



Ethernet Base Controller User Manual

Manual Number H24-EBC-M



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Manual Revisions



If you contact us in reference to this manual, be sure and include the revision number.

Title: Ethernet Base Controller

Manual Number: H24–EBC–M

Edition	Date	Description of Changes
Original	10/98	Original issue
2nd Edition	11/01	Added KEPwareEX OPC use



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Introduction

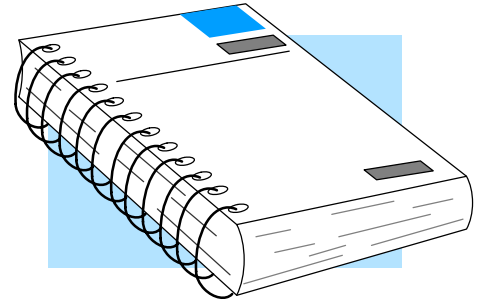
In This Chapter. . . .

- Manual Overview
 - Ethernet Base Controller Overview
 - Frequently Asked Questions
-

Manual Overview

Overview of this Manual

This manual describes the installation and operation of the Ethernet Base Controller. You will find the necessary information for configuring the H2-EBC(-F) and H4-EBC(-F), installing the module in a DL205 or DL405 I/O base and connecting the EBC to a 10BaseT or 10BaseFL Ethernet network.



Other Reference Materials

You may find other technical manuals useful for your application. For technical information related to your PC-based control software or your PC, please refer to the appropriate manual for that product. For more information about the *Direct*LOGIC™ products, you may want to read the following:

- DL205 User Manual
- DL405 User Manual

Who Should Read This Manual

You will find this manual helpful for setup and installation if you have chosen to use all of the following:

- PC-based Control (rather than a traditional PLC CPU)
- Our DL205 or DL405 I/O
- One of our Ethernet Base Controllers for communication to the I/O rack

A familiarity with Ethernet communications and with the setup and installation of PLCs is helpful. An understanding of electrical codes and industrial control is essential.

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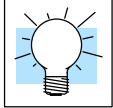
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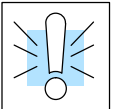
Conventions Used



The “light bulb” icon in the left-hand margin indicates a **tip** or **shortcut**.



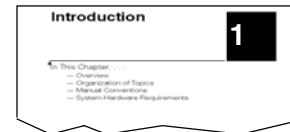
The “note pad” icon in the left-hand margin indicates a **special note**.



The “exclamation mark” icon in the left-hand margin indicates a **warning** or **caution**. These are very important because the information may help you prevent serious personal injury or equipment damage.

Key Topics for Each Chapter

The beginning of each chapter will list the key topics that can be found in that chapter.



Ethernet Base Controller Overview

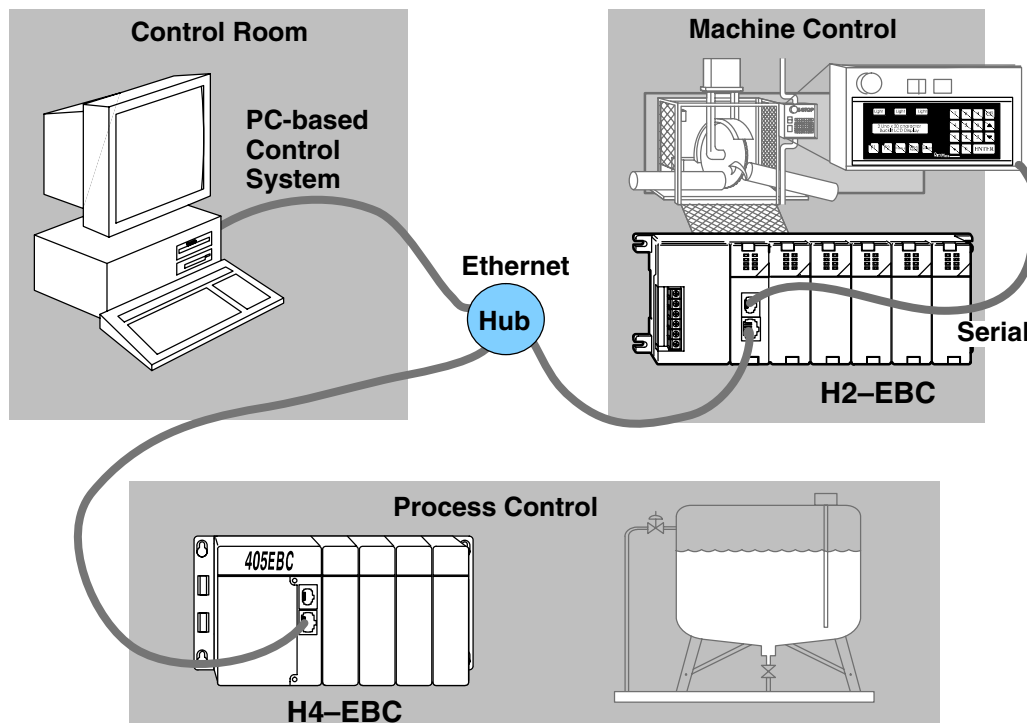
The Ethernet Base Controller (EBC) provides a low-cost, high-performance Ethernet link between a PC-based Control system, DL205 and DL405 I/O bases. The EBC occupies the CPU position of the PLC base and communicates across the backplane to input and output modules.

Although, the Ethernet Base Controller occupies the CPU slot in the PLC base, the control function is not performed by the EBC. The control function is performed by PC-based Control software (which is purchased separately) running on a PC. The function of the EBC is to:

- process analog and digital input signals
- format the I/O signals to conform to the Ethernet standard
- transmit the signals to the PC-based controller
- receive and translate output signals from the PC-based Control software
- distribute the output signals to the appropriate output module in the base

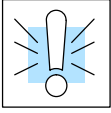
I/O Values Stored in Cache Memory

The EBC module continually scans all I/O and stores the most recent values in cache memory. The cache memory contents are available to the PC-based Control software as a block of data or by individual slot location. The EBC reads all channels of digital modules on each scan. It reads one channel of each analog module on each scan, updating that value in cache memory. On the next scan, the EBC sequences to the next channel and updates that value in cache memory, and so on. Typically, PC-based Control will request *all* input and output values at the same time from the EBC. The EBC passes the cache memory values for all channels of all input and output modules. By using this method, very fast response times can be achieved by the PC-based Control system.



Industry Standard Ethernet

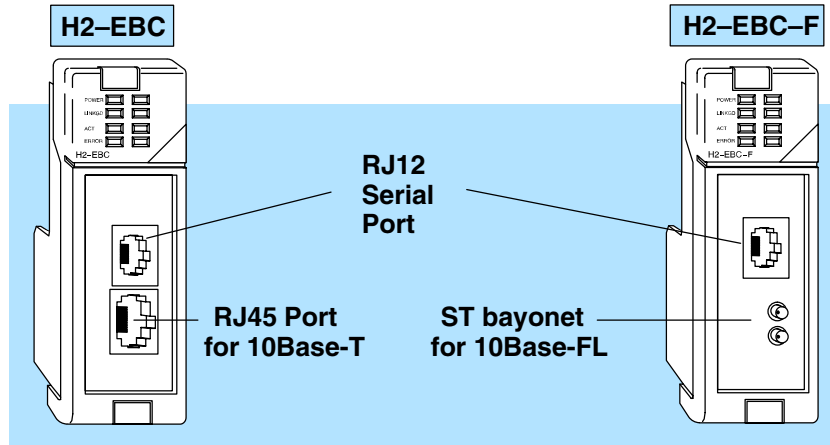
The H2-EBC and H4-EBC modules support industry standard 10BaseT Ethernet communications, and the H2-EBC-F and H4-EBC-F modules support 10BaseFL (fiber optic) Ethernet standards. All EBCs offer 10Mbps transfer rates between your PC application and your I/O base.



WARNING: For deterministic Ethernet communication you must use a dedicated network of EBC modules connected to your PC-based control system. The EBC modules and the PC running PC-based Control Software must be the only devices on the network.

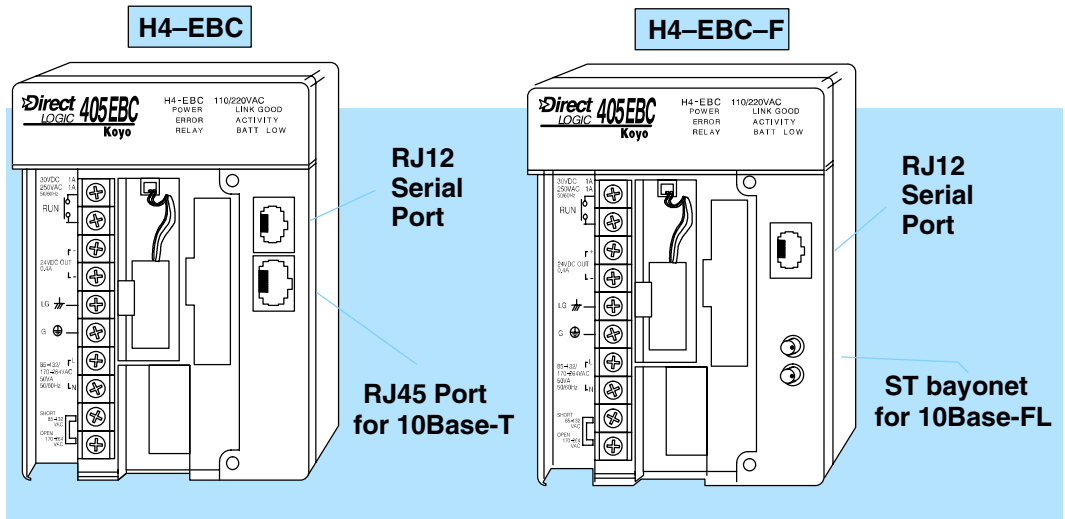
H2-EBC and H2-EBC-F

The H2-EBC(-F) installs in the CPU slot of a DL205 base and communicates across the backplane to digital and analog input and output modules. The H2-EBC(-F) does not support remote I/O or Specialty Modules.



H4-EBC and H4-EBC-F

The H4-EBC(-F) installs in the CPU slot of a DL405 base and communicates across the backplane to digital and analog, input and output modules. The H4-EBC(-F) supports up to three expansion I/O bases (see page 2-19), and it supports the D4-HSC High Speed Counter Module. The H4-EBC(-F) also serves as the power supply for the local base. Expansion bases have their own power supplies.



RS232C Serial Port

An RS232C serial port on-board the EBC module allows serial communication to an operator interface device or other serial device. See your PC-based Control software documentation to determine whether this EBC feature is supported.

Frequently Asked Questions

Q. What is Ethernet?

A. Ethernet is a specification which defines cable type and signalling methods to be used in a local-area-network (LAN). An Ethernet network transmits packets of information between computers at speeds of 10 to 100 million bits per second (Mbps). Currently the most widely used version of Ethernet technology is the 10Mbps twisted-pair variety. Ethernet allows multi-vendor products to communicate using common software protocols.

Q. Which protocols are supported by the EBC?

A. The H2-EBC(-F) and the H4-EBC(-F) support IPX (originated by Novell) and UDP/IP (Universal Datagram Protocol/Internet Protocol). The Windows NT™ operating system supports both protocols. The UDP/IP protocol is supported within the TCP/IP suite.

Q. What Ethernet standards should I be familiar with?

A. Below is a short list of most commonly used Ethernet cabling standards and their key characteristics.

- 10Base-2 – Thin coaxial cable, which supports a maximum of 30 stations per network and is limited to 185 meters (607ft.) per cable segment.
- 10Base-5 – Thick coaxial cable, which supports a maximum of 100 stations and is limited to 500 meters (1,640ft.) per segment.
- 10Base-F – Plastic or Glass Fiber Optic maximum of 1024 stations and distances depend on signaling technology and medium used but can commonly support up to 2 Kilometers.
- 10Base-T – Unshielded Twisted Pair, which supports a maximum of 1024 stations with a segments of 100 meters, but distance is truly based on signal loss in decibels (less than 11.5dB loss source to destination).

Q. Which Ethernet specifications are required to install an EBC system?

A. None. Detailed Ethernet specifications are not necessary for implementing the EBC system.

Q. How do I connect to an Ethernet network?

A. Different types of Ethernet media may be connected to a single LAN network solution using repeaters, bridges, and adaptor type products. A number of vendors offer adaptors or transceivers, which provide interconnection of different types of Ethernet cabling.

Installing the H2-EBC(-F) or H4-EBC(-F)

In This Chapter. . . .

- Setting the Module ID
 - The H2-EBC DIP Switch
 - The H4-EBC DIP Switch
 - Inserting the H2-EBC or H2-EBC-F into the Base
 - Inserting the H4-EBC or H4-EBC-F into the Base
 - DL205 Power Wiring and Grounding
 - H4-EBC Power Wiring and Grounding
 - 10BaseT Network Cabling
 - 10BaseFL Network Cabling
 - Maximum Ethernet Cable Length
 - Calculating the Power Budget for the H2-EBC(-F)
 - Power Consumption Chart (DL205 Modules)
 - Calculating the Power Budget for the H4-EBC(-F)
 - Power Consumption Chart (DL405 Modules)
 - DL405 Local and Expansion I/O
-

Setting the Module ID

Each Ethernet Base Controller must have a Module ID in order to be recognized on the network, and each Module ID must be unique. Duplicate Module IDs on the same network will cause unpredictable results and must be avoided.

Three Methods for Setting Module ID

There are three methods for setting the Module ID, and they are the same for the H2-EBC and the H4-EBC modules. You can set the Module ID using:

- The **DIP switch** on the EBC module
- The **NetEdit** software utility
- The software utility in your **PC-based Control software** (if a utility is provided)

Setting Module ID with DIP Switches

We recommend using the DIP switch to set the Module ID because the DIP switch is simple to set, and the Module ID can be determined by looking at the physical module, without reference to a software utility.

You can use the DIP switch to set the Module ID to a number from 1 – 63. Do not use Module ID 0 *for communications*. The only purpose of Module ID 0 is to allow communications with a PC while changing the Module ID.

If the DIP switch is set to a number greater than 0, the software tools are disabled from setting the Module ID. Again, the software tools will only allow changes to the Module ID if the DIP switch setting is 0 (all switches OFF).

The DIP switch settings are read only at powerup. You must cycle power if you change the DIP switches.

Setting Module ID with Software Tool

Software changes to the Module ID do not require cycling power. To set the Module ID using one of the available software tools, do the following:

- Check to be sure all DIP switches are set to the off position, Module ID = 0 (see page 2-3 or 2-4)
- Insert the module in the base (see page 2-5)
- Connect the power wiring (see page 2-6)
- Connect module to the Ethernet network (see page 2-8 through 2-10)
- Apply power
- Link to the module and change the Module ID using the software of your choice. Remember to update the module before exiting the software. See note below.

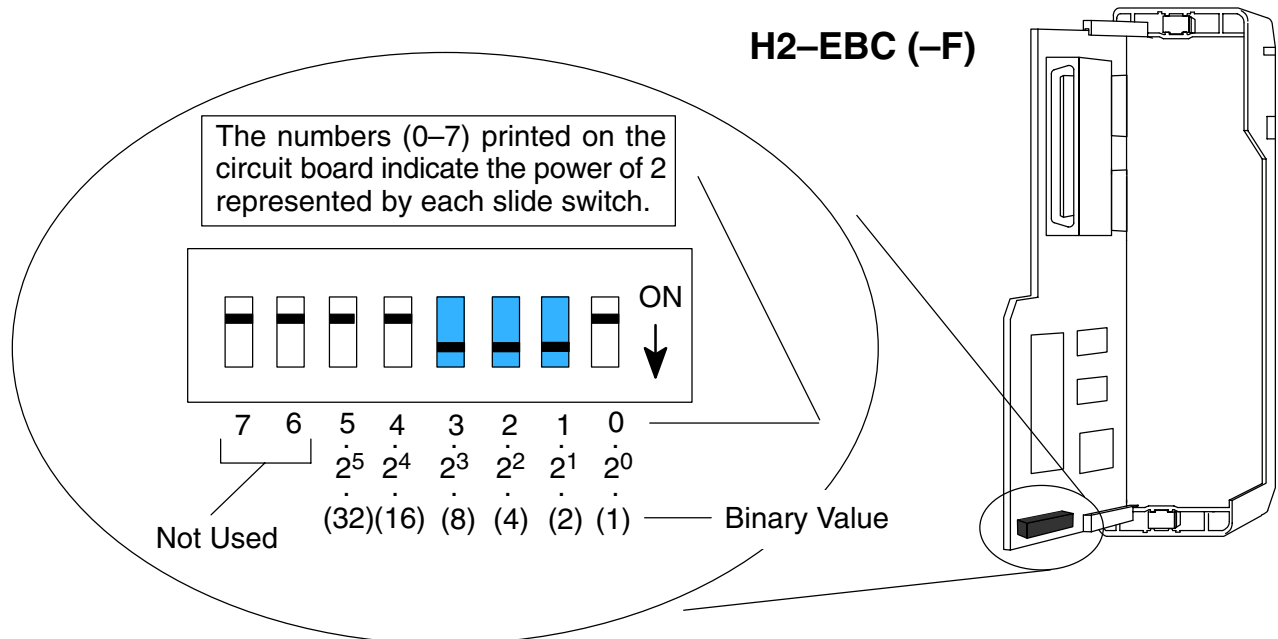


NOTE: Set the Module ID using the method recommended for your PC-based Control software. The use of NetEdit to set the Module ID is described in Chapter 3. Some PC-based Control software packages may make automatic updates to the EBC module configuration, overwriting the configuration developed in NetEdit.

The H2-EBC DIP Switch

The H2-EBC (-F) DIP Switch

The EBC DIP switch contains eight individual switches, but only six of these are active. You will find that the printed circuit board is labeled 0 – 7. The numbers on the printed circuit board indicate the power of 2 represented by each individual switch. For example, switch 0 represents 2^0 (or 1), switch 1 is 2^1 (or 2), switch 2 is 2^2 (or 4), and so on. The figure below shows the binary value of each switch in parentheses ().

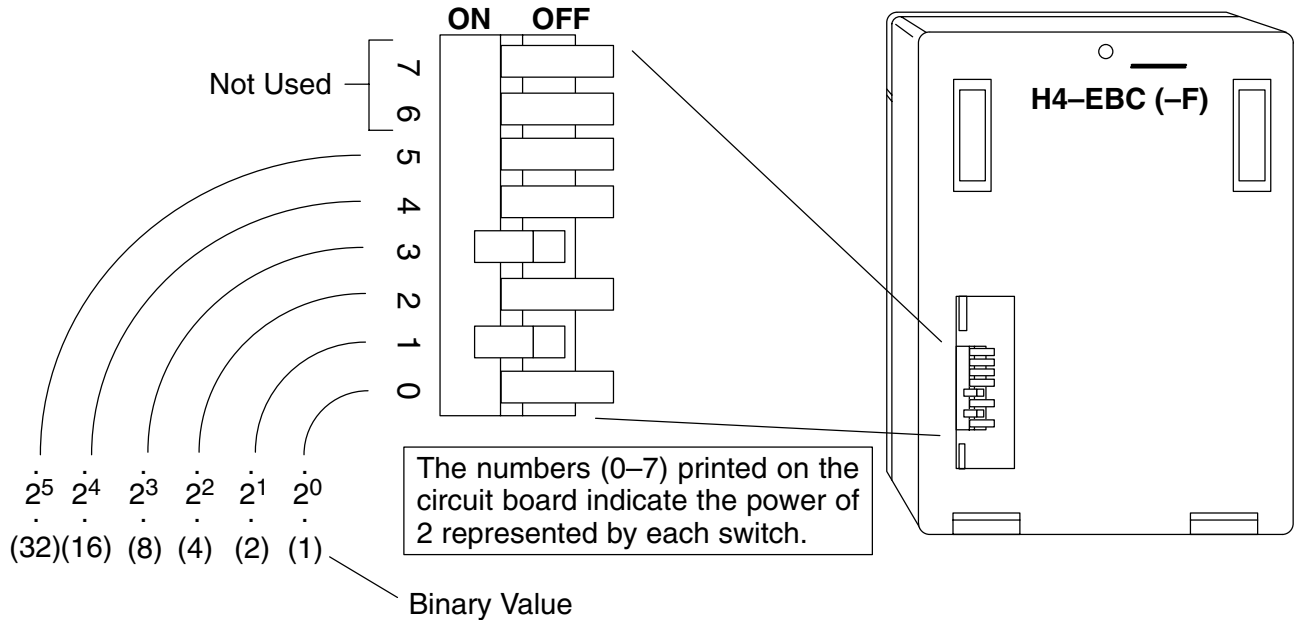


The Module ID equals the *sum* of the binary values of the slide switches set in the ON position. For example, if you set slide switches 1, 2, and 3 to the ON position, the Module ID will be 14. This is found by adding $8+4+2=14$. The maximum value you can set on the DIP switch is $32+16+8+4+2+1=63$. This is achieved by setting switches 0 through 5 to the ON position.

The H4-EBC DIP Switch

The H4-EBC (-F) DIP Switch

The H4-EBC DIP switch contains eight individual switches, but only six of these are active. Two are not used. Notice that the individual switches are labeled 0 – 7 on the printed circuit board. The numbers on the printed circuit board indicate the power of 2 represented by each individual switch. For example, switch 0 represents 2^0 (or 1), switch 1 is 2^1 (or 2), switch 2 is 2^2 (or 4), and so on. The figure below shows the binary value of each switch in parentheses ().

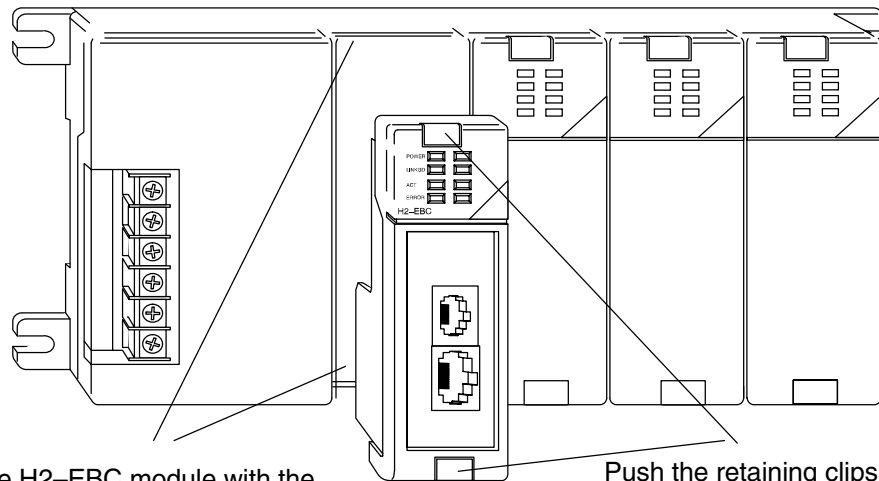


The Module ID equals the *sum* of the binary values of the individual switches set in the ON position. For example, if you set switches 1 and 3 to the ON position, the Module ID will be 10. This is found by adding $8+2=10$. The maximum value you can set on the DIP switch is $32+16+8+4+2+1=63$. This is achieved by setting switches 0 through 5 to the ON position. The DIP switch must be set to a number greater than zero.

Inserting the H2-EBC or H2-EBC-F into the Base

The H2-EBC plugs into the CPU slot of any DL205 base.

- Locate the grooves on the inside top and bottom of the DL205 base.
- Align the module with the grooves and slide the module into the slot until the face of the module is flush with the power supply.
- Push in the retaining clips to secure the module.



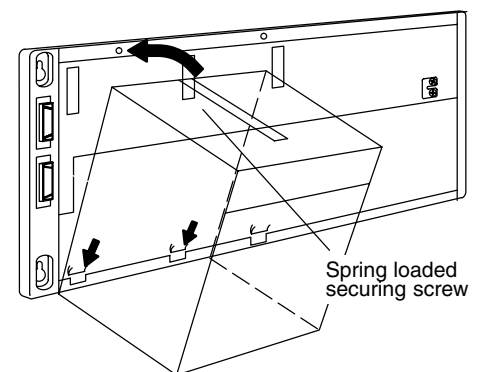
Align the H2-EBC module with the grooves in the base and slide it in.

Push the retaining clips in to secure the module in the DL205 base.

Intalling the H4-EBC or H4-EBC-F onto the Base

The H4-EBC installed in the CPU position of any DL405 I/O base.

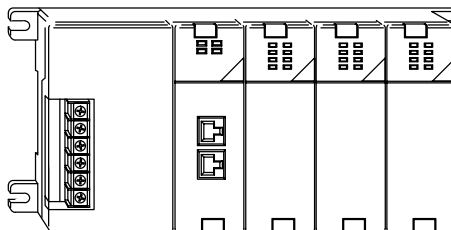
- The EBC has two plastic tabs at the bottom and a screw at the top.
- With the device tilted as shown, hook the plastic tabs into the notches at the bottom of the base.
- Gently push the top of the module toward the base until the back of the module is flush with the base.
- Tighten the screw at the top of the device to secure it to the base.



Spring loaded securing screw

DL205 Power Wiring and Grounding

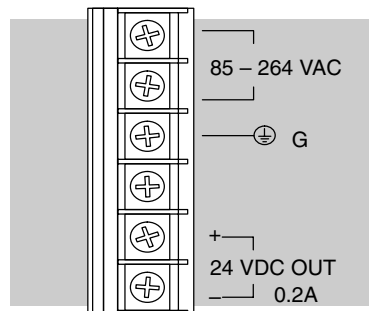
The power wires for the DL205 are *not* connected directly to the H2-EBC as they are on the H4-EBC. The DL205 power supply is an integral part of the base and separate from the EBC. The DL205 also has three power options: 12/24VDC, 125VDC, and 120/240VAC.



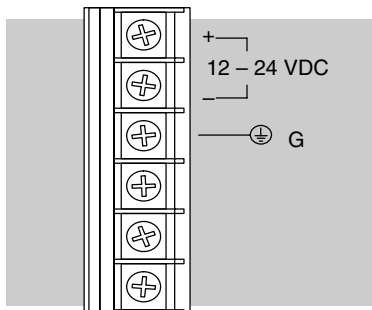
The diagram shows the terminal connections located on the power supply of the DL205 bases. The base terminals can accept up to 16 AWG. You may be able to use larger wiring depending on the type of wire used, but 16 AWG is the recommended size.

NOTE: You can connect either a 120 VAC or 240 VAC supply to the AC terminals. Special wiring or jumpers are not required as with some of the other *DirectLOGIC™* products.

110/220 VAC Base Terminal Strip

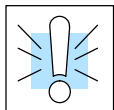
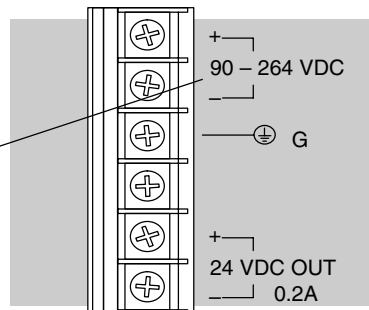


12/24 VDC Base Terminal Strip



125 VDC Base Terminal Strip

D2-09BDC-2 range is 115-264 VDC



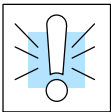
WARNING: Once the power wiring is connected, install the plastic protective cover. When the cover is removed there is a risk of electrical shock if you accidentally touch the wiring or wiring terminals.

H4-EBC Power Wiring and Grounding

The power connection terminals are under the front cover of the Ethernet Base Controller. The list below describes the function of each of the terminal screws.

- **Relay** – normally-open contact indicates that the EBC’s link to hub or PC is good. Link Good indicator light is also on.
- **24VDC Auxiliary Power** – can be used to power field devices or I/O modules requiring external power. It supplies up to 400 mA of current at 20–28VDC, ripple less than 1 V P-P.
- **Logic Ground** – internal ground to the system which can be tied to field devices or communication ports to unite ground signals.
- **Chassis Ground** – where earth ground is connected to the unit.
- **AC Power** – where the line (hot) and the neutral (common) connections are made to the EBC.
- **110/220 Voltage Select** – a jumper across two of the terminals determines the voltage selection. Install the jumper to select 110VAC input power, or remove the jumper to select 220VAC power input.

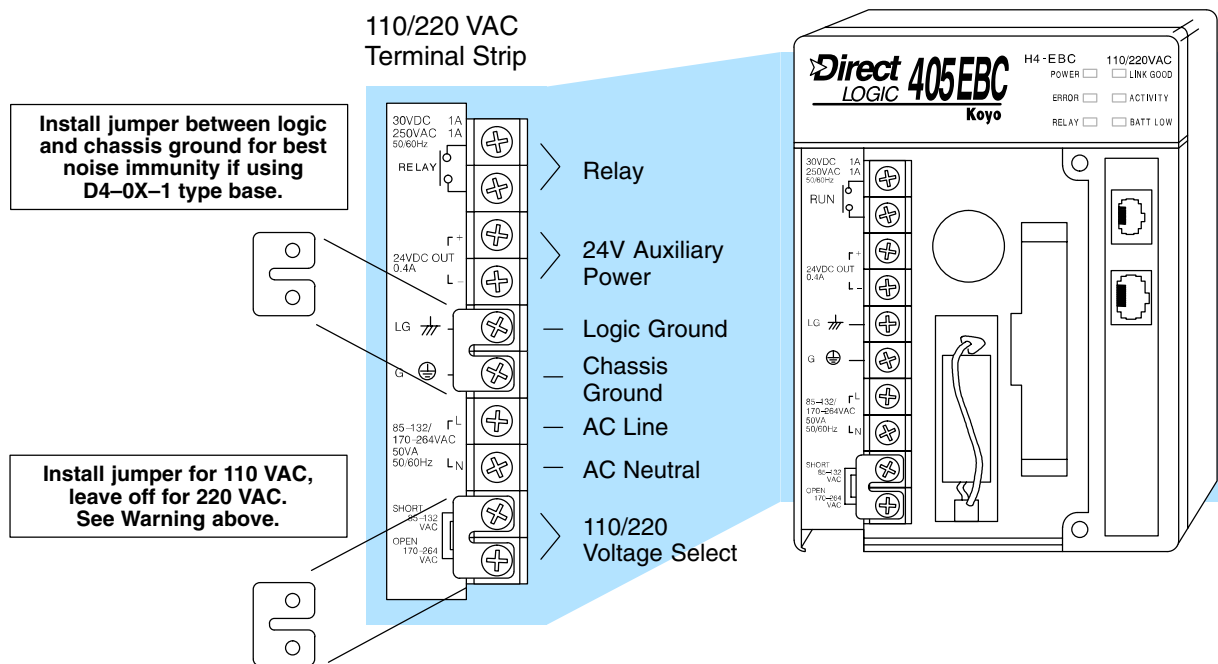
Installation and Setup



WARNING: Damage will occur to the power supply if 220 VAC is connected to the terminal connections with the 115 VAC jumper installed. Once the power wiring is connected, install the protective cover to avoid risk of accidental shock.

EBC Wiring

The following diagram shows the appropriate connections for each terminal. Note that you should install a jumper between logic ground and chassis ground for best noise immunity.

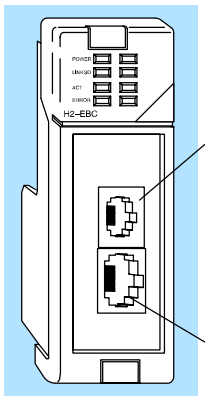


10BaseT Network Cabling

EBC Supports Two Standards

Two types of EBC modules are available. One type supports the Ethernet 10BaseT standard, and the other supports the 10BaseFL standard. The 10BaseT standard uses twisted pairs of copper wire conductors, and the 10BaseFL standard is for fiber optic cabling.

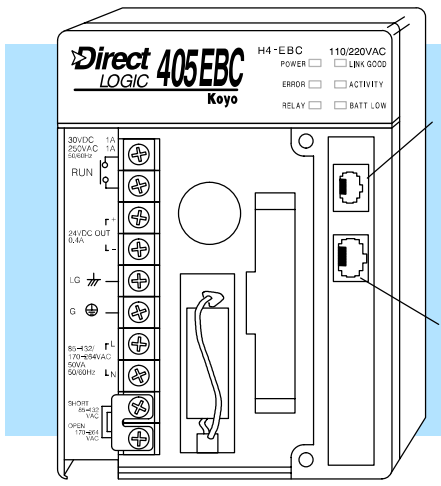
H2-EBC



RJ12 Serial Port RS232

RJ45 for 10BaseT

H4-EBC

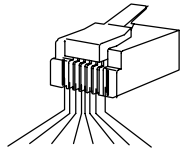


RJ12 Serial Port RS232

RJ45 for 10BaseT

10BaseT Connections

10BaseT



1 2 3 4 5 6 7 8
8-pin RJ45 Connector (8P8C)

The EBC has an eight-pin modular jack that accepts RJ45 connector plugs. UTP (Unshielded Twisted-Pair) cable is rated according to its data-carrying ability (bandwidth) and is given a category number. We strongly recommend using a Category 5 (CAT5) cable for all Ethernet 10BaseT connections. For convenient and reliable networking, we recommend that you purchase commercially manufactured cables (cables with connectors already attached).

To connect an EBC (or PC) to a hub or repeater, use a **patch cable** (sometimes called a straight-through cable). The cable used to connect a PC *directly* to an EBC or to connect two hubs is referred to as a **crossover cable**.

Patch (Straight-through) Cable				Crossover Cable			
EBC		HUB		EBC		PC	
TD+	1	OR/WHT	OR/WHT	1	TD+	1	TD+
TD-	2	OR	OR	2	TD-	2	TD-
RD+	3	GRN/WHT	GRN/WHT	3	RD+	3	RD+
	4	BLU	BLU	4		4	
	5	BLU/WHT	BLU/WHT	5		5	
RD-	6	GRN	GRN	6	RD-	6	RD-
	7	BRN/WHT	BRN/WHT	7		7	
	8	BRN	BRN	8		8	
		RJ45				RJ45	

This diagram illustrates the standard wire positions in the RJ45 connector. We recommend all EBC 10BaseT cables to be **Category 5**, UTP cable.



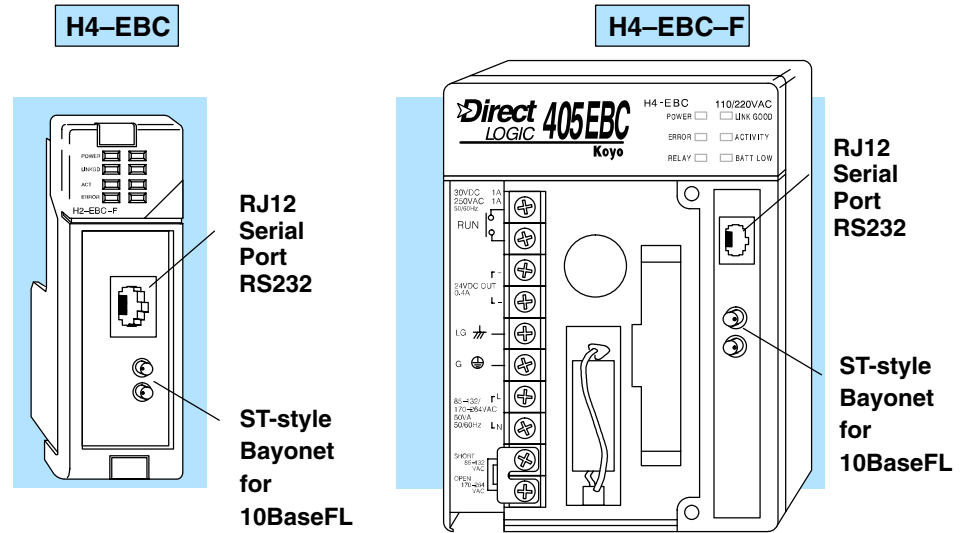
NOTE: See page 2-10 for 10BaseT distance limitations.

Installation and Setup

10BaseFL Network Cabling

EBC Supports Two Standards

Two types of EBC modules are available. One type supports the Ethernet 10BaseT standard, and the other supports the 10BaseFL standard. The 10BaseT standard uses twisted pairs of copper wire conductors, and the 10BaseFL standard is for fiber optic cabling.



Installation and Setup

10BaseFL Connections

Each module has two ST-style bayonet connectors. The ST-style connector uses a quick release coupling which requires a quarter turn to engage or disengage. The connectors provide mechanical and optical alignment of fibers.

Each cable segment requires two strands of fiber: one to transmit data and one to receive data. The ST-style connectors are used to connect the H4-EBC-F module to a PC or a fiber optic hub or repeater.

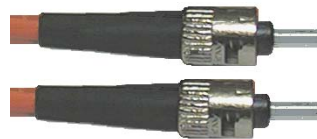
Fiber Optic Cable

The H4-EBC-F module accepts 62.5/125 multimode fiber optic (MMF) cable. The glass core diameter is 62.5 micrometers, and the glass cladding is 125 micrometers. The fiber optic cable is highly immune to noise and permits communications over much greater distances than 10BaseT.

Fiber Optic Module ST Connector

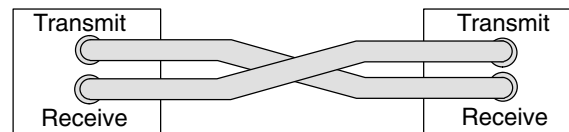
Multimode Fiber Optic (MMF) Cable

Transmit



Receive

62.5/125 MMF cable with bayonet ST-style connectors



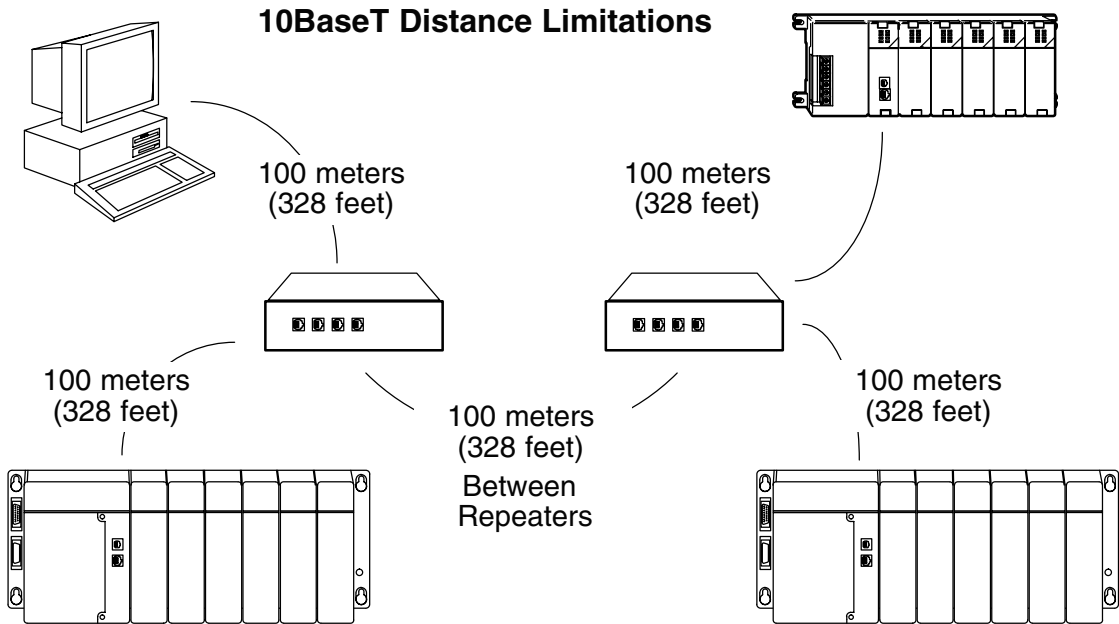
Connecting your fiber optic EBC to a network adapter card or fiber optic hub



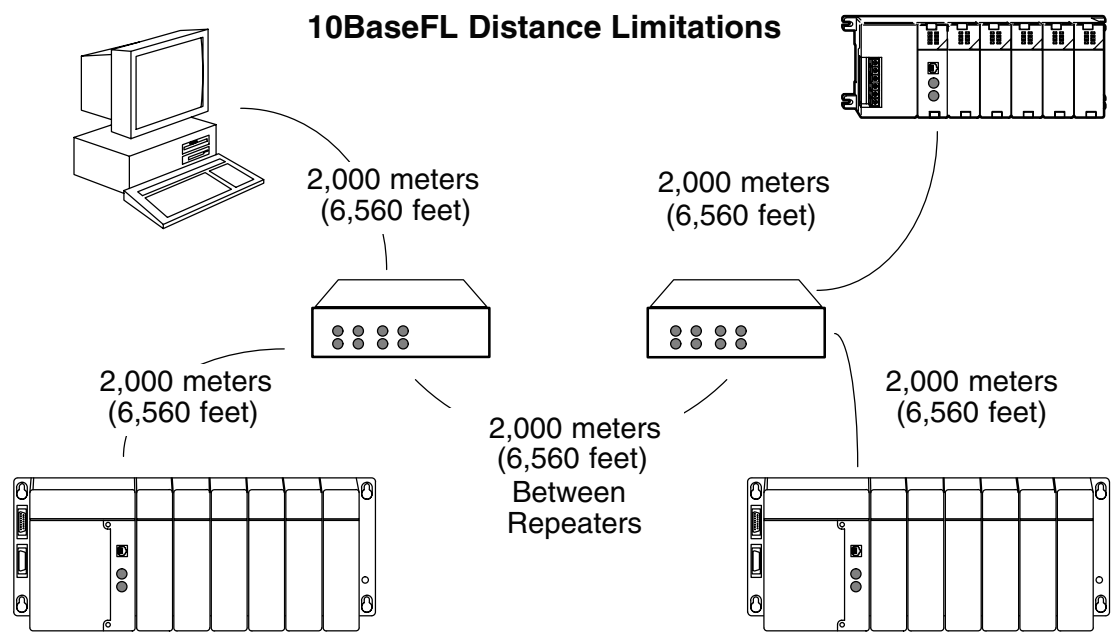
NOTE: See page 2-10 for 10BaseFL distance limitations.

Maximum Ethernet Cable Length

The maximum distance per 10BaseT cable segment is 100 meters or 328 feet. Repeaters extend the distance. Each cable segment attached to a repeater can be 100 meters. Two repeaters connected together extend the total range to 300 meters.



The maximum distance per 10BaseFL cable segment is 2,000 meters or 6,560 feet. Repeaters extend the distance. Each cable segment attached to a repeater can be 2,000 meters. Two repeaters connected together extend the total range to 6,000 meters.



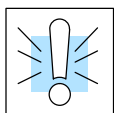
Installation and Setup

Calculating the Power Budget for the DL205 with H2-EBC

Managing your Power Resource

When determining which I/O modules you will be using in the DL205 EBC system, it is important to remember that there is a limited amount of power available from the power supply. We have provided a table showing the power available from the various DL205 base power supplies and a table showing the maximum power consumed by the EBC and each of the I/O modules supported by the EBC. Following these two tables is an example of a completed power budgeting worksheet and then a blank worksheet you can use for your own calculations.

If the I/O modules you choose exceed the maximum power available from the smaller DL205 base power supplies, you will need to use a D2-09B 9-slot base. This base supplies more power than the other bases, as you can see in the table below.



WARNING: It is *extremely* important to calculate the power budget. If you exceed the power budget, the system may operate in an unpredictable manner which may result in a risk of personal injury or equipment damage.

EBC Power Specifications

The following table shows the amount of electrical current available at the two voltages supplied from the DL205 base. Use these values when calculating the power budget for you system.

The Auxiliary 24V power source mentioned in the table is available at the base terminal strip. You can connect to external devices or DL205 I/O modules that require 24VDC, but be sure not to exceed the maximum current supplied.

Bases	5V Current Supplied	Auxiliary 24VDC Current Supplied
D2-03B	1550 mA	200 mA
D2-04B	1550 mA	200 mA
D2-06B	1550 mA	200 mA
D2-09B	2600 mA	300 mA
D2-03BDC-1	1550 mA	None
D2-04BDC-1	1550 mA	None
D2-06BDC-1	1550 mA	None
D2-09BDC-1	2600 mA	None
D2-03BDC-2	1550 mA	200 mA
D2-04BDC-2	1550 mA	200 mA
D2-06BDC-2	1550 mA	200 mA
D2-09BDC-2	2600 mA	300 mA

Module Power Requirements

The chart on the next page shows the maximum amount of electrical current required to power each of the DL205 EBC or I/O modules. Use these values when calculating the power budget for your system.

Power Consumption Chart (DL205 Modules)

Module	5V Power Required (mA)	External Power Source Required
CPUs		
D2-230	120	None
D2-240	120	None
D2-250	330	None
DC Input Modules		
D2-08ND3	50	None
D2-16ND3-2	100	None
D2-32ND3/-2	25	None
AC Input Modules		
D2-08NA-1	50	None
D2-08NA-2	100	None
D2-16NA	100	None
DC Output Modules		
D2-04TD1	60	20
D2-08TD1	100	None
D2-16TD1-2	200	24 VDC @ 80 mA max
D2-16TD2-2	200	0
D2-32TD1/2	350	0
AC Output Modules		
D2-08TA	250	None
D2-12TA	350	None
Relay Output Modules		
D2-04TRS	350	None
D2-08TR	250	None
D2-12TR	450	None
F2-08TR	670	None
F2-08TRS	670	None
Combination Modules		
D2-08CDR	200	0
Analog		
F2-04AD-1(L)	50	18-30 VDC @ 80 mA max; (-L) 10-15VDC @ 90mA
F2-04AD-2(L)	60	18-26.4 VDC @ 80 mA max; (-L) 10-15VDC @ 90mA
F2-08AD-1	50	18-26.4 VDC @ 80 mA max
F2-08AD-2	60	18-26.4 VDC @ 80 mA max
F2-02DA-1(L)	40	18-30VDC @ 60mA; (L) 10-15VDC @ 70mA (add 20mA / loop)
F2-02DA-2(L)	40	18-30 VDC @ 60 mA max; (-L) 10-15VDC @ 70mA
F2-02DAS-1	100	18-32VDC @ 50mA per channel
F2-02DAS-2	60	21.6-26.4 VDC @ 60 mA per channel
F2-08DA-2	60	18-30 VDC @ 80 mA max
F2-04AD2DA	110	18-26.4VDC @ 80mA; add 20mA / loop
F2-04RTD	90	0
F2-04THM	110	18-26.4 VDC @ 60 mA max
Specialty Modules		
D2-CTRINT	50	5 VDC @ 60 mA max (required for outputs only)

Power Budget Calculation Example

The following example shows how to calculate the power budget for the DL205 system.

Base #	Module Type	5 VDC (mA)	Auxiliary Power Source 24 VDC Output (mA)
<u>1</u>			
Available Base Power	D2-09B	2600	300
EBC	H2-EBC	+ 530	+ 0
Slot 0	D2-16ND3-2	+ 100	+ 0
Slot 1	D2-16NA	+ 100	+ 0
Slot 2	D2-16NA	+ 100	+ 0
Slot 3	F2-04AD-1	+ 50	+ 80
Slot 4	F2-02DA-1	+ 40	+ 100
Slot 5	D2-08TA	+ 250	+ 0
Slot 6	D2-08TD1	+ 100	+ 0
Slot 7	D2-08TR	+ 250	+ 0
Other			
Maximum Power Required		1520	180
Remaining Power Available		2600-1520= 1080	300 - 170 = 120

- Using the table on the previous page, fill in the information for the base power supply, the EBC, I/O modules, and any other devices that will use system power including devices that use the 24 VDC output. Pay special attention to the current supplied by the base power supply. The 9-slot base has a larger current capacity than the smaller bases.
- Add the current columns starting with the row for Slot 0 and working your way down to the "Other" category. Put the total in the row labeled "Maximum power required".
- Subtract the row labeled "Maximum power required" from the row labeled "Available Base Power". Place the difference in the row labeled "Remaining Power Available".
- If "Maximum Power Required" is greater than "Available Base Power" in either of the two columns, the power budget will be exceeded. It will be unsafe to use this configuration, and you will need to restructure your I/O. You may need to a 9-slot base to accommodate your current requirements.

Power Budget Calculation Worksheet

This blank chart is provided for you to copy and use in your power budget calculations.

Base #	Module Type	5 VDC (mA)	Auxiliary Power Source 24 VDC Output (mA)
<u>0</u>			
Available Base Power			
CPU Slot			
Slot 0			
Slot 1			
Slot 2			
Slot 3			
Slot 4			
Slot 5			
Slot 6			
Slot 7			
Other			
Total Power Required			
Remaining Power Available			

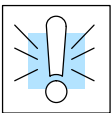
1. Using the table on the previous page, fill in the information for the base power supply, the EBC, I/O modules, and any other devices that will use system power including devices that use the 24 VDC output. Pay special attention to the current supplied by the base power supply. The 9-slot base has a larger current capacity than the smaller bases.
2. Add the current columns starting with the row for Slot 0 and working your way down to the “**Other**” category. Put the total in the row labeled “**Maximum power required**”.
3. Subtract the row labeled “**Maximum power required**” from the row labeled “**Available Base Power**”. Place the difference in the row labeled “**Remaining Power Available**”.
4. If “**Maximum Power Required**” is greater than “**Available Base Power**” in either of the two columns, the power budget will be exceeded. It will be unsafe to use this configuration, and you will need to restructure your I/O. You may need to a 9-slot base to accommodate your current requirements.

Calculating the Power Budget for the H4-EBC(-F)

Managing your Power Resource

When determining which I/O modules you will be using in the DL405 EBC system, it is important to remember that there is a limited amount of power available from the power supply. We have provided a table showing the power available from the H4-EBC and H4-EBC-F or Expansion Unit power supplies and a table showing the maximum power consumed by each of the I/O modules supported by the EBC. Following these two tables is an example of a completed power budgeting worksheet and then a blank worksheet you can use for your own calculations.

If the I/O modules you chose exceed the maximum power available from the power supply you can resolve the problem by shifting some of the modules to an expansion base which contains another power supply.



WARNING: It is *extremely* important to calculate the power budget correctly. If you exceed the power budget, the system may operate in an unpredictable manner which may result in a risk of personal injury or equipment damage.

EBC and Expansion Base Power Specifications

The following chart shows the amount of electrical current available at the two voltages supplied by the EBCs and Expansion units. Use these current values when calculating the power budget for your system.

The Auxiliary 24VDC Power Source mentioned in the table is available at the H4-EBC terminal strip (see page 2-7). You can use this power source to connect to external devices or DL405 I/O modules that require 24VDC.

CPU	5VDC Current Supplied in mA.	Auxiliary 24VDC Power Source Current Supplied in mA.
H4-EBC	3470	400
H4-EBC-F	3330	400
Expansion Units	5VDC Current Supplied in mA.	Auxiliary 24VDC Power Source Current Supplied in mA.
D4-EX	4000	400

Module Power Requirements

The chart on the next page shows the maximum amount of electrical current required to power each of the DL405 I/O modules. Use these values when calculating the power budget for your system.

Power Consumption Chart (DL405 Modules)

Device	5V Current Required (mA)	External 24V Current Req. (mA)
I/O Bases		
D4-04B, D4-04BNX, D4-04B-1	80	None
D4-06B, D4-06BNX, D4-06B-1	80	None
D4-08B, D4-08BNX, D4-08B-1	80	None
DC Input Modules		
D4-08ND3S	100	None
D4-16ND2	150	None
D4-16ND2F	150	None
D4-32ND3-1	150	None
D4-32ND3-2	150	None
D4-64ND2	300 (max)	None
AC Input Modules		
D4-08NA	100	None
D4-16NA	150	None
AC/DC Input Modules		
D4-16NE3	150	None
F4-08NES	90	None
DC Output Modules		
D4-08TD1	150	35
F4-08TD1S	295	None
D4-16TD1	200	125
D4-16TD2	400	None
D4-32TD1	250	140
D4-32TD1-1	250	140 (5-15VDC)
D4-32TD2	350	120 / (4A max including loads)
D4-64TD1	800 (max)	None

Device	5V Current Required (mA)	External 24V Current Req. (mA)
AC Output Modules		
D4-08TA	250	None
D4-16TA	450	None
Relay Output Modules		
D4-08TR	550	None
F4-08TRS-1	575	None
F4-08TRS-2	575	None
D4-16TR	1000	None
Analog Modules		
D4-04AD	200	200
F4-04AD	85	100
F4-04ADS	270	120
F4-08AD	75	90
D4-02DA	250	300
F4-04DA	120	180
F4-04DA-1	70	75 + 20 per circuit
F4-04DA-2	70	75 + 20 per circuit
F4-08DA-1	70	100 + 20 per circuit
F4-16DA-1	70	100 + 20 per circuit
F4-08THM-n	120	50 + 20 per circuit
F4-08RTD	80	None
Specialty Modules		
D4-HSC	300	None
D4-16SIM	150	None

Power Budget Calculation Example

The following example shows how to calculate the power budget for the DL405 system.

Base #	Module Type	5 VDC (mA)	Auxiliary Power Source 24 VDC Output (mA)
<u>1</u>			
EBC/Expansion Unit	H4-EBC	3470	400
Slot 0	D4-16ND2	+ 150	+ 0
Slot 1	D4-16ND2	+ 150	+ 0
Slot 2	D4-02DA	+ 250	+ 300
Slot 3	D4-08ND3S	+ 100	+ 0
Slot 4	D4-08ND3S	+ 100	+ 0
Slot 5	D4-16TD2	+ 400	+ 0
Slot 6	D4-16TD2	+ 400	+ 0
Slot 7	D4-16TR	+ 1000	+ 0
Base	D4-08B	+ 80	+ 0
Other			
Maximum power required		2630	300
Remaining Power Available		$3470 - 2630 = 840$	$400 - 300 = 100$

- Using the table on the previous page, fill in the information for the EBC/Expansion Unit, I/O modules, and any other devices that will use system power including devices that use the 24 VDC output. Pay special attention to the current supplied by the H4-EBC, the H4-EBC-F or the Expansion Unit. Each one supplies a different amount of current.
- Add the current columns starting with the row for Slot 0 and working your way down to the "Other" category. Put the total in the row labeled "Maximum power required".
- Subtract the row labeled "Maximum power required" from the row labeled "EBC/Expansion Unit". Place the difference in the row labeled "Remaining Power Available".
- If "Maximum Power Required" is greater than "EBC/Expansion Unit" in either of the two columns, the power budget will be exceeded. It will be unsafe to use this configuration, and you will need to restructure your I/O. You may need to add expansion bases to accommodate your current requirements.

Power Budget Calculation Worksheet

You may copy and use the following blank chart for your power budget calculations.

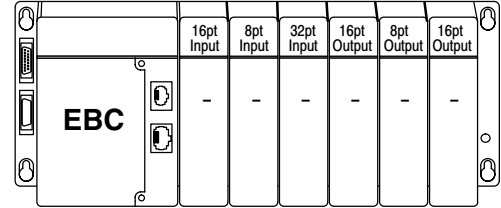
Base #	Module Type	5 VDC (mA)	Auxiliary Power Source 24 VDC Output (mA)
EBC/ Expansion Unit			
Slot 0			
Slot 1			
Slot 2			
Slot 3			
Slot 4			
Slot 5			
Slot 6			
Slot 7			
Base			
Other			
Maximum Power Required			
Remaining Power Available			

- Using the tables at the beginning of the Power Budgeting section of this chapter fill in the information for the EBC/Expansion Unit, I/O modules, and any other devices that will use system power including devices that use the 24 VDC output. Pay special attention to the current supplied by the H4-EBC, the H4-EBC-F or the Expansion Unit since they do differ.
- Add the current columns starting with the row for Slot 0 and working your way down to the "Other" category. Put the total in the row labeled "Maximum power required".
- Subtract the row labeled "Maximum power required" from the row labeled "EBC/Expansion Unit". Place the difference in the row labeled "Remaining Power Available".
- If "Maximum Power Required" is greater than "EBC/Expansion Unit" in either of the two columns, the power budget will be exceeded. It will be unsafe to use this configuration, and you will need to restructure your I/O. You may need to add expansion bases to accommodate your current requirements.

DL405 Local and Expansion I/O

The H4-EBC supports the use of DL405 series I/O local and local expansion bases.

Local Base and I/O The local base is the base in which the EBC resides. Local I/O modules reside in the same base as the EBC. For example, placing 32-point modules in all eight slots in an 8-slot base will use 256 I/O points .

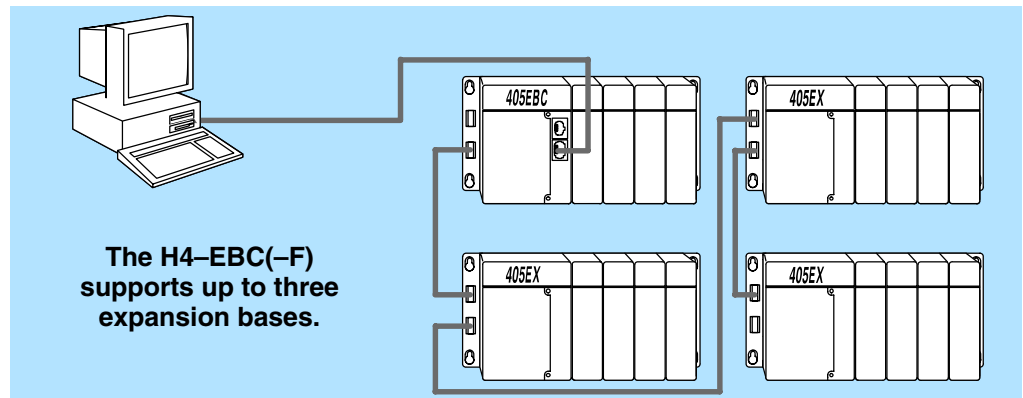


Local Expansion Base and I/O

Use local expansion bases when you need more I/O points or a greater power budget than the local base provides. The expansion bases require a Local Expansion Unit (rather than an EBC) and a cable (either D4-EXCBL-1 or D4-EXCBL-2) to connect to the local EBC base.

The following figure shows one EBC base and three expansion bases. The I/O modules are shown as examples of a usable configuration, but any configuration of I/O modules could be used if it is supported by the power budget. See page 2-15 for information about calculating the power budget.

The H4-EBC supports one local base and a maximum of three expansion bases.



Configuring the EBC Using NetEdit

In This Chapter. . . .

- Starting NetEdit Software
- Using NetEdit
- Using NetEdit to Configure the DL405 Base
- Locating the Ethernet Address Label

Starting NetEdit Software

Operating System Requirements NetEdit is a software utility which can be used to select the Ethernet communication protocol, to set the Module ID for the EBC, and to perform diagnostic and troubleshooting tasks. It can also be used to configure the serial port and to configure the DL405 base.

System Requirements You can run NetEdit on Windows 95/98™, Windows NT™, or Windows 2000™, Windows ME™. NetEdit will run directly from your 3.5" floppy disk drive.

To run the NetEdit program, insert the NetEdit 3.5" floppy disk into drive A: (or the appropriate drive for your PC). Click on the **Start** button and select **Run...** from the pop-up window, enter the letter of the drive, colon, backslash and the name **NetEdit**, and click OK.



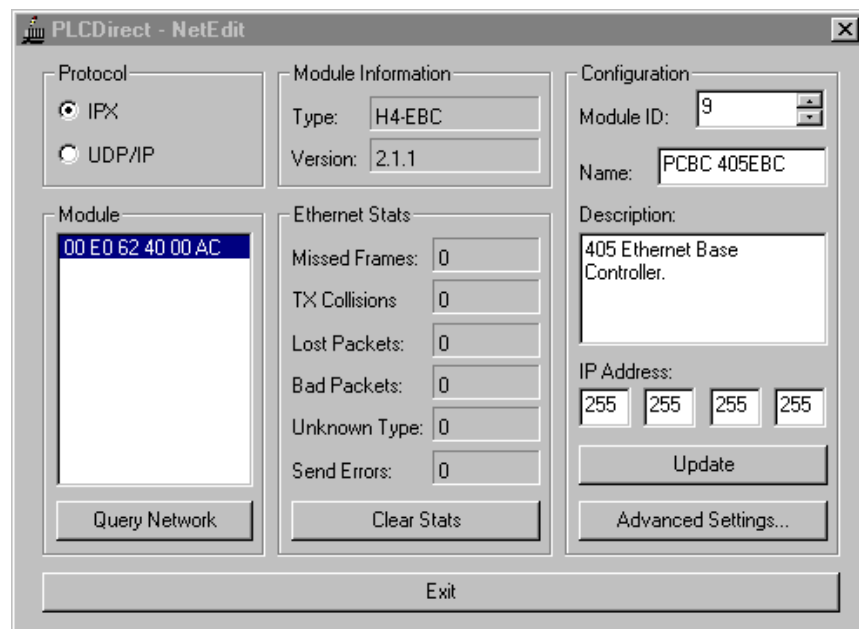
If you prefer, you can copy the NetEdit files from the 3.5" floppy disk to your hard drive. In Windows Explorer, locate the following three files on the floppy disk:

- Hei32_2.dll
- Netedit.exe
- Netedlib.dll

Copy all three files to a single directory on your hard drive, and start NetEdit by double clicking on NetEdit.exe.

The NetEdit Screen

Starting NetEdit brings up the screen below. All NetEdit functions are accessed from this screen.



Using NetEdit

In this section, we will step through the features and uses of NetEdit. We will describe the individual segments of the NetEdit screen and the function of each. If you need to refer to the full screen, you can start NetEdit as described on page 3-2, or you can refer to the figure at the bottom of page 3-2.



NOTE: Your PC-based Control software may be capable of configuring the EBC module. If so, please refer to the appropriate documentation for that software product to determine the best method to configure the EBC. The use of Think & Do software to configure the EBC is discussed in Appendices B and C of this manual.

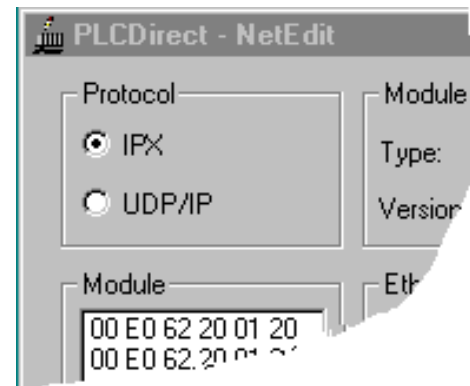
Ethernet Communication Protocol

In the upper left corner of the NetEdit screen, you will find a box labeled *Protocol*. In the box, there are two choices: IPX and UDP/IP. The EBC module understands IPX and UDP/IP protocols. Both protocols are *permanently resident* in the firmware of the module.

When you click on one of these radio buttons, you are selecting the protocol you want your PC to use to communicate with the EBC module. You are not telling the module which protocol to use, because it is using both protocols all the time. IPX is a Novell standard in widespread use, and UDP/IP is a popular protocol supported by the TCP/IP suite of protocols in your PC.

The figure to the right shows the Protocol selection box in the upper left corner of the NetEdit screen. The choice you make here tells your PC which protocol to send to the EBC to link NetEdit to the module. You are not selecting which protocol the EBC understands. It understands both.

Some PC-based control software products may support only one of these protocols. Read the documentation for your software to be sure the protocol you select is supported.

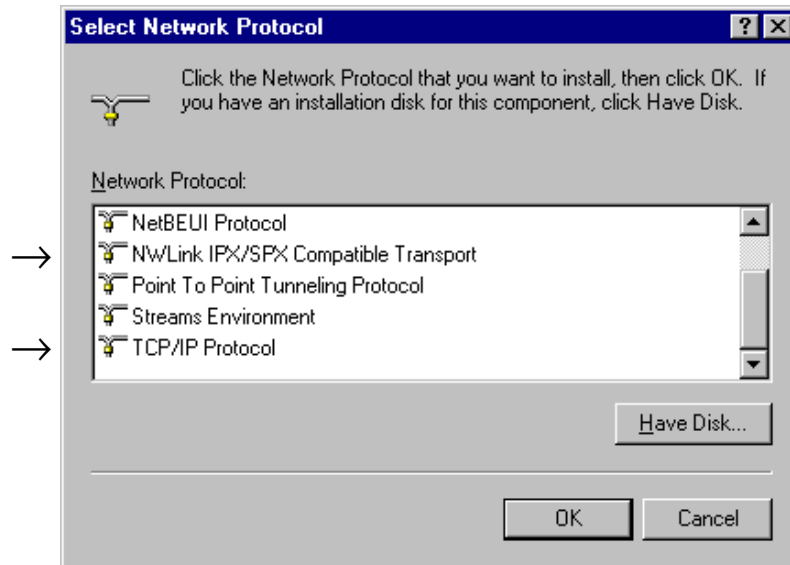


NOTE: We strongly recommend you load IPX protocol on your PC and use it for your PLC links. Use UDP/IP in your application, if required, but also add IPX to your list of active protocols. Having IPX loaded on your PC gives you a backup for troubleshooting communication problems.

Adding Network Protocol Support to Your PC

You may have already set up your PC with selected networking protocols for Ethernet communications. If not, you will need to select the protocols now for communication with the EBC module. We strongly recommend that you include the IPX protocol. From *My Computer* on your PC Desktop, go to *Control Panel*. Double click on *Network*, then click on the *Protocols* tab. If IPX is not listed among the protocols already loaded, add it now by clicking on the **Add...** button. The **Select Network Protocol** window will pop up (see figure below).

Add the TCP/IP protocol if it is necessary for your application. The TCP/IP selection will give you support for the UDP/IP protocol. Also, add the IPX protocol if it is not already active.

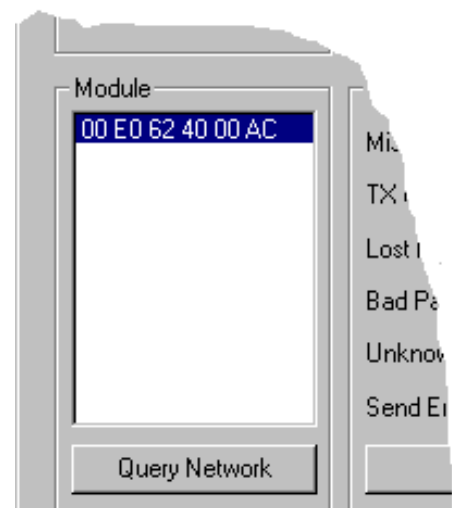


Ethernet Address

The lower left corner of the NetEdit screen displays the *Ethernet Address* of the modules currently on the network.

If modules are added or removed from the network, click on the Query Network button to update the list. Notice that the Ethernet Address is the factory-assigned address that is on the permanent label on the module. See page 3-8.

Select a specific module here by clicking on the Ethernet Address or by using the arrow keys. The selected module is highlighted.



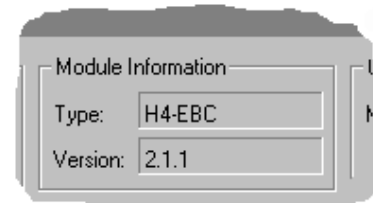
NOTE: The Module box lists the Ethernet Addresses of Ethernet Base Controllers (EBCs) and Ethernet Communications Modules (ECOMs). This manual covers the use of NetEdit for assigning a Module ID to EBCs **only**.



Module Information

The Module Information box gives the Type and the Version number. The Type is the catalog number of the module. The Version refers to the firmware version.

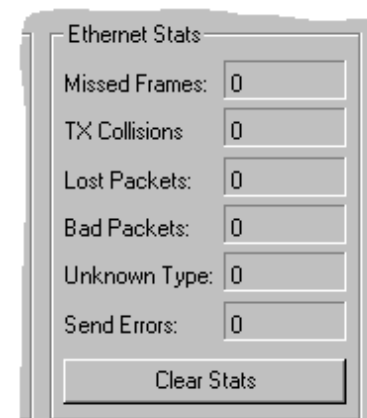
This box is in the top middle of the NetEdit screen.



NOTE: The module information and settings on this page apply to the selected (highlighted) module. To select a module, click on its Ethernet Address in the Module box. See page 3-4 for more information about selecting a module.

The Ethernet Stats are statistics related to communication errors. These statistics are explored in Chapter 4, Maintenance and Troubleshooting.

Click on the Clear Stats button to reset all categories to 0 (zero).



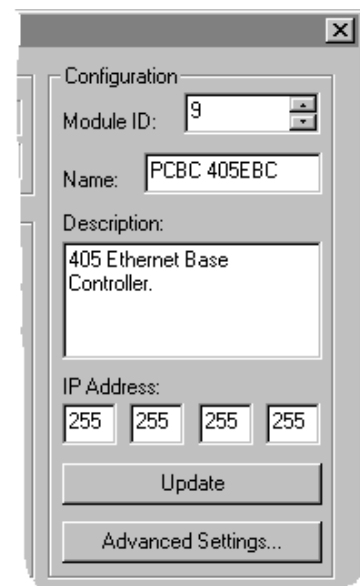
Module ID

The Configuration box allows you to assign a **Module ID**. Module IDs must be unique for each EBC, but they do not have to be in sequence. The DIP switches must all be set to zero to enable any software to change the Module ID. Do not use address zero for communications.

The **Name** field and **Description** field are optional.

To set an **IP Address**, highlight the number in each of the four boxes, and overwrite the number. Use the twelve-digit number assigned to the EBC module by your network administrator. If you change the IP Address, do not use the number "255" in any field. Doing so will cause communication problems.

The Update Module button sends all entries to the module's flash memory. The Advanced Settings button displays a pop-up window described on the next page.

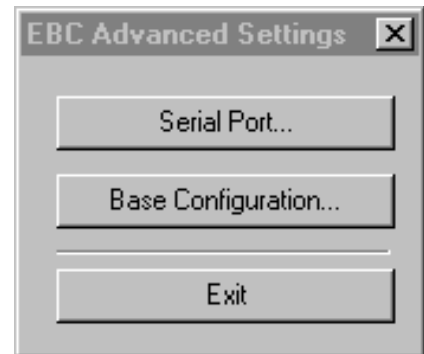


Advanced Settings

The Advanced Settings button in the Configuration box of Net Edit (page 3-5) brings up the *EBC Advanced Settings* window.

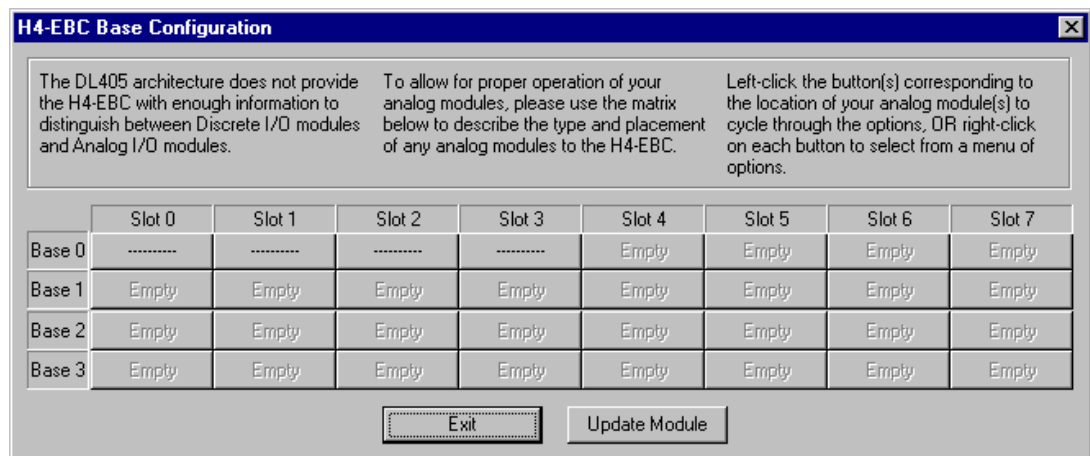
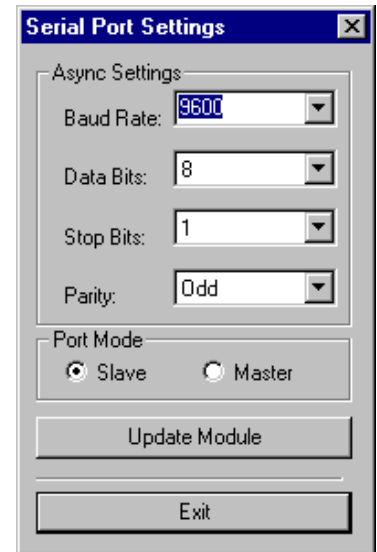
Clicking on the **Serial Port** button (right) causes the *Serial Port Settings* screen to pop up.

Clicking on the **Base Configuration** button causes the *EBC Base Configuration* screen to appear.



On the *Serial Port Settings* screen, make any necessary changes to the serial communication parameters. After making changes, be sure to click on the **Update Module** button. Also, Be sure these parameters match the parameters of the serial device with which you are communicating.

Note: Some PC-based Control software packages may automatically overwrite settings selected here. Refer to the documentation for your PC-based Control software.



When you click on the Base Configuration button (top of page) the *H4-EBC Base Configuration* screen pops up, as shown (immediately above). The H2-EBC is self-configuring and does not require this step.

Using NetEdit to Configure the H4-EBC Base



NOTE: The following configuration information applies only to the H4-EBC(-F) and the DL405 I/O. The H2-EBC(-F) and associated DL205 I/O are self-configuring and do not require this additional step.

The default symbol “-----” appears on the configuration screen where digital or analog modules are present. For digital modules, you do not need to make any changes. The H4-EBC recognizes the digital modules and is self-configuring for the digital modules.

If you are using analog modules, you must let the H4-EBC know that by doing the following. Click on the slot location where the analog module is located. Continue clicking on the same slot location until the part number of your analog module appears.

Configuring Analog Modules

H4-EBC Base Configuration

The DL405 architecture does not provide the H4-EBC with enough information to distinguish between Discrete I/O modules and Analog I/O modules.

To allow for proper operation of your analog modules, please use the matrix below to describe the type and placement of any analog modules to the H4-EBC.

Left-click the button(s) corresponding to the location of your analog module(s) to cycle through the options, OR right-click on each button to select from a menu of options.

	Slot 0	Slot 1	Slot 2	Slot 3	Slot 4	Slot 5	Slot 6	Slot 7
Base 0	-----	-----	F4-08RTD	F4-04DA-n	Empty	Empty	Empty	Empty
Base 1	Empty	Empty	Empty	Empty	Empty	Empty	Empty	Empty
Base 2	Empty	Empty	Empty	Empty	Empty	Empty	Empty	Empty
Base 3	Empty	Empty	Empty	Empty	Empty	Empty	Empty	Empty

Exit Update Module

Once the correct part numbers appear for each of your analog modules, click the **Update Module** button to save the configuration into flash memory onboard the module. Leave the symbol “-----” wherever you have a digital module.

If you are using a High Speed Counter module, the word “Intelligent” will appear in gray. The High Speed Counter module is configured automatically (see below). No other action is required other than clicking on the **Update Module** button.

Configuring the High Speed Counter Module

H4-EBC Base Configuration

The DL405 architecture does not provide the H4-EBC with enough information to distinguish between Discrete I/O modules and Analog I/O modules.

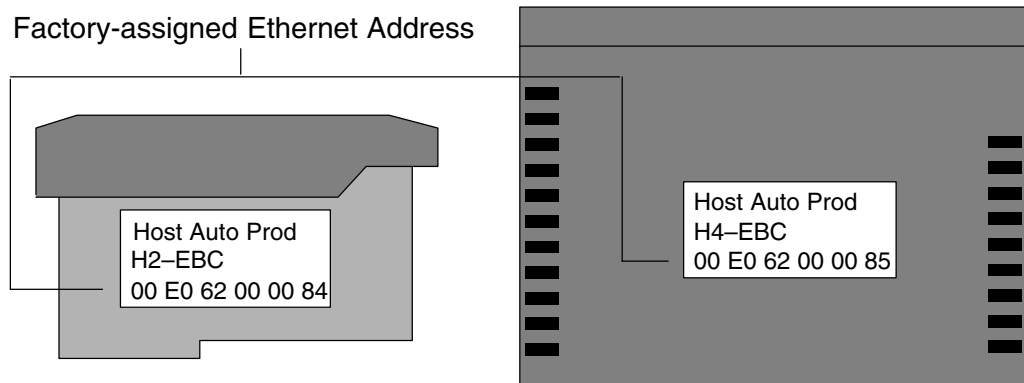
To allow for proper operation of your analog modules, please use the matrix below to describe the type and placement of any analog modules to the H4-EBC.

Left-click the button(s) corresponding to the location of your analog module(s) to cycle through the options, OR right-click on each button to select from a menu of options.

	Slot 0	Slot 1	Slot 2	Slot 3	Slot 4	Slot 5	Slot 6	Slot 7
Base 0	-----	-----	F4-04ADS	Intelligent	Empty	Empty	Empty	Empty
Base 1	Empty	Empty	Empty	Empty	Empty	Empty	Empty	Empty
Base 2	Empty	Empty	Empty	Empty	Empty	Empty	Empty	Empty
Base 3	Empty	Empty	Empty	Empty	Empty	Empty	Empty	Empty

Exit Update Module

Locating the Ethernet Address Label



Ethernet Address A unique Ethernet Address is assigned to each module at the factory and cannot be changed. It is a twelve digit number, and it is printed on a label permanently attached to the EBC module. NetEdit recognizes the Ethernet Address

Troubleshooting

In This Chapter. . . .

- Isolating a Communication Problem
- Troubleshooting Chart
- EBC Module Diagnostic LEDs
- Using NetEdit for Troubleshooting
- Diagnosing Network Cable Problems

Isolating a Communication Problem

If you are experiencing a problem communicating with an EBC module, the problem can usually be isolated to one of four components of the communication link:

- the EBC module itself (hardware or firmware)
- the communication program or the setup of the EBC module
- the cabling and connections
- other external influences, such as electrical noise, heavy communication traffic on the network or exceeding the PLC power budget

Diagnostic Tools and Techniques

Several available tools and techniques can help you isolate a communication problem:

- The LEDs on the face of the module indicate the status of the link, the module, and the network communications.
- Replacing the module may determine whether the problem is in the module.
- NetEdit displays a list of the active modules on the network and their protocol and configuration settings.
- Cable testing devices can pinpoint short or open circuits or diagnose attenuation problems and other cabling problems.
- Diagnostic tools within your PC-based Control software.

Troubleshooting Chart

The following chart summarizes the different types of communication failures you could experience. In each case the **CPU PWR LED** must be on, and you must be attempting to communicate with the EBC in question.

The meaning of the **diagnostic LEDs** is explained on page 4-4.

Troubleshooting Chart	
Legend: <input type="checkbox"/> Off <input checked="" type="checkbox"/> On <input checked="" type="checkbox"/> Flash	
EBC Module LEDs	Corrective Action

LINKGD OR LINKGD
 ACT ACT
 ERROR ERROR

1. Cycle power to the base. This will clear the ERROR if it was due to a transient condition.

2. Replace EBC module

Troubleshooting Chart (Continued)	
Legend: <input type="checkbox"/> Off <input checked="" type="checkbox"/> On <input checked="" type="checkbox"/> Flash	
EBC Module LEDs	Corrective Action

LINKGD
 ACT
 ERROR

1. Try another cable that you know works. Check pinouts (see page 2-8).
2. Try another port on the hub or another hub.
3. Replace EBC module.

LINKGD
 ACT
 ERROR

1. Try another cable between PC and hub.
2. Try another port on the hub or another hub.
3. Make sure you have not exceeded the recommended cable length for your network cable. The link signal could arrive with sufficient strength even though the data transmission does not.
4. Could be related to Windows configuration. Consult Windows documentation.

Note: This is also the indication of proper operation! Troubleshoot only if you are failing to exchange data.

LINKGD OR LINKGD
 ACT ACT
 ERROR ERROR

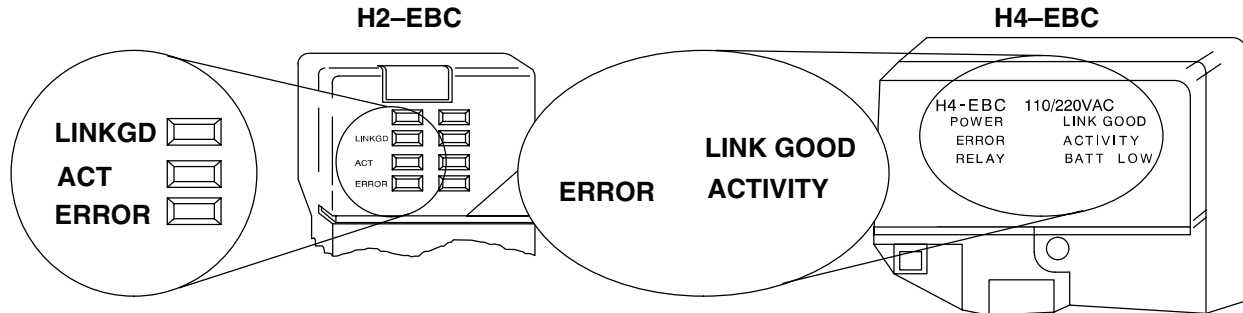
1. Try another cable between PC and hub or EBC and hub.
2. Try another port on the hub or another hub.
3. Look for errors in the setup of the EBC module.

EBC Module Diagnostic LEDs

EBC LEDs

The EBC module has three indicator lights which show the status of the following:

- signal path between the EBC and the hub
- signal between a PC and an EBC
- EBC module hardware



LINK GOOD Indicator

The **green LINKGD** (LINK GOOD) LED is **on steady** when the EBC module is connected properly to an active device on the network and is receiving 5VDC operating voltage from the PLC power supply. The LINKGD LED verifies that the proper cables are connected, and the EBC module is functioning correctly. If a mismatch with the 10BaseT or 10BaseFL connections occurs this LED will not be illuminated.

ACTIVITY Indicator

The **red ACT** (ACTIVITY) LED **flashes** to indicate that the module is detecting data on the network. If any network device is sending or receiving data, the ACT LED will be illuminated. In idle mode (no network traffic) this LED is OFF. During heavy communication loads this LED will be **on steady**.

ERROR Indicator

If the EBC module's **red ERROR** indicator is **flashing** or **on steady**, a fatal error has occurred. The error may be in the EBC module itself, or a network problem may be causing this symptom. The ERROR indication can be caused by a faulty ground, an electrical spike or other types of electrical disturbances. Cycle power to the system to attempt clearing the error.

Using NetEdit for Troubleshooting

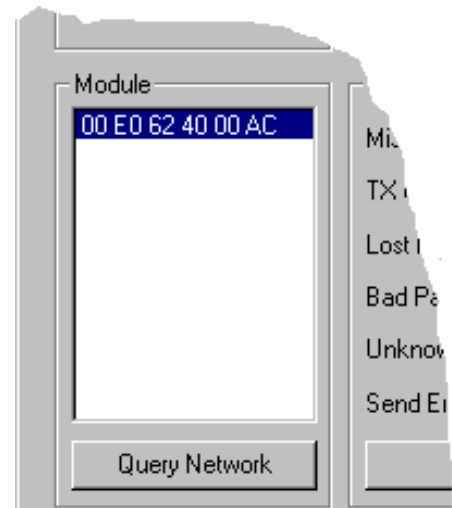
NetEdit is a software utility which came with this manual. To review the procedures for running and using NetEdit, see Chapter 3. NetEdit allows you to:

- See active modules on the network.
- Examine and change the modules' configuration settings.
- See the firmware revision number.
- Review statistical information about communication errors by type.

Select a Module

The Module box shows the Ethernet Addresses of all modules which are currently linked to the NetEdit utility. If your EBC module is not on this list, try the following:

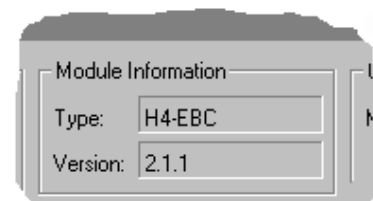
- Change Protocol selection and click on Query Network. See **Change Protocol** on the next page.
- Confirm that your PC has IPX or TCP/IP protocol loaded.
- Confirm that the EBC module's Link Good LED is on.



NOTE: The Ethernet Address is permanently assigned at the factory, and it is recorded on a label on the side of the EBC module. See page 3-8 if you need help locating the label.

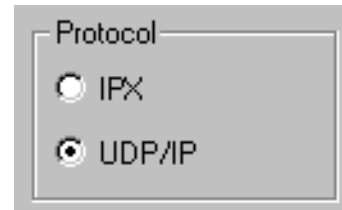
Module Information

The Module Information box is updated with module type and version for the module currently selected. Verify that all modules *of the same type (H2 or H4)* have the same firmware version.



Change Protocol

If you are experiencing a problem communicating from your PC to a module that *does not* appear on the list of active modules, try changing the protocol and clicking on **Query Network**. You may be able to link to your module with the other protocol.



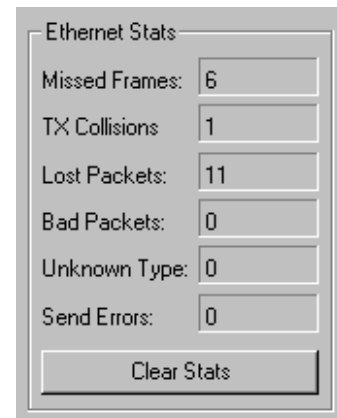
If you are not sure which protocol driver is loaded on your PC, refer to page 3-4, as well as your Windows NT™ documentation.

Ethernet Stats

If you are able to see the *problem* module on the list of modules currently active on the network, you can **select** the module to see the *Ethernet Stats* for that module. Select the module by clicking on the Ethernet Address in the Module box (see page 3-4).

To begin a new statistical record, click the **Clear Stats** button.

The diagnostic information available in the *Ethernet Stats* box is:



- Missed Frames – frames lost due to unavailability of buffer space.
- TX Collisions – detected when RXD+ and RXD- become active during a data transmission. Two devices are trying to communicate at the same time.
- Lost Packets – packets that overflow the queue.
- Bad Packets – packets that fit the Ethernet standard but are not in the right format for the EBC module.
- Unknown Type – a foreign command was received and could not be interpreted. This will probably happen only during software driver development.
- Send Errors – the Ethernet standard number of retries were attempted for a transmission.

Replacing the EBC Module

If you are replacing an existing EBC module with a new one, you need to set up the new module with the same **Module ID** as the module you are replacing. If you used the **DIP switch** to set the Module ID, you will need to set the DIP switch on the replacement module to the same Module ID. See page 2-3 or 2-4 to review the procedure for setting the Module ID using the DIP switch.

If you set up your original EBC module using NetEdit, you will need to duplicate the settings in the new module using the same procedures. See page 3-2 through 3-7 to review the procedures for using NetEdit.

If you set up your original EBC module using your PC-based Control software, you will need to refer to the appropriate documentation.



WARNING: Your system can be damaged if you install or remove system components before disconnecting the system power. To minimize the risk of equipment damage, electrical shock, or personal injury, always disconnect the system power before installing or removing any system component.

Diagnosing Network Cable Problems

If you are experiencing communication problems, swapping cables is one of the simplest diagnostic procedures you can perform. If the network operates correctly with a different cable, you have isolated and cured the problem. If possible, use a short run of cable to test the network because problems with longer cable runs can be more difficult to diagnose and are more often intermittent.

If you are unable to swap cables, verify the proper operation of all other network components. You probably have a cable problem if you have verified that your:

- EBC module is working correctly.
- EBC module configuration is correct.
- RLL program or PC program is correct.
- hubs are working correctly.
- Windows configuration is correct.
- network adapter card is the correct type, and it is working correctly.

It is a good maintenance practice to test network cables periodically and maintain a permanent record of cable characteristics. A number of cable test instruments are available to test 10BaseT and 10BaseFL networks. These instruments will check the electrical or optical characteristics of your cabling, including:

- Continuity – This is a check to make sure the communication pairs are wired correctly, and that the wires are continuous from end to end. In the case of fiber optic network this is a test to be sure light is transmitted from one end of the cable to the other.
- Attenuation – This refers to the amount of signal loss over the cable segment at the signal frequency of interest. The 10BaseT specification allows for a maximum signal loss of 11.5 decibels (dB) for the entire link at the signal frequency used by 10Mbps Ethernet. The 10BaseFL specification calls for the optical loss in link segment to be no greater than 12.5 dB.
- Crosstalk – Crosstalk occurs when a signal in one pair of wires is electromagnetically coupled to an adjacent pair. This is critical for 10BaseT networks which are susceptible to noise interference. 10BaseFL networks are virtually immune to noise interference.



NOTE: Any significant difference between the cable characteristics of the transmitter and receiver can cause communication errors.

Ethernet devices continually monitor the “receive data” path for activity as a means of verifying their link is working correctly. When the network is idle, each network device (including the EBC module) sends a periodic *link test* signal to verify that the network is working. If the link test signal or other network activity is not received periodically, the Link Good LED on the EBC module is turned off.

Appendix A

General

Specifications

In This Appendix

- H2–EBC(–F) and H4–EBC(–F) Specifications
- Serial Port Specifications
- Ethernet Standards

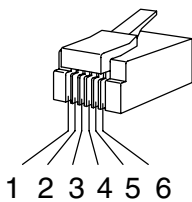
H2-EBC(-F) and H4-EBC(-F) Specifications

Specifications	H2-EBC	H2-EBC-F
Communications	10Base-T Ethernet	10Base-FL Ethernet
Data Transfer Rate	10Mbps	10Mbps
Link Distance	100 meters (328 ft)	2,000 meters (6,560 ft)
Ethernet Port	RJ45	ST-style fiber optic
Ethernet Protocols	TCP/IP, IPX	TCP/IP, IPX
Serial Port	RJ12, K-sequence	RJ12, K-sequence
Power Consumption	530mA	670mA
Manufacturer	Host Automation Prods	Host Automation Prods

Specifications	H4-EBC	H4-EBC-F
Communications	10BaseT Ethernet	10BaseFL Ethernet
Data Transfer Rate	10Mbps	10Mbps
Link Distance	100 meters (328 ft)	2,000 meters (6,560 ft)
Ethernet Port	RJ45	ST-style fiber optic
Ethernet Protocols	TCP/IP, IPX	TCP/IP, IPX
Serial Port	RJ12, K-sequence	RJ12, K-sequence
Power Supplied	3470mA @ 5VDC 400mA @ 24VDC	3330mA @ 5VDC 400mA @ 24VDC
Manufacturer	Host Automation Prods	Host Automation Prods

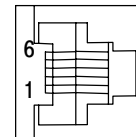
Serial Port Specifications

Serial Port Pin Descriptions		
1	0V	Power (-) connection (GND)
2	5V	Power (+) connection
3	RXD	Receive Data (RS232C)
4	TXD	Transmit Data (RS232C)
5	RTS	Request to Send
6	0V	Power (-) connection (GND)



6-pin Male (RJ12)
Modular Plug

6-pin Female (RJ12)
Modular Jack
as oriented on EBC



Ethernet Standards

Various institutes and committees have been involved in establishing Ethernet data communication standards. These specification standards assure Ethernet network compatibility for products from a broad variety of manufacturers.

The EBC module complies with American National Standards Institute (ANSI) and Institute of Electrical and Electronic Engineers standard ANSI/IEEE 802.3, Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access Methods and Physical Layer Specifications. This standard has been adopted by the International Organization for Standardization (ISO) as document ISO/IEC 8802-3.

The Electronic Industries Association (EIA) and Telecommunications Industries Commercial Building Telecommunications Wiring Standard designated EIA/TIA-568A defines implementation of 10BaseT (twisted pair) and 10BaseF (fiber optics) for Ethernet communications.

The same two organizations produced EIA/TIA TSB40-Additional Transmission Specifications for Unshielded Twisted-Pair Connecting Hardware. The purpose of this document is to specify transmission performance requirements and connecting hardware requirements.

Appendix B

Using the H2–EBC with Think & Do

In This Appendix. . . .

- Configuring the DL205 I/O Base
 - Mapping H2-EBC I/O Points
 - Analog Output Module Setup
 - I/O Module Status Words / Bits
 - Using EZTouch/EZText Panel with the RJ-12 Serial Port
-

Configuring the DL205 I/O Base

The H2-EBC(-F) and DL205 I/O are self-configuring. The H2-EBC(-F) reads the module and identifies it on powerup. Within the Think & Do I/O View tool, the DL205 I/O modules are graphically displayed as soon as a connection is established between your PC and your H2-EBC(-F).

For additional information about establishing a connection between your PC and the H2-EBC(-F), please see the *Think & Do Software Learning Guide*.

Mapping H2-EBC I/O Points

We recommend that you be familiar with “Getting Started” and “Creating a Project” chapters in the *Think & Do Studio Learning Guide* before attempting to map the EBC I/O points/channels to Data Items using ConnectivityCenter.

To launch ConnectivityCenter:

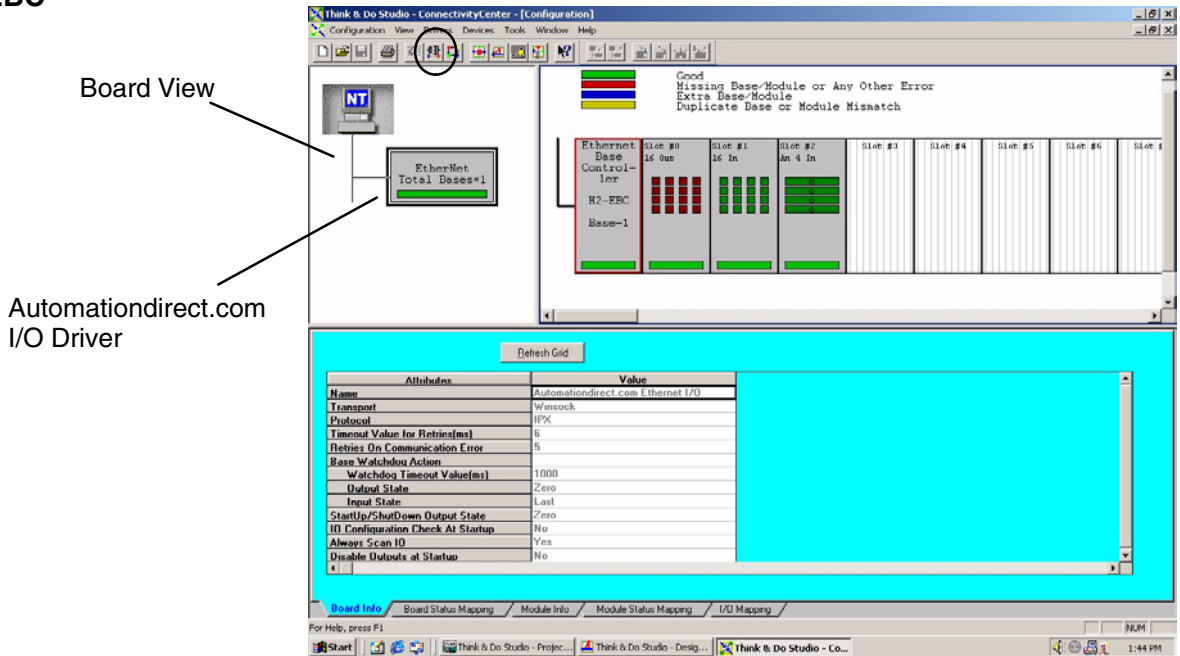
- 1) Launch Think & Do Studio ProjectCenter from the Windows desktop by either clicking on **Start**, then **Programs**, next **Think & Do Studio**, finally **ProjectCenter** or click on the **ProjectCenter** icon to start.
- 2) Click on the File Menu and either open your Think & Do Project or select New.
- 3) Within ProjectCenter select Windows 2000 or NT Certified PC as the Runtime Target.
- 4) Then either click **Tools**, then **ConnectivityCenter** to launch the ConnectivityCenter or click on the ConnectivityCenter shortcut in the Project Explorer.
- 5) Once in ConnectivityCenter click on **Drivers**, then **Add** and select **Automationdirect.com Ethernet I/O Driver**.
- 5) Then either click on **Configuration**, then **Connect** or click on the Connect toolbar button.

ConnectivityCenter will draw a picture of your EBC I/O system.

Appendix B
Using H2-EBC with T&D

Launching Connectivity Center Tool

Connecting to the EBC



Mapping I/O Points to Data Items

This procedure is discussed in detail in the “Creating a Project” chapter in the *Think & Do Studio Learning Guide*. This will map your real world I/O to Data Items.

I/O Module Status Word / Bits

I/O Module diagnostic information is listed for each I/O module under the Module Status Mapping tab. Click on a module graphic to display its Status Item Descriptions.

Status Indicator

The screenshot shows the 'Think & Do Studio - ConnectivityCenter - [Configuration]' window. The top window displays a grid of modules with status indicators. The bottom window shows a table of status item descriptions.

Status Item	Description	Data Type	Logical ID	Tagname	Value
1	Eth_Base01_Slot2_ErrorBits	Input			0
2	Eth_Base01_Slot2_ExtraModule	Input			0
3	Eth_Base01_Slot2_MissingModule	Input			0
4	Eth_Base01_Slot2_ModuleMismatch	Input			0
5	Eth_Base01_Slot2_AnalogInChFailure	Input			0

1 = Error

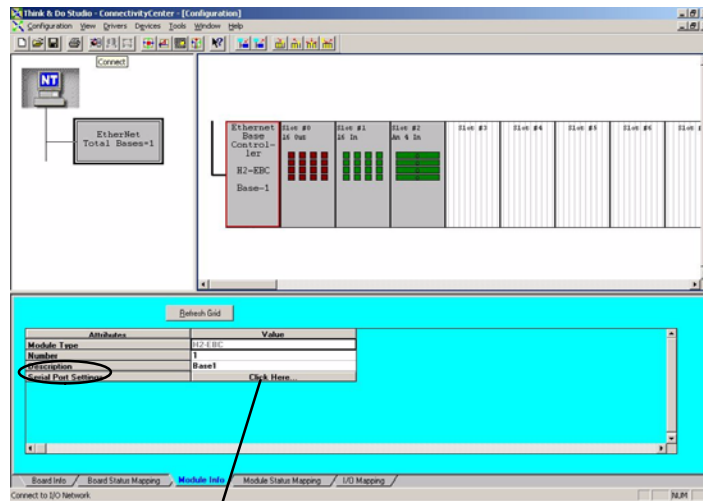
Module Status Mapping Tab

Using EZTouch/EZText Panel with the RJ-12 Serial Port

The H2-EBC has a built-in RS232C serial port that can be used to connect to an operator interface panel. Use ConnectivityCenter to configure the connection from the H2-EBC to the EZTouch or EXText panel. The "HMI Options for Remote Base Controllers" section in the "Operator Screen Techniques" chapter in the *Think & Do Studio Learning Guide* discusses configuring and using Optimate Panels with the EBC.

Click on the H2-EBC graphic and Module Info tab in the ConnectivityCenter. The Serial Port Settings attributes are all that will be visible in ConnectivityCenter when the I/O is disconnected. Follow the steps below to configure the EBC's RJ12 serial port to be used with either the EZTouch or the EZText panels.

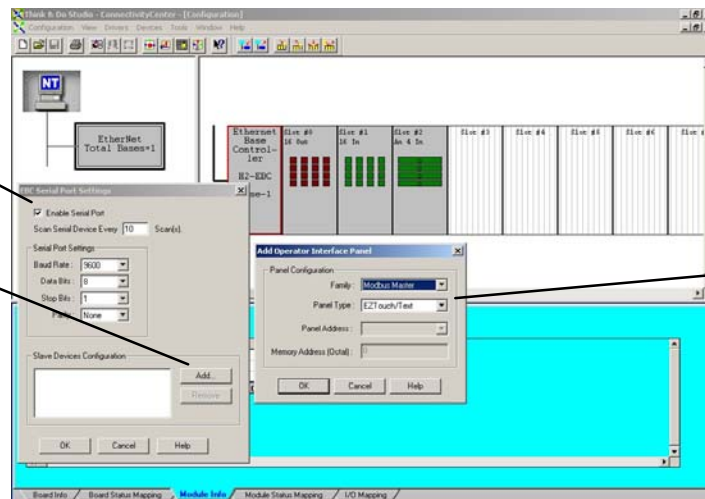
Appendix B
Using H2-EBC with T&D
Adding Operator Interface Device



1. Click Here to access port settings.

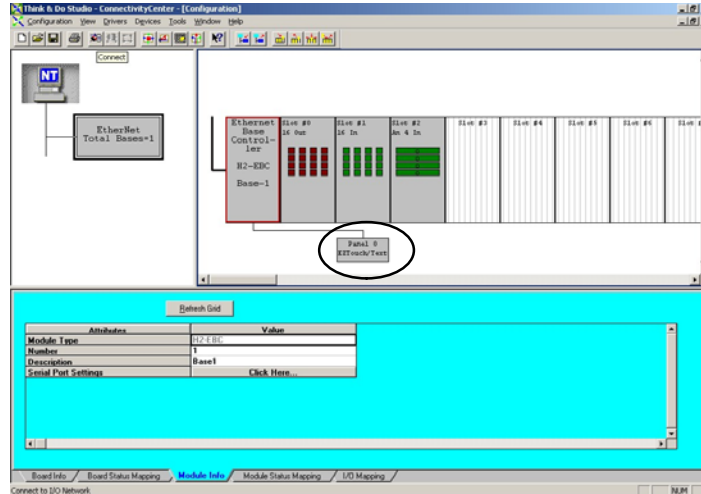
2. Check **Enable Serial Port** to enable the serial port. These settings must match the port configuration of the EZ panel.

3. Click **Add...**



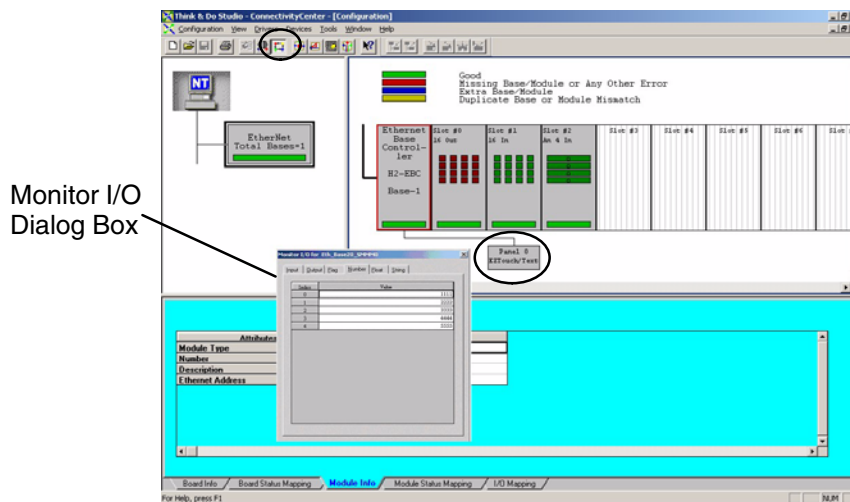
4. Set the Family to Modbus Master and the Panel Type to EZTouch/Text.

Once the EZTouch or EZText panel has been added, it will show up in the list of the configured devices, and an EZTouch/Text panel graphic symbol will be located under the I/O base next to the EBC.



Using Monitor I/O to Verify Panel Operation

Re-connect to the I/O in ConnectivityCenter by either clicking on **Configuration**, then **Connect** or by clicking on the **Connect** toolbar button. Then scan the I/O by either clicking on **Configuration**, then **Scan** or by clicking on the **Scan** toolbar button. Doubleclick on the EZ panel box graphic to launch the Monitor I/O Dialog Box. The Monitor I/O tool allows the user to update the fields at any moment, although the panel continuously updates the fields with changes as well. All of the "Value" fields in the Monitor I/O Dialog Box are read/write and are updated from the the Monitor I/O Dialog box which takes precedence over updates from the panel. The user can update bit values (Input, Output and Flag) immediately by one mouse click or by pressing the space bar. When typing in numbers, the grid will enter the edit mode which will block any conflicting updates from the panel. The edit mode entry is completed after pressing Enter, any arrow key or by selecting a new line.



Appendix C

Using the H4–EBC with Think & Do

In This Appendix

— Configuring the DL405 I/O Base with H4–EBC(–F)

Configuring the DL405 I/O Base with H4-EBC(-F)

Configuring the base is a necessary step in the setup of the H4-EBC module. The H4-EBC must know the type and location of each input and output module installed in the base. Once identified, the configuration resides in non-volatile memory on-board the EBC until a change is made.

The H4-EBC is partially self-configuring. On powerup, the H4-EBC reads the base to determine the specifications of installed modules. The information available allows the H4-EBC to determine:

- whether the I/O modules are inputs or outputs
- whether the installed modules are standard I/O modules or a High Speed Counter module (other intelligent modules are not supported at this time)

If you **are not** using analog inputs or outputs the H4-EBC configures itself. For the following module types, the DL405 I/O system provides the necessary configuration information to the H4-EBC, and the H4-EBC automatically configures the base:

- digital inputs
- digital outputs
- High Speed Counter module

If you **are** using analog inputs or outputs you **must** configure the base manually using a software utility imbedded in Think & Do:

You are ready to configure your base if you have done **all** of the following:

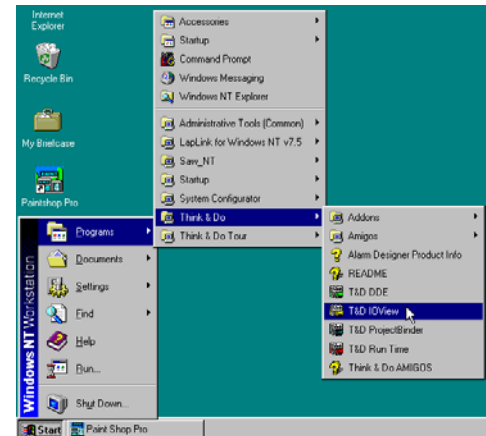
- installed your H4-EBC or H4-EBC-F module
- connected power wiring to the EBC terminal strip
- installed I/O modules and expansion bases as necessary for your application
- connected your PC and EBCs to a dedicated Ethernet network
- installed Think & Do (Version 4.4, or later) on your PC



NOTE: The pages that follow explain how to use the Think & Do software utility for configuring the base. For additional information about using the Think & Do software product, please refer to the **Think & Do Software Learning Guide**.

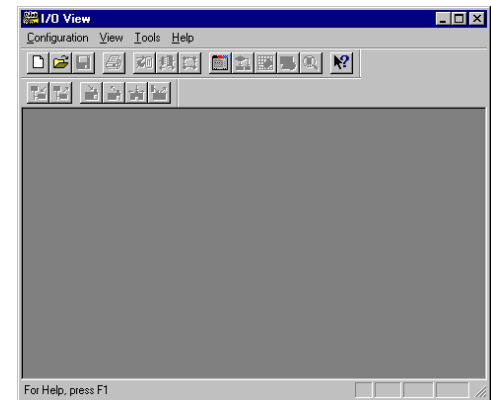
Starting I/O View

I/O View is one of the tools provided by Think & Do software. It is directly accessible from the Start menu after installation. Select **Start**, then **Programs**, then **Think & Do**, then **T&D I/O View**, as shown to the right.



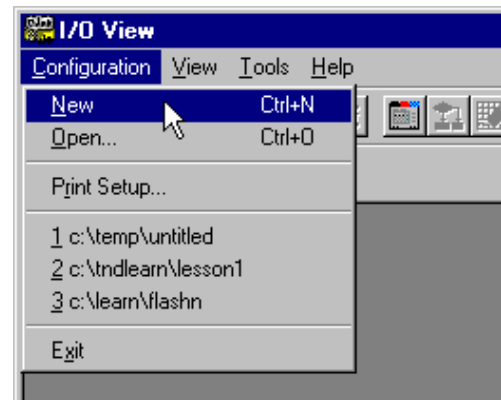
The I/O View window will appear as shown, with a blank I/O configuration screen. If you save this screen without renaming it, the default name will be "IOView1".

We use a new I/O View window to configure the I/O for an example system. The H4-EBC is connected to the PC which is running Think & Do software.



Starting a New Screen in I/O View

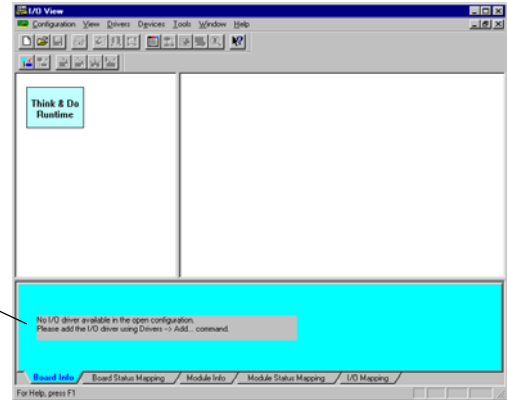
To start a new configuration, select the **Configuration** menu, then **New** as shown.



The next screen is divided into three regions separated by window splitter bars. You can re-size the regions by doing a click-and-drag on a splitter bar.

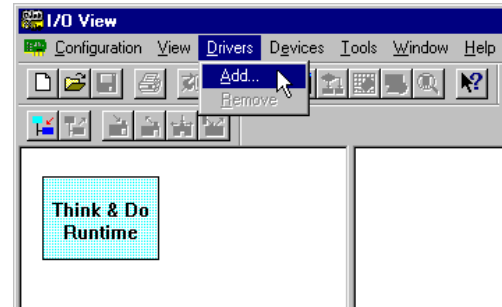
Each project maintains its own record of its I/O configuration.

The first time you open the I/O View window for a new project, it will prompt you to choose an I/O driver, as shown below.

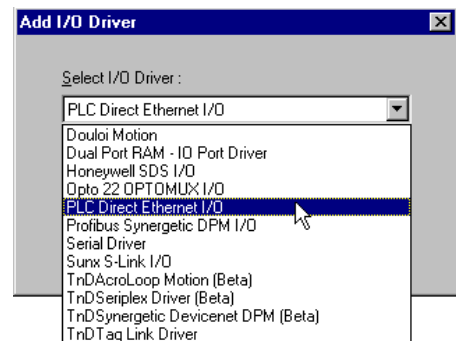


Selecting a Driver

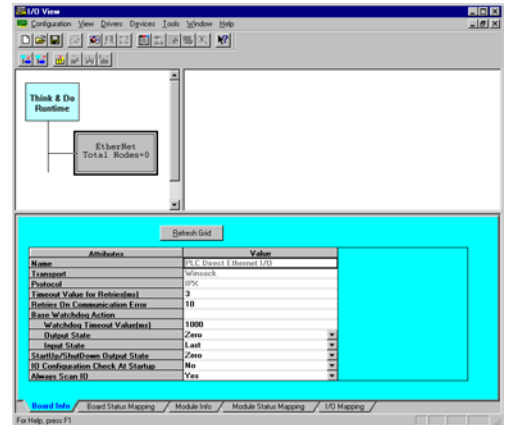
Use the **Drivers** menu and select **Add**, as shown, to access a list of I/O drivers.



Select the **PLC Direct Ethernet I/O** driver. Click OK.

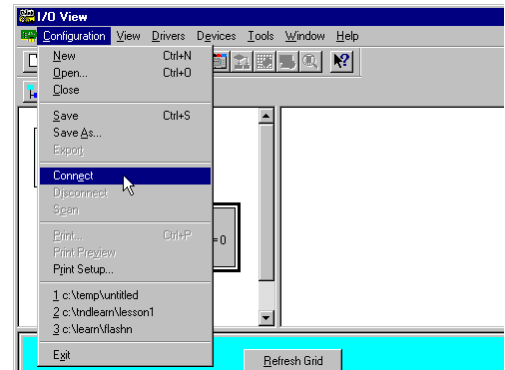


I/O View adds the driver, and attempts to activate the network adapter card. I/O view displays an image of the card as shown to the right.



H4-EBC Base Configuration Screen

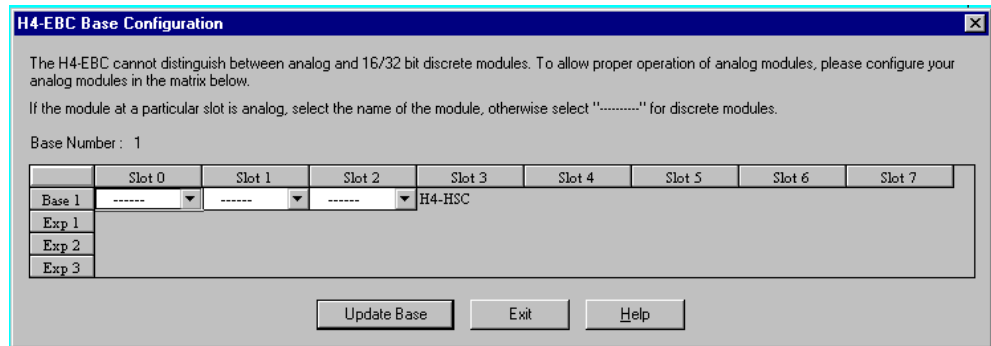
Select the **Configuration** pull-down menu from the I/O View menu bar as shown to the right. Then select **Connect** from the menu. This instructs Think & Do to make the connection to the I/O bases currently on the network.



The module must have a non-zero Module ID set on the DIP switch or an error message will be returned at this point. See page 2-4 “Setting the DIP Switch” for more information.

Think & Do makes a connection to the H4-EBC and automatically displays the **H4-EBC Base Configuration** screen. The screen will overlay the I/O View screen. Discrete and analog modules are both displayed *initially* as a dashed horizontal line “-----” in the block representing the module’s slot location.

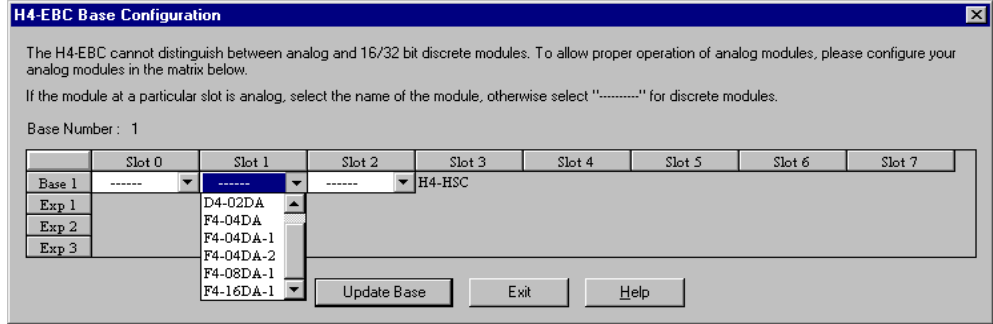
If you have digital inputs and outputs but no analog inputs or outputs, you do not need to do anything additional to configure the base. You may click on Exit or Update Base. Either will return you to the I/O View screen.



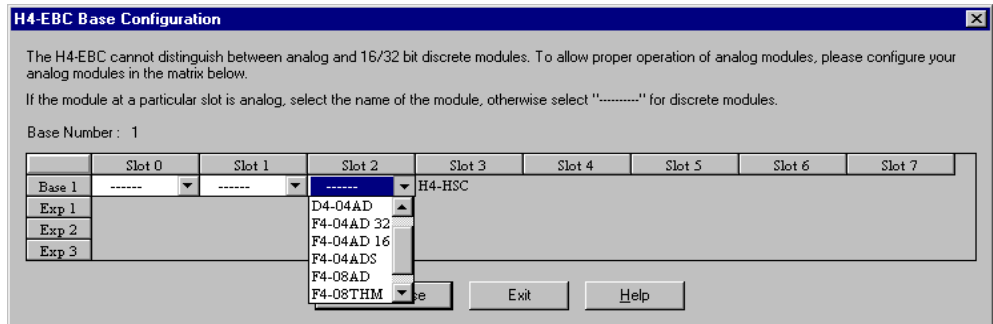
Note: High Speed Counter module may be indicated as D4-HSC or H4-HSC. They are the same.

Identifying Analog Modules

You must identify each analog input or output module by selecting the applicable part number on the Base Configuration screen. The part numbers of all available analog modules appear on the pull-down menu for the appropriate slot (the part number is printed on the face of each module). Click on the arrow beside the slot location to see the menu. The H4-EBC automatically distinguishes between input modules and output modules. In the Think & Do implementation of the Base Configuration utility, the pull-down menu for analog input modules lists only *analog input* modules. It does not list analog output modules.

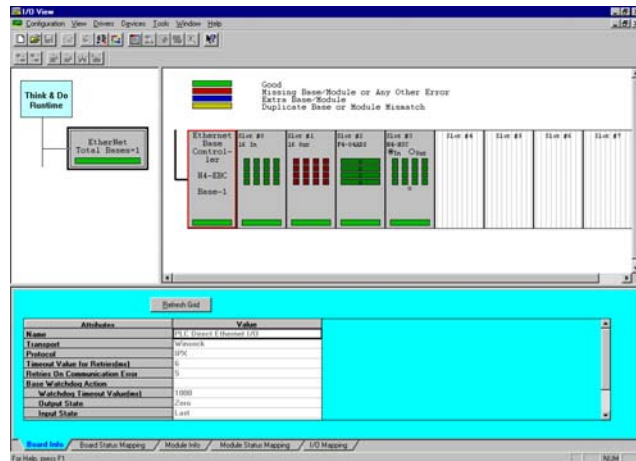


The pull-down menu for analog output modules lists only *analog output* modules.



After selecting the appropriate part number for your analog input or output modules, click on Update. This will save the entries to the H4-EBC's non-volatile memory.

After clicking on Update, a graphical representation of the H4-EBC, the base, and I/O modules appears. You have successfully configured the I/O base. The I/O View screen shows an eight-slot base even if you are using a smaller base. Expansion bases are also shown if connected.



Appendix D

Using the H2–EBC with KEPwareEX OPC Server

In This Appendix. . . .

- Introduction to KEPServerEX
 - KEPServerEX Project: Adding and Configuring a Channel
 - KEPServerEX Project: Adding and Configuring a Device
 - KEPServerEX Project: Adding Tags to the Project
 - H24-EBC I/O Addressing
-

Introduction to KEPServerEX

Introduction to OPC

OPC, OLE (Object Linking and Embedding) for Process Control, is an industry standard created by a number of worldwide leading hardware and software suppliers in cooperation with Microsoft. The OPC Data Access specification, as maintained by the OPC Foundation, is a non-proprietary technical specification that defines a set of standard interfaces based upon Microsoft's OLE/COM technology. An OPC server (driver) allows items such as distributed control systems, programmable logic controllers, I/O systems and smart field devices to communicate with a wide range of HMI/SCADA (client) software packages residing on a PC. Traditionally, each software or application developer was required to write a custom interface, or server/driver, to exchange information with hardware field devices. OPC eliminates this requirement allowing manufacturing customers true plug and play connectivity and the freedom to choose products based on their automation requirements.

DDE Support

While KEPServerEX is first and foremost an OPC server, KEPware recognized that a number of legacy applications still depend upon DDE for their underlying client server technology. Early in the development of Windows, Microsoft provided a generic client server technology called DDE (Dynamic Data Exchange). DDE did provide a basic architecture that would allow many windows applications from a wide range of vendors to share data. But there was one problem, DDE was not designed for the industrial market lacking much of the speed and robustness desired in an industrial setting. However, this did not stop DDE from becoming a dominant client/server architecture, largely due to its availability in most windows applications.

KEPServerEX

KEPServerEX Enhanced OPC/DDE Server is a 32 bit windows application that provides a means of bringing data and information from a wide range of industrial devices and systems into client applications on your Windows PC. KEPServerEX falls under the category of a "Server" application. It is very common to hear the term "client/server application" in use across many software disciplines and business segments. In the industrial market, it has usually come to mean the sharing of manufacturing or production data between a variety of applications ranging from human machine interface software and data historians, to large MES and ERP applications.

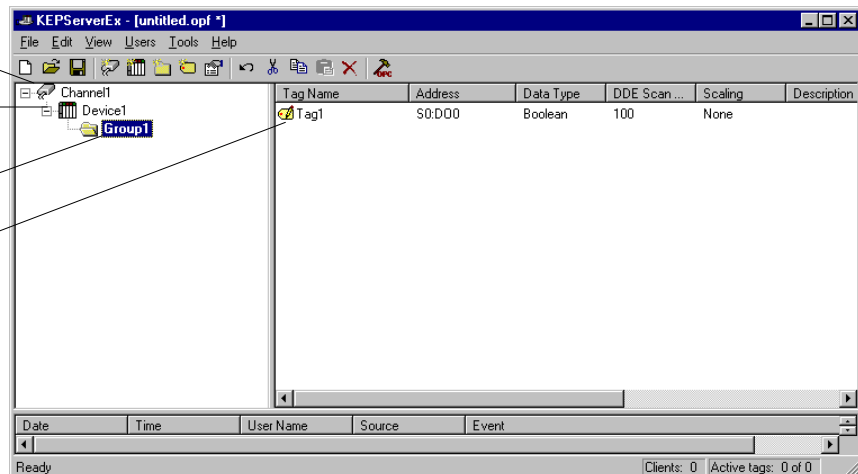
At a high level, the KEPServerEX OPC Server is comprised of several objects that are described on the next page.

Channel Object

Device Object

Group Object

Tag Object



Channel Object: Each protocol or driver used in a KEPServerEX project is referred to as a channel. A channel refers to a specific communications driver. A KEPServerEX project can consist of many channels each with unique communications drivers or each with the same communications driver. Each channel name must be unique in a KEPServerEX application. The channel name entered here will be part of the OPC browser information.

Device Object: Unlike the channel name, "Device names" can be the same from one channel to the next. The device name is a user defined logical name for the device. The device name and channel name will be part of the OPC browser information as well as a DDE item name. Within an OPC client the combination of channel name and device name would appear "ChannelName.DeviceName".

Group Object: KEPServerEX allows tag groups to be added to your project. Tag groups allow you to tailor the layout of OPC data in logical groupings that fit the needs of your application. Using tag groups allows multiple sets of identical tags to be added under the same device. This can be very convenient when a single device handles a number of similar machine segments. From an OPC client standpoint, the use of tag grouping allows you to segregate your OPC data into smaller tag lists, which can make finding a specific tag easier when browsing the server.

Tag Object: KEPServerEX allows both dynamic tags, (tag entered directly at the OPC client that specify device data) and user defined tags. User defined tags have the benefit of allowing the tag to be browsed from an OPC client that supports tag browsing. User defined tags also support tag scaling. Unlike many of the dialogs you will find in KEPServerEX, the tag properties dialog has a number of features that are driven by icons. The tag name is part of the OPC browse data. Tag names must be unique within a given device branch or tag group branch. If your application is best suited by using blocks of tags with the same names, use tag groups to segregate the tags.

KEPServerEX Project: Adding and Configuring a Channel

Running the Server KEPServerEX, like any OPC server, can be started a number of ways. One of the benefits of OPC technology is that your OPC client can automatically invoke the server when it attempts to connect and collect data from it. In order for this automatic mode of operation to occur you must first create and configure a project. Once you have created a project, KEPServerEX will automatically select the most recently used project when it is invoked by an OPC client.

Initially however, you need to manually invoke KEPServerEX using either the desktop icon, if you chose to install it, or by selecting KEPServerEX from the windows start menu. Depending on any changes you may have made to the appearance of KEPServerEX, once invoked you should be presented with the following interface. To learn more about the various elements of the user interface see (Basic KEPServerEX Components).

While discussing how to start KEPServerEX its important to understand what the system requirements are for running the server. KEPServerEX has been designed to place as little strain on your system as possible.

Recommended System Requirements:

400Mhz Pentium

64 Megs of Ram

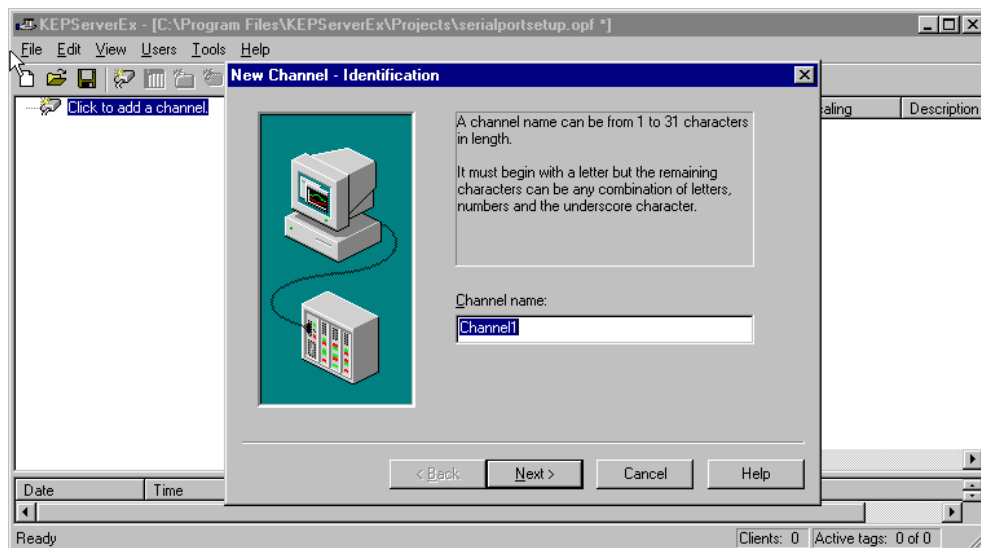
10 Megs of Hard Disk Space

Windows NT(SP6a)/2000 (Strongly recommended for industrial settings)

Available Ethernet Card

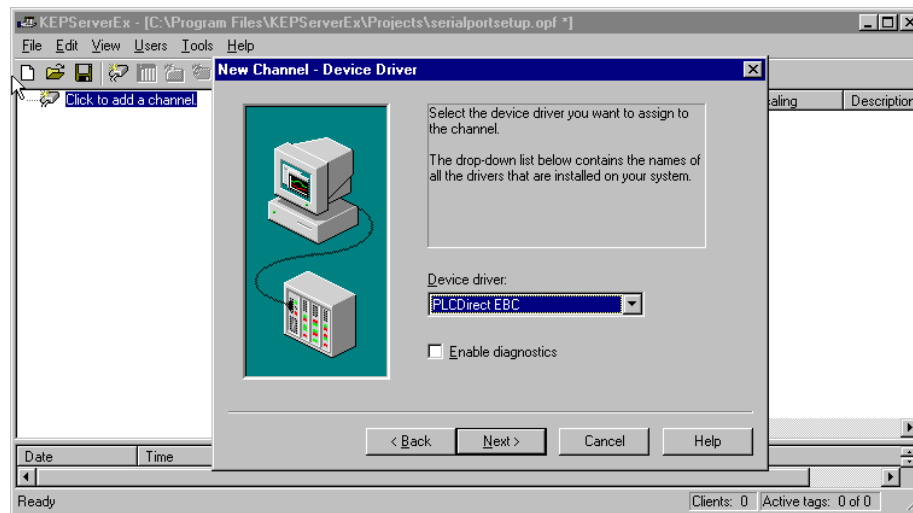
Adding a Channel

A channel refers to a specific communications driver. A KEPServerEX project can consist of many channels each with unique communications drivers or each with the same communications driver. Depending on the driver or drivers you have installed you can define a number of channels within a single project. A channel acts as the basic building block of an OPC link. Properties like communications port, baud rate, and parity are contained at the channel level. Each channel name must be unique in a KEPServerEX project. The channel name can be up to 31 characters long. To add a new channel to your project you can use the Edit menu > New Channel, the Toolbar Add Channel, or the "Click to add a channel" dialog.



Selecting the Device Driver

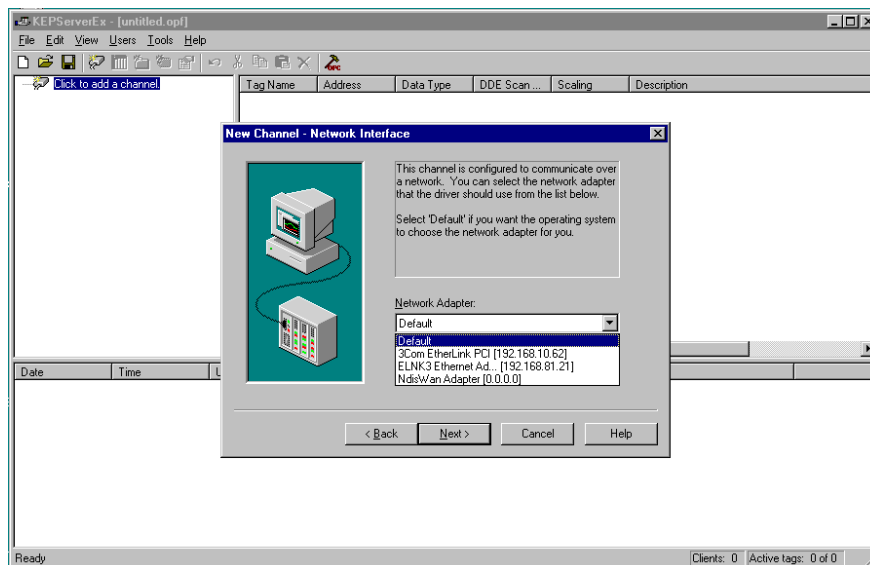
Select the device driver you want to assign to the channel. A driver list will be presented displaying all of the device drivers that are installed in your system.



Selecting the "Enable diagnostics" check box will enable diagnostic information to be available to your OPC application for this channel. With diagnostic functions enabled, diagnostic tags are available for use within client applications. In addition to diagnostic tags, a diagnostic window is also available when this feature is enabled. The diagnostic features of KEPServerEX do require a minimal amount of overhead processing. For this reason it is recommended that you only use the diagnostic features when needed and disable them when not in use which is the default case.

Selecting the Network Adapter

The Network Interface selection allows you to select a specific NIC card for the Automationdirect EBC Ethernet driver to use based on the NIC name or its assigned IP address. By selecting a specific NIC interface you will be able to force the driver to send all Ethernet communication through the specified NIC. If you do not know which NIC you should use, select the "Default" condition.



Setting the Server Writes Optimizations

As with any OPC server, writing data to your device may be the most important aspect of your application. Insuring that the data written from your OPC client application gets to the device in a timely manners is the goal of the server. KEPServerEX provides a number of optimization settings that can be used to tailor the server to meet the needs, and improve the responsiveness of your application.

There are currently three write optimization modes. The following is a brief description of the modes. For a detailed explanation, refer to the “Channel Properties – Write Optimizations” section in the KEPServerEX on-line help file.

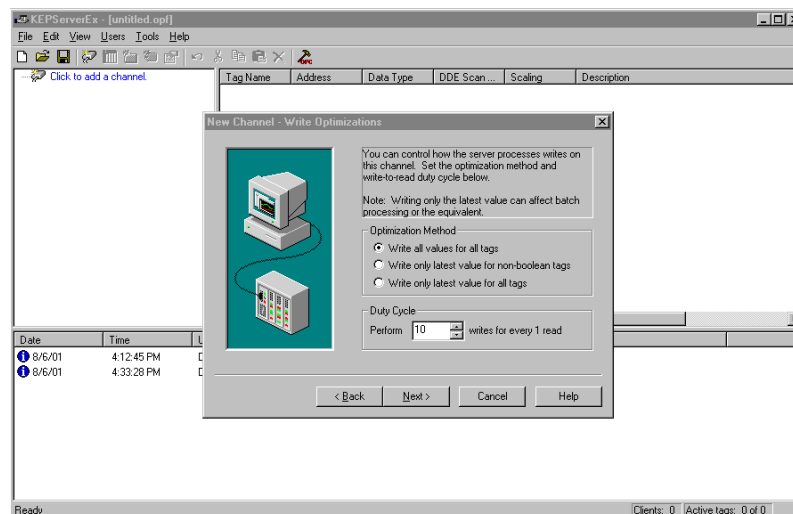
NOTE: We strongly suggest that you characterize your application for compatibility with these write optimization enhancements before using them in a production environment.

The default mode, **“Write all values for all tags”** will force the server to attempt to write every value to the controller. This mode insures that everything written from your OPC client applications will be sent to the target device. While writing every value to the device may seem like the best course of action, there are a number of applications where writing every value, many of which may be the same value, over and over may be simply a waste of communications bandwidth.

The **“Write only latest value for non-boolean tags”** allows any value that is not a boolean value to be updated in the server’s internal write queue and will then be sent to the device at the next possible opportunity. This can dramatically improve the overall performance of your application. This feature must be used with a clear understanding of how it will affect the operation of your application.

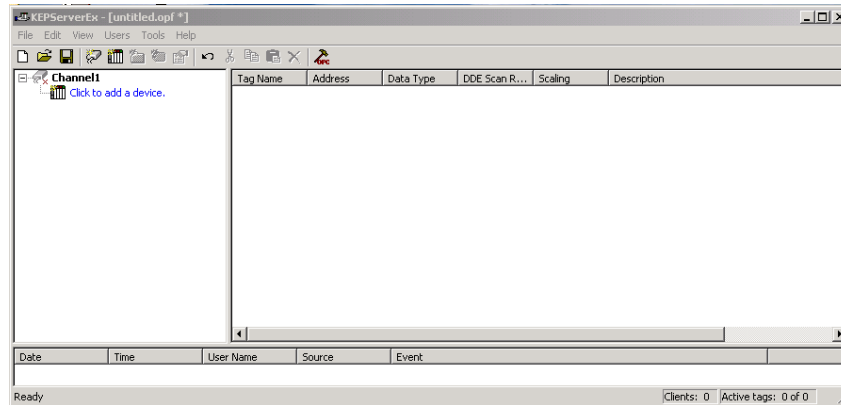
The final write optimization mode, **“Write only the latest value for all tags”**, takes the operation described for the second mode and applies it to all tags.

The **Duty Cycle** selection allows you to control the ratio of write operations to read operations. By default the duty cycle is set to ten. This means that ten writes will occur for each read operation. If your application is doing a large number of continuous writes but you need to insure that read data is still given time to process, you may want to reduce the Duty Cycle. A setting of one will result in one read operation for every write operation. In all cases if there are no write operations to perform, reads will be processed continuously.



Saving the New Channel Settings

With **Channel1** added to the server, the KEPServerEX window will appear as follows:



Note that the channel is shown using the channel name given, but it also has a small red "x" below the channel icon. The red "x" indicates that the channel does not contain a valid configuration. **Channel1** is not valid because a device has not yet been added to the channel.

Using Multiple Channels in a Project

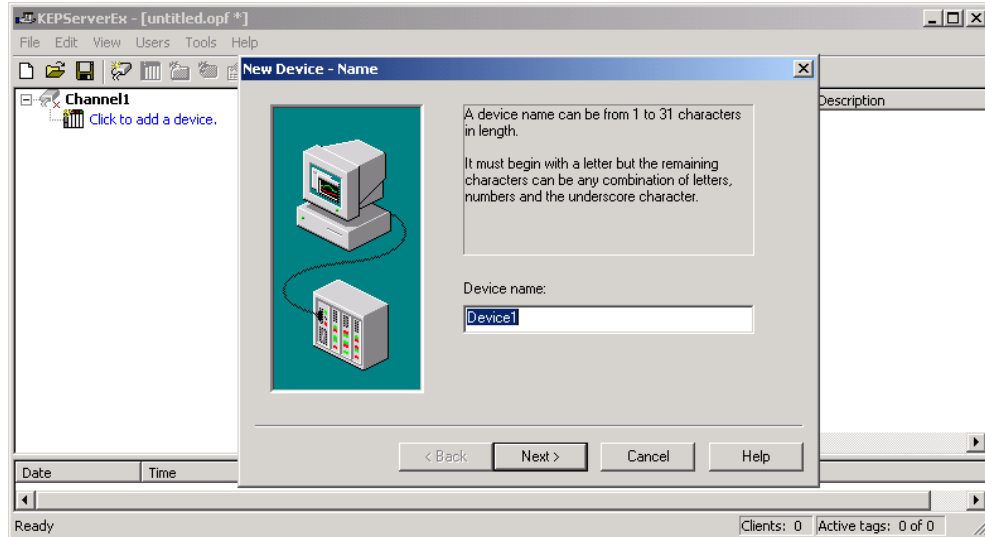
KEPServerEX supports the use of multiple channels. As you add channels to your project you can specify either the same communications driver or different communications drivers. Most communication drivers offered by KEPware support operation on up to 16 communications ports or ethernet network connections simultaneously. By defining multiple channels you can improve the overall performance of you application. In the case of either a serial driver or Ethernet driver using multiple channels allows you to spread large communications loads across the multiple channels. A good example of this would be a serial driver that is being used to communicate with eight devices on the serial line. Normally the communications driver used in this application would be responsible for gathering data from all eight devices in a round robin fashion. If this same application is reconfigured to use multiple channels assigned to multiple communications ports, the device load can be divided across the channels. The end result is reduce work load on each channel and dramatic improvements in the responsiveness of your application. The need to use multiple channels is dependent solely on the needs of your application. In either case there is no additional cost involved to use a licensed driver on multiple communications or Ethernet ports.

KEPServerEX Project: Adding and Configuring a Device

Adding a Device

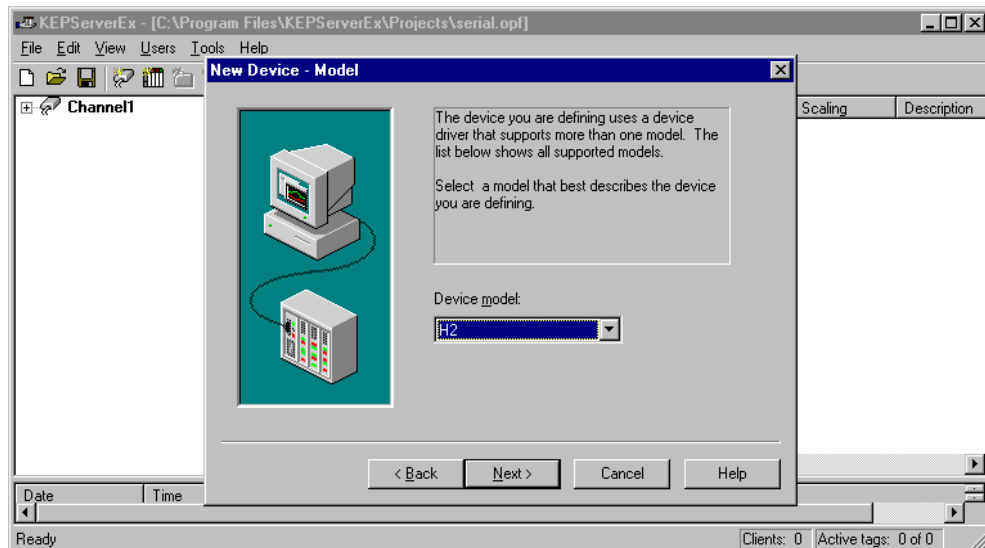
Once a channel has been configured in a KEPServerEX project, a device must be added to the channel. Devices represent PLCs, I/O devices or other hardware that the server will communicate with. Device selection is restricted by the device driver the channel is using.

To add a device to a channel, select the desired channel and use the Edit menu > New Device, the Toolbar Add Device, or the “Click to add a device” dialog.



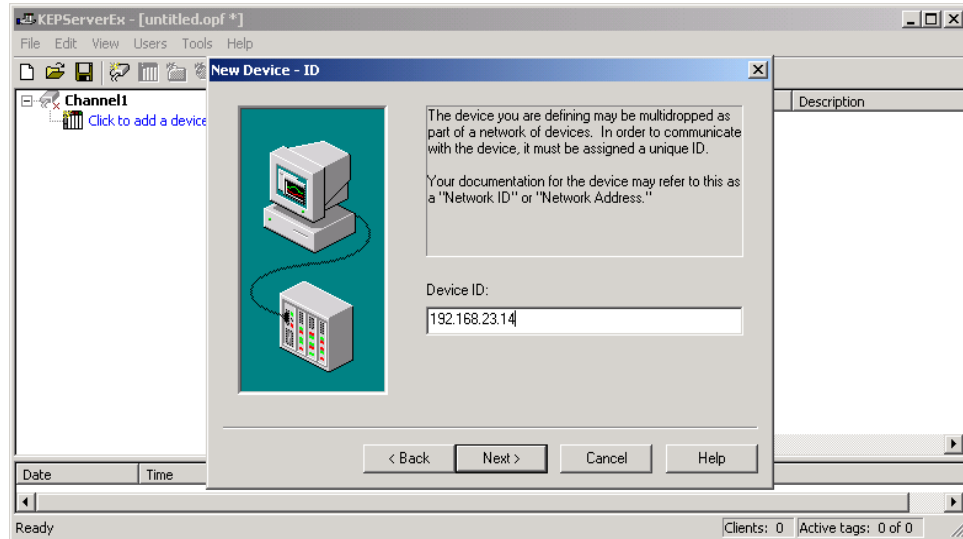
Selecting the Device Model

The “Model” parameter allows you to select the specific type of the device associated with a device ID. The contents of the model selection drop down will vary depending on the chosen communication driver.



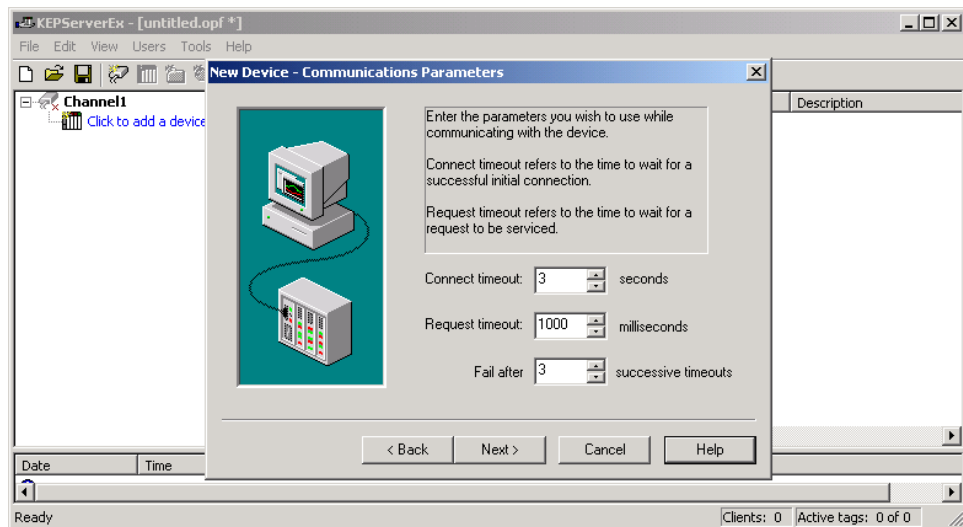
Selecting the Device Model

The "Device ID" parameter allows you to specify the driver specific station or node address for a given device. Since the Automationdirect EBC driver is an Ethernet based driver, a unique and valid TCP/IP address must be entered. IPX protocol is not supported.



Setting the Device Timeout Properties

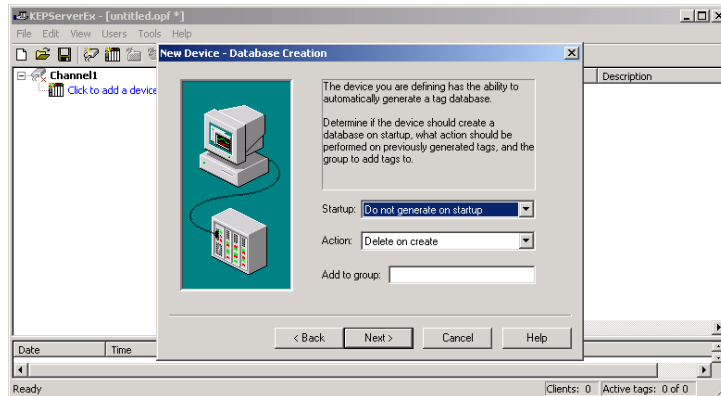
Device timeout parameters allow a driver's response to error conditions to be tailored to the needs of your application. The timeout parameters are specific to each device you configure. Each of the field parameters is defined in detail in the "Device Properties – Timeout" section in the KEPServerEX on-line help file.



The **Connection timeout**: allows the time required to establish a socket connection to a remote device to be adjusted. The **Request timeout**: is used by all drivers to determine how long the driver will wait for a response from the target device. The **Fail after** parameter is used to determine how many times the driver will retry a communications request before considering the request to have failed. If your environment is prone to noise induced communications failures you may want to increase the number of **retries** the driver performs.

Automatic OPC Tag Database Generation

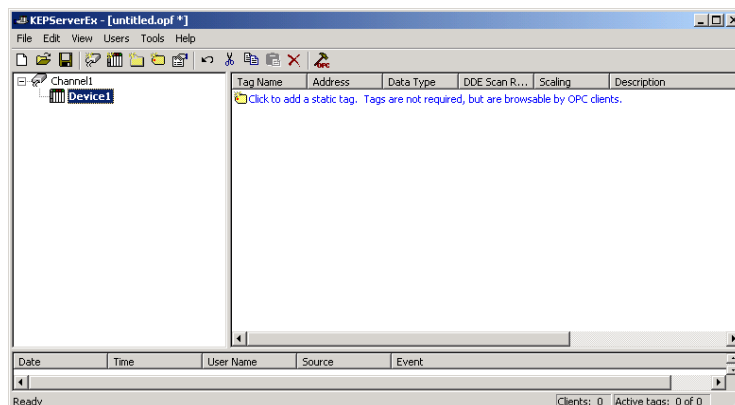
The automatic OPC tag database generation features of KEPServerEX have been designed to make the setup of your OPC application a Plug and Play operation. Since the Automationdirect EBC communication driver supports this feature, you can configure it automatically build a list of OPC tags within KEPServerEX that correspond to device specific data. The automatically generated OPC tags are then browsable from your OPC client. The OPC tags that are generated are dependent upon the nature of the supporting driver. Each field selection is defined in detail in the “Automated OPC Tag Base Generation” section in the KEPServerEX on-line help file.



The “**Automatic tag database generation on device startup**” selection allows you to configure when OPC tags will be automatically generated. There are three possible selections. The default condition, “**Do not generate on startup**”, will prevent the driver from adding any OPC tags to tag space of KEPServerEX. The selection “**Always generate on startup**”, will cause the driver to always evaluate the device for tag information and to add OPC tags to the tag space of the server each time the server is launched. The final selection “**Generate on first startup**” will cause the driver to evaluate the target device for tag information the first time this KEPServerEX project is run and to add any OPC tags to the server tag space as needed. When the automatic generation of OPC tags is selected, any tags that are added to the server’s tag space must be saved with the project. You can configure your KEPServerEX project to auto save from the Tools > Options menu.

Saving the New Device Settings

With **Device1** added to **Channel1**, the KEPServerEX window will appear as follows:



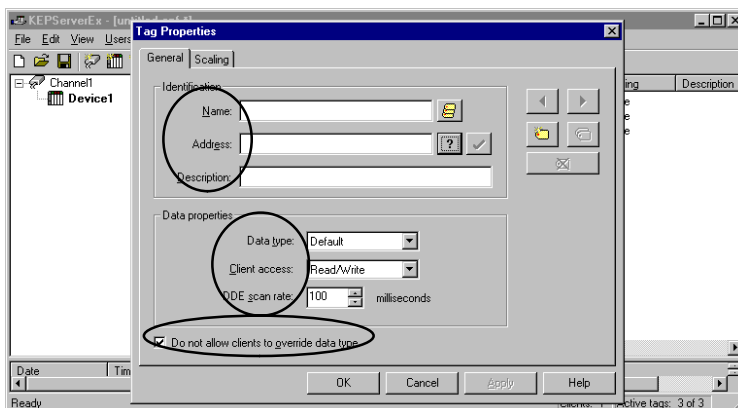
KEPServerEX Project: Adding Tags to the Project

There are two ways to get data from a device to your client application using KEPServerEX. The first method, and most common method, of defining tags is called **User Defined Tags**. This requires that you define a set of tags in the server project and then use the name you assigned to each tag as the item of each OPC/DDE link between the client and the server. The primary benefit to this method is that all user defined tags are available for browsing within OPC clients. Additionally, user defined tags also support scaling.

The second method of defining tags is called **Dynamic Tags**. Dynamic tags allow you to define tags in the client application. Instead of providing the server with a tag name as the OPC/DDE item, you would provide the device address (and optionally a data type). The server will create a tag for that location and start scanning for data automatically. KEPServerEX allows tag groups to be added to your project.

Tag groups allow you to tailor the layout of OPC data in logical groupings that will fit the needs of your application. Using tag groups allows multiple sets of identical tags to be added under the same device. This can be very convenient when a single device handles a number of similar machine segments. From an OPC client standpoint, the use of tag grouping allows you to segregate your OPC data into smaller tag lists, which can make finding a specific tag easier when browsing the server.

User Defined Tags Each field selection is defined in detail in the **Tag Properties** section in the KEPServerEX on-line help file. A brief description of each is listed below.



The tag **Name**: parameter allows you to enter the string that will represent the data available from this tag. The tag name can be up to 31 characters in length. While using long descriptive names is generally a good idea, keep in mind that some OPC client applications may have a limited display window when browsing the tag space of an OPC server. The tag name is part of the OPC browse data. Tag names must be unique within a given device branch or a tag group branch. If your application is best suited by using blocks of tags with the same names, use tag groups to segregate the tags.

The **Address**: parameter allows you to enter the desired driver address for this tag. To determine how an address should be entered, you can use the **Hints button** next to the address parameter. Hints provide a quick reference guide to the address format of the driver. Once you have entered an address you can test it by using the check address button. When pressed, the check address button attempts to validate the address with the driver. If the driver accepts the address as entered no message will be displayed. If an error is detected a pop-up will inform you of the error. Keep in mind that some errors will be related to the data type selection and not the address string.

The **Description**: parameter allows you to attach a comment to this tag. A string of up to 64 characters can be entered for the description. If you are using an OPC client that supports Data Access 2.0 Tag Properties, the description parameter will be accessible from the Item Description property of the tag.

The **Data Type**: selection allows you to specify the format of the tag's data as it is found in the physical device. The data type setting is an important part of how a communication driver reads and writes data to a device. For many drivers the data type of a particular piece of data is rigidly fixed.

The available data type selections are:

- **Default** – This type allows the driver to choose its default data type see the specific driver help for details
- **Boolean** – Single bit data On or Off
- **Char** – Signed 8 bit data
- **Byte** – Unsigned 8 bit data
- **Short** – Signed 16 bit data
- **Word** – Unsigned 16 bit data
- **Long** – Signed 32 bit data
- **Dword** – Unsigned 32 bit data
- **Float** – 32 bit Real value IEEE format
- **String** – Null terminated ASCII string
- **Double** – 64 bit Real value IEEE format
- **BCD** – Two byte packed BCD value range is 0 – 9999
- **LBCD** – Four byte packed BCD value range is 0 – 99999999

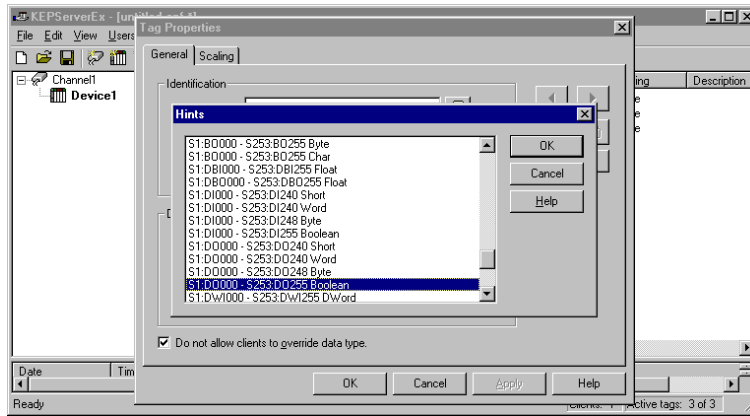
The **Client access**: selection allows you to specify whether this tag is Read Only or Read/Write. By selecting Read Only you can prevent client applications from changing the data contained in this tag. By selecting Read/Write you are allowing client applications to change this tag's value as needed.

The **DDE scan rate**: parameter allows you to specify the the update interval for this tag when used in a DDE client. OPC clients can control the rate at which data is scanned by using the update rate that is part of all OPC groups.

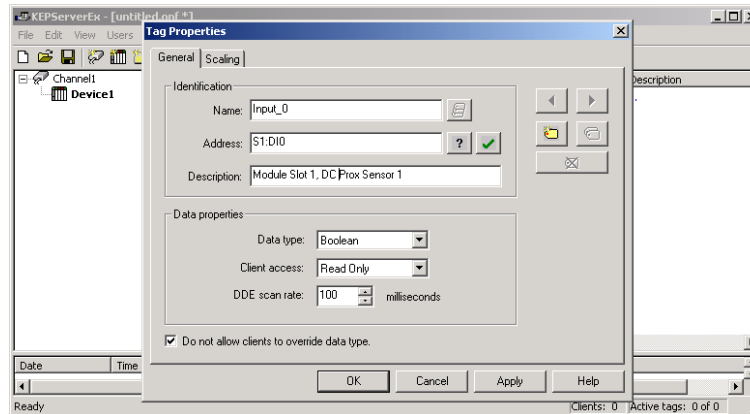
The **Do not allow client to override data type** selection allows you force OPC clients to use the data type you have specified for this tag. OPC clients can specify how they desire to view the data from a particular tag.

Creating a User Define Tag

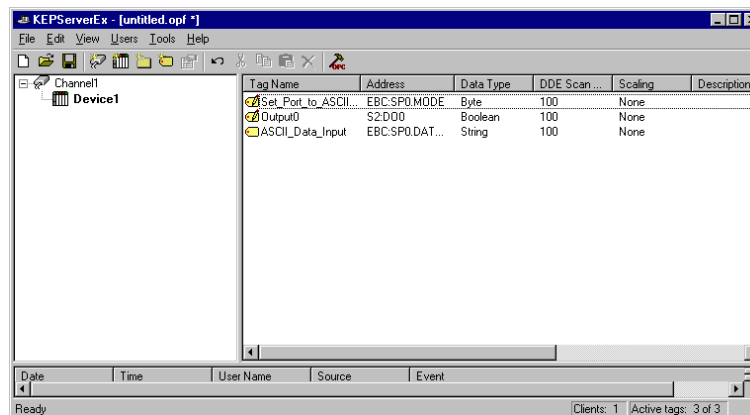
To determine how an address should be entered, use the Hints button “?” to the right of the address field. Hints provide a quick reference guide to the address format of the driver.



Once you have entered an address you can test it using the check address “✓” button. When pressed, the check address button attempts to validate the address with the driver. If the driver accepts the address as entered, no message will be displayed. If an error is detected, a pop-up window will inform you of the error. Keep in mind that some errors will be related to the data type selection and not the address string. Below is an example of a valid tag properties.



The window below shows a valid configured channel, device and several user defined tags.



H2-EBC I/O Addressing

I/O slots must be individually addressed in the following form: S<ss>:<t><nn> where ss is the slot number (0 to 8), t is the address type (X, Y, K, V, DI, DO, WI, WO, etc.), and nn is the address. The address ranges from 0 to an upper limit determined by the module occupying the slot.

I/O Type	Syntax	Data Type
Discrete Inputs	X or DI<nn> nn = Bit Number (decimal)	Boolean , Byte, Char, Word, Short, DWord, Long
Discrete Outputs	Y or DO<nn> nn = Bit Number (decimal)	Boolean , Byte, Char, Word, Short, DWord, Long
Byte Inputs	BI<nn> nn = Bit Number (decimal)	Byte , Char
Byte Outputs	BO<nn> nn = Bit Number (decimal)	Byte , Char
Word Inputs	K or WI<nn> nn = Bit Number (decimal)	Word , Short
Word Outputs	V or WO<nn> nn = Bit Number (decimal)	Word , Short
DWord Inputs	DWI<nn> nn = Bit Number (decimal)	DWord , Long
DWord Outputs	DWO<nn> nn = Bit Number (decimal)	DWord , Long
Float Inputs	FI<nn> nn = Bit Number (decimal)	Float
Float Outputs	FO<nn> nn = Bit Number (decimal)	Float
Double Inputs	DBI<nn> nn = Bit Number (decimal)	Float
Double Outputs	DBO<nn> nn = Bit Number (decimal)	Float

H2-EBC I/O Addressing Example

Each field selection is defined in detail in the “Tag Properties” section in the KEPServerEX on-line help file.

H2-EBC Module	Slot 0 8 Inputs	Slot 1 32 Inputs	Slot 2 4 Analog Inputs	Slot 3 8 Outputs	Slot 4 16 Outputs	Slot 5 8 Analog Outputs
	Addresses S0:X0 to S0:X7	Addresses S1:X0 to S1:X31	Addresses S2:K0 to S2:K3	Addresses S3:Y0 to S3:Y7	Addresses S4:Y0 to S4:Y15	Addresses S5:V0 to S5:V7

Appendix E

Using the KEPwareEX OPC Quick Client

In This Appendix. . . .

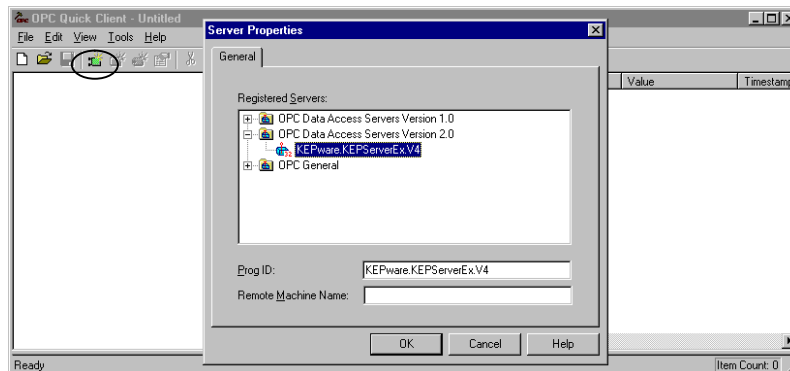
- Creating a KEPServerEX Quick Client Project
 - Using the RJ12 Serial Port in ASCII Mode
-

Creating a KEPServerEX Quick Client Project

KEPServerEX Quick Client can be used to assist in the test and development of KEPware's OPC Data Access 1.0 and 2.0 Servers.

Connecting the Client to the OPC Server

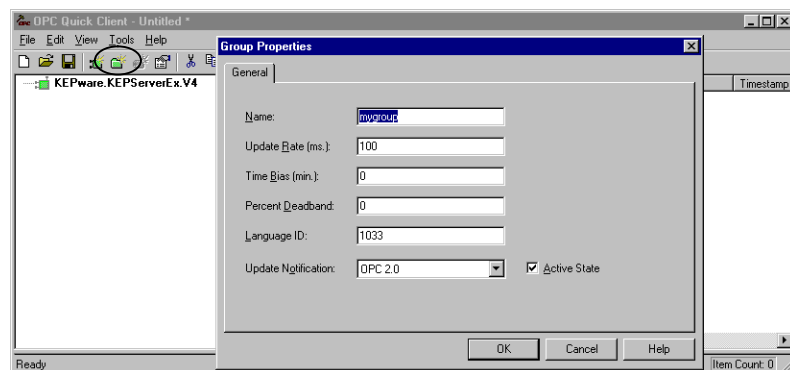
A server connection provides a link between the Quick Client and the KEPServerEX OPC server. To add a server connection to the Quick Client, you can use either the Edit menu>New Server Connection or click on the New Server icon in the toolbar menu.



Specify the Prog ID of the OPC Server the client should connect to. You can browse for registered servers by expanding any of the branches. Double-clicking on any registered server will automatically update the Prog ID field. For more information on the registered servers, click on the **Help** button to display the “Server Connection” section of the on-line help file. Once a connection to the OPC server has been established, additional “Server Operations” can be accessed by right clicking on the highlighted server in the right window column or by using the **Tools** menu>Server selection.

Creating a Client Group

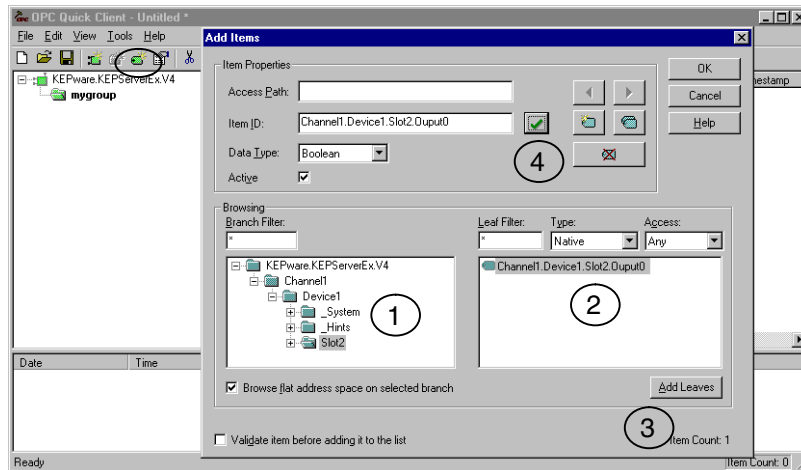
A group is used to organize a collection of items with a common set of properties. To add a Group to the Quick Client, you can use the **Edit** menu>New Group or click on the **New Group** button in the toolbar menu.



A The group specifies the following properties: group **Name**, **Update Rate**, **Time Bias**, **Percent Deadband**, **Language ID**, **Active State** and the type of data connection that should be made to the server. For detailed information on the group properties, click on the **Help** button to display the “Group” section of the on-line help file. Once a Group has been created, additional “Group Operations” can be accessed by right clicking on the highlighted branch Group or by using the Tools menu>Group selection.

Selecting a Group Item

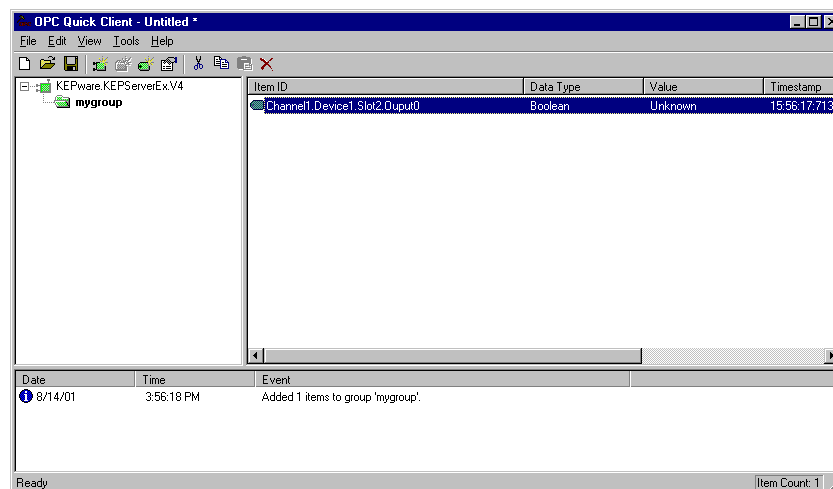
Items represent data that may be accessed via the OPC server. An item specifies the following properties: **Access Path**, **Item ID**, **Data Type** and **Active** state. For detailed information these properties, click on the **Help** button to display the **Item** section of the on-line help file. To add an **Item** to the Quick Client Group, you can either use the Edit menu>New Item or click on the New Item icon on the toolbar.



If the OPC Server was configured to automatically generate OPC tags, the generated tags would be browsable from the OPC client. If automatic tag generation was not selected, create an item by:

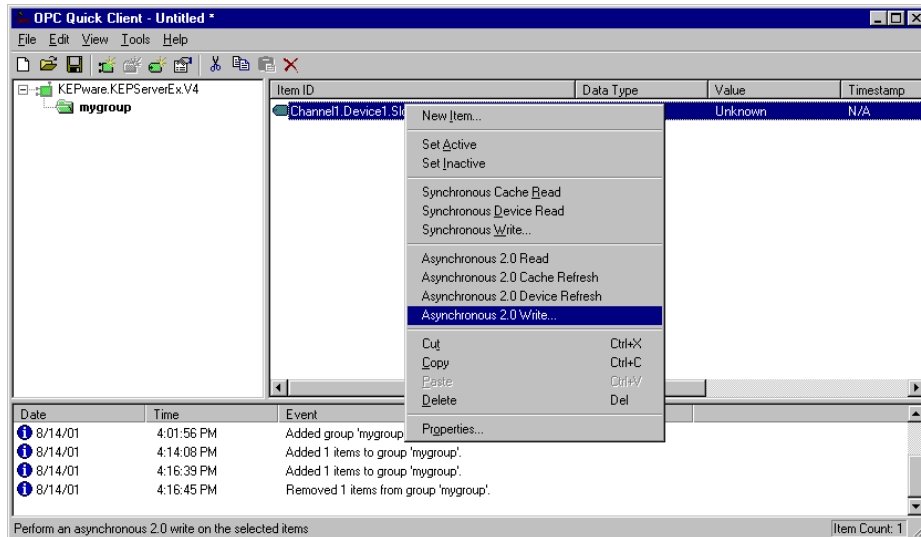
- 1) browsing the OPC Server branch tags
- 2) highlighting the desired tag in the right column
- 3) clicking on the “Add Leaves” button
- 4) clicking on the “Green Check Mark” button to validate the item
- 5) and clicking on the “OK” button.

After clicking on the **OK** button, the following window will display the created items.

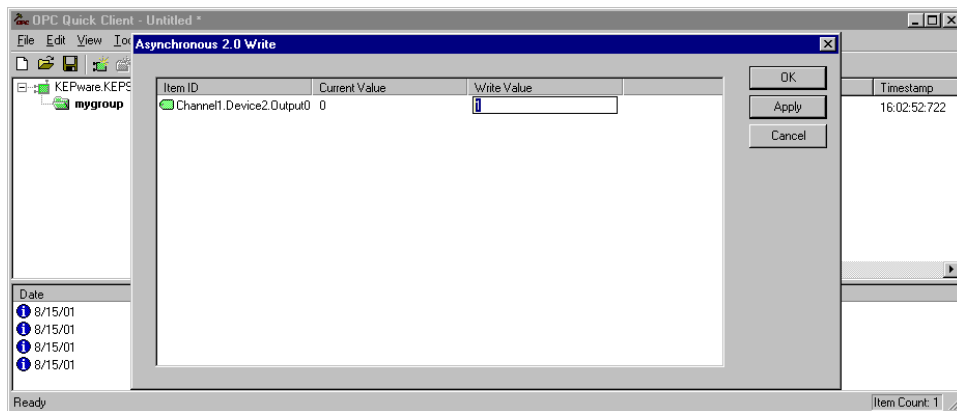


Item Operations

Item operations can be accessed by right clicking on the desired item or by using the **Tools** menu>Group selection.



After clicking on the desired item operation, a window similar to the following will be displayed. In this example, a logic 1 value (Boolean data type) is being written to a discrete output to turn it on. The item operations can be used to read discrete/analog inputs and write to discrete/analog outputs, etc.

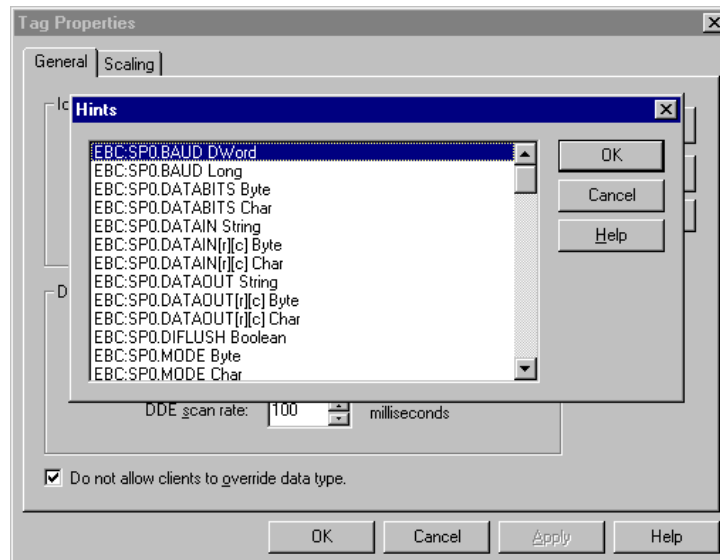


Using the RJ12 Serial Port in ASCII Mode

The H24–EBC RJ12 serial port can be configured for generic ASCII communications (refer to the “Advanced Settings” section in Chapter 3 to confirm or change the RJ12 serial port settings). Both the transmit buffer and receive buffer of the driver are 127 bytes in size. Thus, the corresponding tags can be a maximum of 127 bytes. Incoming bytes are appended to the receive buffer.

Port specifiers precede the serial port address. It defines which port the serial port address corresponds to. To define an EBC address the mnemonic EBC is used and the mnemonic SP0 specifies serial port 0. For addressing the EBC serial port, no base or slot information is needed.

As shown below in the **Hints** dialog, there are several port address parameters. In many cases the default values can be used. A detailed list explaining the parameters are found by clicking on the **Help** button in the **Hints** window. Then click on the **Index** button in the Terminator I/O, I/O Addressing window. Then locate the “H2, H4, Terminator I/O Serial Port Addressing” help section.

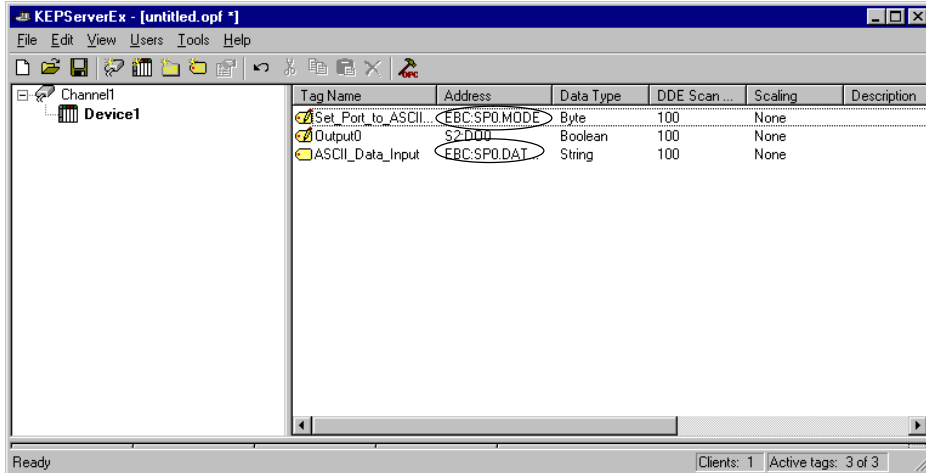


The communication parameter defaults are:

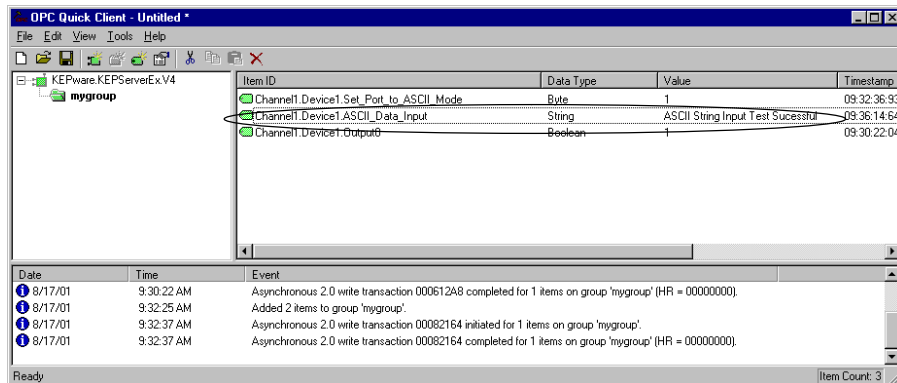
- 9600 baud
- 8 data bits (7 may be selected)
- no parity (odd or even may be selected)
- 1 stop bits (2 may be selected)

The following tags were created in the KEPServerEX OPC server for this example.

- EBC:SP0:MODE
- EBC:SP0:DATAIN



The tags created above were browsed and selected as items within the Quick Client as shown below. The **EBC.SP0.MODE** address must be set to a value of 1 to select the ASCII communications mode. The ASCII string **ASCII String Input Test Successful** was entered via the RJ12 serial port. The ASCII Sting displays in the **ASCII_Data_Input** Item ID's Value column.



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