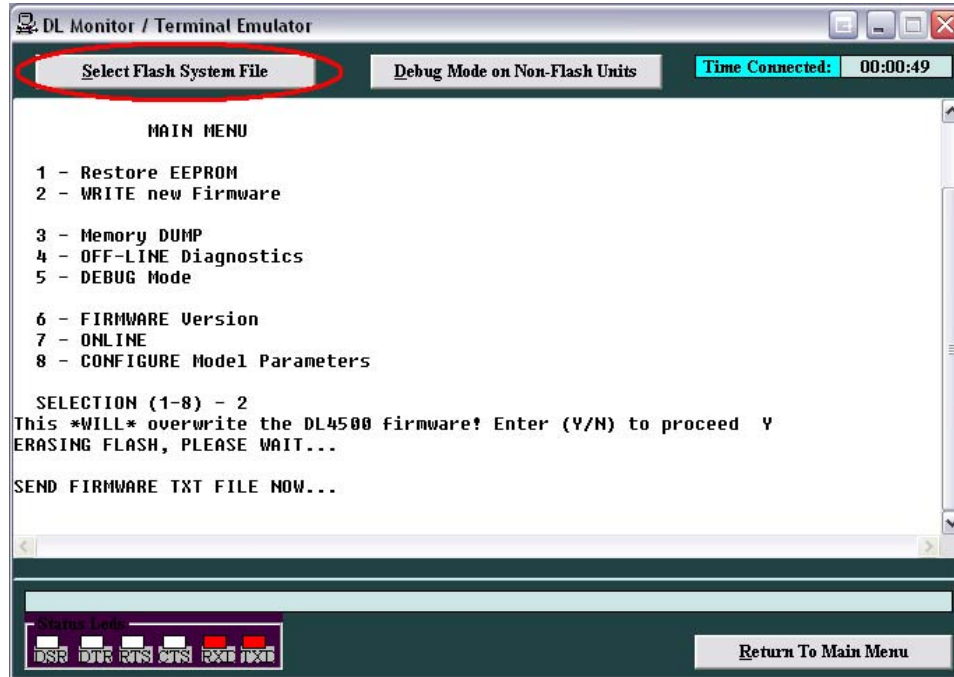
5. When the *Send Flash System File* button is pressed, a message box will appear asking if the *WRITE new Firmware* option was selected. Click Yes to continue.

6. Select the desired firmware file and the DL4500 will begin upgrading the firmware. Upon a successful install, the following text will appear.

> *A-OK* BURN COMPLETE!

7. The DL32 Configuration Software can now be closed. Press the Reset button on the DL4500 to put it online.

7   Wiring Diagrams

This section contains the information required for connecting your DL4500 to Allan Bradley's DH+ and DH-485 networks. It also contains wiring diagrams for building an RS-232 null modem cable which is used to connect serially to the DL4500.
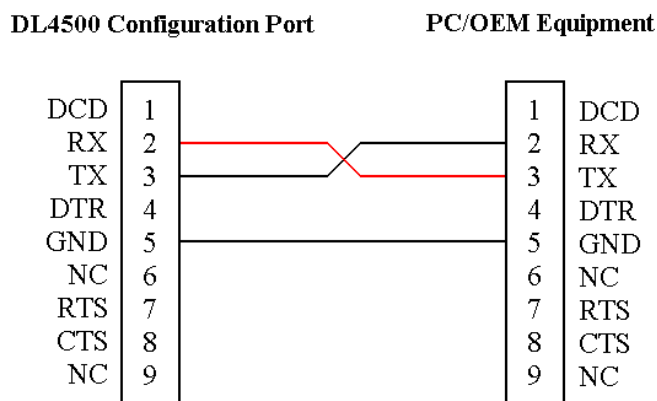
7.1   DL4500 Pin out Diagram

Below is an image of the DL4500 that shows the numbering of the DH+/DH-485 connector. Pin 1 is located closest to the power connector.
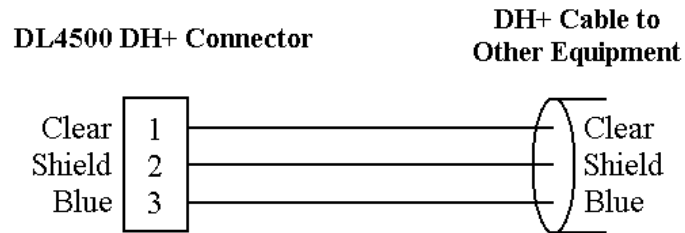

7.2   RS-232 Null Modem Cable

The RS-232 null modem cable is used to serially connect to the DL4500 in order to use the *DL Offline Manager* or configure the device using the DL32 Configuration Software.

7.3 DH+ Cable

Below is a diagram of the DL4500 DH+ connector. Pin 1 is the pin closest to the power connector.

DL4500 DH+ Connector **DH+ Cable to Other Equipment**

```
Clear   | 1 |────────────────( Clear
Shield  | 2 |────────────────  Shield
Blue    | 3 |────────────────  Blue
```

7.4 DH-485 Cable

Below is a diagram of the DL4500 DH-485 connector. Pin 1 is the pin closest to the power connector. *Note that Shield cannot be replaced by Common.*

DL4500 DH-485 Connector **DH-485 Cable to Other Equipment**

```
B      | 1 |────────────────( B
Shield | 2 |────────────────  Shield
A      | 3 |────────────────  A
```
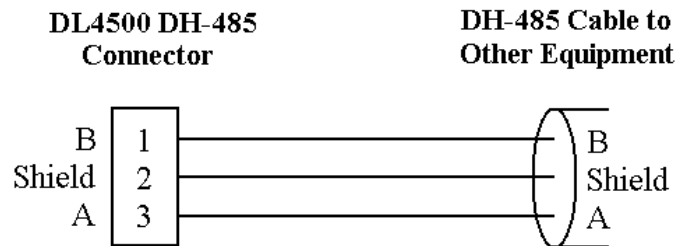
8   DL4500 Typical Applications

The DL4500 is designed to be used in applications using Ethernet to communicate with devices on a DH+ or DH-485 network. Some of the typical applications that use the DL4500 are shown in this section.

8.1   DL4500-EDH+

The following example shows a PC using tunneled DF1 over Ethernet with a DL4500 to communicate with the PLC's and other devices on the DH+ network.
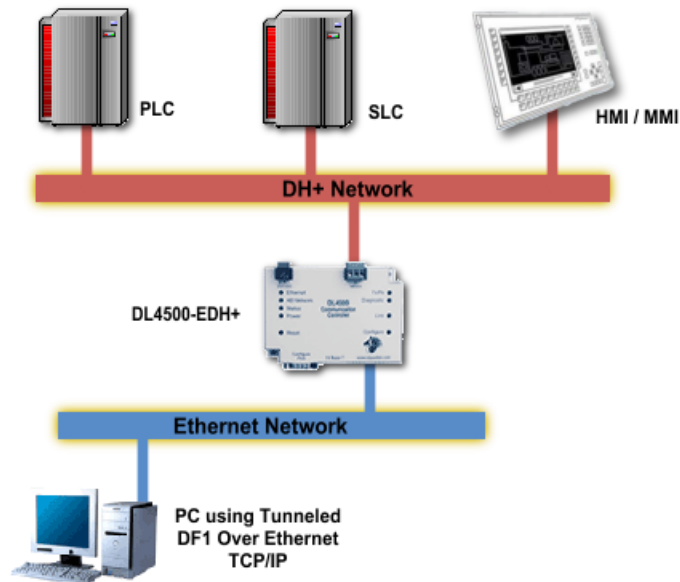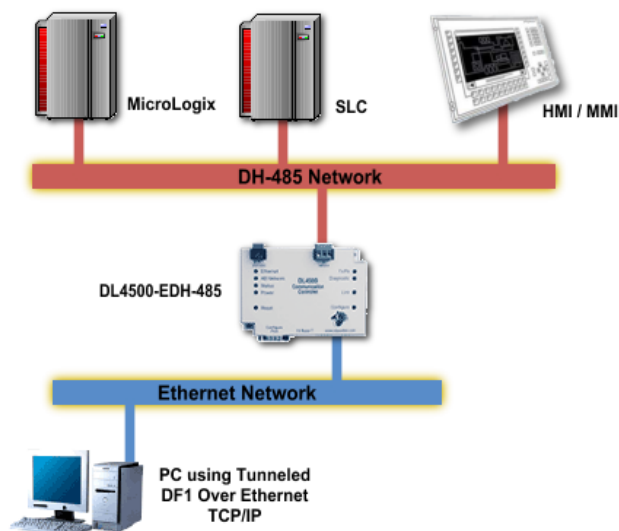

8.2   DL4500-EDH-485

The following example shows a PC using tunneled DF1 over Ethernet with a DL4500 to communicate with the PLC's and other devices on the DH-485 network.

9 Frequently Encountered Problems

This section outlines some of the most frequently encountered problems when trying to configure the DL4500. If the problem you are having is not located in this section, please contact technical support.

9.1 Device Installer cannot find the DL4500

If for some reason the Device Installer software cannot find the DL4500 on the Ethernet network, it can possibly be because one of the following problems:

1. Another device on the Ethernet network has the same IP address that is currently assigned to the DL4500.

2. The DL4500 may have an IP address in which the network ID portion of the address does not match the network ID that is being used by the Ethernet network.

In order to assign an IP address to the DL4500, the address resolution protocol (ARP) will be used. Using the ARP command will only temporarily change the IP address in the device. To configure the unit so that it keeps the IP address, you must telnet to the unit and change its IP address from the configuration menu. In order for the ARP command to work in Windows 95, the ARP table on the PC must have at least one IP address defined other than its own. To use the ARP command to assign a temporary IP address, follow the steps below.

1. Open an MS DOS command prompt window.

2. At the command prompt, type the following to view the ARP table.

     arp –a

   To add another value to the ARP table, ping another device on the current network.

3. Use the following ARP command to add the DL4500 to the ARP table.

     arp –s xxx.xxx.xxx.xxx aa-bb-cc-dd-ee-ff

   The first entry after the arp –s is the IP address that you wish to temporarily assign to the DL4500 (denoted by xxx.xxx.xxx.xxx). The next entry is the MAC address of the DL4500 which can be located on the bottom of the unit (denoted by aa-bb-cc-dd-ee-ff).

4. Open a telnet session to the DL4500 using port 1. This is done by typing the following at the command prompt.

<p align="center">**telnet xxx.xxx.xxx.xxx 1**</p>

The connection will fail when this is done, but will temporarily change the IP address of the DL4500 to xxx.xxx.xxx.xxx.

5. Finally open another telnet session but this time to port 9999 as follows.

<p align="center">**telnet xxx.xxx.xxx.xxx 9999**</p>

6. Set the IP address of the DL4500 by changing the *Network* or *Server* settings from the main menu of the telnet session. The IP address assigned here will become the permanent IP address of the DL4500.

Appendix A: TCP/IP Tutorial

This section is design to guide you to gain a brief understanding to TCP/IP addressing mechanism and the meaning behind the DL4500 IP configurations. TCP/IP suite is the most commonly used Ethernet communication protocol in both industrial and commercial networking applications. The protocol implements a two-level addressing mechanism in order to assign a computer or other Ethernet device (1) its Node Address (Host ID), and (2) its Network Address (Network ID). With the node address, the Ethernet device can identify itself on a network; with the network address, the Ethernet device can identify the network in which it belongs to, and facilitate communication among computers across different networks.

Analogy

The node address is analogous to the suite number in an apartment, and the network address is equivalent to the residential number of the entire apartment building. When my friends want to visit me, I must give them both my suite number and the residential number of the apartment in which I live in, else they wouldn't be able to find my place.

A.1 IP Address

TCP/IP uses a four-segmented number set to store the node address and the network address; the number in every segment varies from 0 to 255, and segments are separated

by decimal points. This segmented number set is called the IP Address, and has the appearance of XXX.XXX.XXX.XXX.

Ex.   Here are some valid IP addresses:

192.168.2.1   (reserved for Local Area Network applications)
68.142.197.85   (www.yahoo.com)
64.233.187.99   (www.google.ca)
127.0.0.1   (Networking Interface Card Loopback IP)

A.2   Subnet Mask

At this point, one may start to wonder how to identify the node address and the network address from the four number segments. Sadly, with only the IP address, no one can meaningfully separate the node address from the network address, not even computers. What is needed in addition to IP address is the Address Delimiter – The Subnet Mask. A Subnet Mask has the same format as the IP address (XXX.XXX.XXX.XXX); however, the segments are usually filled with either 255 or 0.

Ex.   Here are some valid subnet masks:

255.255.255.0   (Class C Subnet Mask)
255.255.0.0   (Class B Subnet Mask)

A.3   IP Address and Subnet Mask Couple

When combining IP address with Subnet Masks, the node address can be separated from the network address in this way: (1) the node address is the IP address segment that maps to the Subnet Mask segment(s) that is/are filled with 0; (2) the network address is the IP address segment that maps to the Subnet Mask segment(s) that is/are filled with 255.

Ex.   Illustration of IP address / Subnet Mask mapping rule:

IP address   192.168.2.3

35

Subnet Mask   255.255.255.0

<u>Solution</u>
This IP address couple gives you:
       Node Address   3
       Network Address   192.168.2

Note: The IP address/Subnet Mask mapping rule introduced above is generally true for most of the TCP/IP networking applications; in some specialized networks, network administrators can enter numbers other than 255 or 0 in the Subnet Mask segments for network customizations. However, this advance TCP/IP application is beyond the scope of this tutorial.

A.4   Valid IP Addresses

Although the IP address / Subnet Masks couple gives a phenomenally large number of possible combinations of node/network address, only certain combinations are "valid". Here are some general classifications of valid IP addresses:

<u>Local Area Network</u>

192.168.x.x
This set of IP addresses is reserved for addressing in Local Area Network (the network that is not connected directly to the internet, but through routers or gateways).

127.0.0.1
This IP address points to the Node itself. (Loopback Address)

0.0.0.0
This IP points to current network.

Node Address of 255
This IP address points to every nodes on the network. (Broadcast Address)

Node Address of 0
This IP address points to the entire network with the network address described in the IP address.

When connected to the internet, network nodes must use the IP Addresses from the following Categories:

Class A IP Address
IP addresses with the first segment ranging from 1 to 127, and subnet mask 255.0.0.0.

Class B IP Address
IP addresses with the first segment ranging from 128 to 191, and subnet mask 255.255.0.0.

Class C IP Address
IP addresses with the first segment ranging from 192 to 223, and subnet mask 255.255.255.0.

Class D IP Address (Multicast)
IP addresses with the first segment ranging from 224 to 239.

Class E IP Addresses (Reserved)
IP addresses from 240 and above in the first segment.

Note:

1. These IP address regulations are weakly enforced; users are allowed to violate these rules. In Local Area Network applications, IP rule violation will not cause problems on network connectivity. However, when connected to the internet, users are expected to strictly conform to the IP regulations to ensure valid connectivity. For more in-depth information on IP address regulation, please consult your networking administrator.

2. Since 1993, the "Classful" IP address regulation has no longer been the only IP rules implemented on the internet. Many inter service providers (ISPs) adopted class-less IP address regulations, in which the IP address / Subnet Mask couple is interpreted differently than in classful IP address. Detail information on class-less IP address regulations is out of the scope of this tutorial.

Appendix B: RSLinx Setup

This section will assist in setting up RSLinx to communicate with the DL4500. Before continuing make sure that the DL4500 and the ComPort Redirector has been configured. To setup RSLinx, follow the steps below.
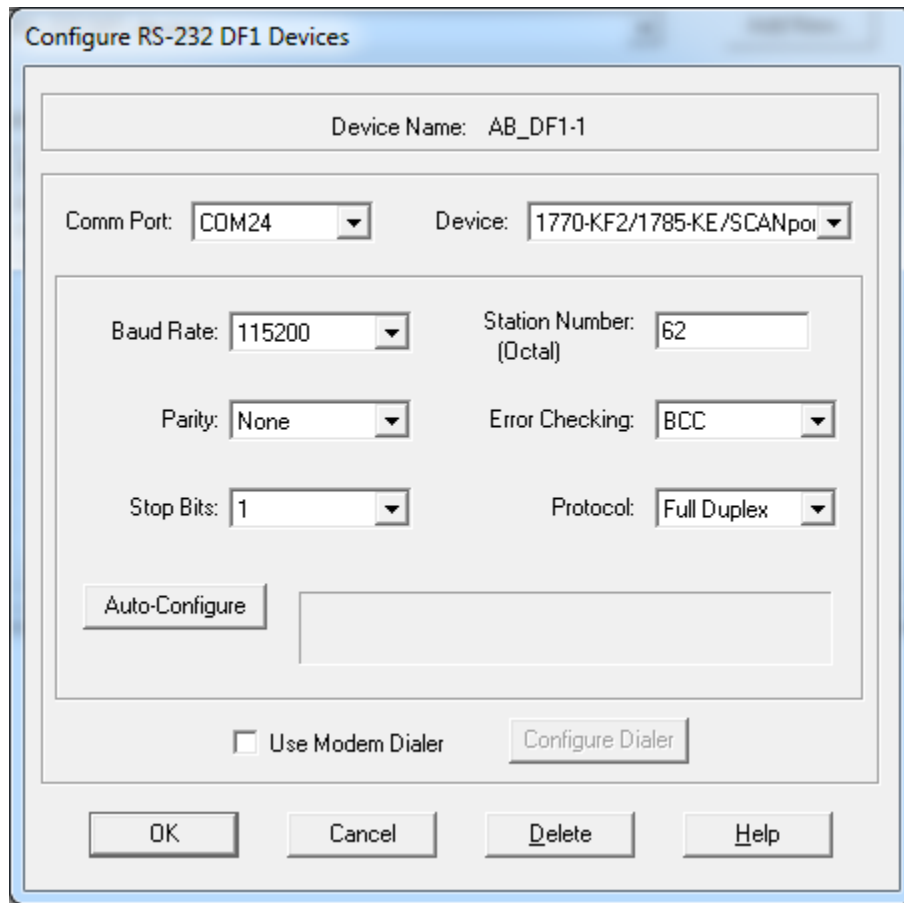
1. Start RSLinx.
2. Click the *Configure Drivers* button.
3. For the Available Driver Types, choose the *RS-232 DF1 Devices* option.
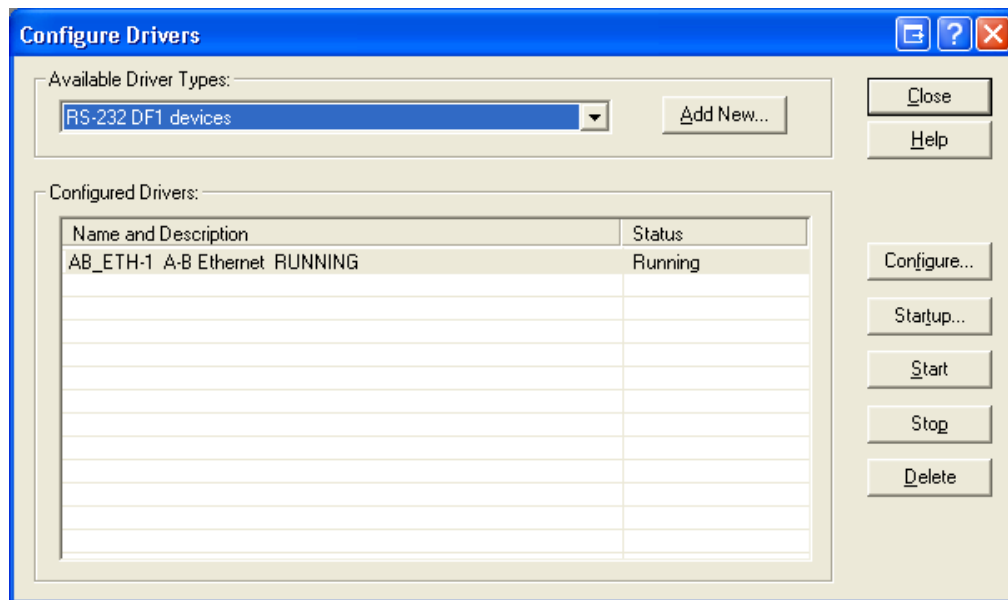
4. Click the *Add New* button.
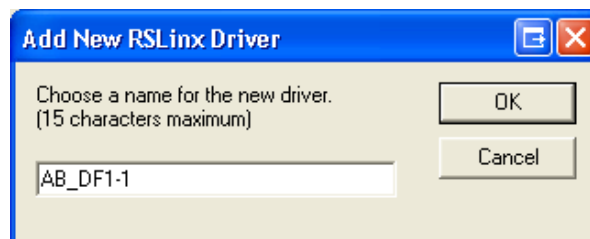
5. Type in a name for the driver or use the default name and click OK. The following screen will appear.

6. Select the COM port that was setup in the ComPort Redirector.
7. For the device, select the *1770-KF2* device for the DL4500-EDH+ or the *1770-KF3* for the DL4500-EDH-485.
8. Set the baud rate to (*115200 if DH4500EDH+ or 19200 if DL4500EDH485)*, parity to *None*, Stop Bits to *1*, Error Checking to *BCC*, and Protocol to *Full Duplex*.
9. For the Station Number, use the node address that is assigned to the DL4500; this value of the last octet of the IP address.

Note: Do not click on the *Auto-Configure* button as it will cause RSLinx to freeze.