Getting Started

with PC-based Control and Ethernet I/O

PC Software for Machine Control and Industrial Process Automation

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Revisions

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

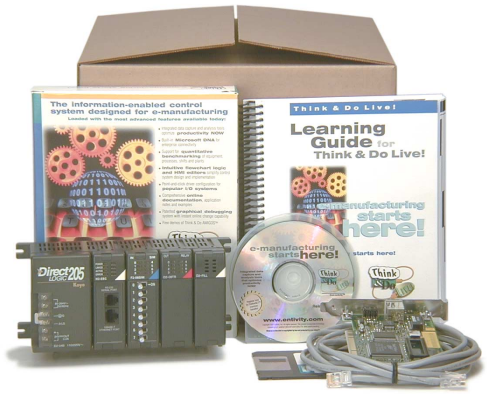
Title: Getting Started with PC-based Control with Ethernet I/O

Manual Number: PC–505S–M

Issue	Date	Effective Pagess	Description of Changes
Original	April, 1999	Cover/copyright Contents	Original edition
2nd Edition	March, 2001	Cover/copyright Contents	2nd Edition update of booklet for Think & Do Studio compatible Starter Kit
3rd Edition	May, 2002	Cover/front Warranty (in English and French) Table of Contents, page i History, page ii Booklet, pages 1 – 16 Cover/back	3rd Edition update of booklet for Think & Do Live! compatible Starter Kit

Introduction

The PC-based Control Starter Kit featuring Think & Do Live! from Entivity and Ethernet I/O is a great way to get started in PC-based control. It includes PC-based control software from Entivity, a PC Ethernet adapter card, and a DL205 I/O starter system from ***Automationdirect.com***.



Start Here!

The purpose of this Getting Started booklet is to help you install Think & Do Live! software and connect the I/O components to your PC. This booklet is specific to the Think & Do PC-based Control Ethernet Starter Kit, part number PC-505-START. After completing the installation steps in this Getting Started booklet, you'll be ready to use the Learning Guide that comes with the software to create your first project.

Packing List

Please take a moment to become familiar with the components in your starter kit. Make sure each item is present and that no damage occurred during shipping.

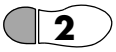
Quantity	Part Number	Item Description
1	PC-TND-LIVE	Think & Do Live! on CD-ROM—includes online help and a comprehensive learning guide
1	PC-505S-M	Getting Started with PC-based Control and Ethernet I/O (this booklet)
1	D2-INST-M	DL205 Installation and I/O Manual
1	D2-04B	DL205 4-slot base with power supply
1	H2-EBC	Ethernet base controller for DL205 I/O
1	F2-08SIM	8-point input simulator module for DL205 I/O
1	D2-08TR	8-point relay output module for DL205 I/O
1	—	Ethernet adapter for PC PCI slot with 10Base-T connector, 10' peer-to-peer Ethernet cable

Installation of Think & Do Live! Software

Insert CD

Step 1: You will need to install Think & Do Live! from Entivity to equip the PC to control the DL205 I/O system via the Ethernet connection. At this time, be sure the Think & Do Live! CD is inserted in the CD-ROM drive.

NOTE: Be sure that you are logged on to Windows NT as "Administrator," or that your current user profile has administrator privileges. The Think & Do Live! installation must write to the Windows NT registry, which requires administrator privileges.

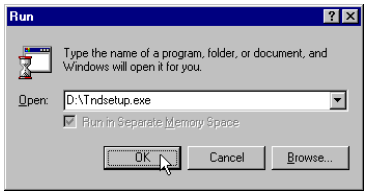


Run TNDSETUP

Step 2: From the *Start* menu, select *Run*. In the command line field, type the drive letter of your CD-ROM drive, followed by the TNDSETUP command. For example, if the CD-ROM drive is drive D, type:

D:\tndsetup.exe

You can also use the *Add/Remove* applet in the Control Panel.



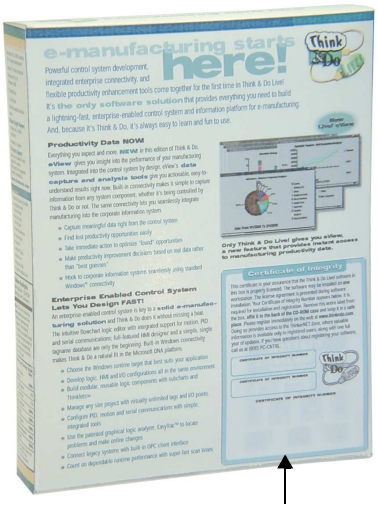
Follow On-screen Instructions

Step 3: After you run TNDSETUP, the Think & Do Live! installation will display the startup banner (splash screen) to begin the installation. While the banner is displayed, the InstallShield Wizard begins loading to perform the remainder of the installation. Just follow the on-screen instructions to complete the installation.

Be sure to read the license agreement which will be displayed on screen during the installation. Continue with the installation only if you agree with the license terms.

During the installation you will be asked to locate the Certificate of Integrity number. It will be on the Certificate of Integrity, located on the back of the product box as shown.

The Certificate of Integrity shown to the right has two Product ID removable stickers for affixing the ID number to the Learning Guide and to the product registration card (be sure to register the software!). You can also remove the entire Certificate of Integrity from the box for safe keeping with your records.



Certificate of Integrity

If the Installation Stops –
If your disk drive does not have enough space for installation (300 MB), you will see the dialog as shown. The installation will pause while you make more space available. Be sure to check Windows' Recycle Bin for any files that have not been permanently deleted.

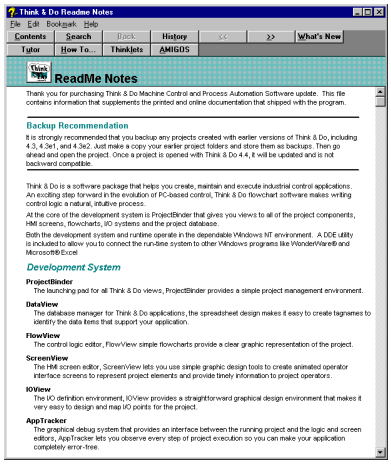
If the *Severe* error dialog appears as shown, the installation has failed. The message "Failed to Create Multiple Level Keys" indicates the installation process was unable to write to the registry. The current user logon profile must have administrator privileges in order for the installation to write to the registry.

In the event of this error message, follows these steps:

- Click *OK* to continue.
- Use Windows Explorer to delete the Think & Do directory ("thinkndo," or the directory you chose for the Think & Do Live! install directory).
- Press Ctrl-Alt-Delete, and log on as "administrator," or use an existing user name with administrative privileges. Alternatively, reconfigure Windows to give the current logon profile administrative privileges.
- Now, re-install the Think & Do Live! This should eliminate the error.

Completing the Installation

Step 4: As the installation process completes, we encourage you to view the Readme Notes presented on-screen in the Help System. The Help System is a powerful tool to explore the terminology and features of Think & Do Live! Access to the Help System is also available from each project design desktop toolbar.

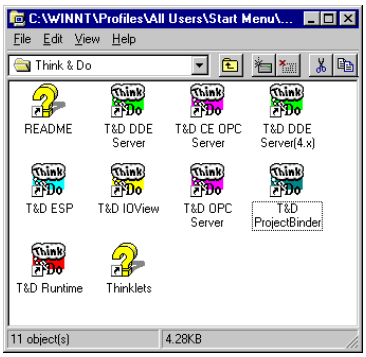


You may also get printouts directly from the Help System by using the *Print* function.

After viewing the Help System files, the installation screen recommends restarting your computer for the installation setups to take effect. Be sure to restart the computer before running Think & Do Live! for the first time after a new installation. Click *Finish* to end the installation process. The computer will automatically restart if you have selected that option.

Taking the Next Step

Step 5: The Think & Do Live! software icon group has several components. Use Project-Binder for your normal starting point, which will be on the desktop as an individual icon.



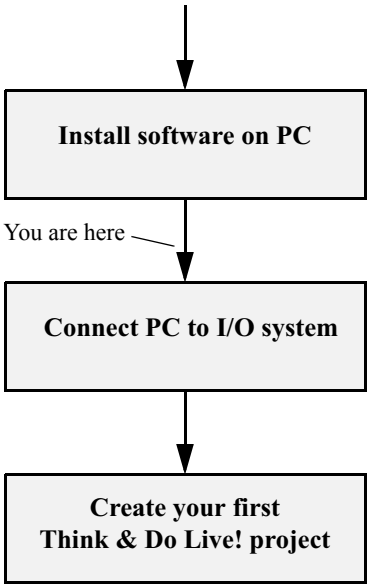
You can also place a folder containing the icons above on your NT desktop. Using Windows NT Explorer, locate the folder:

C:WINNT\Profiles\All Users\Start Menu\Programs\Think & Do

Place the mouse cursor on the folder, right-click, and select *Copy.* Then place the cursor over the desktop background and do a right-click, then *Paste*. Double-click the folder to access the program icons shown above.

After installing Think & Do Live! software on your PC with Windows NT, it's time to use specific software tools to connect your development system to the starter kit I/O hardware. You will use I/O View to connect the Ethernet I/O system. The next section shows you how to install the hardware and connect to your PC.

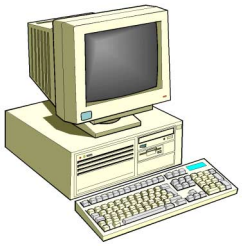
After the hardware setup and checkout, you will be ready to begin Chapter 3 in the Learning Guide, Creating a Project, to help you create the first project for your system.



Hardware Installation

Check Your PC Hardware Requirements

Step 1: Please check these requirements for running Think & Do Live! when choosing your PC components and configuration:



Development / Runtime System

Generic Pentium PC (you provide)

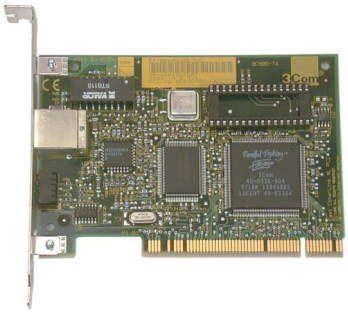
- Windows NT-compatible Pentium 133 MHz
- 64 MB RAM
- 260 MB available hard drive space (in addition to space for operating system)
- CD-ROM drive
- Color monitor, with at least 800 x 600 resolution

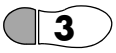
I/O Network or Scanner Card

Step 2: Proper installation of your I/O network card is an important step of the installation. Think & Do Live! software will use it to communicate with I/O devices in the DL205 I/O system in the Starter Kit.

a. For this step, install the Ethernet card per the manufacturer's instructions.

b. After installing the Ethernet card, apply power to the PC. If there are any interrupt or address conflicts which you can detect, it is best to resolve them now, before going any further.



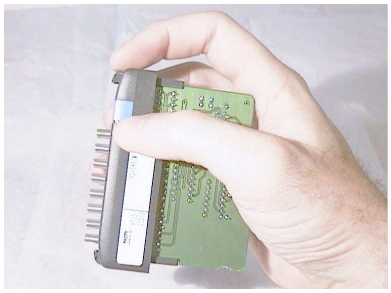


I/O System Assembly

Step 3: The installation procedure that follows is specific to the PC-505-START starter kit. If you have other I/O devices, we recommend connecting only the DL205 starter kit I/O at this time. Using the starter kit configuration is ideal (8 inputs, 8 outputs) for an introductory lesson to PC-based control. After you get the software running and work through the examples in the Learning Guide, adding more I/O will be easy to do. Follow the instructions below for assembling your starter kit I/O.

a. Remove the starter kit components from their boxes (shown above).

b. Open the module retention latches at the top and bottom of each module bezel as shown (below left), so they protrude from the bezel surface.



c. Temporarily install the H2-EBC Ethernet Base Controller in the CPU slot (left-most slot), next to the power supply in the D2-04 base (you'll need to configure its DIP switches for the Ethernet node address in Step 4).

d. Install the F2-08SIM 8-point input simulator in slot 1, just to the right of the Ethernet base controller.

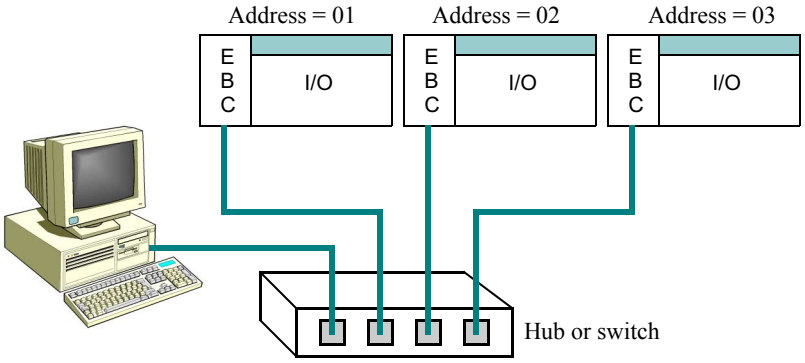
e. Install the D2-08TR 8-point relay output module in slot 2, just to the right of the input simulator. This leaves slot 3 (on the right end) open for later use.

f. Close all the module retention latches by pressing them flush with the module bezels as shown (above right).

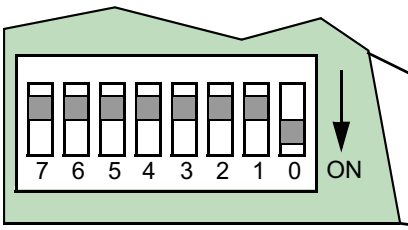
Ethernet Base Controller Setup

Step 4: After configuring the I/O network card in your PC, it's a good time to go ahead and configure the device controller on the other end of the I/O link cable. If you have installed the Ethernet base controller in the base, temporarily remove it to set its address in the following steps.

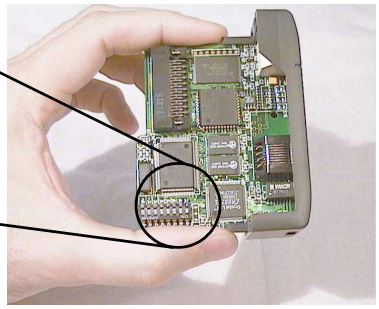
Each EBC (Ethernet base controller) must have a unique Ethernet address. Even if you are only using one EBC (such as a Starter Kit system), you will still need to take a moment to set the base address of the EBC. The figure below shows a 3-base system which uses a hub for the Ethernet network expansion.



The H2-EBC uses DIP switches as shown below to select a node address between 1 and 63. All switches OFF is an invalid setting for use with Think & Do Live! **To use with Think & Do Live!, you must use a DIP switch address 1 to 63.** The figure below shows an address = 1, which we recommend for the starter kit.

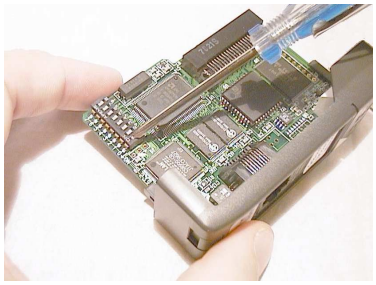


Address select
(binary weighted)



For other addresses, compute the binary-weighted pattern (for example, to select Addr = 9, turn on switches 0 and 3).

To set the EBC node address, just use the tip of a small screwdriver to access the switch stems. In the picture to the right, the EBC is being configured for a node address=1. When the address is set, re-install the base controller in the CPU slot, and fasten its module retaining tabs.



5

I/O System Wiring

Step 5: In this step you connect a power input cord to the I/O base power supply. The D2-04B base has a built-in power supply, with wiring terminals on the left end of the base as shown. You'll need the following:

- A 3-wire power cord
- A screwdriver, regular or Phillips

WARNING: To avoid the risk of a severe electrical shock, be sure the power cord is unplugged from any power source while connecting it to the I/O base supply.

Connect the power cord to the base supply by following these steps:

a. Remove the plastic cover from the base supply terminal strip.

b. Connect the power cord to the power input terminals as marked. You can use spade lug connectors, or stripped bare wire (3/8" max. length).

c. Ensure the power cord is not connected to a power source. Then replace the plastic cover over the power supply terminals to prevent accidental contact.

WARNING: Ensure the power source meets the input requirements of your I/O base supply. The starter kit's D2-04B input range is 85-264VAC, 50/60 Hz.

Now we're ready to connect the I/O base controller to the PC! The figure to the right shows an Ethernet cable (peer-to-peer type) being connected to the base controller.

d. Connect the I/O link cable to the I/O base controller.

e. Connect the other end to the adapter card on your PC.

Now everything's connected! No wiring to I/O points is required at this time. The I/O checkout procedure uses starter kit I/O.

f. Connect power to your I/O base. The POWER LED on the EBC will turn on.

g. Connect power to your PC and turn on the PC. The LINKGD (link good) LED indicator on the H2-EBC will turn on if the Ethernet link is functional.

NOTE: You may not get a LINKGD (link good) indication if NT is not configured, or if the Ethernet cable is incorrect (use peer-to-peer cable when not using a hub).

Network Card Adapter Configuration

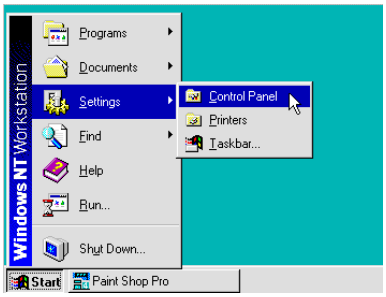
Access the Control Panel

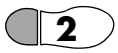
Step 1: If you are using the starter kit's 3COM Etherlink III network card in your PC, it should already be properly configured for most PC systems. If so, you may proceed on to the next section.

To configure a different type of network card or to properly configure the starter kit's 3COM card, please note the following:

- Locate the manufacturer's installation disk that came with your network adapter. The disk contains drivers which you will need to install.
- If you need to install two network cards, ensure that they are configured to have unique I/O addresses and unique interrupts. The best way to verify these settings is to power up the PC using a DOS or Windows 95 / 98 boot disk and then run the network card's setup utility that was shipped with the card. Write down the configuration for each card so you can use the information during the NT networking setup. If you have to configure the cards, we recommend that you visit the Web site at **www.entivity.com** and read Application Note #50 on dual network card configuration.

Using the *Start* menu, click *Settings...> Control Panel*.





Network Settings

Step 2: From the *Control Panel*, double-click the *Network* icon. This will enable you to add a network card to the Windows NT configuration for your system.

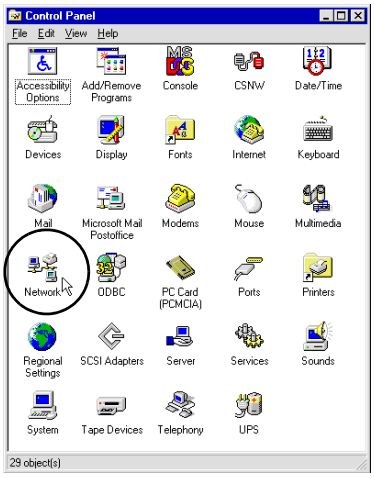
If a dialog box appears stating “Windows Networking is not installed. Do you want to install it now?” do the following:

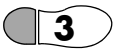
a. Insert your Windows NT disk in the CD-ROM drive.

b. Click *Yes* in the dialog to install Windows NT networking.

In the *Network Setup Wizard*, check the box for “Wired to the Network.”

After Windows networking is installed, you can install the Ethernet adapter.

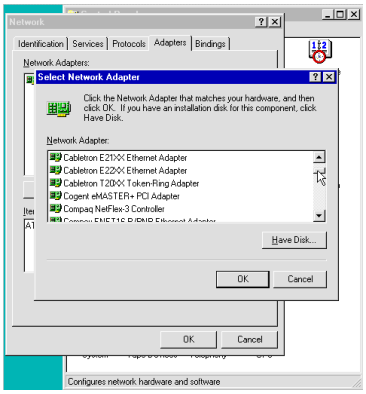




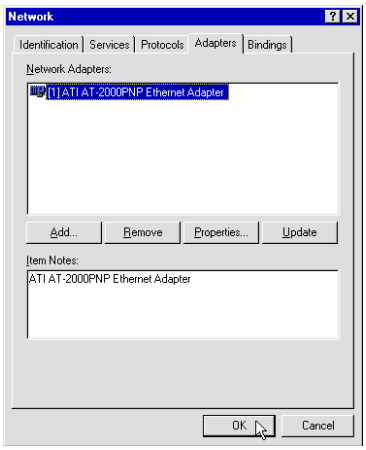
Add Network Adapter Card

Step 3: In the *Network* dialog box, select the *Adapters* tab, then *Add...*, to access the list of adapter cards.

- If you see the name of your network adapter card in the list, select it and click *OK* to continue.
- If you do not see the name of your network adapter card in list, then insert the manufacturer's disk in drive A and select *Have Disk* to continue. This will load the driver from the disk into the Windows NT configuration.



Follow the on-screen instructions to complete the installation of your network adapter card. When you are finished, a successful installation will list your adapter card's name in the *Adapters* tabbed dialog as shown to the right. Click *OK* to continue.



Restart Your Computer

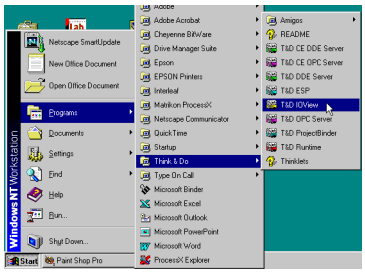
Step 4: After adding the network adapter card, Windows NT will need to reboot the computer and restart to use the new settings. This will load the driver and make the network card active and available to Think & Do Live! You will need this functionality for the next section. Be sure to restart your computer at this time.

NOTE: Some users will have an NT workstation with two Ethernet adapter cards. Although it is not necessary to physically separate WinPLC communications from an existing office network, using two adapter cards will accomplish that separation. Naturally, having two network cards in a PC system raises some additional questions and issues about configuration. For more information, visit the Entivity Web site at **www.entivity.com** and reference Application Note #50 on dual network card configuration.

I/O System Checkout

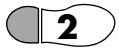
Start I/O View

Step 1: I/O View is one of the views in Think & Do Live! A *view* is a tool that lets you create a particular part of your project. I/O View will help you configure your I/O system. It is directly accessible from the *Start* menu after installation. Click *Start* > *Programs* > *Think & Do* > *TND I/O View*, as shown to the right.



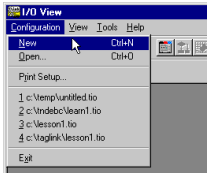
The I/O View window will appear, with a blank I/O configuration screen (the default name is “IOView1”).

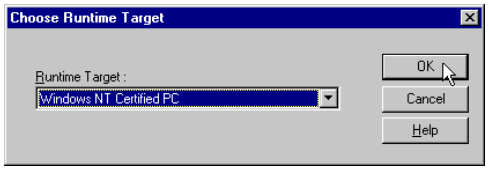
For now we are going to use a new I/O View window temporarily, to verify that the I/O in our new system is connected and accessible from Think & Do Live!



Start a New Configuration

Step 2: To start a new I/O configuration, click the *Configuration* menu > *New* as shown. The *Choose Runtime Target* dialog will appear (normally you will set this in ProjectBinder for a new project). Select “Windows NT Certified PC” and click *OK*.

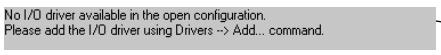


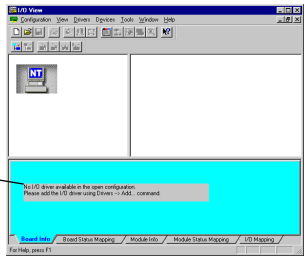


Add the Ethernet I/O Driver

Step 3: The next screen which appears is divided into three regions separated by window splitter bars. Just select and drag each bar to re-size a pane.

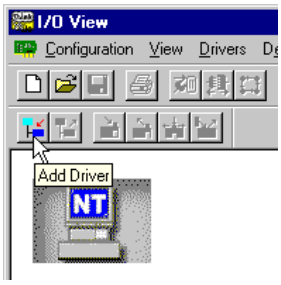
Each project maintains its own I/O configuration (and motion configuration, if it exists). So the first time you open I/O View to create a new project, it will prompt you to choose an I/O driver as shown below.



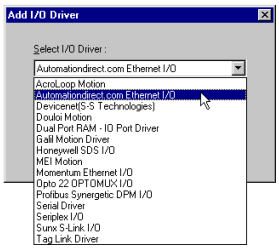


Use the *Drivers* menu and select *Add* or use the Add Driver toolbar button as shown to access a list of I/O drivers. Other I/O toolbar buttons include:

- *Add Driver*
- *Remove Driver*
- *Add Device*
- *Remove Device*
- *Insert Device*
- *Replace Device*



From the list of I/O drivers, select the ***Automationdirect.com*** Ethernet driver. Then Click *OK* to continue.

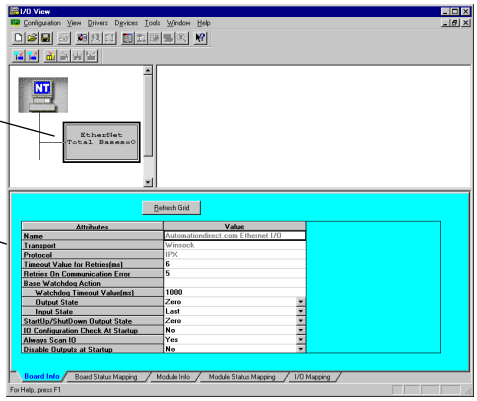


NOTE: New I/O drivers are constantly in development and will be available as soon as each one is created. Check the Entivity Web site at **www.entivity.com**.

I/O View now adds the Ethernet driver and attempts to activate the network adapter card. If the adapter card is installed properly, I/O View will display an image of the card as shown below (multiple cards will be shown in a tree-like structure).

I/O network card found; driver loaded

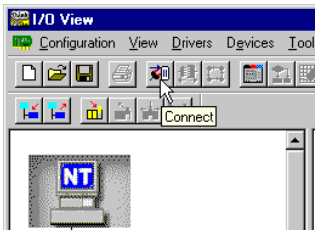
Board info on the network card displayed



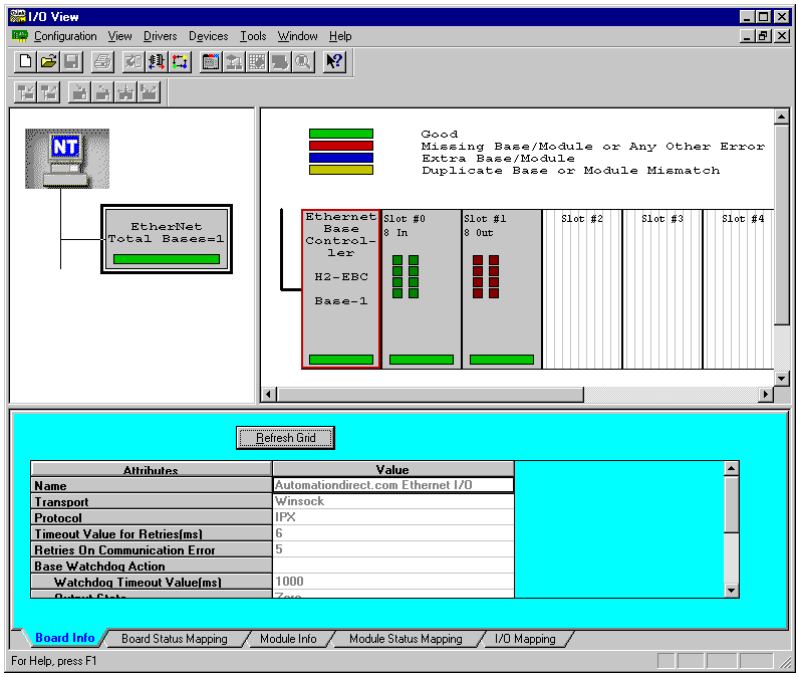
Additional information on the network adapter is available in the tabbed dialog at the bottom of the screen. If the network adapter configuration is OK, we're ready to connect to the I/O system!

Connect to the I/O System

Step 4: Use the *Configuration* pull-down menu and select *Connect*, or use the toolbar button for *Connect* as shown to the right. This instructs Think & Do Live! to make the connection to the I/O bases or devices on the network immediately.



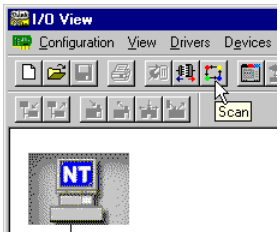
When the I/O connection is made, I/O View acquires status information from the network, creating an on-screen image of the starter kit I/O system. The legend at the top of the I/O View window describes the colored status bars on each device. Verify that your I/O system is correctly installed (green status bar = good) and that it is connected to the PC-based control system.



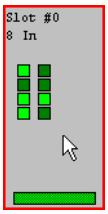
NOTE: I/O View always shows eight slot positions for ***Automationdirect.com*** DL205 bases, although your particular base may have fewer slots.

Scan the I/O

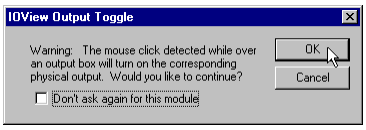
Step 5: From the *Configuration* menu, select *Scan,* or use the toolbar *Scan* button as shown to the right. After doing so, I/O View will continuously scan the base(s) in the system. When using the DL205 or DL405 Ethernet base controllers, the ACT (active) LED will be ON at this time.



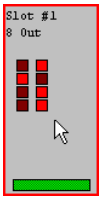
Monitor Inputs - While I/O View is scanning, you can monitor the status of discrete inputs. For example, turn on some of the switches on the input simulator, and the corresponding on-screen LED will brighten to indicate the ON status. I/O View is a great tool for I/O checkout, as well as creating I/O configurations for projects.



Turn On Outputs - While I/O View is scanning you can toggle output points ON or OFF! Just click the LED on the module faceplate. The first time for each module, you'll see the warning dialog as shown. You can disable the message if desired.

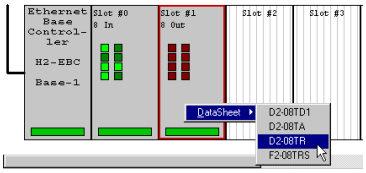


Just click an LED to turn ON the corresponding point, and click it again to turn it OFF. This new feature makes I/O checkout easy, since you avoid having to write programs or configure forced I/O.

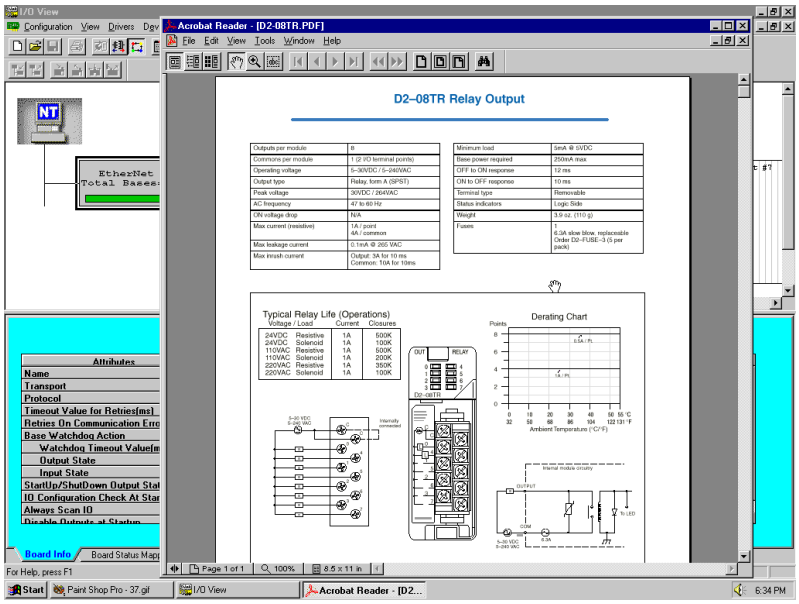


Other I/O View Features

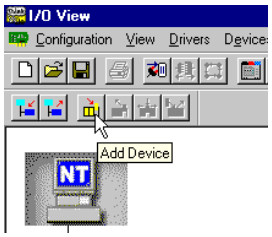
Step 6: Think & Do Live! has online I/O module information for ***Automationdirect.com*** I/O modules, which you can access in I/O View. Following the example shown, place the cursor over a module graphic and right-click for a data sheet menu. The menu will list applicable modules in the current I/O family. Select F2-08TR to get the data sheet for the starter kit's relay output module, for example. This feature provides convenience during system wiring and installation.



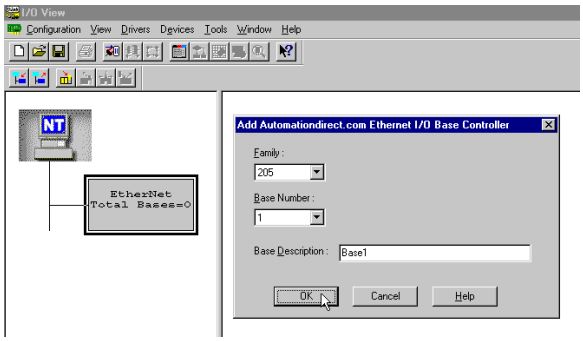
The viewer for module data sheets is the Acrobat Reader, by Adobe Systems. When the file reader loads, the module's data sheet will appear as shown below. Note that some modules (such as analog type) have multiple pages. For those modules, use the page control toolbar buttons in Acrobat Reader. You can print the data sheet using the *File > Print* command in the reader. Close the reader when you are finished.



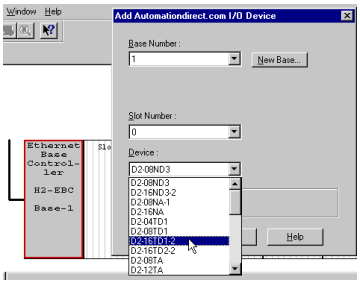
When I/O View is not connected to the I/O system, you can access the *Devices* toolbar buttons (shown at right). It will let you *Add*, *Insert*, *Remove*, or *Replace* I/O modules or bases in the configuration. This allows you to create and save I/O configurations before you have the actual I/O attached!



The example below shows an *Add Device* operation when the configuration was empty. I/O View first has you add either a DL205 or DL405 base (select DL205 for the starter kit) and then select a base number and enter a description.

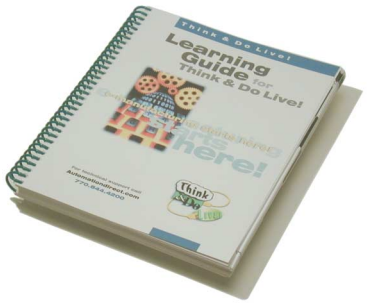


After the base is configured, select *Add Device* again to begin adding I/O modules in the selected slot positions. I/O View lists the available modules for the current base type.



7 End I/O Checkout

Step 7: To end this I/O checkout session:

- From the *Configuration* menu, select *Disconnect* (or click the *Disconnect* button).
- From the *Configuration* menu, select *Close*. I/O View will ask if you want to save the changes to "I/O View1." Select *No*.
- From the *Configuration* menu, select *Exit*, which returns to the Windows NT desktop.

Congratulations! You are now ready to create your first project in the Learning Guide for Think & Do Live! that came with the development/runtime software in the starter kit. In Chapter 3, Creating a Project, you will learn how to create flowcharts and HMI screens. For information on establishing communications for remote debugging, refer to Chapter 7, Communications, in the Learning Guide.