SAF-Link

Communications Gateway

Users Guide

Manual Version 1.6

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Introduction

What is X-Link?

The X-Link gateway product from S-S Technologies makes it possible to transfer data between two communications networks. Dissimilar programmable controllers (PLCs) can connect and share data through the X-Link gateway.

X-Link also allows other devices to interface with programmable controllers, allowing access to data from bar-code readers, weigh scales and other peripherals through normal PLC communication mechanisms.

What is SAF-Link?

The SAF-Link CA414 Interface card from SAF Drives and Automation is a repackaged X-Link that fits in a SAFphire rack. Instead of allowing communications between two different networks, communications occurs between a network and the SAFphire backplane. This allows SAFphire to share data through the SAF-Link to other programmable controllers and peripherals.

Throughout the software and documentation, references to X-Link can be applied to SAF-link as well. References to SAF-Link apply only to SAF-Link.

Why Do I Need This Manual?

If you are a new X-Link user, you may want to follow one of the tutorials for DOS or Windows 95/NT to learn the X-Link basics. If you have used X-Link before, you may want to look through the *General Reference Guide* and the appropriate *Software Reference Guide* or the on-line help to refresh your memory on specific tasks.

This manual shows you how to prepare your X-Link for operation. You will learn how to:

install the necessary hardware to connect two networks

install the software to control the X-Link and to interface with the networks

load the configuration which controls the flow of data between the two networks

How Do I Use this Manual?

The following conventions will help you better understand and use the material in this manual.

Text you type appears in Courier font. For example, "Type `mkdir C:\XLINK` to make a new X-Link directory."

Menu Names are italicized. You *choose* menu options. For instance, "Choose the *X-Link/New...* command."

Dialog Box Names are italicized. For example, "The *File to Open* dialog box appears."

Dialog Box Options are *selected.* For example, "Select the COM port you are using from the *Ports* list."

Text in Message Boxes appears in quotation marks. For example: The message *"Already Downloaded - Reload?"* appears*.*

Keystrokes Key names appear in square brackets. Press keys listed together at the same time. For example, "Press [Alt] [O]," means you should press the *Alt* key and hold it down while pressing the *O* key.

Mouse or Keyboard? You may use either a mouse or the keyboard to select options in the configuration program. There are typically several different ways to choose a command. Refer to the *Shortcut Summary* for additional choices.

Where Can I Find More Help?

If you have a question or problem that the manual or the on-line help do not address, you can contact Technical Support by mail, fax or e-mail, or by phone during regular business hours (Eastern Standard Time).

SAF Technical Support
SAF Drives and Automation.
88 Ardelt Ave.
Kitchener, Ontario
N2C 2C9
CANADA

Voice: (519) 743-5491
Toll Free 1-800-3 ASK SAF
Fax: (519) 743-3610

Internet e-mail: *support@safdrives.com*

SAF Drives and Automation web site: *http://www.safdrives.com*

SAFphire web site *http://www.safphire.com*

Installation

To set up the X-Link, you have to install the configuration software on an IBM compatible PC that can be connected to the X-Link serial configuration port, install the hardware and configure the gateway.

This chapter tells you how to:

- set up the X-Link unit
- install the interface cards
- connect the X-Link to your PC
- install the configuration software

Familiarizing Yourself with SAF-Link

Before you proceed with the installation, acquaint yourself with the SAF-Link unit.
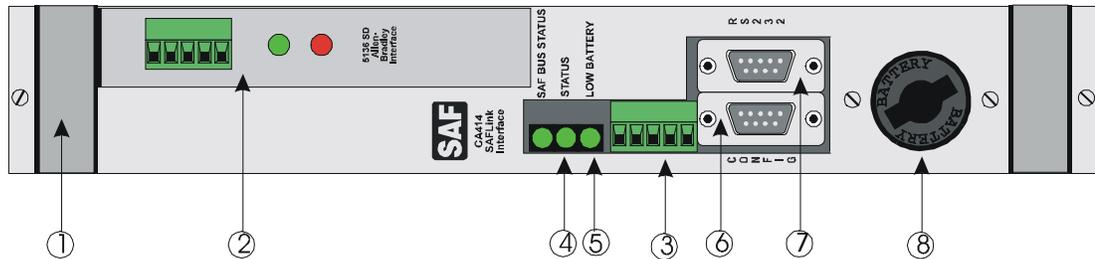
Figure 1 SAF-Link

Parts of SAF-Link

1	top handle	**5**	Battery LED
2	Card Slot	**6**	Config Port
3	RS485 connector	**7**	RS232 Connector
4	Status LED	**8**	Battery Holder

On all units, the STATUS LED indicator lights red, green or amber to show the operating state of the X-Link. A solid green STATUS light indicates normal operating conditions, while solid red indicates that the X-Link has not been loaded with software.

The BATT LED lights green if X-Link is on and the battery is properly installed. It lights red if the battery is discharged or improperly installed.

For more information on the LED indicators, see chapter 8, *Troubleshooting*.

Handling the SAF-Link and the Interface Cards

The SAF-Link and the network communication cards contain components sensitive to electrostatic discharge. Do not handle the SAF-Link or remove any communication cards from their protective wrappings without following these precautions:

- Before handling a card or opening the case, ground yourself by touching a grounded object, such as the metal chassis of your computer or PLC.
- Never touch the backplane connectors or pins. Handle cards by their mounting brackets.

- Always store all cards in their protective wrappers.

Verifying the Battery Condition

The X-Link requires a single 3.6 V lithium battery to maintain configuration when turned off or during a power failure. The preinstalled battery typically lasts at least five years. The BATT LED lights green if the battery is properly installed and in good working order. If the BATT LED lights red, verify that the battery is installed correctly. If it is and the BATT LED still lights red, it is time to change the battery.

To prevent loss of configuration data, change the battery while the X-Link is powered on. Replace *only* with a 3.6 V lithium battery. Handle the discharged battery with care and dispose of it appropriately.

Replace the battery with TADIRAN TL-5104.

1. Remove the circular battery cover using a coin.

   The cover unlocks when the slot is straight up and down.

2. Remove the old battery.

   It should pop out far enough to grasp and remove. If not, gently push the battery into the holder and quickly release it.

3. Insert the new battery, checking the polarity (+ to the outside).

   The battery case cover shows the polarity of the battery. No damage will occur if you install the battery improperly, but the X-Link will not maintain its data when the power is turned off.

4. Lock the cover back in place with a coin.

   The cover locks when the slot lines up with the mounting screws.

   If you have installed the battery correctly, the BATT LED lights green.

Installing Communication Cards in the SAF-Link

X-Link driver settings default to match the interface card manufacturer's default settings. You must verify any switch or jumper settings with the documentation for your interface card.

To install a card:

1. If the SAF-Link card is installed in a SAFphire rack, turn off power to the SAFphire rack.
   Remove the SAF-Link card from the SAFphire rack.

   Inserting or removing a card with the SAFphire powered can cause permanent damage.

2. Loosen the two screws holding the top handle to the faceplate of the SAF-Link card.

3. Slide the top handle off the SAF-Link card.

4. Press the card firmly into the ISA backplane connector.

5. Reinstall the handle to the SAF-Link card and tighten the screws. The handle ensures the communication card remains firmly seated in the backplane connector

6. Reinstall the SAF-Link card in the SAFphire rack.

7. Turn power back on.

Connecting the X-Link to the PC

The X-Link and the PC have the same RS-232 serial port pin connections. You connect the X-Link to the PC with the supplied serial cable on the serial ports. All configuration is done through this serial connection.

1. Attach the cable to the CONFIG port on the X-Link box.

2. Attach the other end of the cable into a serial port on the PC.

If you are using multiple X-Links, each connects to the PC on a different serial port. Remember which COM port(s) you use on the PC, as the configuration software requires this information.

The only required connections for the configuration port are RX, TX and Signal Ground. However, we recommend use of the Data Terminal Ready signal. The following table provides cable pinouts for a 9-pin and a 25-pin PC serial port.

CONFIG Port Signal	X-Link CONFIG Port Pin	DB25 Pin	DB9 Pin
RX-Data	2	2	3
TX-Data	3	3	2
Ground	5	5	7
Data Terminal Ready	4	4	6

Installing and Running the Software

The X-Link software consists of three parts:

- the kernel, which executes on the X-Link to control its operation

- the configuration software, a DOS or Windows 95/NT program which executes on the PC to configure the X-Link

- the drivers, which allow communication between the X-Link and the networks

All software is provided on 3.5" high density floppy disk.

Installing and Running the DOS Software

1. Insert the DOS disk into your floppy drive.

2. Type `A:` at the DOS prompt.

    If your floppy drive is not A:, substitute the correct drive letter.

3. Type `INSTALL A: C:\X-LINK`.

    This assumes your floppy is drive A: and you want to install to the X-Link directory on the root of drive C:. To substitute a different source or destination, follow this format:
    `INSTALL [SOURCE] [DESTINATION\PATH]`

4. Follow the instructions on the screen.

5. If you will be using drivers from the Supplemental disk, insert the Supplemental disk in your floppy drive and repeat steps 3 and 4.

6. Type `CD\X-LINK` to move into the X-Link directory.

7. At the DOS prompt, type `CONFIG` to run the software.

Installing and Running the Windows 95/NT Software

1. Insert the Windows disk into your floppy drive.

2. From the *Start* menu, choose the *Run…* command.

3. Type `A:\Setup` in the *Run* dialog box. If your floppy drive is not A:, substitute the correct drive letter.

4. Follow the instructions on the screen to complete the installation.

5. In the *Start* menu, choose *Programs/X-Link Configuration/X-Link Config* to run the configuration program.

Installing Additional Drivers

From time to time, additional drivers or updates to existing drivers may be available. Each driver consists of a *.DRV*, a *.CNT* and a *.HLP* file. To allow the X-Link configuration software to access new drivers, all of these files *must* be copied into your X-Link directory.

Using CONFIG for DOS

1. If you get the file from our BBS or Web site, it will be in a zip format. Copy the zip file to a temporary directory and unzip it.

2. At the DOS prompt, type `COPY <source>\*.* C:\X-LINK` where `<source>` is the temporary directory or floppy disk where the new drivers are located.

    This assumes your X-Link directory is in the root on C:.

If the new drivers are in a *Beta* directory on the floppy, type `CD BETA` at the A: prompt to move into the *Beta* directory.

Using CONFIG for Windows 95/NT

1. If you get the file from our BBS or Web site, it will be in a zip format. Copy the zip file to a temporary directory and unzip it.

2. Run the CONFIG software.

3. Download the driver from the temporary directory or floppy drive (if you received the files on disk).

   Refer to *Downloading a Driver* in the *Windows 95/NT Software Reference Guide*, later in this guide, for more information. The download procedure copies the new driver and associated files to your X-Link directory.

Uninstalling the Software

To uninstall the DOS Configuration software, delete the entire X-Link directory.

To uninstall the Windows 95/NT Configuration software:

1. Choose the *Start/Settings/Control Panel* command.

2. Double click on the *Add/Remove Programs* icon.

3. Select the *Install/Uninstall* tab.

4. Select *X-Link Configuration* from the list box.

5. Click on the *Add/Remove…* button.

6. Follow the directions on the screen.

   You will have to manually delete any items the uninstall does not remove, such as driver files.

CONFIG for DOS X-Link Tutorial

Make sure you have followed all the installation steps outlined in chapter 2, *Installation*, before beginning this tutorial.

You will learn how to configure the X-Link for two popular drivers, the Allen-Bradley Data Highway Plus and the Modicon Modbus. The steps in this tutorial will be similar for all drivers but you must refer to the documentation for your particular drivers for configuration details.

For general information on mappings and the kernel, see chapter 5, *General Reference Guide*. For more information on working with the configuration program, see chapter 6, *DOS Software Reference Guide*.

In this tutorial, you will learn how to:

create a new X-Link connection

download the kernel

download the drivers

create mappings

Running the CONFIG Software

Before beginning the tutorial, ensure you have copied the X-Link software to your hard disk.

At the DOS prompt, type `CD C:\X-LINK` to move into the X-Link directory.

This assumes the X-Link directory is on the root of your C: drive.

Type `CONFIG` to run the X-Link software configuration program.

Creating a New X-Link Access

The first time you run the configuration software, you need to create a new connection or *access* to the X-Link.

Choose the *X-Link/New...* command.

The *X-Link Definition* dialog box appears.
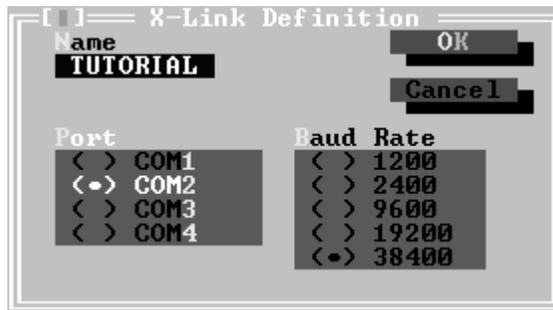
Enter `TUTORIAL` in the *Name* field.

Select the *Port* that connects your PC to the X-Link.

The default is COM1.

Select the *Baud Rate* for the X-Link CONFIG port.

The default is 38400 baud.

Click on the *OK* button or press [Alt] [O].

If this is the first time you have used the software, an "X-Link Not Executing Kernel - Please Download" message box appears. This means you have not yet downloaded the kernel to the X-Link.

Click on the *OK* button or press [Alt] [K] to dismiss the message box.

Downloading the Kernel

The kernel, a software program that runs on the X-Link, handles all transactions between the two networks.

Choose the *Download/Kernel...* command.

The *Kernel File to Download* dialog box appears.

```
┌─[■]════════ Kernel File to Download ════
│
│ Name
│ X-LINK.KRN                          ↓    ┌ Open ─┐
│                                          └───────┘
│ Files
│ X-LINK.KRN                               ┌ Cancel ┐
│ X-LINK_S.KRN                             └────────┘
│ BETA\
│ DISK2\
│ ..\
│
│ ◄■                                    ►
│ C:\XLINK\*.KRN
│ X-LINK.KRN    52086        Mar 21,1996  03:07PM
│ VER: 1.20.01 BETA
```
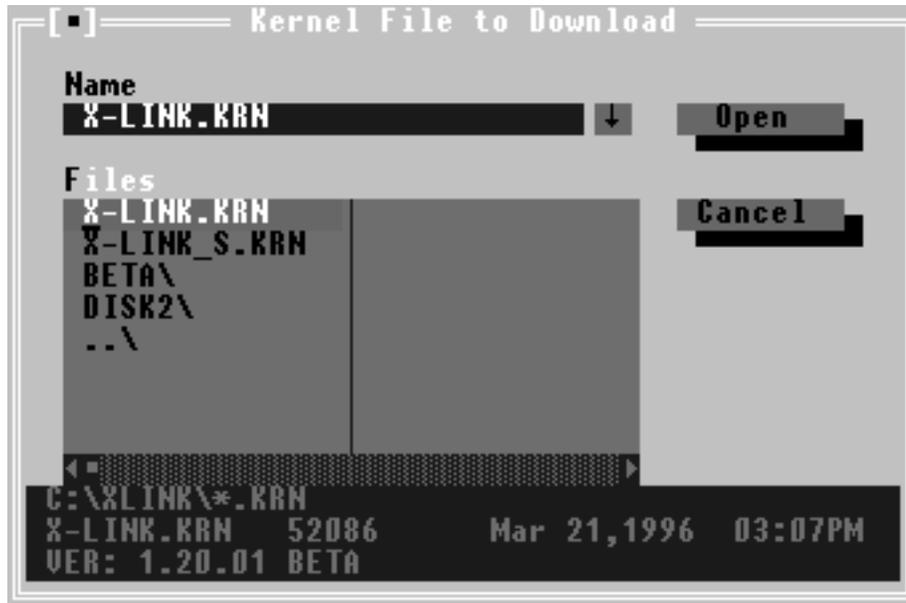
Select *X-LINK.KRN* from the *Files* box.

If you use the Intellicon Intelligent Serial Communications Adapter, use the *X-LINK_S.KRN* file, which can be found in the *Beta* directory.

Click on the *Open* button or press [Alt] [O].

After a while, the *X-Link Configuration* dialog box appears.

```
┌─[■]════════ X-Link Configuration ════
│                                     ┌ OK ─┐
│ [ ] Case Insensitive Names          └─────┘
│
│ BaudRate   ( ) 1200
│            ( ) 2400
│            ( ) 9600
│            ( ) 19200
│            (•) 38400
│
│ [ ] Reply 0 to Uninitiated Data
│ [ ] Timers in Tenths of Seconds
│
│ Async 3 Port  3E8  Async 3 IRQ  3
│ Async 4 Port  2E8  Async 4 IRQ  5
```
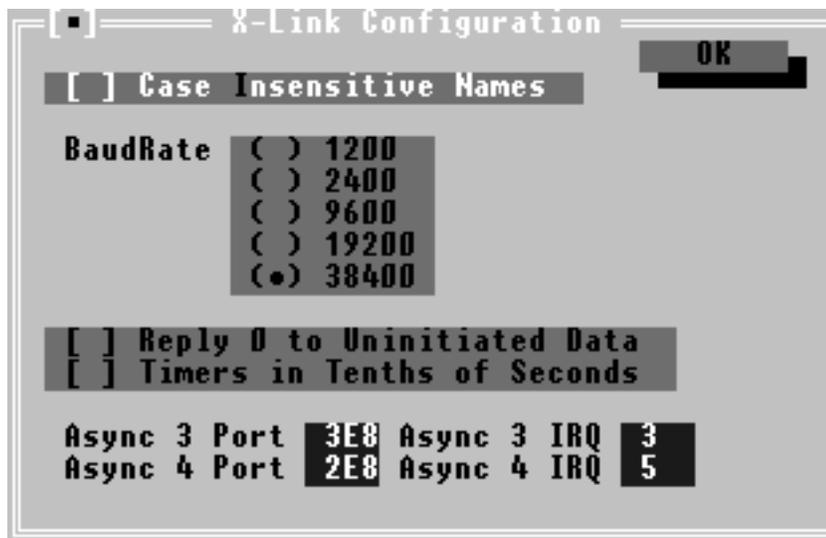
Select the *Baud Rate* for the X-Link to PC communications.

> The default is 38400 baud.

For this tutorial, the rest of the default settings will be used.

Click on the *OK* button or press [Alt] [O] to accept your settings.

> A message, "Driver 1 not Downloaded," appears. You have not yet downloaded Driver 1.

Click on the *OK* button or press [Alt] [K] to dismiss the message box.

Downloading the Allen-Bradley Data Highway Plus Driver

> The steps for downloading will be similar for all drivers. However, you must refer to your manual for the configuration details of your specific driver.

Choose the *Download/Driver 1...* command.

> The *Driver 1 File to Download* dialog box appears.
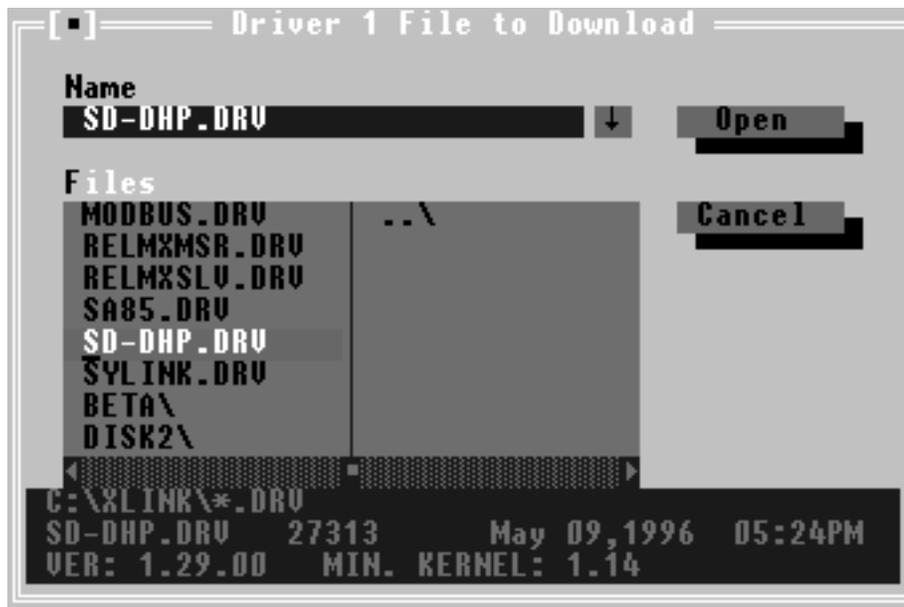
Find and select *SD-DHP.DRV* in the *Files* list.

Click on the *Open* button or press [Alt] [O] to open the file.

> After a moment, the *SD-DHP Configuration* dialog box appears.
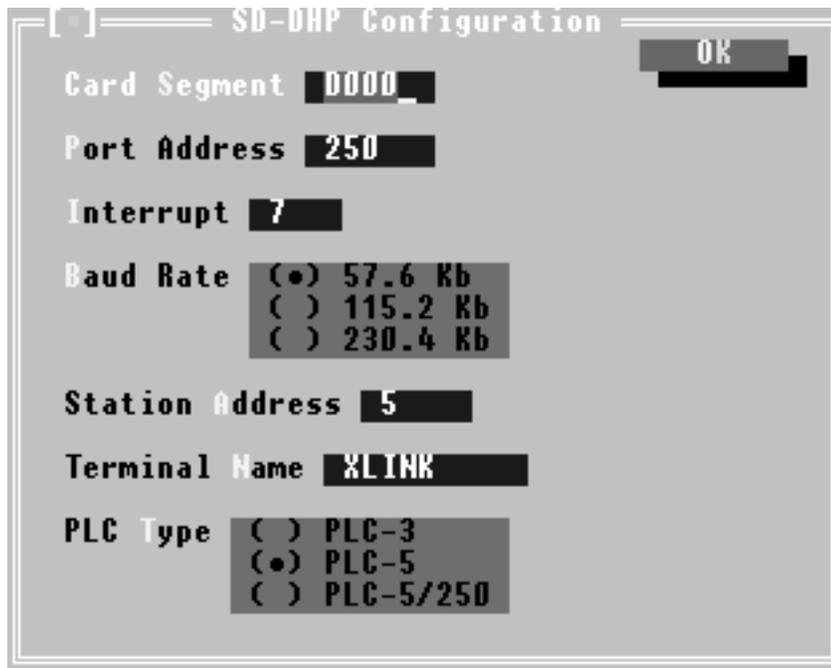
```
=[■]========== SD-DHP Configuration =====
                                        ┌──────────┐
                                        │    OK    │
 Card Segment  D000_                    └──────────┘

 Port Address  250

 Interrupt  7

 Baud Rate  (•) 57.6 Kb
            ( ) 115.2 Kb
            ( ) 230.4 Kb

 Station Address  5

 Terminal Name  XLINK

 PLC Type  ( ) PLC-3
           (•) PLC-5
           ( ) PLC-5/250
```

For this tutorial, the default settings will be used. Refer to your driver manual for more information on changing the driver configuration settings.

Click on the *OK* button or press [Alt] [O].

A message, "Driver 2 not Downloaded", appears.

Click on the *OK* button or press [Alt] [K] to dismiss the message box.

Downloading the Modicon Modbus Driver

These steps will be similar for every driver but you must refer to your driver documentation for the specific configuration details of your driver.

Choose the *Download/Driver 2...* command.

The *Driver 2 File to Download* dialog box appears.

```
┌─[■]══════ Driver 2 File to Download ═══
│
│  Name
│  MODBUS.DRV                           ↓      Open
│
│  Files
│  MODBUS.DRV           ..\              Cancel
│  RELMXMSR.DRV
│  RELMXSLV.DRV
│  SA85.DRV
│  SD-DHP.DRV
│  SYLINK.DRV
│  BETA\
│  DISK2\
│  ◄■                                        ►
│  C:\XLINK\*.DRV
│  MODBUS.DRV    21431        May 09,1996   11:26AM
│  VER: 1.00.00   MIN. KERNEL: 1.14
```
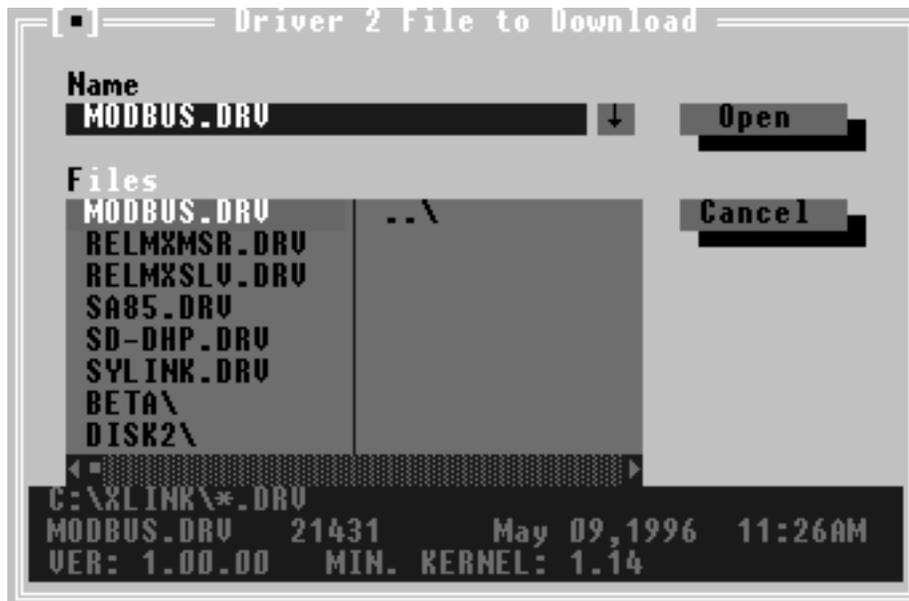
Find and select *MODBUS.DRV* from the *Files* list.

Click on the *Open* button or press [Alt] [O] to open the file.

The *Modbus Configuration* dialog box appears.
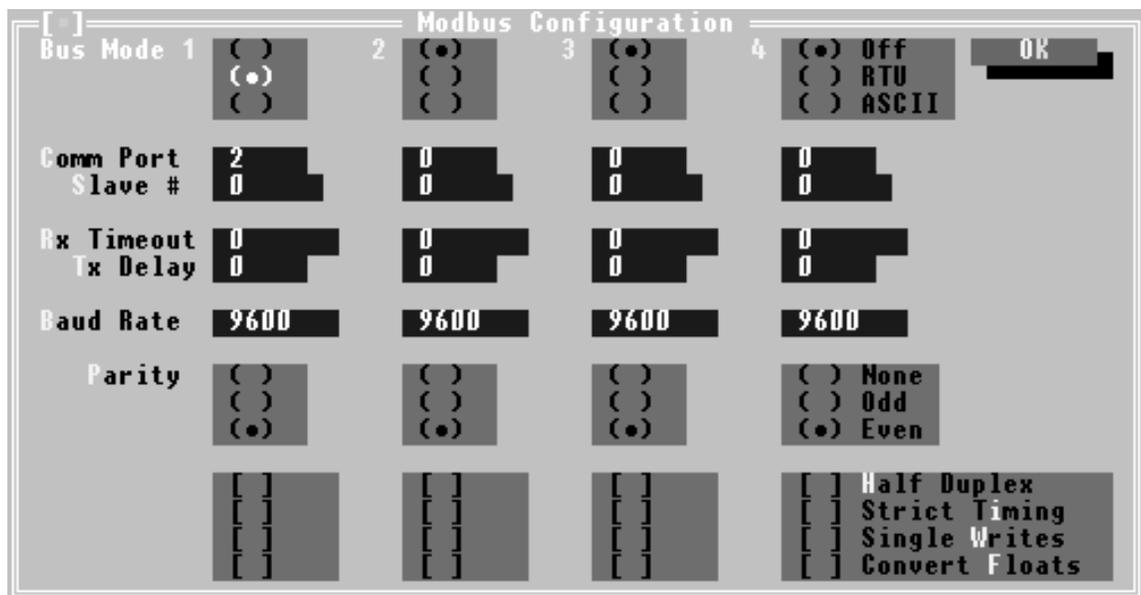
```
┌─[■]════════════════ Modbus Configuration ═══
│ Bus Mode 1  ( )      2  (•)    3  (•)    4  (•) Off         OK
│             (•)         ( )       ( )       ( ) RTU
│             ( )         ( )       ( )       ( ) ASCII
│
│ Comm Port   2          0         0         0
│   Slave #   0          0         0         0
│
│ Rx Timeout  0          0         0         0
│   Tx Delay  0          0         0         0
│
│ Baud Rate   9600       9600      9600      9600
│
│   Parity    ( )        ( )       ( )       ( ) None
│             ( )        ( )       ( )       ( ) Odd
│             (•)        (•)       (•)       (•) Even
│
│             [ ]        [ ]       [ ]       [ ] Half Duplex
│             [ ]        [ ]       [ ]       [ ] Strict Timing
│             [ ]        [ ]       [ ]       [ ] Single Writes
│             [ ]        [ ]       [ ]       [ ] Convert Floats
```

For this tutorial, the default settings will be used. Refer to your driver manual for more information on changing the driver configuration settings.

Click on the *OK* button or press [Alt] [O].

NOTE: You may receive an X-Link hardware error at this point. For the

tutorial, ignore the error as the settings and drivers you actually use may be different than those used in this tutorial.

Now you are ready to create mappings. For general information on mappings, see *Understanding Mappings* in chapter 5.

Creating a Sample Mapping

This sample mapping monitors the speed of a pump on the Data Highway Plus network.

Adding a Mapping

Choose the *Mappings/Upload* command.

The *TUTORIAL - Configuration* window opens.

Choose the *Mappings/Add...* command or press [A] to create a new mapping.

The *Mapping Definition* dialog box appears.

Type `pumpspeed` in the *Name* field.

For this tutorial, you will use the defaults for *Type* and *Length*.

Click on the *OK* button or press [Alt] [O].

The *Data Source Definition* dialog box appears.

You will now define the source of the data.

Selecting a Source

In this example, the X-Link reads the data from the Data Highway Plus network. The PLC is node 4 and the data is at address N7:15.

Make sure the *Data Source Definition* dialog box is visible.
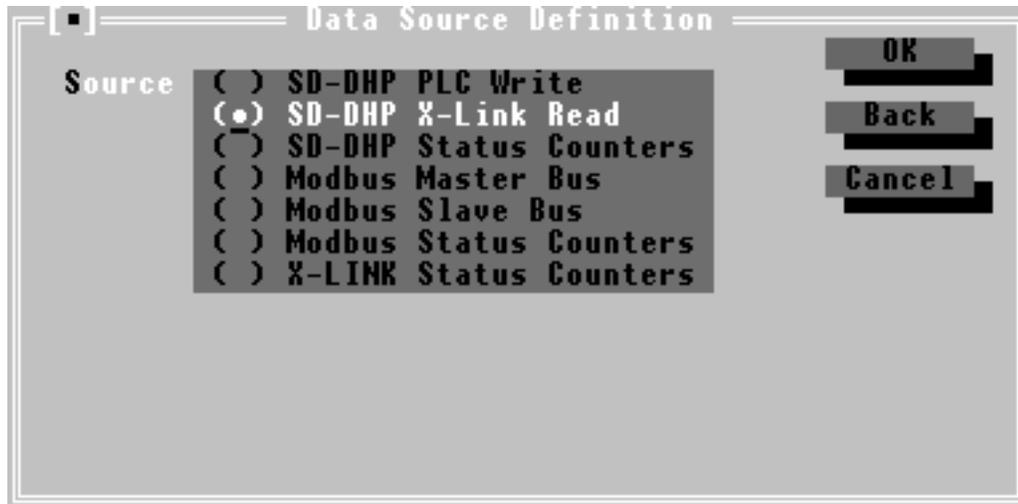
For more information on displaying this dialog box, see *Adding a Mapping*.

Select *SD-DHP X-Link Read* from the *Source* list.

Click on the *OK* button or press [Alt] [O].

The *AB External PLC Address* dialog box appears.
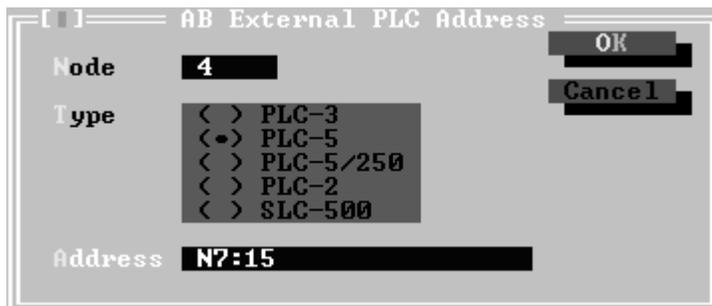
Type `4` in the *Node* field.

Type `N7:15` in the *Address* field.

Click on the *OK* button or press [Alt] [O].

The *When to Read* dialog box appears.

Select *Poll Regularly*.

Click on the *OK* button or press [Alt] [O].

The *Data Poll Rate* dialog box appears.

```
=[■]============ Data Poll Rate =======
                                          ┌─────────┐
                                          │   OK    │
  Poll Rate (sec) ██10████                └─────────┘
                                          ┌─────────┐
                                          │ Cancel  │
                                          └─────────┘
```
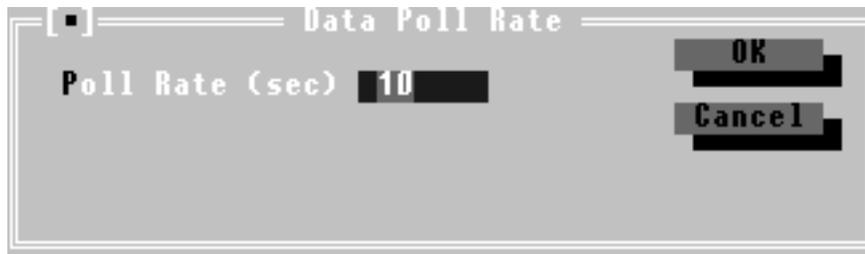
Click on *OK* or press [Alt] [O] to accept the default of 10 seconds.

The *Data Destination Definition* dialog box appears.

You can now select one or more destinations.

Selecting a Destination

For this example mapping, the X-Link sends data to the Modbus network.

Make sure the *Data Destination Definition* dialog box is visible.

```
=[■]========= Data Destination Definition =====
                                            ┌─────────┐
  Dest  ( ) SD-DHP PLC Read                 │   OK    │
        ( ) SD-DHP X-Link Write             └─────────┘
        (•) Modbus Master Bus               ┌─────────┐
        ( ) Modbus Slave Bus                │  Done   │
                                            └─────────┘
                                            ┌─────────┐
                                            │  Back   │
                                            └─────────┘
                                            ┌─────────┐
                                            │ Cancel  │
                                            └─────────┘
```
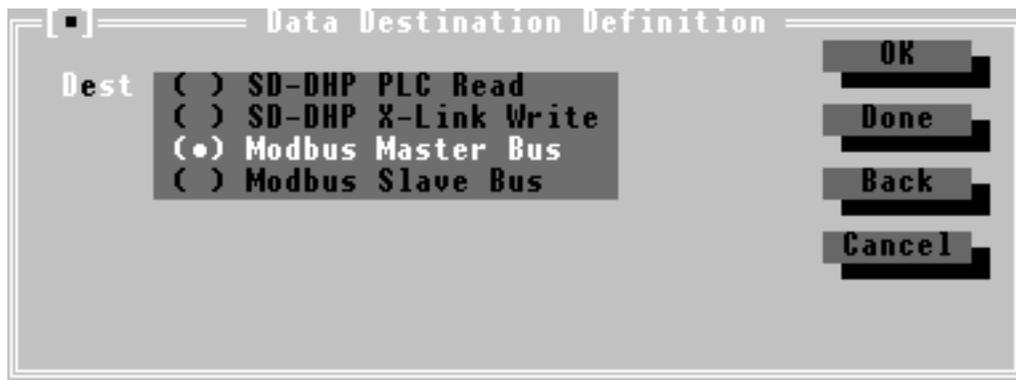
For more information on displaying this dialog box, see *Selecting a Source*.

Select *Modbus Master Bus* in the *Dest* list.

Click on the *OK* button or press [Alt] [O].

The *Modicon Master Write Address* dialog box appears.
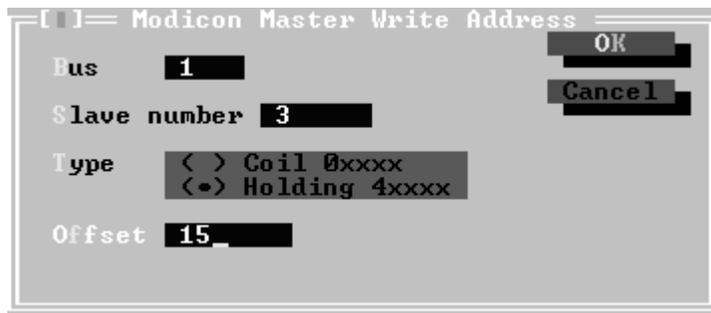
Leave the default value `1` in the *Bus* field.

Type `3` for *Slave Number.*

Select *Holding 4xxxx* in the *Type* box.

Type `15` in the *Offset* field.

This means you are writing to register 40015.

Click on the *OK* button or press [Alt] [O].

The *When to Write* dialog box appears.

Select *Whenever Changed.*

Click on the *OK* button or press [Alt] [O].

The *Data Destination Definition* dialog box reappears.

You are able to select up to 255 destinations for any one source. In this example however, you only need one destination.

Click on the *Done* button or press [Alt] [D].

The mapping now appears in the window.

The completed mapping allows the X-Link to read the speed of the pump on the Data Highway Plus network every 10 seconds and relay the information to the Modbus network whenever there is a change.

Creating Additional Mappings

Now you can create examples of different types of mappings, following the steps in *Creating a Sample Mapping*, above. Enter the information in sequence in the dialog boxes to create the mappings.

The first mapping reads the flow rate of a device from the Modbus network and writes to the Data Highway Plus network.

Name: flowrate
Type: Float
Length: 3
Source: Modbus Master Bus
Bus: 1
Slave Number: 3
Type: Holding 4xxxx
Offset: 17
When to Read: Poll Regularly
Poll Rate(sec):   10
Dest: SD-DHP X-Link Write
Node: 4
Type: PLC-5
Address: F8:0
When to Write: Whenever Updated

The second mapping is an emergency stop and is a write from the Data Highway Plus network to the X-Link, and from the X-Link to the Modbus network.

Name: e_stop
Type: Integer
Length: 1
Source: SD-DHP PLC Write
Address: N13:0
Dest: Modbus Master Bus
Bus: 1
Slave number: 3
Type: Holding 4xxxx
Offset: 100
When to Write: Whenever Updated

The *TUTORIAL - Configuration* window should now look like this:

```
┌─[■]══════════════════ X-LINK - Configuration ═══════════════════1=[‡]┐
│ Name          Type    Len  Source / Destinations                    █│
│ pumpspeed     Integer  1   Modbus Polled every 10 sec. Bus 4 [1][%14903] / │
│                            SD-DHP X-Link Wrt on Change ☺♥◘※         │
│ flowrate      Float    3   Modbus Polled every 10 sec. Bus 1 [3][40017] / │
│                            SD-DHP X-Link Write Stn [4] PLC-5 f8:0    │
│ e_stop        Integer  1   SD-DHP PLC Write n13:0 /                  │
│                            Modbus Automatic update Bus 1 [3][40100]  │
└──────────────────────────────────────────────────────────────────────┘
```

The *pumpspeed* source is Data Highway Plus polled read (every 10 seconds) and the destination is Modbus update on change.

The *flowrate* mapping has source Modbus polled read (every 10 seconds) and Data Highway Plus X-Link write destination.

The *e_stop* mapping's source is Data Highway Plus write and its destination is Modbus automatic update.

Viewing the Value of a Mapping

Because you did not hook the X-Link up to any real devices in this tutorial, there are no valid values for the data. Take a look at the *Value* window anyway, as it provides valuable information for troubleshooting.

Make sure you are looking at the *TUTORIAL - Configuration* window.

For more information on displaying the *TUTORIAL - Configuration* window, see *Creating a Sample Mapping*, earlier in this chapter.

Select the *pumpspeed* mapping by moving the cursor keys until the mapping is highlighted or by clicking on it with the mouse.

Choose the *Mappings/Value* command. You can also press [V] to open the window.

If you receive an error message at this point, click on the *Cancel* button to ignore it. This tutorial may not be using the drivers and settings you will use in your network setup.

The value window for *pumpspeed* opens. The window displays the name, type and size of the mapping. *Status* shows the current status of *pumpspeed* and *Error* shows the last error received for the *pumpspeed* connection. *Output* indicates the current display type. For more information, refer to the *DOS Software Reference Guide*, later in this manual.

```
=[▓]== pumpspeed =2=[↑]=
<-->Integer Length: [1]
Status: [00] Error: [00]
Output: [Default]
 00:       0
```

You can change the display type of the output by pressing the following keys:

Display Type	Key
Reset	[R]
Hexadecimal	[H]
Octal	[O]
Decimal	[D]
Binary	[B]
Unsigned	[U]

Moving On

Now that you've learned the basics of X-Link operation, you can create your own mappings for your particular situation and particular networks.

Refer to the *DOS Software Reference Guide*, *General Reference Guide* and driver and card documentation for additional information on the DOS CONFIG software, the X-Link and the drivers.

CONFIG for Windows 95/NT X-Link Tutorial

Make sure you have followed all the installation steps outlined in chapter 2, *Installation*, before beginning this tutorial.

You will learn how to configure the X-Link for two popular drivers, the Allen-Bradley Data Highway Plus and the Modicon Modbus. The steps in this tutorial will be similar for all drivers but you must refer to the documentation for your particular drivers for configuration details.

For general information on mappings and the kernel, see chapter 5, *General Reference Guide*. For more information on working with the configuration program, see chapter 7, *Windows Configuration Software Reference Guide*. You can also refer to the software's on-line help as you work.

In this tutorial, you will learn how to:

create a new X-Link connection

download the kernel

download the drivers

create mappings

Running the Config Software

To run the configuration software:

From the *Start* menu, choose *Programs/X-Link Configuration/X-Link Config.*

The configuration program opens.

If you close the software while it is minimized, the program will run minimized on startup. Simply click on the X-Link icon in the taskbar to restore the window to regular size.

Creating a New Access to the X-Link

The first time you run the configuration software, you need to create a new connection or *access* to the X-Link.

Choose the *File/New…* command.

The *X-Link Definition* dialog box appears.
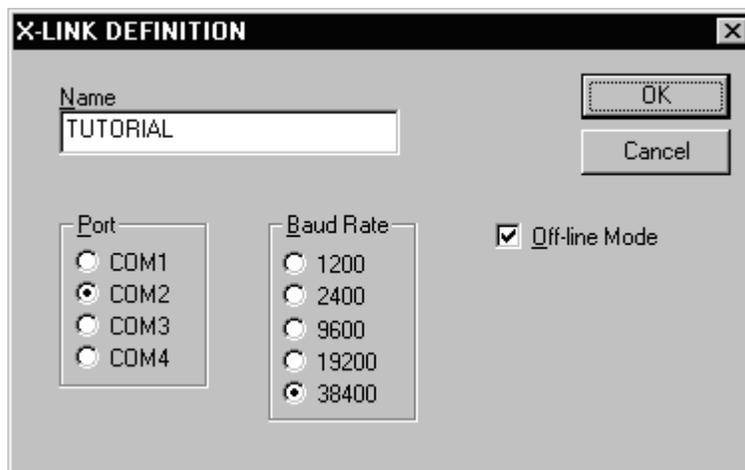
Enter TUTORIAL in the *Name* field.

Enable the *Off-line Mode* option.

Select the *Port* number that connects your PC to the X-Link.

The default is COM2.

Set the *Baud Rate* for communication between your PC and the X-Link.

The default is 38400 baud.

Click on the *OK* button to accept your settings.

A message box appears, telling you that data will not be verified or

downloaded in off-line mode. Off-line mode emulates the presence of the X-Link but does not download any data to the X-Link box.

Click on the *OK* button to continue.

If this is the first time you have run the configuration software, a message box appears asking you to download the kernel.

Click on the *OK* button to continue.

Downloading the Kernel

The kernel, a software program that runs on the X-Link, handles all transactions between the two networks.

Choose the *Download/Kernel…* command.

The *Download Kernel* dialog box appears.
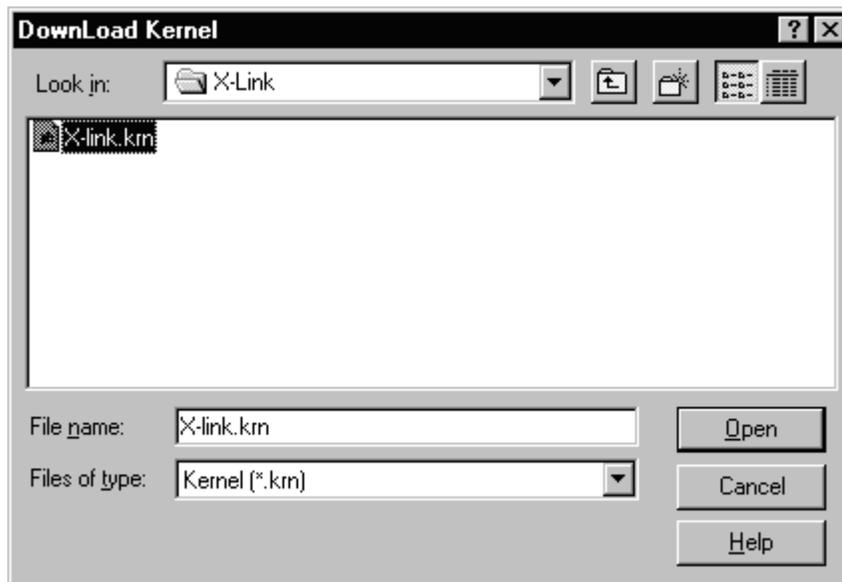
Find and select the *X-LINK.KRN* file.

The kernel can be found on the DOS Software disk.

If you use the Intellicon Intelligent Serial Communications Adapter, use the *X-LINK_S.KRN* file found in the *Beta* directory on the DOS Software disk.

Click on the *Open* button.

The configuration program copies the file you selected to the hard disk and downloads it to the X-Link.

After a moment, the *X-Link Configuration* dialog box appears.

X-Link Configuration

OK

☐ Case Insensitive Names

BaudRate
○ 1200
○ 2400
○ 9600
○ 19200
◉ 38400

☐ Reply 0 to Uninitiated Data
☐ Timers in Tenths of Seconds

Async 3 Port 3E8   Async 3 IRQ 3
Async 4 Port 2E8   Async 4 IRQ 5
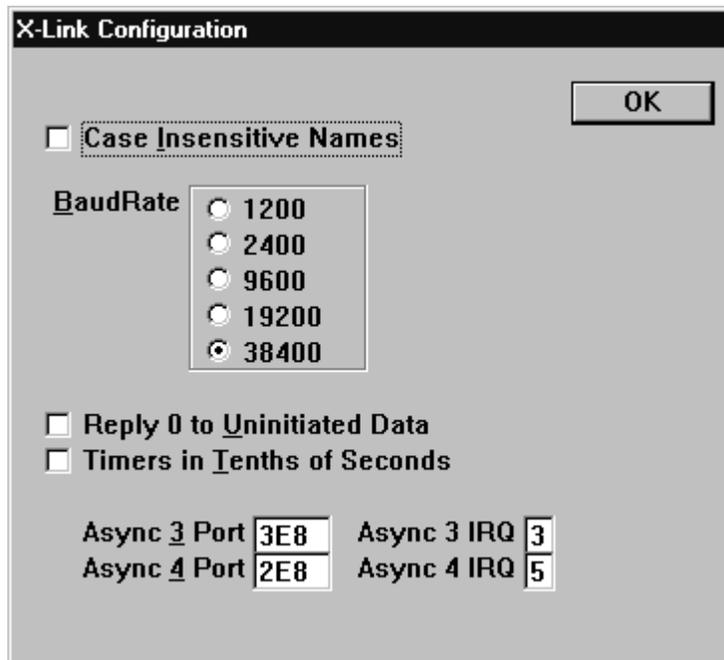
Click on the *OK* button to accept the defaults.

Refer to the *Windows 95/ NT Software Reference Guide*, later in this guide, or the on-line help for more information on the configuration options.

A message appears telling you to download Driver 1.

Click on the *OK* button to continue.

Downloading the Allen-Bradley Data Highway Plus Driver

The steps for downloading will be similar for all drivers. However, you must refer to your manual for the configuration details of your specific driver.

Choose the *Download/Driver 1…* command.

The *Download Driver 1* dialog box appears.

DownLoad Driver 1

Look in: X-Link

Modbus.drv
Sd-dhp.drv

File name: Sd-dhp.drv

Files of type: Driver (*.drv)

Open
Cancel
Help

Find and select the *SD-DHP.DRV* file.

The drivers can be found on the DOS Software and Supplementary Drivers floppy disks. Refer to the file *filelist.txt* in your X-Link directory for a complete list of driver locations.

Once you download a driver, it is copied to your hard drive for future use.

Click on the *Open* button.

After a moment, the *SD-DHP Configuration* dialog box appears.

SD-DHP Configuration

OK

Card Segment [D000]

Port Address [250]

Interrupt [7]

Baud Rate
- ● 57.6 Kb
- ○ 115.2 Kb
- ○ 230.4 Kb

Station Address [5]

Terminal Name [XLINK]

PLC Type
- ○ PLC-3
- ● PLC-5
- ○ PLC-5/250

Click on the *OK* button to accept the default settings.

Refer to the *Windows 95/ NT Software Reference Guide* or the on-line help for more information on the configuration options.

A message box appears telling you to download Driver 2.

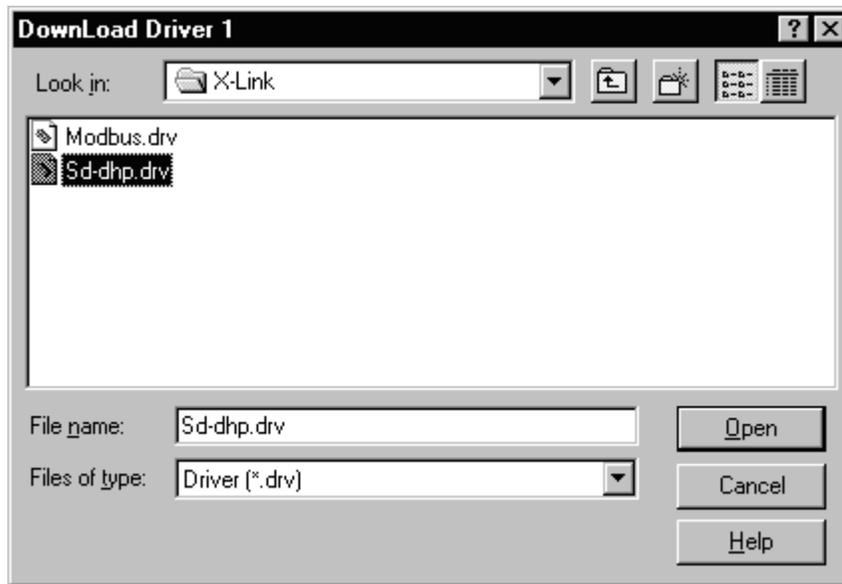Click on the *OK* button to continue.

Downloading the Modicon Modbus Driver

The steps for downloading will be similar for all drivers. However, you must refer to your manual for the configuration details of your specific driver.

Choose the *Download/Driver 2…* command.
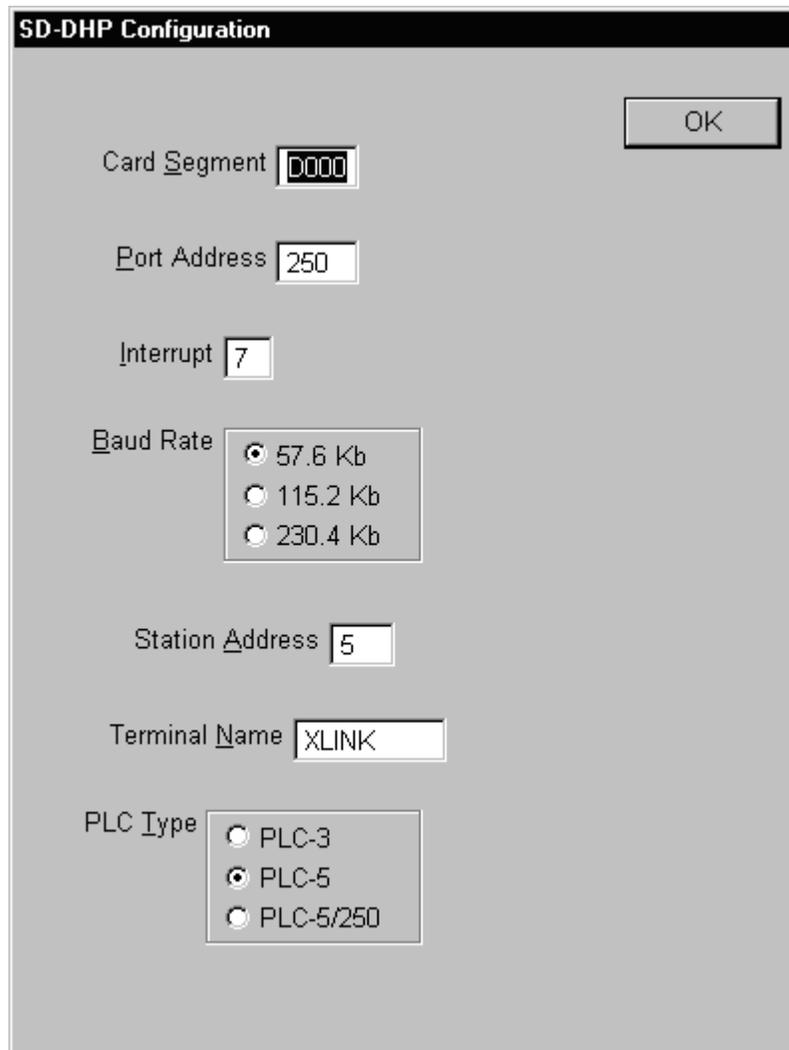
The *Download Driver 2* dialog box appears.
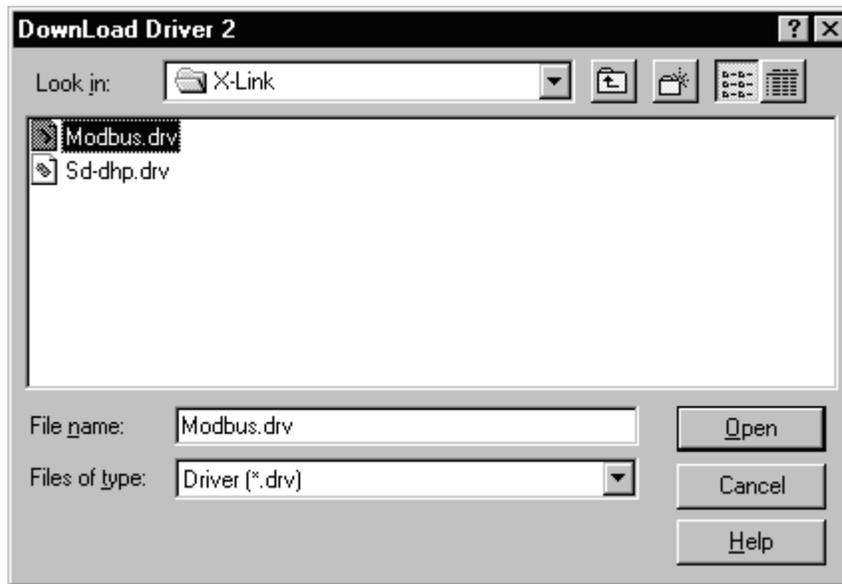
Find and select the *MODBUS.DRV* file.

The drivers can be found on the DOS Software and Supplementary Drivers floppy disks. Refer to the file *filelist.txt* in your X-Link directory for a complete list of driver locations.

Once you download a driver, it is copied to your hard drive.

Click on the *Open* button.

After a moment, the *Modbus Configuration* dialog box appears.

Click on the *OK* button to accept the default settings.

Refer to the *Windows 95/ NT Software Reference Guide* or the on-line help for more information on the configuration options.

Now you are ready to create mappings. For general information on mappings, see *Understanding Mappings* in chapter 5.

Creating a Sample Mapping

This sample mapping monitors the speed of a pump on the Data Highway Plus network.

Adding a Mapping

Choose the *Mappings/Upload* command.

The *TUTORIAL - Configuration* window opens.

Choose the *Mappings/Add...* command.

The *Mapping Definition* dialog box appears.
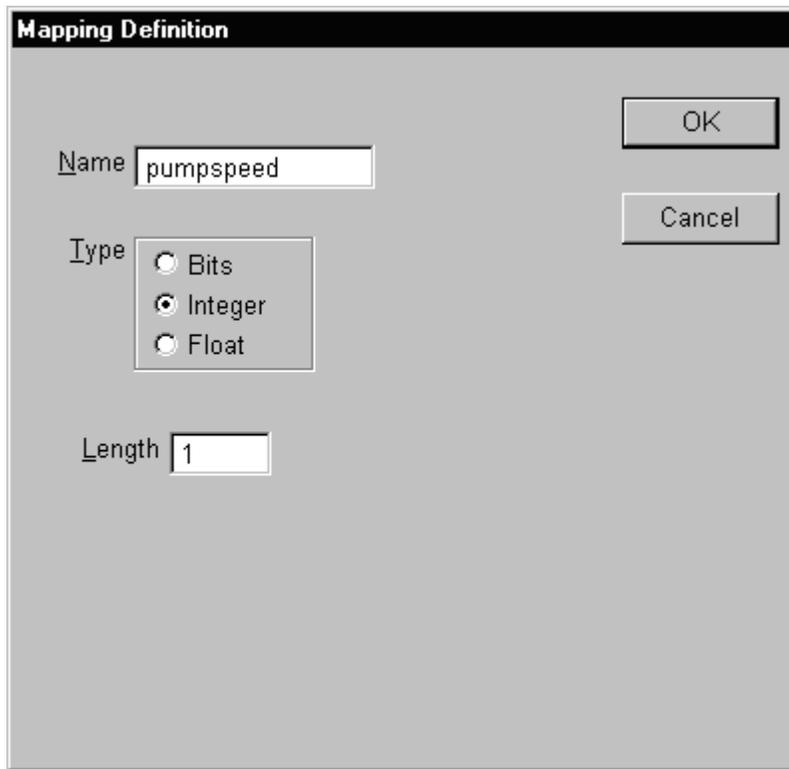
Mapping Definition

Name [pumpspeed]

OK

Cancel

Type
- ○ Bits
- ◉ Integer
- ○ Float

Length [1]

Type `pumpspeed` in the *Name* field.

Leave the default values for *Type* and *Length*.

Click on the *OK* button.

The *Data Source Definition* dialog box appears.

You will now define the source of the data.

Selecting a Source

In this example, the X-Link reads the data from the Data Highway Plus network.

Make sure the *Data Source Definition* dialog box is visible.
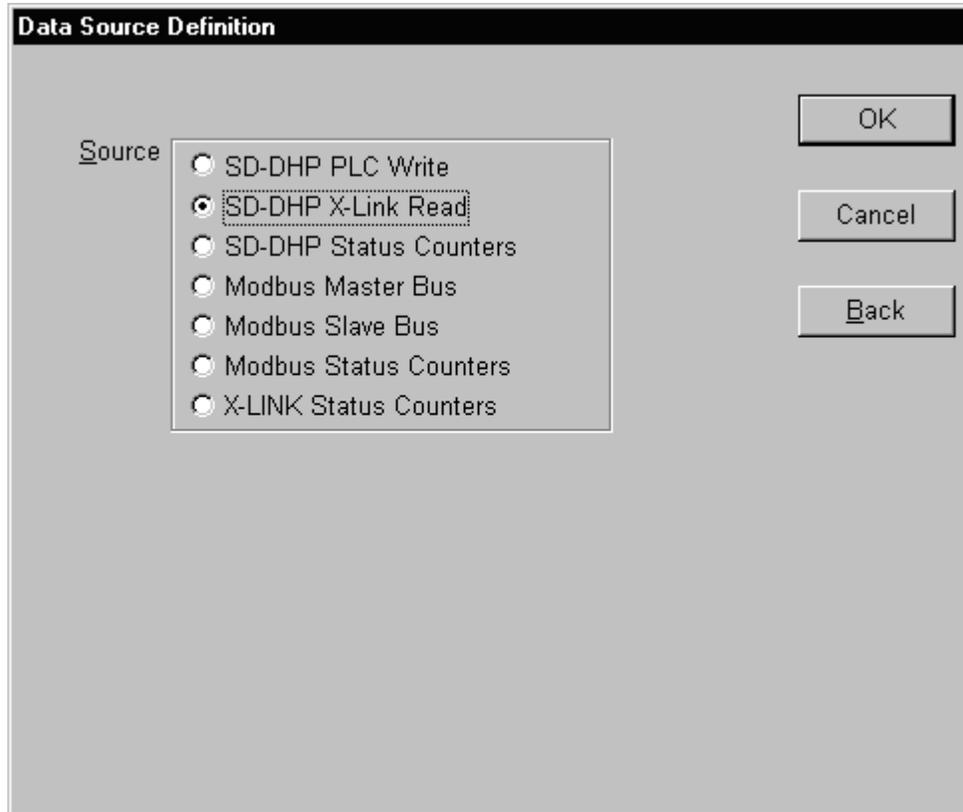
For more information on displaying this dialog box, see *Adding a Mapping*.

Select *SD-DHP X-Link Read* from the *Source* list.

Click on the *OK* button.

The *AB External PLC Address* dialog box appears.
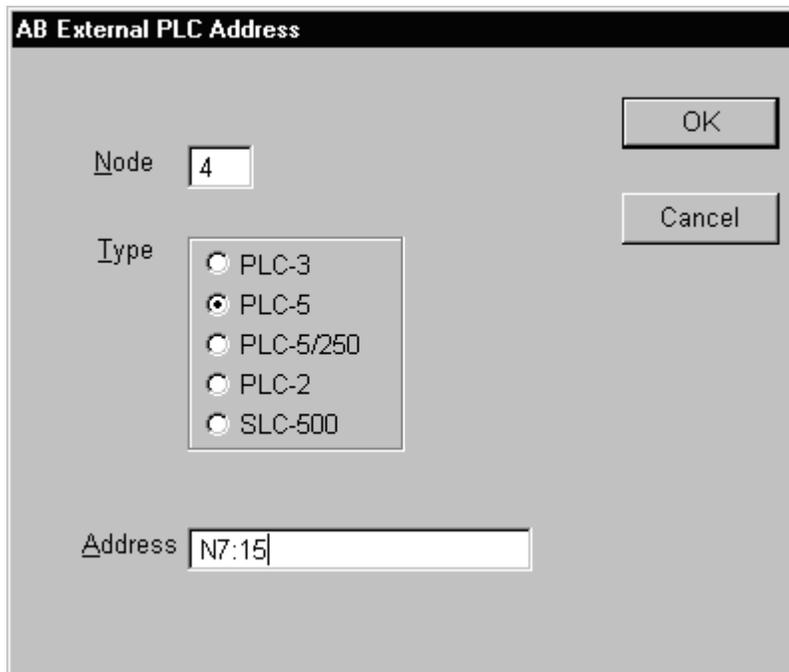
AB External PLC Address

OK

Node [4]

Type
- ○ PLC-3
- ◉ PLC-5
- ○ PLC-5/250
- ○ PLC-2
- ○ SLC-500

Cancel

Address [N7:15]

Type `4` in the *Node* field.

Type `N7:15` in the *Address* field.

Click on the *OK* button.

The *When to Read* dialog box appears.
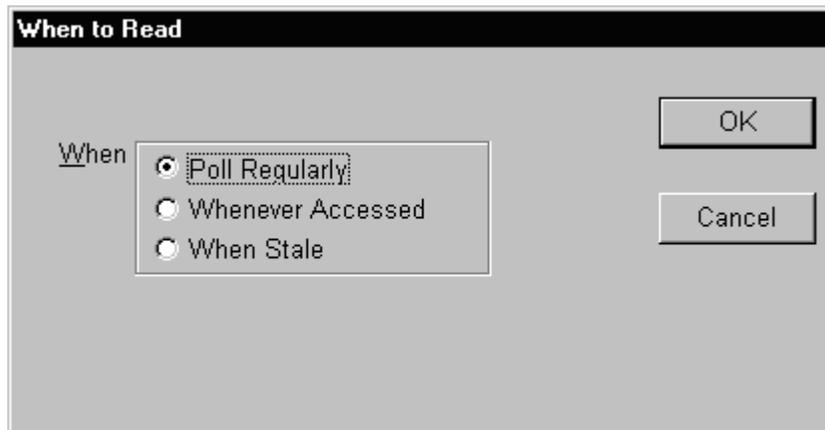
When to Read

OK

When
- ◉ Poll Regularly
- ○ Whenever Accessed
- ○ When Stale

Cancel

Choose *Poll Regularly*.

Click on the *OK* button.

The *Data Poll Rate* dialog box appears.

Click on the *OK* button to accept the default of 10 seconds.

The *Data Destination Definition* dialog box appears.

You can now select one or more destinations.

Selecting a Destination

For this example mapping, the X-Link sends data to the Modbus network.

Make sure the *Data Destination Definition* dialog box is visible.
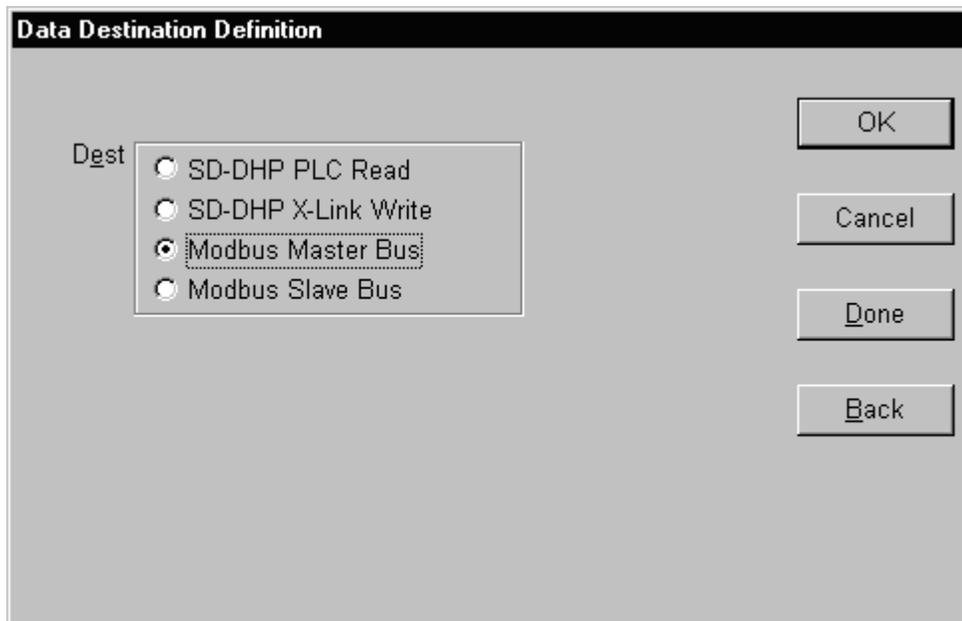
For more information on displaying this dialog box, see *Selecting a Source*.

Select *Modbus Master Bus* in the *Dest* list.

Click on the *OK* button.

The *Modicon Master Write Address* dialog box appears.
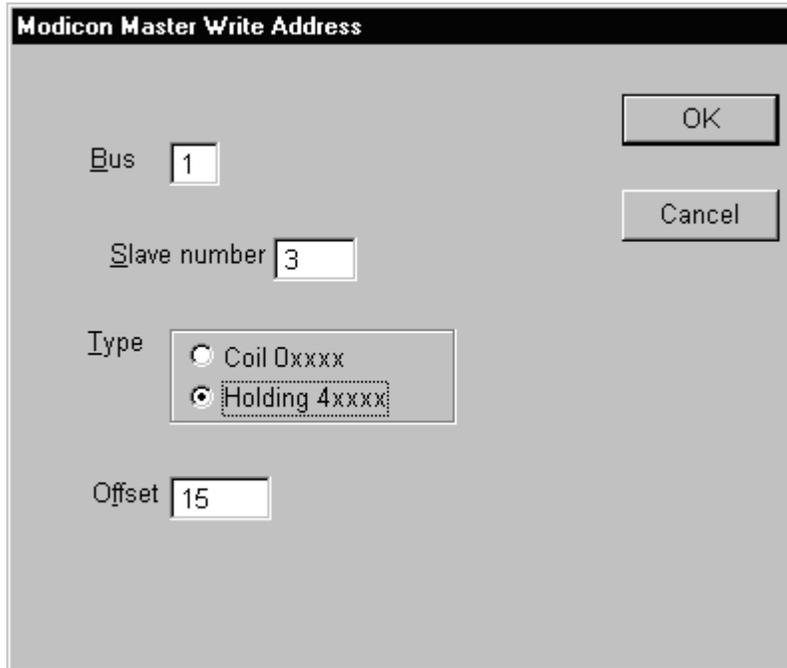
Modicon Master Write Address

OK

Cancel

Bus [1]

Slave number [3]

Type
○ Coil 0xxxx
◉ Holding 4xxxx

Offset [15]

Leave the default value 1 in the *Bus* field.

Type 3 for *Slave Number*.

Select *Holding 4xxxx* in the *Type* box.

Type 15 in the *Offset* field.

Click on the *OK* button.

The *When to Write* dialog box appears.
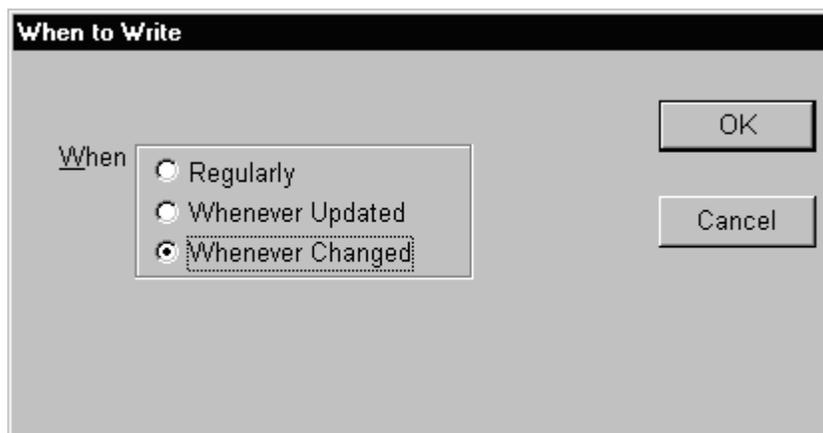
When to Write

OK

Cancel

When
○ Regularly
○ Whenever Updated
◉ Whenever Changed

Select *Whenever Changed*.

Click on the *OK* button.

The *Data Destination Definition* dialog box reappears.

You are able to select up to 255 destinations for any one source. In this example however, you only need one destination so this mapping is complete.

Click on the *Done* button.

The completed mapping allows the X-Link to read the speed of the pump on the Data Highway Plus network every 10 seconds and relay the information to the Modbus network whenever there is a change.

Creating Additional Mappings

Now you can create two examples of different mapping types, following the steps in *Creating a Sample Mapping.* Enter the information in sequence in the dialog boxes to create the mappings.

The first mapping reads the flow rate of a device from the Modbus network and writes to the Data Highway Plus network.

```
Name:    flowrate
Type:    Float
Length:  3
Source:  Modbus Master Bus
Bus:     1
Slave Number:                3
Type:    Holding 4xxxx
Offset:  17
When to Read:                Poll Regularly
Poll Rate(sec):              10
Dest:    SD-DHP X-Link Write
Node:    4
Type:    PLC-5
Address: F8:0
When to Write:               Whenever Updated
```

The second mapping, an emergency stop, is a write from the Data Highway Plus network to the X-Link, and from the X-Link to the Modbus network.

```
Name:    e_stop
Type:    Integer
Length:  1
Source:  SD-DHP PLC Write
Address: N13:0
Dest:    Modbus Master Bus
Bus:     1
Slave number:                3
Type:    Holding 4xxxx
Offset:  100
When to Write:               Whenever Updated
```

The *TUTORIAL - Configuration* window should now look like this:
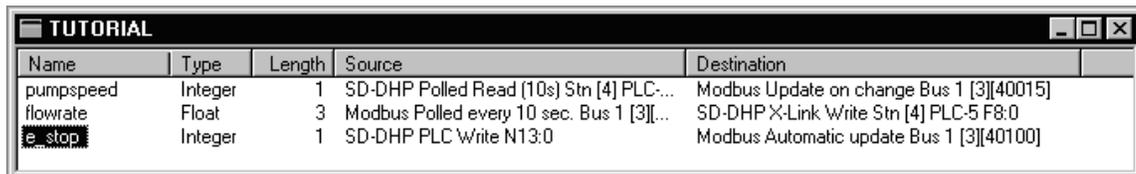
Name	Type	Length	Source	Destination
pumpspeed	Integer	1	SD-DHP Polled Read (10s) Stn [4] PLC-...	Modbus Update on change Bus 1 [3][40015]
flowrate	Float	3	Modbus Polled every 10 sec. Bus 1 [3][...	SD-DHP X-Link Write Stn [4] PLC-5 F8:0
e_stop	Integer	1	SD-DHP PLC Write N13:0	Modbus Automatic update Bus 1 [3][40100]

The *pumpspeed* source is Data Highway Plus polled read (every 10 seconds) and the destination is Modbus update on change.

The *flowrate* mapping has source Modbus polled read (every 10 seconds) and Data Highway Plus X-Link write destination.

Finally, the *e_stop* mapping's source is Data Highway Plus write and its destination is Modbus automatic update.

Viewing the Values of a Mapping

Because you did not hook the X-Link up to any real devices in this tutorial, there are no valid values for the data. Take a look at the *Value* window anyway, as it provides valuable information for troubleshooting.

Make sure you are looking at the *TUTORIAL - Configuration* window.

For more information on displaying the *TUTORIAL - Configuration* window, see *Creating a Sample Mapping*, earlier in this chapter.

Select the *pumpspeed* mapping by clicking on it with the mouse or by moving the highlight bar with the cursor keys.

Choose the *Mappings/Values…* command or press [Shift] [V].

The value window for *pumpspeed* opens.
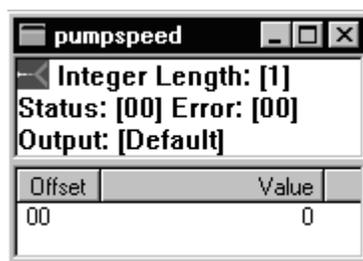
```
pumpspeed              _ □ ×
Integer Length: [1]
Status: [00] Error: [00]
Output: [Default]

Offset            Value
00                    0
```

The window displays the name, type and size of the mapping. *Status* shows the current status of *pumpspeed* and *Error* shows the last error received for the *pumpspeed* connection.

You can change the display type of the *Output*.

Display Type	Key
Reset	[R]
Hexadecimal	[H]
Octal	[O]

Decimal   [D]
Binary   [B]
Unsigned   [U]

Moving On

Now that you've learned the basics of X-Link operation, you can create your own mappings for your particular situation and particular networks.

Refer to the *DOS Software Reference Guide*, *General Reference Guide* and driver and card documentation for additional information on the DOS CONFIG software, the X-Link and the drivers.

General Reference Guide

The *General Reference Guide* provides information about the kernel and mappings. This chapter also contains examples of mappings.

Understanding Mappings

Data transfer between networks happens via mappings configured in the X-Link kernel. A mapping is simply a declaration of the type, length and source of data. It can include one or more destinations for that data.

Name

Each mapping has a unique name which the configuration program uses to access the mapping. In some cases, the drivers also use the name to access the data. Try to make the name represent the origin or purpose of the data (e.g. PUMPSPEED). The name can be up to 13 characters in length and can not contain spaces.

Type

The X-Link stores data in the standard X-Link representations for the data types Bits, Integers, Floating Points (Floats) and Strings. The driver software translates network data representations into standard data representations. Only data types supported by both drivers will be available.

Length

You must specify the length of each mapping. For Bits, Integers and Floats, the length represents the number of elements of that type which can be stored in the mapping. For a String, the length represents the maximum number of characters that can be stored in the mapping. The limit on the length of a mapping depends on the drivers you are using.

Source

To complete a mapping, a data source must be provided. A device on the network may write data to the X-Link or the X-Link may actively read data. Some drivers may restrict how or when data is sourced but, in general, the X-Link can be active or passive in both the reading and writing of data on either network.

Read Options

If the data source requires the X-Link to read data from the network, you have to select when the X-Link should retrieve data. Options include:

Poll Regularly	read the data every user-selectable period
Read When Accessed	generates a fetch of the data whenever the other driver accesses the mapping
Read When Stale	generates a fetch of the data when the mapping is accessed, if and only if the data hasn't been fetched during the last user-

	selected period

Destination

Normally, each mapping specifies one or more destinations for the data. X-Link thus makes the data available for network accesses. If you do not specify a destination, the mapping is still valid as data can be polled from the configuration PC.

Write Options

If the destination requires the X-Link to write the data, you must select when a write occurs. The options are:

Write Regularly	write every user selected period
Write When Updated	write whenever a driver updates the data
Write When Changed	X-Link generates a write to forward the data when data has changed from its previous value

Understanding the Kernel

The kernel is a software program that runs on the X-Link and handles all transactions between the two networks. The kernel determines where to forward requests for processing. Requests can originate from the network drivers, the configuration port or the X-Link.

Requests from Drivers

When a request arrives from a driver, the kernel compares the address in the request to a list of addresses used in the X-Link mappings. (For more information on mappings, see *Understanding Mappings* earlier in this chapter.) Each time an overlap occurs between the request and a mapping, the data is processed.

Read and Write Requests

If the request is a read (query), the X-Link returns data to the requester. If the request is a write (update), the X-Link copies the data into the mapping. One request can overlap many mappings. This allows a PLC or other device to read one block of integers even when the block's data comes from multiple sources.

Fully Mapped Requests

Reads need to be fully mapped to succeed. There can be no gaps between data elements. Writes, however, usually succeed even if only part of the data is mapped. For example, if a write request for ten integers does not map to exactly ten integers, it will still be processed. If a read request for ten integers does not map to exactly ten integers, the X-Link generates an error and the request fails. Success depends on options set by the driver.

The X-Link will perform an individual request and will read the whole mapping for each X-Link initiated mapping.

Mappings and the X-Link's CMOS RAM

As you create or modify mappings, X-Link stores them in CMOS RAM for retention in case of power failure or power down. This storage process takes about 10 seconds to complete. After changing mappings, wait at least 10 seconds before powering off the X-Link. During this time delay, the status light on the X-Link will flash amber.

Examples of Mappings

Here are some sample mappings to give you an idea of how different sources and destinations will affect data transfer. For each of these mappings, data moves from Network 2 to Network 1.

Basic Mapping

This example presents a standard mapping; however, problems may occur if Network 1 is faster than Network 2.

Source: Network 2 X-Link Read on Demand
Destination: Network 1 PLC Read
Advantages: Returns current error and data
Disadvantages: Faster Network 1 can swamp Network 2 with multiple read requests

High Speed / Slow Speed Mapping

This mapping is an improvement on the Basic Mapping where Network 1 is faster than Network 2.

Source: Network 2 X-Link Read Polled [0 sec]
Destination: Network 1 PLC Read
Advantages: Slower Network 2 won't be overloaded with many read requests
Disadvantages: Returns last data/status read
                                Non-deterministic (number of mappings will impact speed)

Exception Based Mapping

This mapping only communicates across networks when defined events occur.

Source: Network 2 - PLC Write
Destination: Network 1 - PLC Read
Advantages: Network 1 can poll as often as necessary without generating traffic on Network 2
Disadvantages: Need to program devices on both networks to generate a message when an   event occurs

MMI Configuration or Maintenance Screen

Source: Network 2 - X-Link read when stale [0 sec]
Destination: Network 1 PLC Read
Advantages: The source won't generate any network traffic when the MMI screen is not displayed   (i.e. Network 1 doesn't poll).
While screen is displayed, the data will be updated at rate
      specified.
Disadvantages: Returns last data/status read
                        Non-deterministic (number of mappings will impact speed)

Inefficient Transfer

This mapping is inefficient because both networks are constantly polling for changes.

Source: Network 2 Polled
Destination: Network 1 Polled
Advantages: None (use Automatic Transfer instead)
Disadvantages: Twice the overhead.
        If the networks are different speeds, there can be many more reads than writes (or   vice-versa).

Automatic Transfer

This example is an improvement over the Inefficient Mapping. Network 1 is accessed only when there is a change.

Source: Network 2 - X-Link polled
Destination: Network 1 when updated.
Advantages: No programming on either network
Disadvantages: May transfer data more often then necessary

Network Traffic

Requests generate extra traffic on the network. For example, if one network originates a transaction to write sixteen individually mapped data items, sixteen individual transactions may be generated on the other network. This causes excessive network traffic if the driver forwards all the transactions to the network.

Status and Error Messages

When you create a mapping or first start up the X-Link, all values in existing mappings are flagged as invalid for 10 seconds. Any read access of this data returns an invalid data error. Once X-Link writes data into the mappings, any errors detected on X-Link generated transactions will be reported.

If data is available within the X-Link for immediate access by the network, the status returned by the X-Link does not indicate the current health of

the network. If, however, a transaction generates a transaction on the other network (when required, when changed, when stale), the resulting status code indicates any errors that occur.

Kernel Status Counters

The kernel status counters indicate the status of communication between the kernel and the drivers and the general state of the kernel. The offsets allow you to use the status counters as data sources in mappings.

Offset	Counter Name	Description
0	Messages Processed	total count of messages processed by the kernel
1	Replies Past Timeout	a reply was received after a message timed out
2	Queries	total query (read) messages generated by drivers
3	Updates	total update (write) messages generated by drivers
4	X-Link Queries	total query (read) messages generated by X-Link
5	X-Link Updates	total update (write) messages generated by X-Link
6	Parameter Packets	total parameter management messages processed
7	Mapping Packets	total mapping management messages processed
8	Access Packets	total access management messages processed
9	Status Packets	total status request messages processed
10	Unknown Packets	total unsupported messages received
11	Unsupported Replies	total unsupported messages of reply type
12	Unsupported Requests	total unsupported messages of request type
13	Messages Timed Out	total number of messages timed out
14	Messages Aborted	total messages aborted
15	Battery 1=charged	An indication of the state of the CMOS battery

The following table list *Set* and *Report* status counters for the kernel. The *Set* counters indicate how frequently an error is set on a mapping. The *Report* counters indicate that the error has been reported (to a driver for example)

Offset (Set/Report)	Counter Name	Description
16/41	Map Not Found	Mapping name wasn't found
17/42	Address Not Found	Address wasn't found
18/43	Communications	Communications error occurred on a network
19/44	Undetermined	Network generated an unspecified error
20/45	Internal Error	X-Link generated an unexpected error
21/46	Local Error	Error on X-Link end of driver network
22/47	Timeout Error	Timed out on message
23/48	Hardware Error	Could not access required hardware
24/49	Command Error	Command received is invalid
25/50	Protection Error	Operation couldn't complete due to protection violation
26/51	Invalid Address	Invalid device address
27/52	Remote Error	Error on other end of communication network

28/53	Invalid Data	Data doesn't match expected format or is not yet available
29/54	Out of Memory	X-Link buffers all full
30/55	Duplicate Mapping	Tried to add a map name already used
31/56	Checksum Error	Checksum error on download
32/57	Mapping Too Long	Mapping length is larger than the driver can support
33/58	Out of kernel buffers	The CONFIG port can't allocate buffers
40/65	Unknown Error	Count of all other errors

Config Port Counters

The following table lists the CONFIG port counters.

Counter Name	Description
Messages Received	total count of CONFIG port messages received
Messages Originated	total count of CONFIG messages originated
Messages Replied	total replies sent
Messages Aborted	total abort message requests processed
Status Queries	number of times port status requested
Out of Kernel Bufs	number of messages discarded because of lack of kernel buffers
Out of Config Bufs	number of messages discarded because of lack of configuration port buffers
Rmte Chars betwn pkts	characters X-Link received between packets
Rmte Bad RX Sum	X-Link received a packet with a check sum error
Rmte Early ETX	X-Link received short packets
Rmte Early STX	X-Link received garbled packet
Rmte NAK Received	X-Link received a NAK
Rmte NAK Sent	X-Link sent a NAK
Locl Timeouts	PC time out waiting for a reply
Locl Chars betwn pkts	PC received data between packets
Locl NAK Received	PC received a NAK
Locl Early ETX	PC received a short packet
Locl Data Too Long	PC received a garbled packet
Locl Bad RX Sum	PC received a packet with a check sum error
Locl Wrong Sequence#	PC received a packet it didn't expect
Locl Retries	PC re-transmitted a request

DOS Software Reference Guide

The X-Link configuration program is a text-based windowing application which executes under DOS on an IBM compatible PC. A mouse is not necessary to work with the program, but makes the interface easier to use.

The configuration program accesses the X-Link gateway to load the kernel and drivers and to build and monitor data mappings.

This chapter explains common tasks you may perform when working with X-Link configuration software, such as:

creating, opening and deleting accesses

downloading the kernel

downloading the drivers

creating, editing and deleting mappings

Creating a New Access

The first time you run the configuration software, you must create a new connection or *access*.

Choose the *X-Link/New...* command.

The *X-Link Definition* dialog box appears.
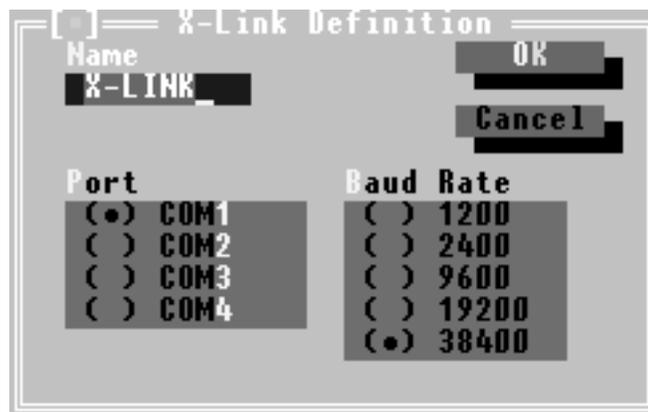
Type a name for your connection in the *Name* field.

If you create more than one connection, give each connection a unique name. Otherwise, you can use the default *X-Link* name.

In the *Port* list, select the COM port that connects the X-Link to your PC.

In the *Baud Rate* list, select the baud rate of the configuration computer.

Click on the *OK* button or press [Alt] [O].

Opening an Existing Access

When you re-enter the configuration program, the last access you used is automatically reloaded. If you want, you can re-establish a different access.

Choose the *X-Link/Access...* command.

The *Access an X-Link* dialog box appears.
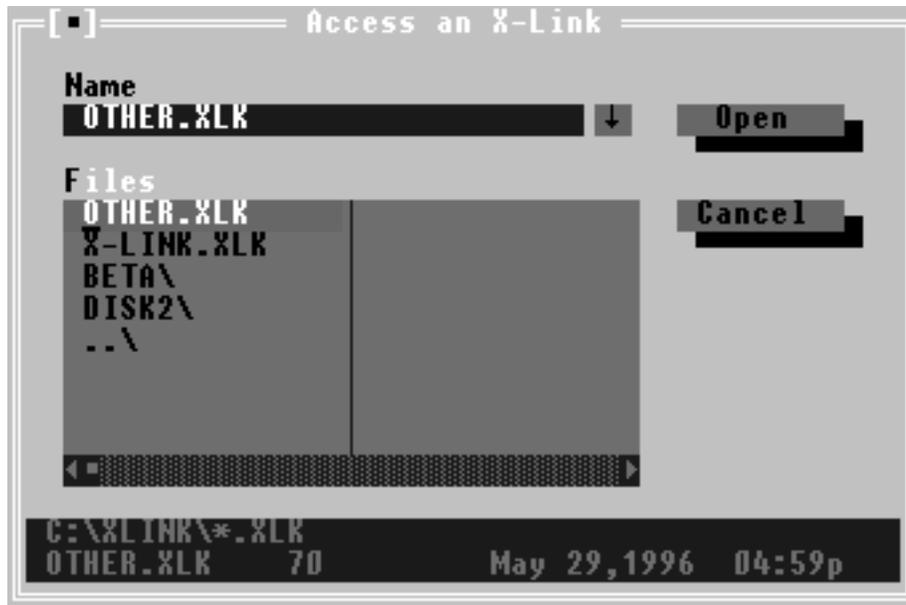
In the *Files* box, select the access you want to open.

The access will end with *.XLK*. The default name is *X-LINK.XLK*.

Click on the *Open* button or press [Alt] [O].

Deleting an Existing Access

You will not be asked for verification on deletion so be sure you want to delete the access.

Choose the *X-Link/Delete...* command.

The *Delete an X-Link* dialog box appears.
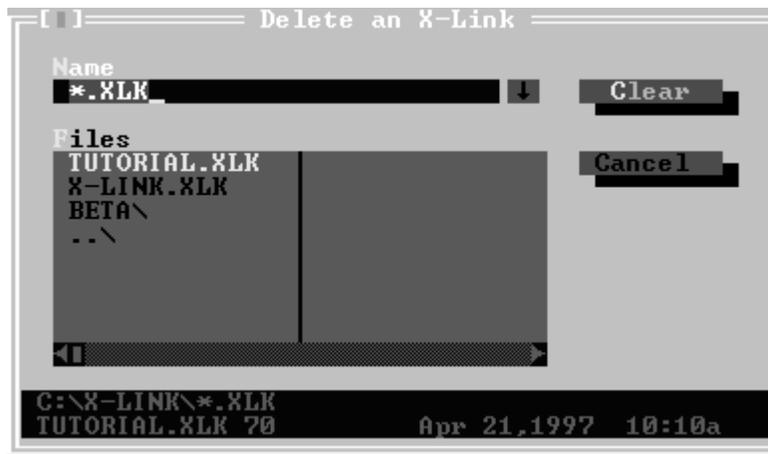
In the *Files* box, select the access name you want to delete.

The access filename will end with *.XLK*.

Click on the *Clear* button or press [Alt] [C].

The connection is deleted.

Downloading the Kernel

Once loaded, the X-Link stores the kernel in battery-backed memory. Use the *Help/About...* command to determine what software is loaded. If you are not sure that the correct version of the software is installed, you can repeat the download procedure.

To download the kernel:

Choose the *Download/Kernel...* command.

The *Kernel File to Download* dialog box appears.

```
=[■]======= Kernel File to Download =
   Name
   X-LINK.KRN                      ↓      Open

   Files
   X-LINK.KRN                             Cancel
   X-LINK_S.KRN
   BETA\
   DISK2\
   ..\

   ◄■                            ►
   C:\XLINK\*.KRN
   X-LINK.KRN    52086      Mar 21,1996  03:07PM
   VER: 1.20.01 BETA
```
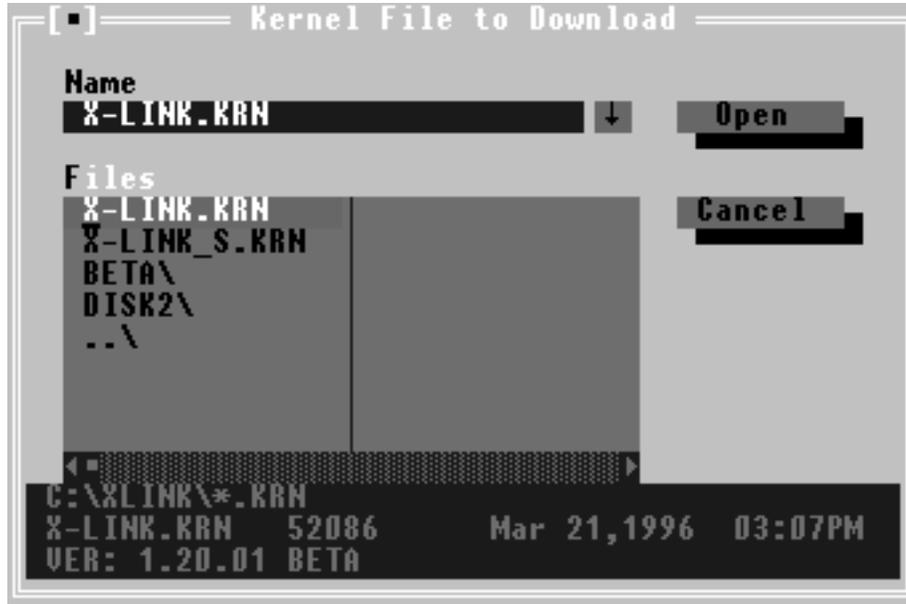
The information pane at the bottom of the window gives version information for the highlighted file.

Select the *X-LINK.KRN* from the *Files* list.

Use *X-LINK_S.KRN* only if you are using the Intellicon Intelligent Serial Communications Adapter. You can find the *X-LINK_S.KRN* file in the *Beta* directory.

Click on the *Open* button or press [Alt] [O].

The *X-Link Configuration* dialog box appears.

```
=[■]======= X-Link Configuration =
                                    OK
   [ ] Case Insensitive Names

   BaudRate  ( ) 1200
             ( ) 2400
             ( ) 9600
             ( ) 19200
             (●) 38400

   [ ] Reply 0 to Uninitiated Data
   [ ] Timers in Tenths of Seconds

   Async 3 Port  3E8  Async 3 IRQ  3
   Async 4 Port  2E8  Async 4 IRQ  5
```
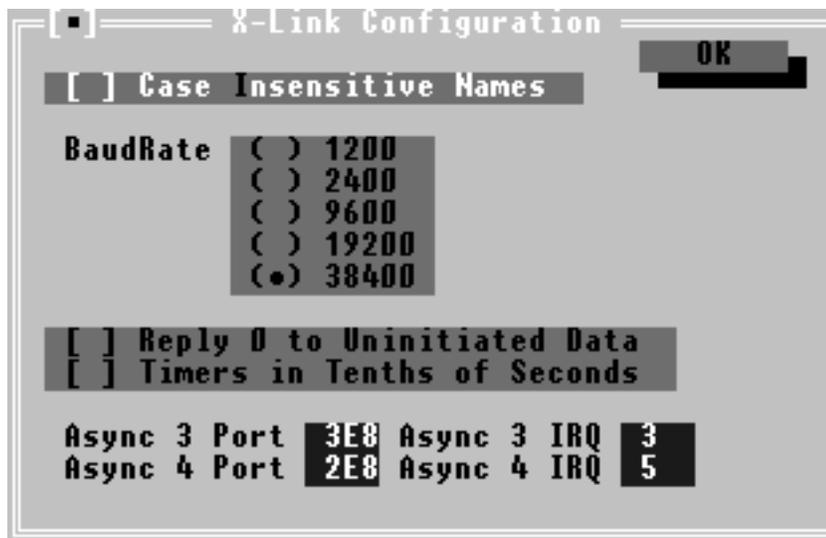
Select *Case Insensitive Names* if you want upper and lower case names to be equivalent for mapping names.

Select the baud rate.

The default baud rate is 38400.

Select *Reply 0 to Uninitiated Data* if you want to return 0 to requests for invalid data.

All mappings marked as containing invalid data when X-Link first starts up. Setting the *Reply 0 to Uninitiated Data* option prevents errors by returning 0 when a request is made on the invalid data. Some software programs will halt if they receive an error status.

Select *Timers in Tenths of Seconds* for faster polling rates if you desire.

The time interval in the *X-Link - Configuration* window will still be listed in seconds.

Before you set this option, consider setting the poll rate to 0 so the X-Link polls as fast as it is able. Note that setting both the poll rate to 0 and *Timers in Tenths of Seconds* may actually slow down polling.

If you use the *Async* port settings, make sure the ports and interrupts match your hardware settings. Refer to your card's documentation.

Do not use IRQ 4.

Port Number: **Used for:**
1, 2   built in serial ports
3, 4   add-on dumb cards
5-13   add-on smart cards, such as the Intellicon Intelligent Serial Communications   Adapter

Click on the *OK* button or press [Alt] [O].

Downloading a Driver

The drivers, once installed, remain in the X-Link's battery-backed memory. Use the *Help/About..* command to determine what software is loaded. If you are still not sure that the correct version of the software is installed, repeat the download procedure.

Choose the *Download/Driver 1...* or *Download/Driver 2...* command.

The *Driver x File to Download* dialog box appears.

The information pane at the bottom of the window gives version information for the drivers and minimum kernel version required for use of the driver. If the current kernel does not meet the minimum version requirements, the last line of the information pane will be highlighted in red.

Select the name of the driver file from the *Files* list.

> All driver files end with *.DRV.*

Click on the *OK* button or press [Alt] [O].

> You will see a "Downloading Code" message.

> A configuration dialog box will appear for the driver you have selected.

Set your configuration options.

> Refer to your driver manual for more information on particular settings.

Click on the *OK* button or press [Alt] [O] to continue.

> The hardware will automatically reset after downloading the driver.

Editing the Kernel or Driver Parameters

> You can edit the kernel or driver parameters without reloading the software.

Choose the *Download/Kernel...*, *Download/Driver 1...* or *Download/Driver 2...* command.

> An "Already Loaded - ReLoad?" message box appears.

Click on the *No* button or press [Alt] [N].

> A configuration dialog box appears for the kernel or driver you selected.

Make the desired changes to the configuration settings.

> See *Downloading the Kernel* or *Downloading the Driver* and your driver manual for more information on changing settings.

Click on the *OK* button or press [Alt] [O] to continue.

Updating the Kernel

> There may be updates to the kernel made available which you will want to use. To load a new kernel, you must also reload the drivers and mappings. When an X-Link kernel is loaded, software previously in the X-Link's memory is cleared.

Make a note of drivers you have loaded and all of their parameters.

> To check the parameters, choose *Download/Driver 1…* or *Download/Driver 2...* You will be asked if you want to reload. Choose *No*. You will then see the configuration screen and can note the parameters.

Save all mappings to a file.

See *Saving Mappings to File*, later in this chapter.

Insert the disk with the new kernel in your floppy drive.

If you download the kernel from our Web site or BBS, it will be in a zip format. Copy the zip file to a temporary directory and unzip it.

Move into the X-Link directory by typing `CD C:\X-LINK` at the DOS prompt.

Type `COPY <SOURCE>\*.* C:\X-LINK` where *<SOURCE>* is the location of the new kernel file.

This assumes the X-Link directory is in the root of your C: drive. Substitute the appropriate drive letter and path for your setup.

Download the new kernel and reload the drivers, resetting all the original parameters.

See *Downloading the Kernel* and *Downloading a Driver*, as well as your driver manuals, for more information.

Load the mappings from the file.

See *Loading Mappings from File* for more information.

Updating the Drivers

There may be updates to the drivers made available which you will want to use. The drivers will have three files: *drivername.DRV*, *drivername.HLP* and *drivername.CNT*.

Before you update the drivers, save your existing mappings to a file.

See *Saving Mappings to File*, later in this chapter, for more information.

You can update the drivers without removing the mappings but results may be unpredictable.

Clear all the mappings.

See *Clearing and Removing Mappings*, later in this chapter, for more information.

Insert the disk with the new drivers into your floppy drive.

If you download the kernel from our Web site or BBS, it will be in a zip format. Copy the zip file to a temporary directory and unzip it.

Type `COPY <SOURCE>\*.* C:\X-LINK` where *<SOURCE>* is the location of the new driver files.

This assumes the X-Link directory is in the root of your C: drive. Substitute the appropriate drive letter and path for your setup.

Follow the steps in *Downloading a Driver* to set up the new software.

Reload the mappings from the file.

See *Loading Mappings from File*, later in this chapter, for help.

Creating and Uploading Mappings

Mappings provide the cross connection of data items. Each mapping has a name, type, length and source for the data it contains. You can add one or more destinations to a mapping to allow data transfer to devices on either network. For general information on mappings, see *Understanding Mappings*, in the *General Reference Guide*.

Choose the *Mappings/Upload…* command.

The *X-Link - Configuration* window opens. If any mappings already exist, they appear in the window.

NOTE: The Report status counters will increment each time mappings are uploaded. The *Map Not Found* counter will increment once for each upload and the *Address Not Found* will increment once for each mapping. The X-Link recognizes these counters as the end of the mapping file and the end of the mapping respectively.

Choose the *Mappings/Add...* command or press [A] to create a new mapping.

The *Mapping Definition* dialog box appears.

```
┌─[ ]══════ Mapping Definition ═══════════════
│                                      ┌──────────┐
│                                      │    OK    │
│   Name  ┌──────────────────┐         └──────────┘
│         │_                 │         ┌──────────┐
│         └──────────────────┘         │  Cancel  │
│   Type  ┌──────────────┐             └──────────┘
│         │ ( ) Bits     │
│         │ (•) Integer  │
│         │ ( ) Float    │
│         └──────────────┘
│   Length ┌────────────┐
│          │ 1          │
│          └────────────┘
│
└──────────────────────────────────────────────
```

Type a *Name* for the mapping.

All names must be unique. The X-Link assumes upper and lower case names to be different unless you select *Case Insensitive Names* in the *X-Link Configuration* dialog box. For more information on displaying this dialog box, see *Downloading the Kernel*, earlier in this chapter.

Select the *Type* of mapping desired.

Only types supported by both drivers are listed.

Enter the *Length* of the mapping.

The configuration software tests the length against criteria provided by both drivers and generates an error message if the length is unacceptable. The drivers can also reject the mapping based on length.

Click on the *OK* button or press [Alt] [O].

You must now set a source and one or more destinations for the mapping. These will differ for each driver so refer to your driver documentation for more information.

Clearing and Removing Mappings

To remove all existing mappings from the X-Link, use the *Clear...* command.

Choose the *Mappings/Clear…* command.

A "Remove All Mappings" message appears.

Click on the *Yes* button or press [Alt] [Y] to confirm you want to clear all mappings.

To remove a single mapping, use the *Remove...* command.

Select the mapping you want to remove by moving the highlighted line over your selection with the cursor keys or clicking on it with the mouse.

Choose the *Mappings/Remove...* command or press [Delete].

A confirmation message box appears.

Click on the *Yes* button or press [Alt] [Y] to confirm removal.

Editing Mappings

Select the mapping to edit.

To select, move the highlighted line with the cursor keys until it is over the chosen mapping or click on the mapping with the mouse.

Choose the *Mappings/Edit…* command or press [E] to edit the mapping.

The *Mapping Definition* dialog box appears.

You can now change the desired options by moving through the dialog boxes for the selected mapping. Refer to *Creating and Uploading Mappings*, earlier in this chapter, for more information on the available options.

Saving Mappings to File

Choose the *Mappings/Save…* command.

The *Save Configuration to File* dialog box appears.
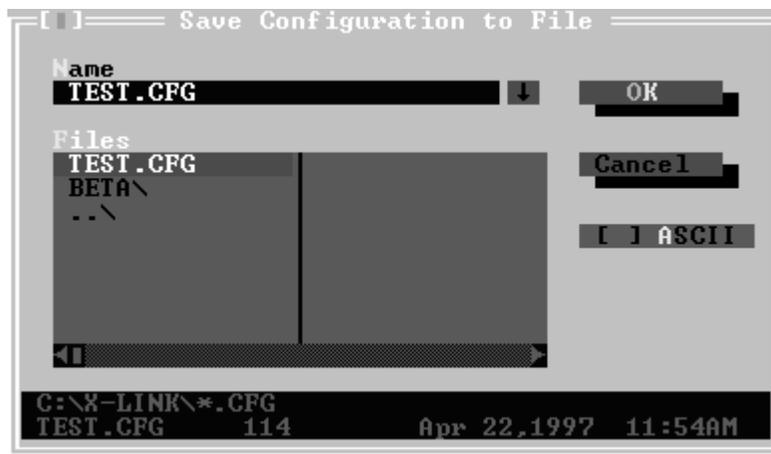
The file can be saved as an ASCII file by selecting the ASCII option. This allows you to edit the mappings file in an ASCII editor.

Type a save filename in the *Name* box.

Select a location to save to in the *Files* box.

Click on the *OK* button or press [Alt] [K].

Loading Mappings from File

If you save mappings to a file, you can later reload them into your X-Link (after kernel update, for example). Or you can load the mappings into a different X-Link.

Choose the *Mappings/Load…* command.

The *Load a Configuration File* dialog box appears.
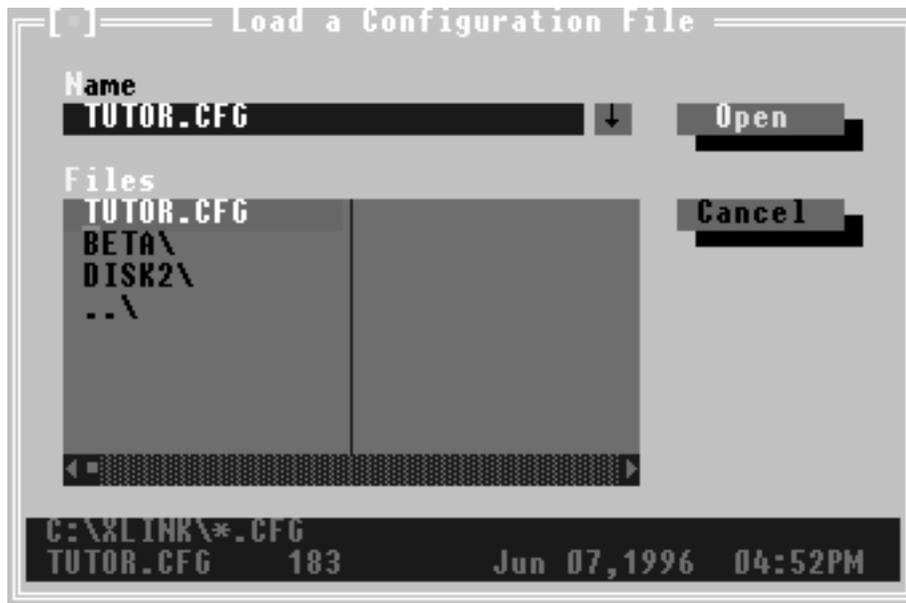
Select the file you want to load.

The file will have a *.CFG* extension.

Click on the *Open* button or press [Alt] [O].

The *X-Link - Configuration* window opens. Loaded mappings are displayed.

Merging Mappings

You may want to merge mappings currently in the X-Link with mappings from a file on disk.

Choose the *Mappings/Merge* command.

The *Merge a Configuration File* dialog box appears.
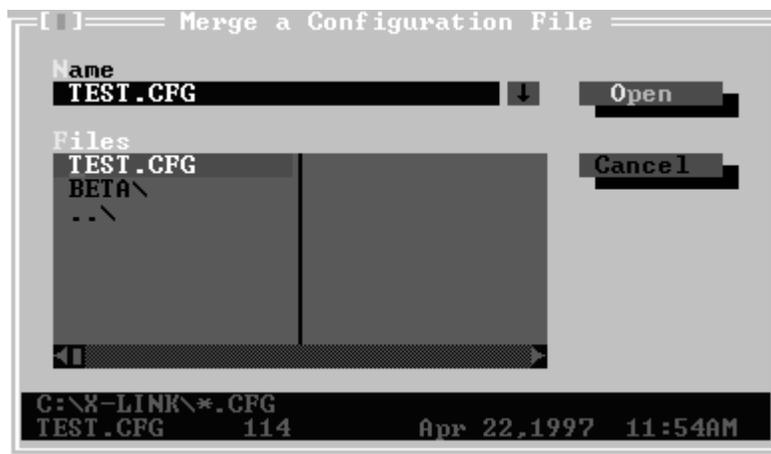
Select the file you want to merge into the X-Link.

The filename will end with *.CFG*.

Click on the *Open* button or press [Alt] [O].

A "Loading File" message will appear.

The configuration software will notify you if it can not load a mapping.

Deleting a Mapping File

Choose the *Mappings/Delete* command.

The *Delete a Configuration File* dialog box appears.
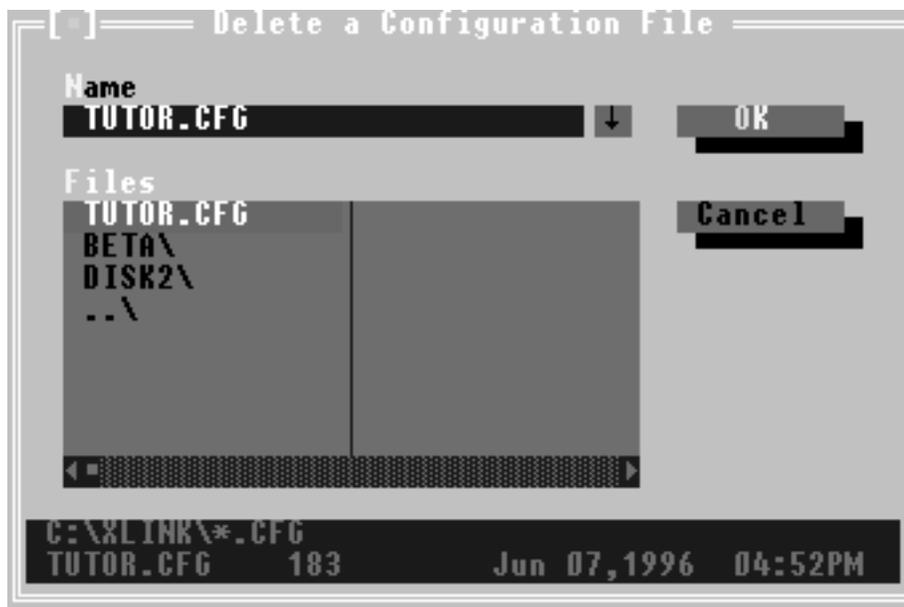
Select the name of the file to delete.

The filename will have a *.CFG* extension.

Click on the *OK* button or press [Alt] [K].

Monitoring Values and Status of Mappings

The values and status of all mappings can be monitored.

Select the mapping you want to monitor. Use the cursor keys to move the highlighted line or click on the mapping with the mouse.

Choose the *Mappings/Values…* command or press [V].

The value window for the selected mapping opens.
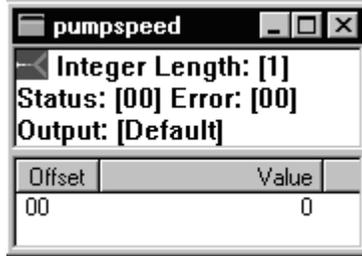
This window is updated periodically.

For all mapping types except floats, you can switch the display type of the output by pressing the following keys:

Display Type	Key
Reset	[R]
Hexadecimal	[H]
Octal	[O]
Decimal	[D]
Binary	[B]
Unsigned	[U]

The symbol in the top left corner of the value window indicates the communication status of the mapping. The left side changes whenever the configuration software retrieves values from the X-Link. The right side changes when values retrieved have been updated in the X-Link.

The *Status* field displays the result of the most recent transaction processed for the data. A zero value indicates success. The *Error* field shows the last non-zero status stored for the mapping. See chapter 8, *Troubleshooting*, for a list of error codes.

Printing the Mappings

Ensure you are looking at the *X-Link - Configuration* window.

For information on displaying the *X-Link - Configuration* window, see *Creating and Uploading Mappings*, earlier in this chapter.

Choose the *Mappings/Print* command.

The mappings will print on LPT1.

Monitoring Status Counters

Within the kernel, several counters log events and errors. As well, most drivers maintain counters of network events in hardware or software.

To view the counters, choose one of the following options from the *Status* menu.

Choose:	To:
Kernel	view window of kernel counters
Driver 1	display counters for Driver 1

Driver 2   display counters for Driver 2
Config   view CONFIG port counters

Clearing Counters

You can zero all the counters in the active window.

Choose the *Status/Clear Cntrs* command.

Changing Counter Update Frequency

You may configure the frequency at which the counters update on the screen.

Choose the *X-Link/Options…* command.

The *Options* dialog box appears.
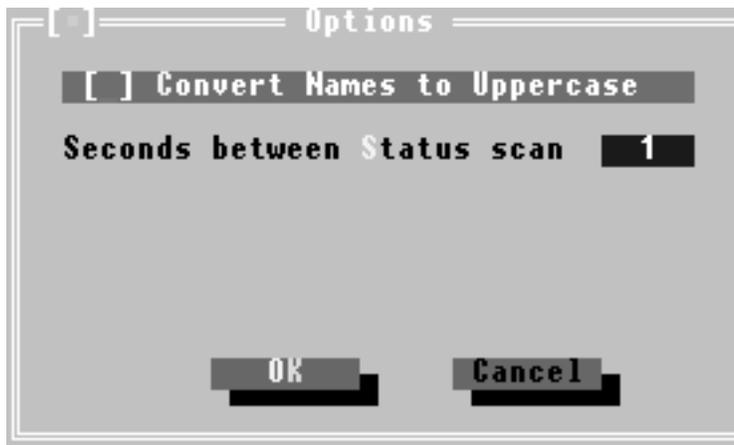
If you open multiple status screens, they are polled in a round-robin fashion.

The kernel status counters are explained in the *General Reference Guide*.

Using the Trace Feature

The *Trace* command opens a window to receive trace messages from the X-Link. During development, trace messages were added to the software to provide monitoring of the processing in the X-Link. If there are too many trace messages or tracing is left on too long, you will receive a trace task watchdog and the X-Link will reset.

Trace messages are classified into the following categories:

Option	Description
Task Messages	normal inter-task communication
Internal Errors	errors detected by the kernel
Driver Messages	normal driver processing
Driver Errors	errors detected by a driver

| Debug Messages | messages added for specific monitoring |

Choose the *Status/Trace…* command.

The *Trace Options* dialog box appears.

Select the type of messages and errors you wish to trace.

Click on the *OK* button or press [Alt] [O].

The *X-Link - Trace* window opens.

You can not perform any other actions until tracing is stopped.

To halt tracing, press [Esc].

Viewing the Error Log

The kernel in the X-Link maintains a buffer of the last few errors traced (Driver or Internal Errors).

Choose the *Status/Error Log* command.

The *X-Link - Error Log* window opens and displays the error buffer from the X-Link.

This window is not updated. To get the latest log, perform the error log command again.

Viewing the Execution Log

The execution log lists resets and times of resets that have occurred in the X-Link. It may be a useful tool for troubleshooting problems. The execution log should not contain any watchdogs. Refer to chapter 8, *Troubleshooting*, for additional information.

Choose the *Status/Execution Log* command.

The *Execution Log* window appears.

Press [Esc] to close the window.

Resizing and Moving Windows

Choose the *Windows/Resize/Move* command or press [Ctrl] [F5].

The active window border will change color indicating the resize/move mode.

To move the window, press the arrow keys for the desired direction.

To resize the window, press [Shift] and the desired arrow key direction.

Press [Enter] to complete the action.

Maximizing a Window

To maximize the active window:

Choose the *Windows/Zoom* command.

You can also press [F5] to maximize.

Switching Between Windows

To move between several open windows:

Choose the *Windows/Next* command or press [F6] until you reach the desired window.

Closing Windows

To close an active window:

Choose the *Windows/Close* command or press [Alt] [F3] to close an active window.

Arranging Open Windows

To tile the active windows so they are all visible:

Choose the *Windows/Tile* command.

To arrange the active windows one on top of the other with title bars showing:

Choose the *Windows/Cascade* command.

Getting Help

To open the help index:

Choose the *Help/Index...* command or press [F1].

The *Help* window opens.

Use the mouse or press [Tab] to select the topic you want to get help on.

Press [Enter].

The help topic is displayed.

Press [Esc] to quit help.

Displaying Version Numbers and Loaded Software

You can determine what software has been loaded into the X-Link and view the version numbers in the *About* dialog box.

Choose the *Help/About* command.

The *About* dialog box appears.

Exiting the Configuration Program

To exit the software:

Choose the *X-Link/Exit* command or press [Alt] [X].

Windows 95/NT Software Reference Guide

This chapter explains common tasks you may perform when working with the Windows 95/NT configuration software, such as:

creating, opening and deleting accesses

downloading the kernel

downloading the drivers

creating, editing and deleting mappings

Creating a New Access

The first time you run the configuration software, you must create a new access to the X-Link.

Choose the *File/New...* command.

The *X-Link Definition* dialog box appears.
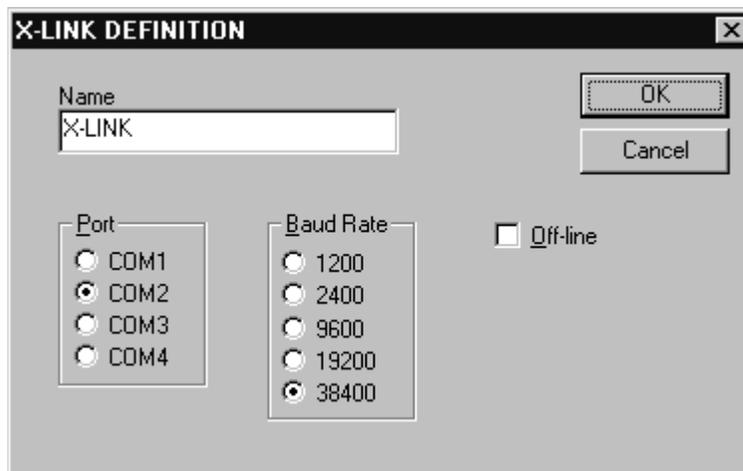
Type a name for your access in the *Name* field.

If you create more than one access, give each access a unique name. Otherwise, you can use the default *X-LINK* name.

Select the COM *Port* which connects your PC to the X-Link.

Select the *Baud Rate* of the configuration computer.

If you want to work off-line, enable the *Off-line* option.

Click on the *OK* button.

Opening an Existing Access

When you re-enter the configuration program, the last access you used is automatically reloaded.

To open a different access:

Choose the *File/Open...* command.

The *Open* dialog box appears.
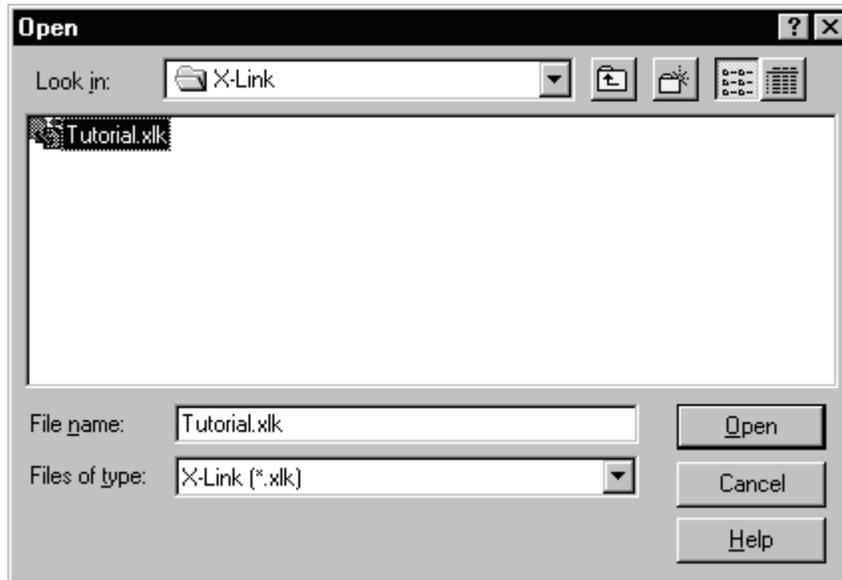
Find and select the access file you want to open.

The file name will end with *.XLK*. The default name is *X-LINK.XLK*.

Click on the *Open* button.

Editing the Current Access

To edit the current access:

Choose the *File/Edit…* command.

The *X-Link Definition* dialog box appears.
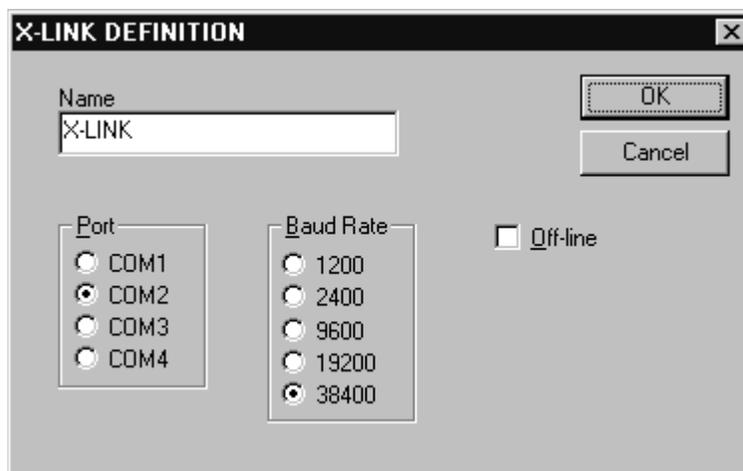
Make the desired changes.

Refer to *Creating a New Access*, earlier in this chapter, for details on the options.

NOTE: If you change the *Name* of the access, you are actually creating a new access file.

Click on the *OK* button to accept your changes.

Downloading the Kernel

Once loaded, the X-Link stores the kernel in its battery-backed memory.

Choose the *Download/Kernel...* command.

The *Open* dialog box appears.

Select the *X-LINK.KRN* or the *X-LINK_S.KRN* file.

Use *X-LINK_S.KRN* (found in the *Beta* directory) only if you are using the Intellicon Intelligent Serial Communications Adapter.

Click on the *Open* button.

Several diagnostic messages appear briefly on the screen. Then the *X-Link Configuration* dialog box appears.
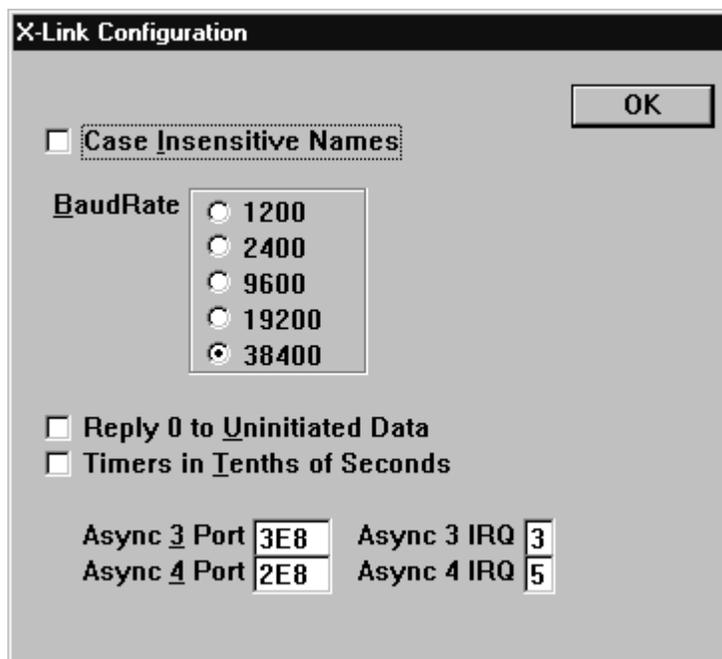
Select *Case Insensitive Names* if you want upper and lower case names to be equivalent in mapping names.

Set the *Baud Rate*.

The default baud rate is 38400.

Select *Reply 0 to Uninitiated Data* if you want to return 0 instead of an error status.

When X-Link first starts up, all mappings are marked as containing invalid data. Setting the *Reply 0 to Uninitiated Data* option prevents errors by returning 0 when a request is made on the invalid data. Some software programs will halt if they receive an error status.

Select *Timers in Tenths of Seconds* for faster polling rates if you desire.

NOTE: The time interval in the configuration window will still be listed in seconds.

Before you set this option, consider setting the poll rate to 0 so the X-Link polls as fast as it is able. Note that setting both the poll rate to 0 and *Timers in Tenths of Seconds* may actually slow down polling.

If you use the *Async Port* settings, make sure the ports and interrupts match your hardware settings.

Refer to your card's documentation for more information.

Do not use IRQ 4.

Port Numbers: **Used for:**

1, 2   built in serial ports
3, 4   add-on dumb cards
5-13   add-on smart cards, such as the Intellicon Intelligent Serial Communications Adapter

Click on the *OK* button.

A message asking you to download Driver 1 appears.

Click on the *OK* button to continue.

Downloading a Driver

The drivers, once installed, remain in the X-Link's battery-backed memory. Use the *Help/About CONFIG...* command to determine what software is loaded. If you are still not sure that the correct version of the software is installed, repeat the download procedure.

Choose the *Download/Driver 1...* or *Download/Driver 2...* command.

The *Download Driver x* dialog box appears.

Find and select the driver file.

All driver files end with *.DRV*. If you have not previously downloaded the driver, you must download it from the floppy disks your software came on. Refer to the *filelist.txt*, in your X-Link directory, for the location of your driver.

NOTE: If you cannot see the driver files (.DRV) in the dialog box, you must change the *View* options in Windows Explorer. Open Explorer. Choose *View/Options*. On the *View* tab, select *Show all files*. Close Explorer and try your download again.

Click on the *Open* button.

A "Downloading Code" message appears briefly on the screen.

A configuration dialog box appears for the driver you have selected.

Set your configuration options.

Options are driver dependent. Refer to your driver manual for more information on particular settings.

Click on the *OK* button.

The hardware automatically resets after downloading the driver.

Editing the Kernel or Driver Parameters

You can edit the kernel or driver parameters without reloading the software.

Choose the *Download/<item to edit>...* command.

An "Already Loaded - Reload?" message box appears.

Click on the *No* button.

A configuration dialog box appears for the item you selected.

Make the desired changes to the configuration settings.

Click on the OK button.

Updating the Kernel

Occasionally, updates to the kernel may be made available. The latest versions of the kernel may be found on the S-S Technologies BBS or on our Web site.

When you load the X-Link kernel, all software previously in the X-Link's memory is cleared. You must reload all drivers and mappings after reloading the kernel.

Make a note of the drivers you have loaded and all of their parameters.

Save all mappings to a file.

Refer to *Saving Mappings to File*, later in this chapter, for help.

Download the new kernel.

Follow the steps in *Downloading the Kernel*, earlier in this chapter, if you need assistance.

Download the drivers again, resetting all the original parameters.

See *Downloading a Driver*, earlier in this chapter, for additional information.

Load the mappings from the file you created in step 2.

Refer to *Loading Mappings from File*, later in this chapter, for more information.

Updating the Drivers

Updates to the drivers may occasionally be made available. The latest released versions of the drivers may be found on the S-S Technologies BBS or on our Web site.

The drivers will have three files: *drivername.DRV*, *drivername.HL_* and *drivername.CNT*. You *must* copy all three files to your X-Link directory to be able to use the new driver.

Before you update the drivers, save your existing mappings to a file,

See *Saving Mappings to File*, later in this chapter, for more information.

You can update the drivers without removing the mappings but results may be unpredictable.

Clear all the mappings.

See *Clearing and Removing Mappings*, later in this chapter, for more information.

Make a note of your current driver parameters.

Download the new driver, resetting your original parameters.

If you need help downloading the driver, refer to *Downloading a Driver*, earlier in this chapter.

Creating and Uploading Mappings

Mappings provide the cross-connection of data items. Each mapping has a name, type, length and source for the data it contains. You can add one or more destinations to a mapping, allowing data transfer to devices on either network. For general information on mappings, refer to *What are Mappings?* in the *General Reference Guide*.

Choose the *Mappings/Upload* command.

The mappings window opens. If any mappings already exist, they appear in the window.

Choose the *Mappings/Add…* command or press [Shift] [A] to create a new mapping.
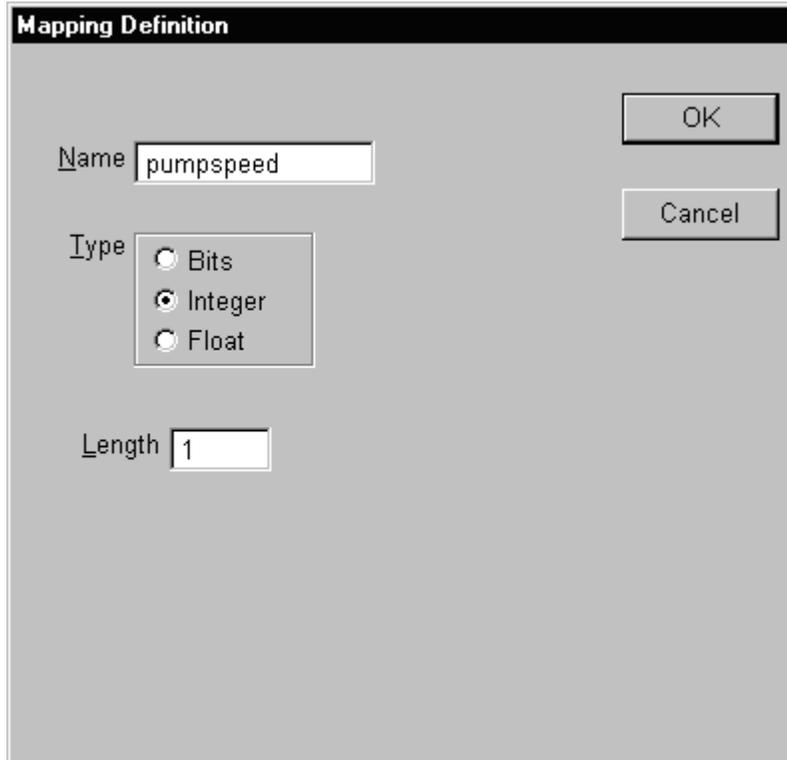
The *Mapping Definition* dialog box appears.

```
┌─────────────────────────────────────────────┐
│ Mapping Definition                           │
│                                              │
│                              ┌───────────┐   │
│                              │    OK     │   │
│   Name  pumpspeed            └───────────┘   │
│                                              │
│                              ┌───────────┐   │
│   Type  ┌──────────────┐     │  Cancel   │   │
│         │  ○ Bits      │     └───────────┘   │
│         │  ● Integer   │                     │
│         │  ○ Float     │                     │
│         └──────────────┘                     │
│                                              │
│   Length  1                                  │
│                                              │
└─────────────────────────────────────────────┘
```

Type a *Name* for the mapping.

Select the *Type* of mapping desired.

Enter the *Length* of the mapping.

Click on the *OK* button.

You must now set a source and one or more destinations for the mapping. These will differ for each driver so refer to your driver documentation for more information.

Clearing and Removing Mappings

To remove *all* existing mappings from the X-Link, use the *Clear...* command.

Choose the *Mappings/Clear…* command.

A confirmation message box appears.

Click on the *Yes* button to confirm you want to clear all mappings.

To remove a single mapping, use the *Remove...* command.

Select the mapping you want to remove.

To select, move the highlighted line with the cursor keys until it is over the chosen mapping or click on the mapping with the mouse.

Choose the *Mappings/Remove...* command or press [Delete].

A confirmation message box appears.

Click on the *Yes* button to confirm removal of the selected mapping.

Editing Mappings

To edit an existing mapping:

Select the mapping to edit.

To select, move the highlighted line with the cursor keys until it is over the chosen mapping or click on the mapping with the mouse.

Choose the *Mappings/Edit…* command.

The *Mapping Definition* dialog box appears.
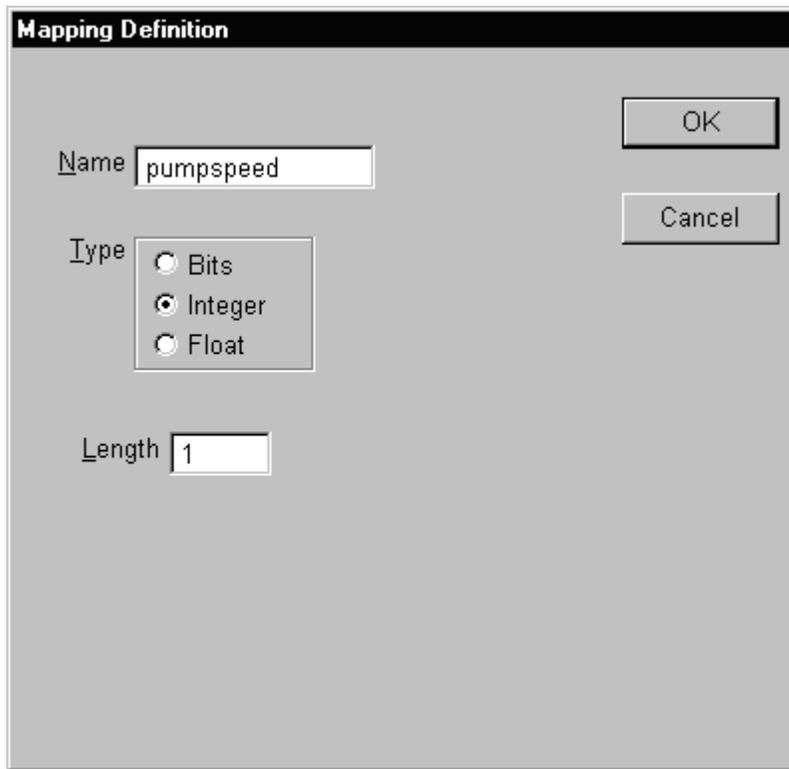
Mapping Definition

Name | pumpspeed

Type
- ○ Bits
- ⦿ Integer
- ○ Float

Length | 1

OK

Cancel

Change the desired parameters.

Click on the *OK* button to accept your changes.

Saving Mappings to File

To save the current mapping to file:

Make sure the mapping window is open and in focus.

Choose the *File/Save As...* command.

The *Save As* dialog box appears.

```
Save As                                              ? X
Save in:      Win                    ▼   🔼  🗂️  🔳 🔳

  ▣ joe.CFG
  ▣ joe2.CFG




File name:     *.cfg                          Save
Save as type:  Mappings (*.cfg)          ▼    Cancel
                                              Help
```
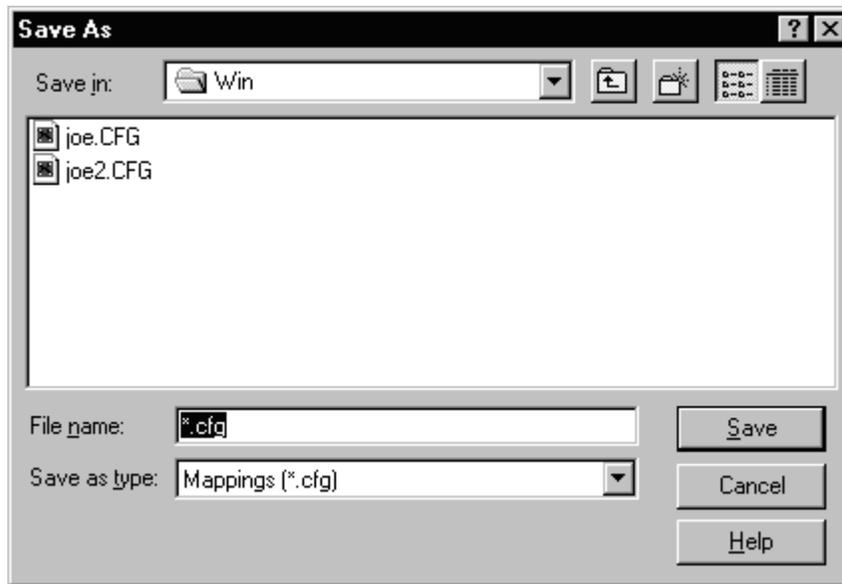
Enter a name for your file in the *File* name box.

The default extension is *.CFG*.

Choose a location to save your file to.

Click on the *Save* button.

Loading Mappings from File

If you save your mappings to a file, you can later reload them into your X-Link (after kernel update, for example) or you can load the mappings into a different X-Link.

Choose the *Mappings/Load…* command.

The *Open* dialog box appears.
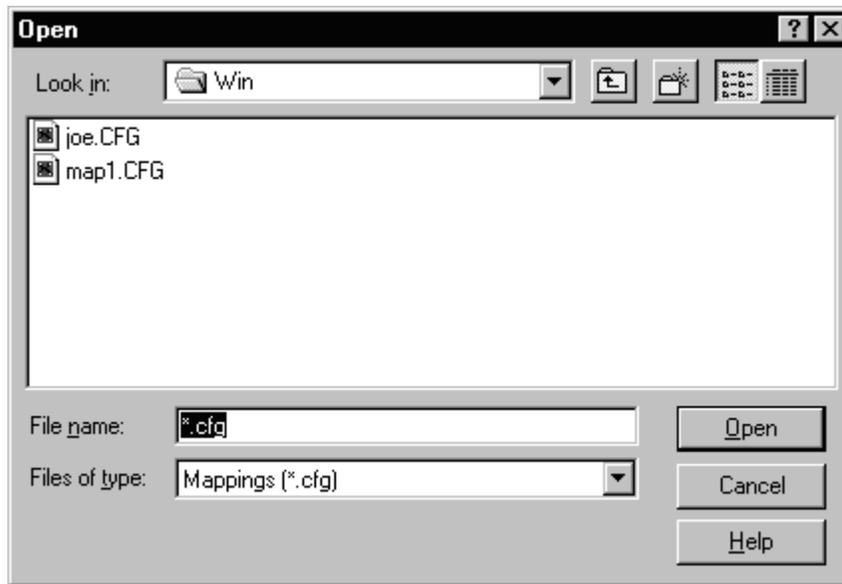
Select the file you want to load.

The file will usually end with *.CFG*.

Click on the *Open* button.

The mapping window opens. Loaded mappings are displayed. The configuration software will notify you if there are problems loading any of the mappings from file.

Merging Mappings

You may want to merge mappings currently in the X-Link with mappings from a file on disk.

Choose the *Mappings/Merge…* command.

The *Open* dialog box appears.
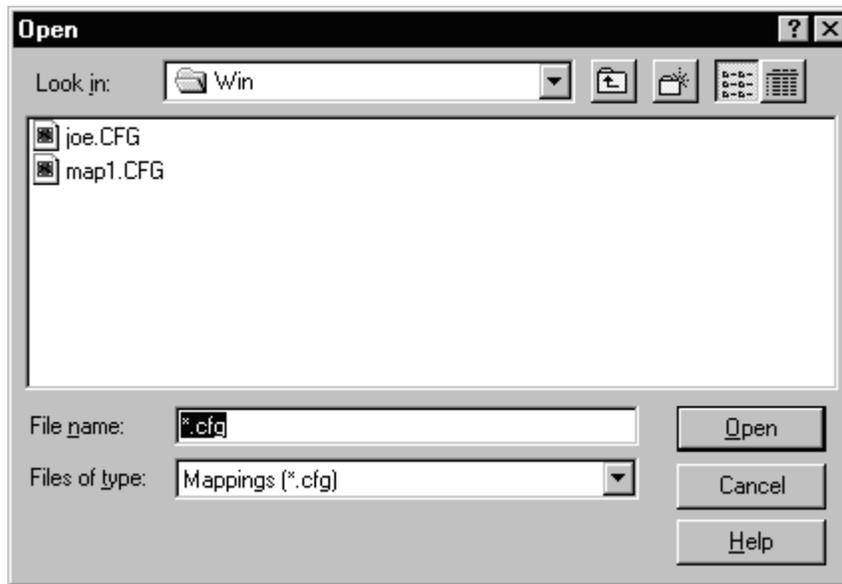
Select the file you want to merge into the X-Link.

The file name will usually end with *.CFG*.

Click on the *Open* button.

A "Loading File" message will appear.

The configuration software will notify you if there are problems loading any of the mappings from file.

Monitoring Values and Status of Mappings

The values and status of all mappings can be monitored.

Select the mapping you want to monitor.

Use the cursor keys to move the highlighted line or click on the mapping with the mouse.

Choose the *Mappings/Values* command.

The values window for the selected mapping opens. This window is updated periodically.
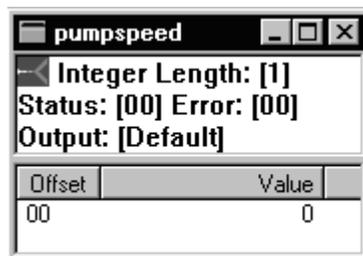
For all mapping types except floats, you can switch the display type of the output by pressing the following keys:

Display Type	Key
Reset	[R]
Hexadecimal	[H]
Octal	[O]
Decimal	[D]
Binary	[B]
Unsigned	[U]

The symbol in the top left corner of the value window indicates the communications status of the mapping. The left side changes whenever the configuration software retrieves values from the X-Link. The right side changes when values retrieved are updated in the X-Link.

The *Status* field displays the result of the most recent transaction processed for the data. A zero value indicates success. The *Error* field shows the last non-zero status stored for the mapping. See chapter 8, *Troubleshooting*, for a list of error codes.

Printing the Mappings

Ensure the mappings window is in focus.

Choose the *File/Print...* command.

The *Print* dialog box appears.
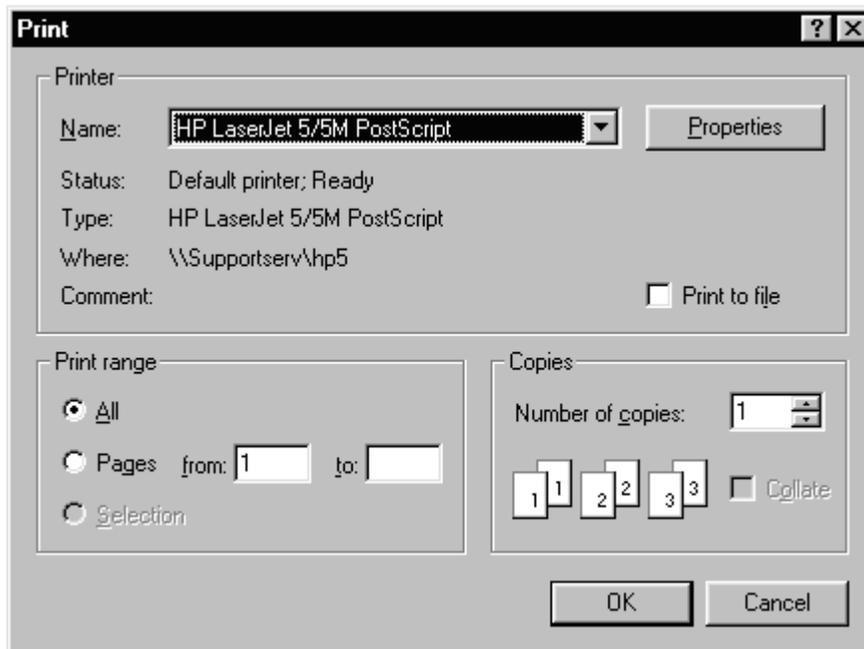
Set the desired print options.

Click on the *OK* button to print the mappings.

Monitoring Status Counters

Within the kernel, several counters log events and errors. As well, most drivers maintain counters of network events in either hardware or software.

To view the counters:

Choose one of the following options from the *Status* menu.

Choose:	To:
Kernel	view window of kernel counters
Driver 1	display counters for Driver 1
Driver 2	display counters for Driver 2
Config	view CONFIG port counters

Clearing Counters

You can zero all the counters in the active window.

Choose the *Status/Clear Counters* command.

The counters all reset to zero.

Changing Counter Update Frequency

You may configure the frequency at which the counters update on the configuration screen.

Choose the *File/Options…* command.

The *Options* dialog box appears.
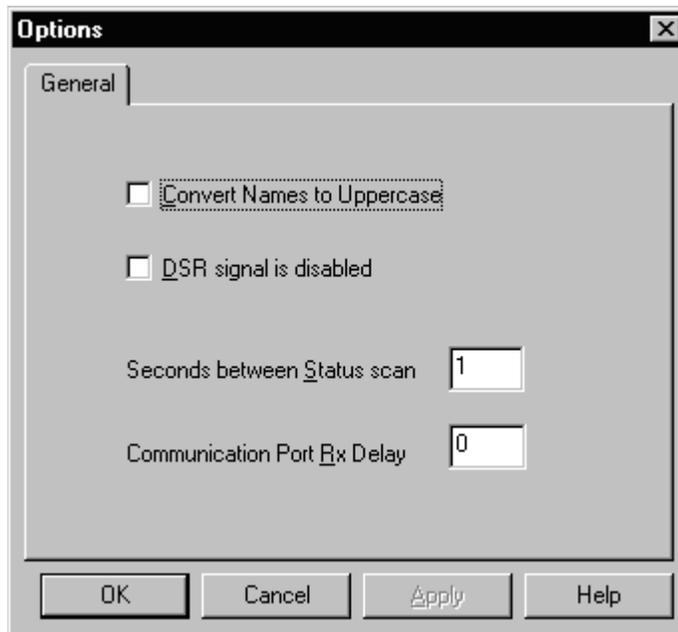
Change the value for *Seconds between Status scan* to the desired number of seconds.

Click on the *OK* button to accept your changes.

Using the Trace Feature

The *Trace* command opens a window to receive trace messages from the X-Link. During development, trace messages were added to the software to provide monitoring of the processing in the X-Link. If there are too many trace messages or tracing is left on too long, you will receive a trace task watchdog and the X-Link will reset.

To start tracing:

Choose the *Status/Trace...* command.

The *Trace Options* dialog box appears.
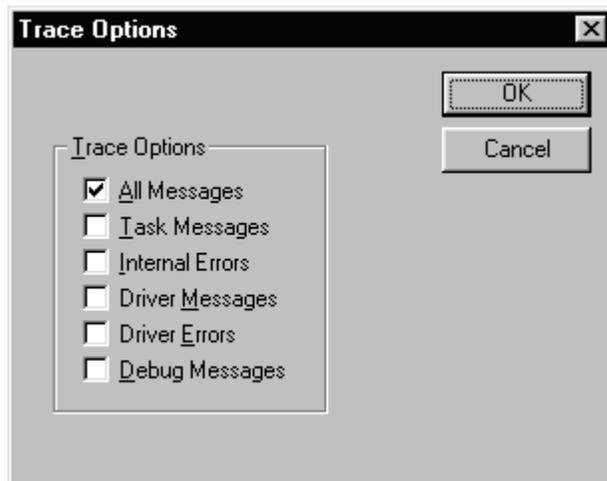
Select the type of messages and errors to trace in the *Trace Options* list.

Trace messages are classified into the following categories:

Task Messages - normal inter task communication
Internal Errors - errors detected by the kernel
Driver Messages - normal driver processing
Driver Errors - errors detected by a driver
Debug Messages - messages added for specific monitoring

Click on the *OK* button to begin the trace.

You cannot perform any other actions until you stop tracing.

Press [Esc] to quit tracing.

Viewing the Error Log

The kernel in the X-Link maintains a buffer of the last few driver or internal errors traced.

To open the Error Log:

Choose the *Status/Error Log* command.

The *Error Log* window opens and displays the error buffer from the X-Link.

This window is not updated. To get the latest log, perform the Error Log command again.

Viewing the Execution Log

The Execution Log lists events and times of events that have occurred in the X-Link. It may be a useful tool for troubleshooting problems.

To open the Execution Log:

Choose the *Status/Execution Log* command.

The *Execution Log* window appears.

Resizing and Moving Windows

To resize the active window:

Use the mouse to click and drag on the borders of the window until the desired size is reached.

Choose the *Size* command from the *System* menu. You can then use the cursor keys to resize the window.

To move the active window:

Click and drag the window by its title bar.

Choose *Move* from the *System* menu. You can then use the cursor keys or the mouse to move the window.

Minimizing and Maximizing Windows

To minimize the active window:

Click on the small button in the upper right corner with an underscore type line on it.

Choose *Minimize* from the *System* menu

To maximize the active window:

Click on the small maximize button in the upper right corner. The button has a picture of a square on it.

Double click on the title bar of the window

Choose the *Maximize* command from the *System* menu

Switching Between Windows

To switch between open windows:

Click on the title bar of the desired window.

Choose the desired window name or number from the *Windows* menu.

Closing Windows

To close the active window:

Click on the small *X* button in the upper right corner

Double click on the application or window icon in the upper left corner

Choose *Close* from the *System* menu

Arranging Open Windows

To arrange open windows so they are overlapping with title bars visible:

Choose the *Window/Cascade* command.

To arrange the open windows so they are all visible:

Choose the *Window/Tile* command.

Getting Help

To open the Help Contents:

Choose the *Help/HelpTopics* command.

The *Help Topics* dialog box appears.
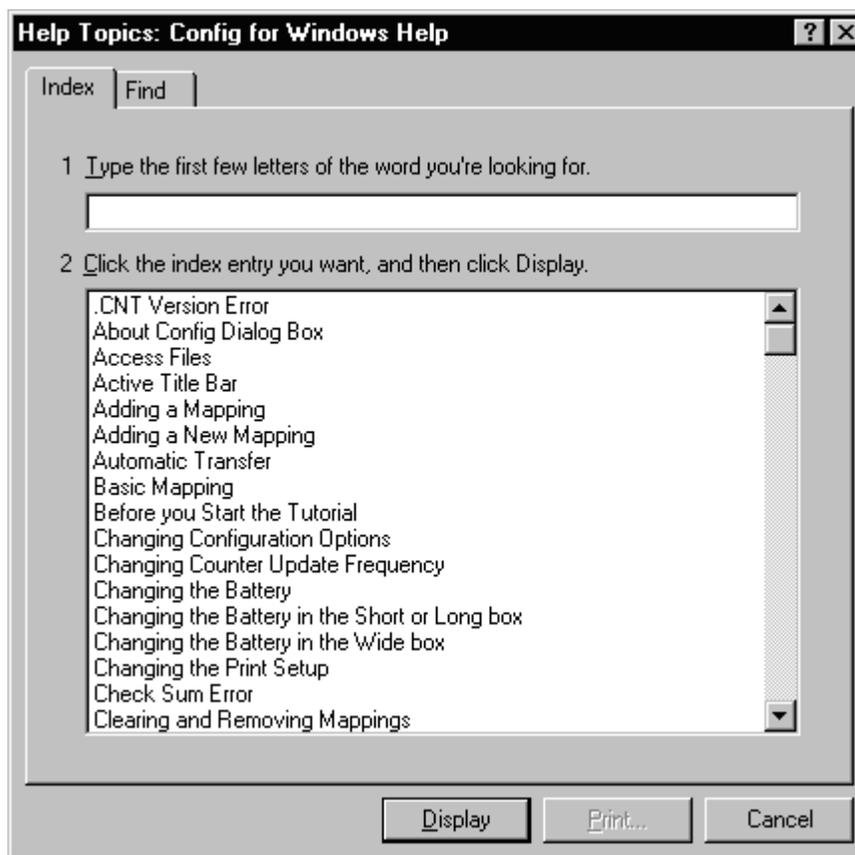
You can use the *Contents*, *Index* and *Find* features to search for help on a particular topic.

Using Context Sensitive Help

Context Sensitive Help provides information on your current task, the tool you are using or an action you can perform at this time. You can use the Context Sensitive Help pointer to obtain help on an element of the application window, a menu command or another program element.

To use Context Sensitive Help pointer:

Click on the *Context Help* button .

The mouse pointer changes to an arrow and question mark symbol.

Click somewhere in the application window or choose a menu command to receive help on that item.

To obtain context sensitive help on dialog boxes, windows or menu commands, you can also press [F1].

Displaying Version Numbers and Loaded Software

To view information about the loaded kernel and driver, hardware, copyrights and version numbers:

Choose the *Help/About CONFIG…* command.

Exiting the Configuration Program

To exit the configuration program:

Choose the *X-Link/Exit* command or press [Alt] [X].

Troubleshooting

The troubleshooting section offers solutions to communication problems and lists possible X-Link errors and error code numbers.

Backup and Restore Card Contents

There are 3 major downloadable components (kernel, drivers and mappings) required to make a SAFLink communicate.   The kernel and drivers also have settings that must be correct. A simple method of backing up and restoring card contents (all settings, drivers and mappings) is provided. To make a backup of an existing card, start the Config software (windows only). Set up the default X_LINK.XLK access file for the correct port and baud rate. Select DOWNLOAD, UPLOAD CMOS, ALL. Provide a suitable filename (*.dmp) The resulting file is a complete backup of the contents of the SAFLink card. This includes the kernel, drivers, mappings and all other settings. It does not include the firmware on any installed ISA cards. To restore the file to another SAFLink, again start the Config software (windows only). Set up the default X_LINK.XLK access file for the correct port and baud rate. Exit from the config software, start a dos window, go to the SAFLink software directory, enter BLAST filename. Filename is the filename entered during the backup. If the BLAST.EXE does not exist in the SAFLink software directory, Update the SAFLink software from the SAFphire website (http://www.safphire.com/software/software.htm). The backup and restore processes take a few minutes to complete.

STATUS LED

The X-Link performs internal diagnostics during the power up sequence. The STATUS LED displays the results of these tests.

On a normal start up or reset, the STATUS LED flashes green 4 or 5 times, then lights solid amber and, finally, solid green. The amber indicator means a valid kernel has been found and executed.

If the STATUS light shows solid red after flashing green, the X-Link has successfully completed its diagnostics, but the CMOS memory does not contain a valid kernel for execution. This is normal if you have not yet downloaded a kernel.

If any problems occur during power up diagnostics, the STATUS light flashes red. The flashing is coded to indicate the type of error. There will be a group of red flashes then a pause. This sequence will repeat until the X-Link is reset. Record the number of red flashes and call technical support.

Once the X-Link kernel is executing, the STATUS LED indicates the following states:

STATUS LED	Message
Solid Green	All OK
Flashing Amber/Off	Drivers not loaded
Flashing Amber/Red	Driver error on startup
Flashing Green/Off	No mappings loaded
Flashing Amber/Green	Mappings not committed to CMOS (the flashing should stop after 10 seconds)

Resetting the Baud Rate

If you forget the baud rate set in the X-Link or if an operating kernel has changed the default 38400 baud rate to some other value, you may have to cold boot the gateway.

Remove the SAF-Link card from the SAFphire rack. Install the jumper on J7 to the position **NOT** indicated by the silkscreen.

Reinstall the SAF-Link card and reapply power.

The SAF-Link resets but does not execute the installed kernel. This allows communications to be established at the known speed of 38400 baud.

J7 must be returned to the position indicated by the silkscreen to resume normal operation

Uploading CMOS

The *Download/Upload CMOS…* command is not normally used but may be helpful for technical support.

Choose the *Download/Upload CMOS…* command.

Type a name for the file.

The filename ends with *.DMP*.

Click on the *Open* button.

An "Uploading CMOS Contents" message appears and remains until the operation is complete.

Loading and Editing Mappings from an ASCII File

If you have loaded your mappings from an ASCII file and attempt to edit a mapping, the configuration program will be unable to recognize your previous selection for the source or destination of the mapping. You need to re-enter the source in the *Data Source Definition* dialog box and the destination(s) in the *Data Destination Definition* dialog box. For additional information, see *Errors during ASCII Configuration File Loading* in the *Error Codes and Messages* section, later in this chapter.

COM Port Determination

To determine the COM Port on the computer, insert a paper clip across pins 2 and 3 of the port or serial cable and run a communications software package such as Windows HyperTerminal. If the data you type is echoed back to you, the COM port selected is correct.

If Communication Fails

If the startup diagnostics succeed, communication with the X-Link should be possible through the CONFIG port. If communication fails, check the cabling first. Be sure all connectors are attached to the correct ports and are securely connected.

Verify that the baud rate is set the same in the PC and the X-Link. If communication is still not possible, try resetting the baud rate. See *Resetting the Baud Rate*, earlier in this chapter for more information. If communication is still not possible, there may be a hardware problem.

Communication Stops After Normal Reset

If communication is possible, but stops when you do a normal reset, the kernel is corrupted or is programmed to use a different baud rate. Try re-loading the X-Link or test other baud rates. See *Resetting the Baud Rate*, earlier in this chapter, to re-establish a known baud rate.

Troubleshooting with the Status Counters

Once the PC is communicating with the X-Link, the status counters on each network can be used to troubleshoot network problems. Refer to the appropriate *Software Reference Guide* for a list of the status counters.

Running in a DOS Box under Windows

If you are running the DOS configuration software in a DOS box under Windows, you may receive "Unable to communicate with X-Link" errors. This is normal, but if these errors occur frequently there may be another problem.

Unable to Find Driver Files While Using Windows 95/NT Software

If you are unable to find driver files while downloading, you need to change the type of files that Windows will display.

Open Windows Explorer

Choose the *View/Options…* command.

The *Options* dialog box appears.

On the *View* tab, select *Show All Files*.

Click on the *OK* button.

Exit Explorer and try your download again.

Error Codes and Messages

X-Link Error Codes

Error Number	Message
1	Mapping not Found
2	Address not Found
3	Communications Error
4	Undetermined Error
5	Internal Error
6	Error on Local end of link
7	Timeout on Message
8	Hardware Error
9	Command Error
10	Protection Error
11	Invalid Device Address
12	Error on Remote end of link
13	Invalid Data
14	Out of Memory
15	Duplicate Mapping
16	Checksum Error
17	Mapping Too Long
18	Out of Kernel Buffers

General Errors From the Configuration Program

Error Displayed	Reason/Message
Unable to communicate with X-Link	X-Link is disconnected or one of the communication parameters is wrong
Unable to open file	The requested file cannot be found
Unable to read file	The file has been corrupted
Unable to create file	Disk is full or existing file is read only
Unable to write file	Disk is full
Unable to delete file	File is read only
Unable to clear last error code	The mapping error code cannot be cleared. This can be caused by X-Link communication problems or version mismatch
Unable to get patch levels	There was a communication error while trying to get patch and version numbers or there may be a version mismatch
File cannot be loaded at this time	You are trying to download a mapping file but haven't finished configuring the X-Link

Errors During ASCII Configuration File Loading

Error Displayed	Reason/Message
File line too long	The ASCII import line length is limited to 120

	characters
Unable to read file header	Wrong file or file corrupted
File header invalid	File corrupt or wrong format
Mappings must start in col. 1	File corrupt or wrong format
Mapping name too long	Mapping names are limited to 13 characters
Unknown data type	The data type in the file is not valid
Invalid mapping length	Mapping length read from the file is not valid
Unable to match Destination Access for mapping	Destination read from the file was not found in either driver .CNT file
Unable to match Source Access for mapping	Source read from the file was not found in either driver .CNT file
Number of destinations exceeds 255	Too many destinations for a mapping in the file

Errors During Configuration

Error Displayed	Reason/Message
Unable to clear all mappings	Command failed. Usually caused by communication errors
File created for different drivers	Attempt to use .CFG file saved for a different set of drivers
Unable to open LPT1 file	Port may not exist
Invalid mapping name	Spaces were probably included in a mapping name
Name already exists	Each mapping name must be unique
Map size must be multiple of 16 bits	With some drivers the mapping is forced to align on words
Unable to get mapping number	An internal error has occurred. The mapping number just added could not be found.
Unable to read back access	An internal error has occurred. The access just added could not be read.
Unable to add mapping	X-Link command failed. Usually caused by communication errors
Unable to add access	X-Link command failed. Usually caused by communication errors
Unable to remove mapping	X-Link command failed. Usually caused by communication errors
Invalid access	A driver in X-Link failed to validate the access or address specified
A problem was encountered while loading	An internal error occurred. The result code and the Error Log will provide more detailed information on the error
Unable to add more than 255 destinations	You are trying to add the 256th destination. A mapping can have only 255 destinations.
Unable to retrieve source access	X-Link couldn't read back access. Usually caused by communication errors.

Errors During Download

Error Displayed	Reason/Message
Bad load checksum	After downloading, X-Link data doesn't compare to configuration data, usually a corrupt driver file
Unable to reset X-Link	X-Link command failed, usually communication errors
File version is newer than hardware supports	Kernel can not execute on this X-Link

Driver too large	Selected file is too large to be read by the Config program
Unable to read file header	File is wrong or corrupt
Invalid file header	File corrupt or wrong kind
Unable to read driver header	File is wrong or corrupt
Invalid driver header	File corrupt or wrong kind
Unable to read driver version	File is wrong or corrupt
Unable to download to the X-Link	X-Link command failed, usually communication errors
Unable to read file version pointer	File is too short or invalid
Unable to read file version	File is too short or invalid
Unable to clear old kernel	X-Link command failed, usually communication errors
Unable to reset X-Link	X-Link command failed, usually communication errors
New kernel failed to execute	Error detected by X-Link and execution halted
Unable to upload from the X-Link	X-Link command failed, usually communication errors
Unable to write CMOS file	The disk may be full or the file is read-only
Unable to copy file	Can't read from the floppy drive or the install directory is full
Unable to open CMOS file	Usually caused by communication errors or by a manual reset. This can occur if there is no kernel loaded and you try to view the logs.
Unable to read .CNT file	Can be caused by a disk error.

Errors During Status Tracing/Logging

Error Displayed	Reason/Message
Unable to turn on trace	X-Link command failed, usually communication errors
Unable to turn off trace	X-Link command failed, usually communication errors
Unable to clear counters	X-Link command failed, usually communication errors
Unable to capture log	X-Link command failed, usually communication errors or version mismatch
Unable to get log message	X-Link command failed, usually communication errors or version mismatch
Unable to clear error log	X-Link command failed, usually communication errors or version mismatch
Unable to open execution log	X-Link command failed, usually communication errors or version mismatch
Unable to read execution header	X-Link command failed, usually communication errors
Unable to read execution record	X-Link command failed, usually communication errors

Errors During X-Link Access

Error Displayed	Reason/Message
Unable to open XLK file	The requested file can not be found
Unable to read XLK file	File is too short
Unable to open control file	.CNT file to match driver can not be found
.CNT version mismatch. Expected to find version *X* but found version *Y* instead.	Version of .DRV and .CNT do not correspond
X-Link not executing kernel - please download	X-Link has not been programmed or has lost its programming due to faulty battery backup
Unable to set clock	X-Link command failed, usually communication errors
Unable to communicate with	Communication errors

X-Link kernel	
During the last reset, driver x reported an error. Please refer to error log for more information	The Error log will provide more detailed information on this error
Driver x not downloaded – Please download	You have not yet downloaded Driver x. This is a warning, not an error.

Appendix A - Technical Data

CONFIG / RS-232 Connector Pinouts

1   DCD   Data Carrier Detect
2   RXD   Receive Data
3   TXD   Transmit Data
4   DTR   Data Terminal Ready
5   GND   Ground
6   DSR   Data Set Ready
7   RTS   Request to Send
8   CTS   Clear to Send
9   RI   Ring Indicator

RS-422/485 Connector Pinouts

(Pin 1 is top of the connector)
1   TX-   Transmit Data Low
2   RX-   Receive Data Low
3   DRAIN   Shield
4   RX+   Receive Data High
5   TX+   Transmit Data High

Technical Support

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