Getting Started

with PC-based Control
using Windows® CE and the WinPLC™

PC Software for Machine Control and Industrial Process Automation

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Table of Contents

Revisions

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

Title: Getting Started with PC-based Control using Windows CE and the WinPLC

Manual Number: PC–WPLCS–M

Issue	Date	Revision Comments	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 Warning (in English and French) Table of Contents, page i, ii History, page iii Booklet, pages 1 to 30 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 the WinPLC™ is a great way to get started in PC-based control. It includes PC-based control software from Entivity, a PC Ethernet adapter card, a WinPLC™ running Windows® CE, 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 WinPLC and I/O to your PC. This booklet is specific to the Think & Do PC-based Control WinPLC Starter Kit, part number PC-WPLC-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 using Windows® CE and the WinPLC™ (this booklet)
1	D2-INST-M	DL205 Installation and I/O Manual
1	D2-04B	DL205 4-slot base with power supply
1	H2-WPLC1-TD	Think & Do WinPLC 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

1

Insert CD

Step 1: You will need to install Think & Do Live! from Entivity to equip your PC to create projects for the PC, or to load on the WinPLC. The WinPLC™ is the runtime target CPU in the starter kit system. 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.

2

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

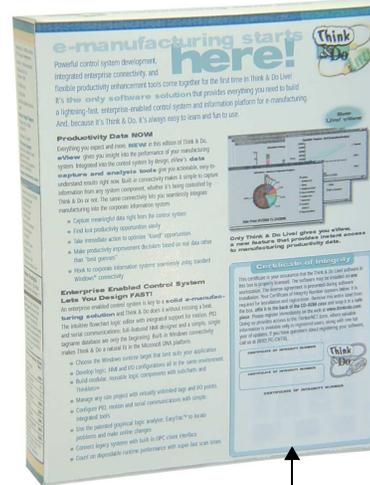You can also use the *Add/Remove* applet in the Control Panel.

3

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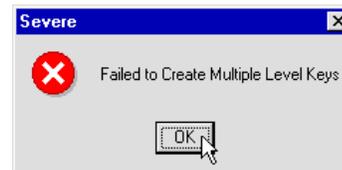
In the event of this error message, follows these steps:

• 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.

4

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.

The Help System features both context-sensitive and topical help. You can use the *?Help* button in conjunction with selecting fields or objects for more information on them. Function Key F1 also provides immediate access to the Help System.

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.
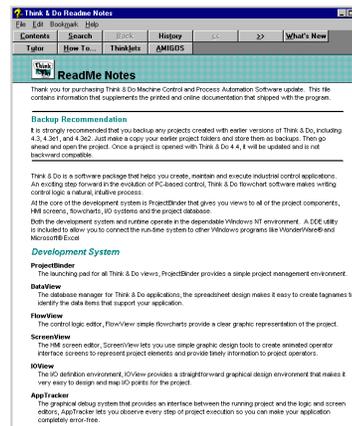
5

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 WinPLC runtime target and I/O hardware. You will use I/O View to connect the WinPLC and 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.

Install software on PC

You are here

Connect PC to WinPLC and I/O system

Create your first Think & Do Live! project
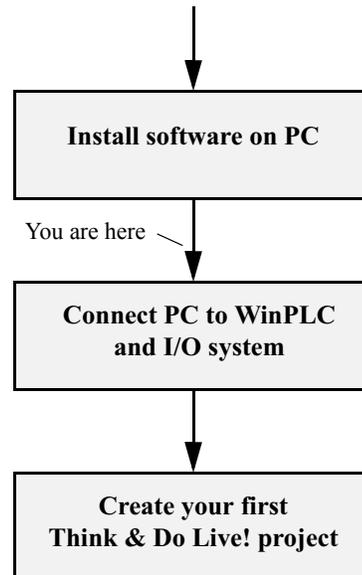
Hardware Installation

1

Check Your PC Hardware Requirements

Step 1: Please check the requirements below for running Think & Do Live! when choosing your PC components and configuration. The Getting Started exercises focus on your WinPLC as the runtime PC in your starter kit system. However, you can also use your development PC as a runtime system later (for example, to generate HMI screens to augment the WinPLC project).

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 operating system space)
- CD-ROM drive
- Color monitor, with at least 800 x 600 resolution

2

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

- **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.
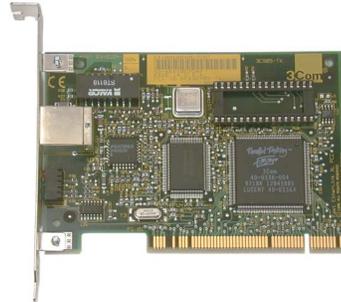
3

**I/O System
Assembly**

Step 3: The installation procedure that follows is specific to the PC-WPLC-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 Think & Do WinPLC in the CPU slot #0 (left-most slot), next to the power supply in the D2-04 base.

   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).

4
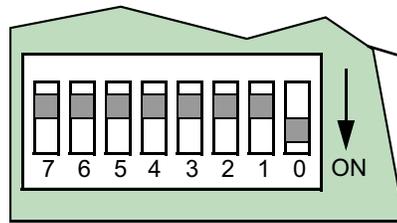
**WinPLC
Hardware Setup**

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

The WinPLC uses DIP Switch 0 as shown to select the action of running the project at powerup:
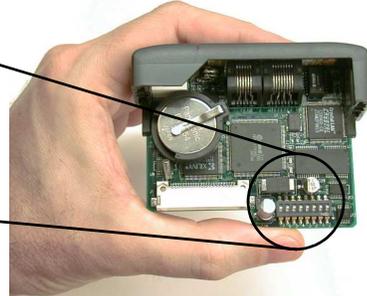
• OFF = Disable automatic running of user project at powerup

• ON = Enable

NOTE: DIP switches 1 to 7 are reserved. For proper operation, leave switches 1 to 7 in the OFF position as shown.


```
7  6  5  4  3  2  1  0    ON
```

Default setting shown

During project development, you may prefer the WinPLC *not* to run the project at powerup. To change the DIP switch setting, use the tip of a small screwdriver to access the switch stem. When the switch is set, re-install the WinPLC in the CPU slot (slot 0), and fasten its module retaining tabs.
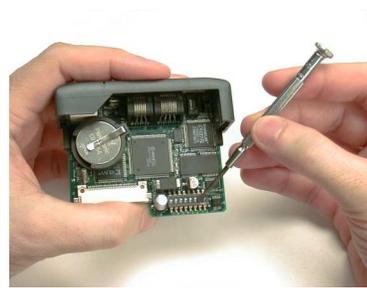
NOTE: You can read the DIP switch positions from the Think & Do ESP tool.

Mac ID - The WinPLC has a hardware network address that is factory-set and unchangeable. Called a "Mac ID" (Media Access Code) or Ethernet address, the number is recorded in the lower left corner on the product label as shown. Now is the best time to record the MAC ID (before installing in the base), because you may need the MAC ID number later to do a soft reset from Think & Do Live!

MAC ID
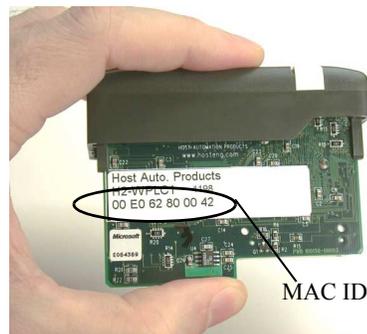
5

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 WinPLC and I/O system to the PC! The figure to the right shows an Ethernet cable (peer-to-peer type) being connected to the WinPLC.

    d. Connect the I/O link cable to the WinPLC Ethernet port.

    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 WinPLC's POWER LED will turn ON.

    g. Connect power to your PC and turn on the PC. The LINK (link good) LED indicator on the WinPLC 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

1

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*.

2

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.

    c. In the *Network Setup Wizard*, check the box for "Wired to the Network."

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

3

**Add Network
Adapter Card**

Step 3: In the *Network* dialog box, click 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.
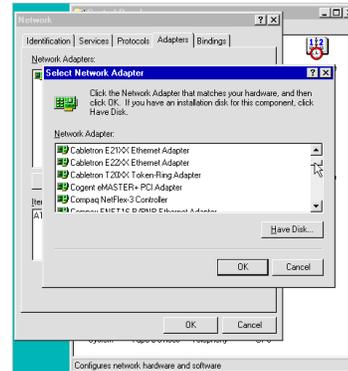
Follow the on-screen instructions to complete the installation of your network adapter card. When you are finished, a successful installation will list your adapter card's name in the *Adapters* tabbed dialog as shown to the right. Click *OK* to continue.
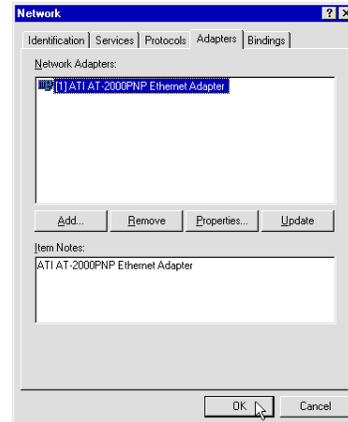
4

**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.

Creating a Peer-to-Peer Connection

Setting Up Your Windows NT Workstation

Step 1: When your PC has Windows Networking installed and the Ethernet adapter is installed, you're ready to configure the PC to communicate with the WinPLC. This section will show you how to configure a peer-to-peer network. The WinPLC uses an IP (Internet Protocol) address for identification on the Ethernet network. This step is necessary whether you have one or several WinPLCs connected.
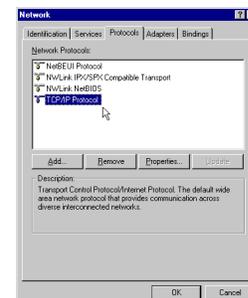

Peer-to-peer network connection
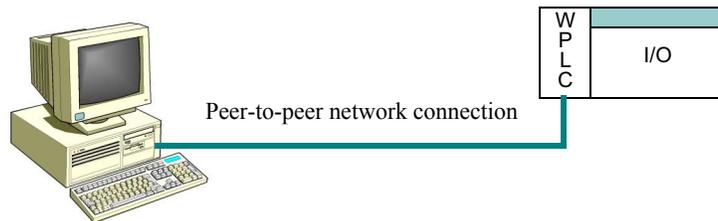
a. Click the Windows *Start* menu > *Settings* > *Control Panel* to open the Control Panel window.

**b.** In the Control Panel, double-click the *Network* icon as in the previous section.

c. In the *Network* properties sheet, select the *Protocols* tab. You should see the TCP/IP protocol in the list.
• If so, skip to step (e.).
• If not, click the *Add...* button.

d. Clicking the *Add...* button opens the *Select Network Protocol* dialog. Then select TCP/IP Protocol from the list. After you click *OK*, Windows Networking will add TCP/IP to the list in the *Protocols* tab.
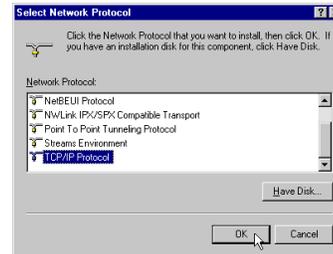
e. Once the TCP/IP protocol has been added to the *Network Protocols* list, click the *Properties...* button to open the *Microsoft TCP/IP Properties* dialog.
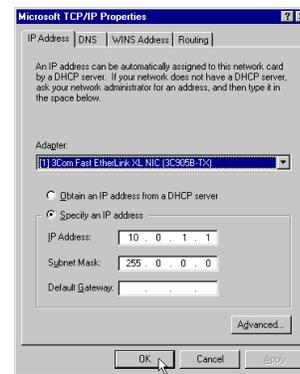
f. In this dialog, select the *IP Address* tab. Make sure the name of the Ethernet adapter which will connect to the WinPLC is listed in the *Adapter* field. Then select *Specify an IP address*, and in the IP address field, enter 10.0.1.1. Then in the *Subnet Mask* field, enter 255.0.0.0.

g. Click the *WINS Address* tab. In the dialog, make sure the *Enable LMHOSTS Lookup* box is checked as shown to the right. Leave all other settings at their defaults.
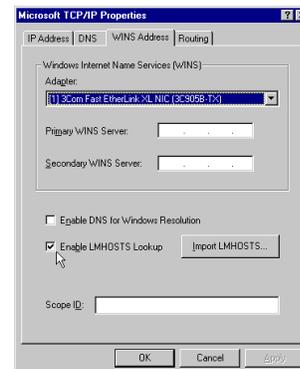
h. Click *OK* to close the *Microsoft TCP/IP Properties* dialog and return to the *Network* dialog. Do not close it yet!

Normal network communications between the Windows NT workstation and the WinPLC will use the TCP/IP protocol added above. In some instances you will need to reset the WinPLC's IP address when it is set for a different (or unknown) network address than the NT workstation address setting. Think & Do Live! uses the IPX/SPX protocol to locate and reset a WinPLC that has an incompatible IP address. The following steps install the IPX/SPX protocol.

i. In the *Network* dialog, select the *Protocols* tab. You should see the NWLink IPX/SPX Compatible Transport in the list:
• If so, skip to step (2.)
• If not, click the *Add...* button.
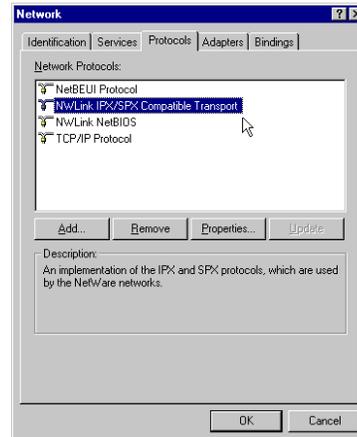
j. Clicking the *Add...* button opens the *Select Network Protocol* dialog. Then select NWLink IPX/SPX Compatible Transport from the list. After you click *OK*, Windows Networking will add NWLink IPX/SPX Compatible Transport to the list in the *Protocols* tab. Click *OK*. You will have to restart your computer for the changes to take effect.
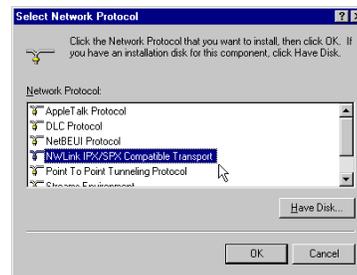
NOTE: The default address for the WinPLC is IP address 10.0.1.100, Subnet Mask 255.0.0.0. The subnet mask identifies the particular network to be scanned. Later in this booklet we discuss the *Find Windows CE - Think & Do WinPLC* utility. It requires that all WinPLCs and your Windows NT system have the same subnet mask value.

Step 2: Be sure you have restarted your Windows NT system after configuring the network settings above. If you have installed the WinPLC, the input simulator and relay output module in the starter kit's DL205 base, you're ready to connect.

Establishing WinPLC Communications

a. Confirm the Ethernet cable connection between the WinPLC and your Windows NT workstation. The WinPLC's LINK LED should be ON.

b. Click the ProjectBinder icon on the Windows desktop on your PC to launch ProjectBinder.

c. Use the *File* menu, and click *New* (or use the *New* toolbar button) to open the *Choose Runtime Target* dialog. Choose the *Windows CE Think & Do WinPLC* from the list of available target types.
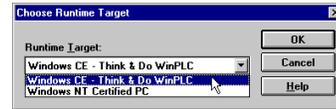
d. After ProjectBinder opens, click the arrow to the right of the *Runtime Station* list on the ProjectBinder toolbar. From the list, select *Find CE Runtime...*

e. When the system has scanned the network, the *Find/Configure CE Runtime* dialog will open. If your starter kit WinPLC still has the factory default IP address setting, it should automatically be listed.
• **If the WinPLC is listed**, select (highlight) it and click the *Select* button and go to Step 3.
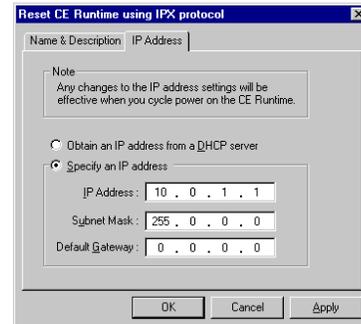• **If the WinPLC is not listed**, make sure your WinPLC Ethernet cable (peer-to-peer type) is connected and its LINK LED indicator is ON (correct any network cable problems until the Link indicator is ON). Then click the *Re-scan* button in the *Find/Configure* dialog. If the WinPLC is still not listed, continue with step (f.).
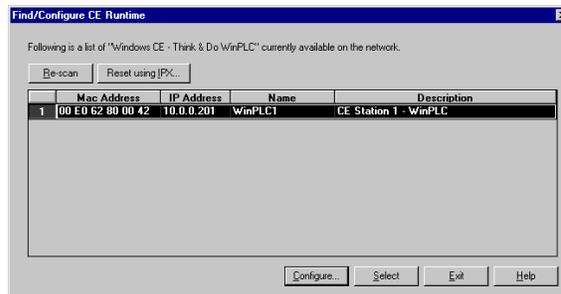
f. The *Find/Configure CE Runtime* dialog cannot communicate (using TCP/IP) with the WinPLC when its IP address setting is for a different network than your NT workstation network adapter's setting. To access the WinPLC to reset it, click the *Reset using IPX...* button. In the dialog provided, enter the MAC ID of your WinPLC (see page 6). The *Waiting for booter* dialog will be prompt you to power cycle the WinPLC.
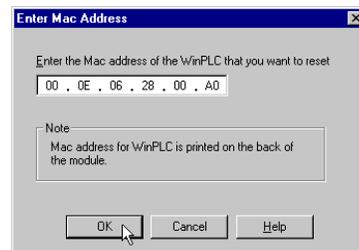
g. After power cycling the WinPLC, you will see a *Reset WinPLC using IPX protocol* dialog. Click the *IP Address* tab, and select *Specify an IP address*. Now you can see the current WinPLC address that was set for a different network than your workstation PC. Enter 10.0.1.1 as the default, and enter a Subnet Mask 255.0.0.0. Click *Apply*, then *OK*. At this point, the RUN LED on the WinPLC will flash rapidly (indication means it's communicating in IPX mode rather than TCP/IP). Power cycle the WinPLC again to reset it and restore TCP/IP communications, and the Run LED will remain off. Click the *Re-scan* button in the *Find/Configure CE Runtime* dialog, and WinPLC will be listed.

A successful peer-to-peer connection has been established. These steps will not have to be repeated the next time you need to connect your development system PC to the Windows CE WinPLC since the network addressing has been established.

3

**Understanding
WinPLC
LED Indicators**

Step 3: The WinPLC has four LED indicators (left column) on the front bezel to inform you of the general status of the CPU and your project. The meaning of each LED is as follows:
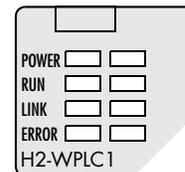
LED	State	Condition
Power	ON	The WinPLC is receiving power from the DL205 base.
Run	ON	The Think & Do Live! project is running.
	Flashing – slow	An error condition exists. For details, use Think & Do ESP *Think & Do Project* tab, then click the *Details* button. Power cycle the WinPLC to clear the error.
	Flashing – fast	The Ethernet port is in IPX mode (rather than TCP/IP). Power cycle the WinPLC to reset it and restore TCP/IP communications.
	OFF	The Think & Do Live! project is stopped.
Link	ON	The Ethernet (electrical) connection good (does not indicate whether IP address, etc. are correctly configured).
Error	ON	The WinPLC CPU detected an internal error. Power cycle the WinPLC to clear the error.

NOTE: If both POWER and RUN LEDs are flashing, an internal severe error was detected. If this occurs, please call (800) PCCNTRL to report the error.

### Connecting to a WinPLC Through an Existing Network

You may prefer to use an existing network to connect to your WinPLC. This assumes you already have an Ethernet adapter installed in your PC development system. After you have verified this, you're ready to assign an IP address. Just follow steps 2a. through 2g. under Creating a Peer-to-Peer Connection. After you have opened the *Microsoft TCP/IP Properties* dialog, check the IP address.

TIP: Before you change any Windows NT networking settings, it's a good idea to record existing settings at this time. You will need those settings later when you have to re-connect the NT system to the original network.

Your Windows NT system must match the Subnet Mask of the WinPLC. If it does not match, then enter the IP address 10.0.1.1 and the Subnet mask of 255.0.0.0. After you change these settings, you'll need to restart your computer for them to take effect.

Next, launch ProjectBinder. Start a new project and choose the Windows CE Think & Do WinPLC as the target runtime. When ProjectBinder opens, click the down arrow to open the Runtime station list and choose *Find CE Runtime...*
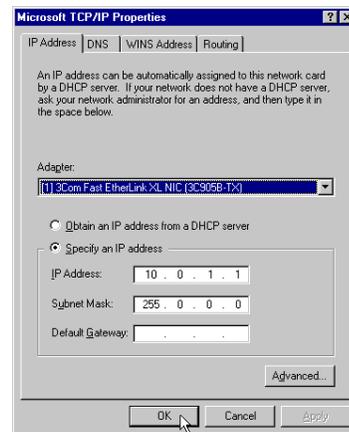

The *Find CE Runtime* utility will scan the network, and your WinPLC should appear in the resulting list similar to the one shown below (refer back to Step 2 e.). If you do not see the WinPLC in the list, click the *Re-scan* button in the dialog to search the network again.
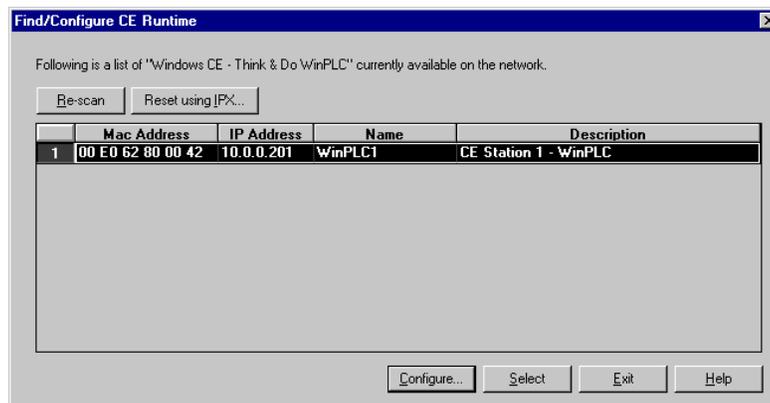
Assigning Addresses to the WinPLC

**Using a
Static Address**

After the WinPLC appears on the list, select it and click the *Configure* button to open the *Configure WinPLC* dialog. Select the *IP Address* tab and enter an available IP address. The Subnet Mask must be the same as your network. When the address has been changed, you'll need to power cycle the WinPLC for the changes to take effect.
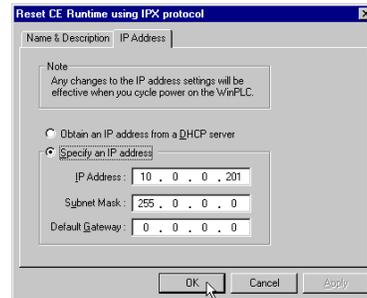
Using a DHCP Server If you prefer, you can allow a DHCP (Dynamic Host Configuration Protocol) server to assign an address to the WinPLC. Your network must have a server of this type before selecting this option for the WinPLC. Follow steps 1-6 for setting the IP address and Subnet Mask under Setting up Your Windows NT Workstation. This will allow you to find the WinPLC on the network. Then, follow Steps a. to h. under Connecting to the WinPLC. Stop before accepting the default address settings.

NOTE: Before changing the IP address and the Subnet Mask of your development system PC, make a note of the original settings. You will need to know these settings to reset your development system when you have finished setting up your WinPLC.

    a. Instead of accepting the defaults, select your WinPLC from the list and click the *Configure* button to open the *Configure WinPLC* dialog.
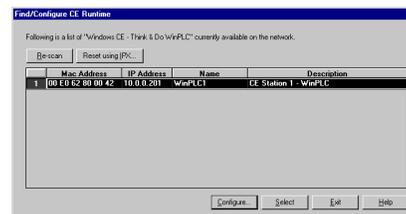
    b. After the *Configure WinPLC* dialog opens, select the *IP Address* tab and click *Obtain an IP address from a DHCP server*. Click *OK* to confirm the address assignment. You will need to restart the WinPLC for the changes to take effect.
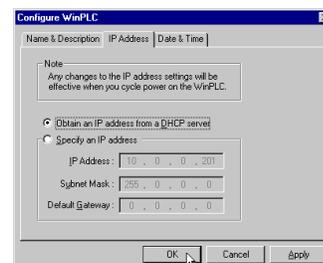
    You will also need to reset the address of your Windows NT workstation to its original IP address and Subnet Mask, so it will be able to connect to the network and find the WinPLC. To reset your development system PC, repeat Steps a. to f. under Setting Up Your Windows NT Workstation.

I/O System Checkout

1

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!
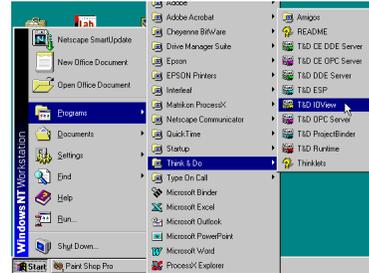
2

Start a New Configuration

Step 2: To start a new I/O configuration, click *Configuration* menu > *New.* The *Choose Runtime Target* dialog will open (normally you will set this in ProjectBinder for new projects). Select "Windows CE Think & Do WinPLC" and click *OK*.
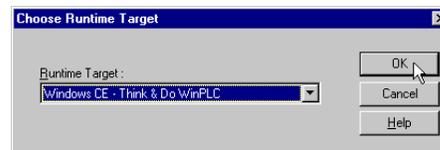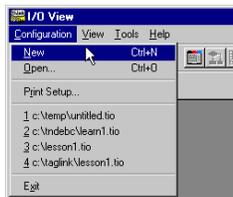
3

Getting to Know I/O Drivers

Step 3: The I/O View window is divided into three regions separated by window splitter bars. Just select and drag each bar to re-size a pane.

I/O View uses drivers to create an I/O communications link between a control project (flowcharts and HMI screens). I/O View displays an image of each driver in a tree-like structure that supports multiple drivers. When the PC is the runtime target, you normally have to select and add drivers for the intended I/O network type. However, selecting the WinPLC as the runtime target automatically adds the two drivers shown below.

Backplane Driver

Serial Comm. Driver

Window Splitter Bars
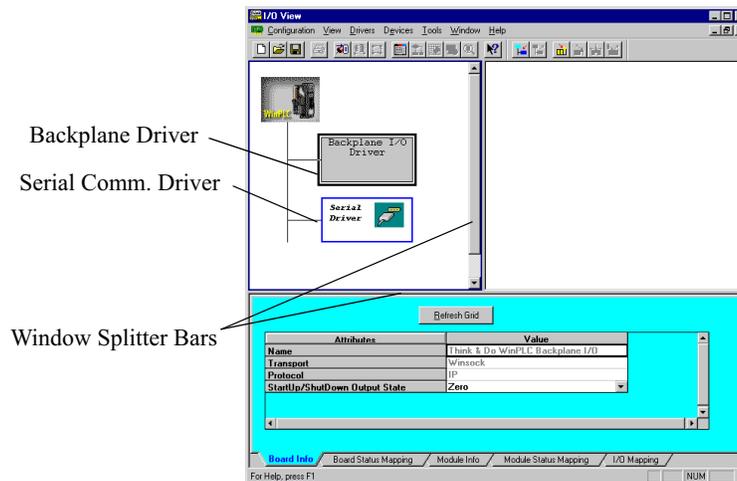
- **Backplane driver –** This driver enables the WinPLC to communicate with I/O modules in same the base as the WinPLC.
- **Serial driver –** This driver enables the WinPLC's RS-232 serial port to communicate with external devices such as operator panels and bar code readers.

The Drivers pane shows all currently loaded drivers. The Module pane shows the actual physical I/O devices which are connected to the selected (highlighted) driver. At the bottom of the I/O View window is a pane with tabbed information tables. These display information such as status or I/O mapping that is associated with the currently select driver or module. With the WinPLC backplane driver selected (highlighted), click the Module Info tab for additional information on the WinPLC. If the WinPLC configuration is correct, you're ready to connect I/O View to the I/O system!

I/O driver pane   I/O module pane

Board/module information tab pane
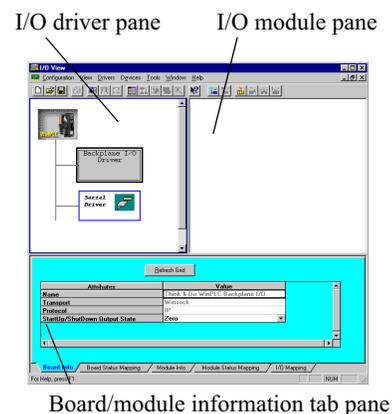
4

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 (below left). This instructs Think & Do Live! to make the connection to the Windows CE target on the network immediately. First, the *Select CE Runtime* dialog opens. This is due to the fact that Think & Do Live! views can target only one particular WinPLC at a time on the network. Make sure the WinPLC for your starter kit is highlighted, and click *Select*.
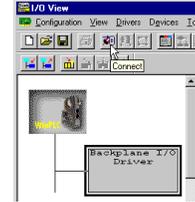
NOTE: If the WinPLC is already running a project, I/O View will be unable to start the I/O scan. A dialog box will prompt you to stop the WinPLC project and try again.
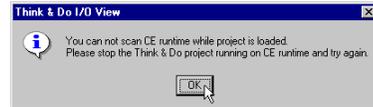
When the I/O connection is made, I/O View acquires status information from the network, creating an on-screen image of the starter kit I/O system. The legend at the top of the I/O View window describes the colored status bars on each device. Verify that your I/O system is correctly installed (green status bar = good) and that it is connected to the PC-based control system.
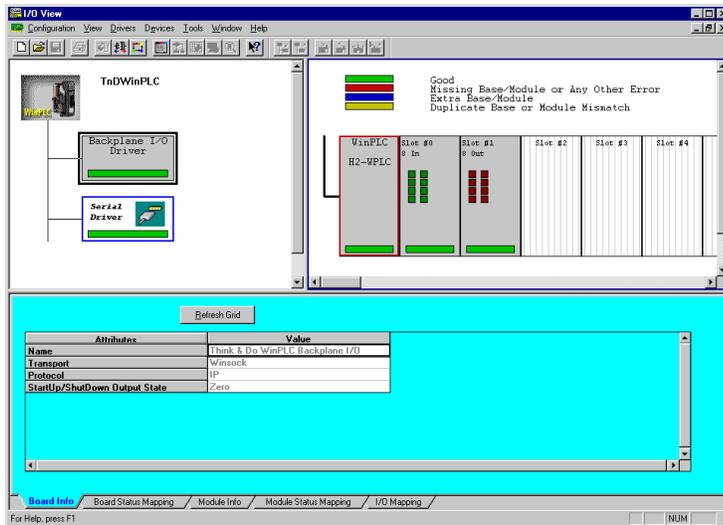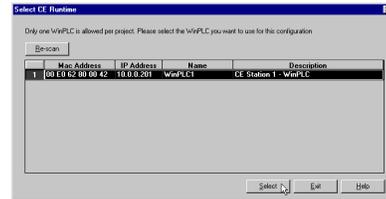
NOTE: I/O View always shows eight slot positions for *Automationdirect.com* DL205 bases, although your starter kit base has fewer slots.

5

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. The Link LED on the WinPLC will flicker rapidly during the I/O scan.

NOTE: If the WinPLC is already running a project, I/O View will be unable to start the I/O scan. A dialog box will prompt you to stop the WinPLC project and try again.
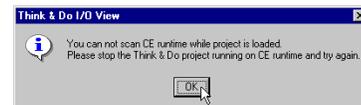
A Serial Port Scanning dialog box will appear. It is useful for manually sending/receiving characters from a serial device. For now, minimize the Serial Port Scanning dialog box, as this section concentrates on starter kit I/O checkout.
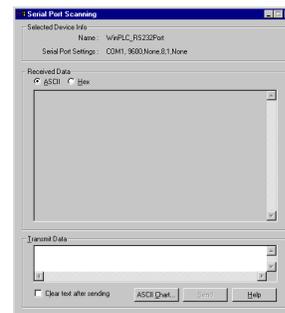
Monitor Inputs - While I/O View is scanning you can monitor the status of discrete inputs. For example, turn on some of the switches on the input simulator, and the corresponding on-screen LED will brighten to indicate the ON status. I/O View is a great tool for I/O checkout, as well as creating I/O 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.
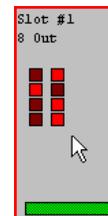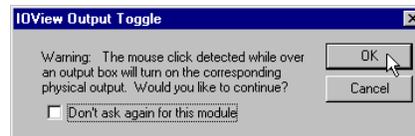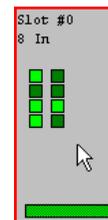
Just click an LED to turn ON the corresponding point, and click it again to turn it OFF. This feature makes I/O checkout easy, since you avoid having to write programs or configure forced I/O.

6

Other I/O View Features

Step 6: Think & Do Live! has online I/O module information for *Automationdi-rect.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.
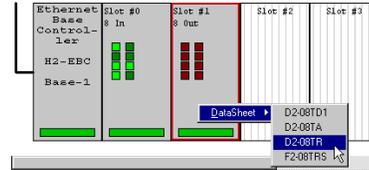
The viewer for module data sheets is the Acrobat Reader, by Adobe Systems. When the file reader loads, the module's data sheet will appear as shown below. Note that some modules (such as analog type) have multiple pages. For those modules, use the page control toolbar buttons in Acrobat Reader. You can print the data sheet using the *File > Print* command in the reader. Close the reader when you are finished.
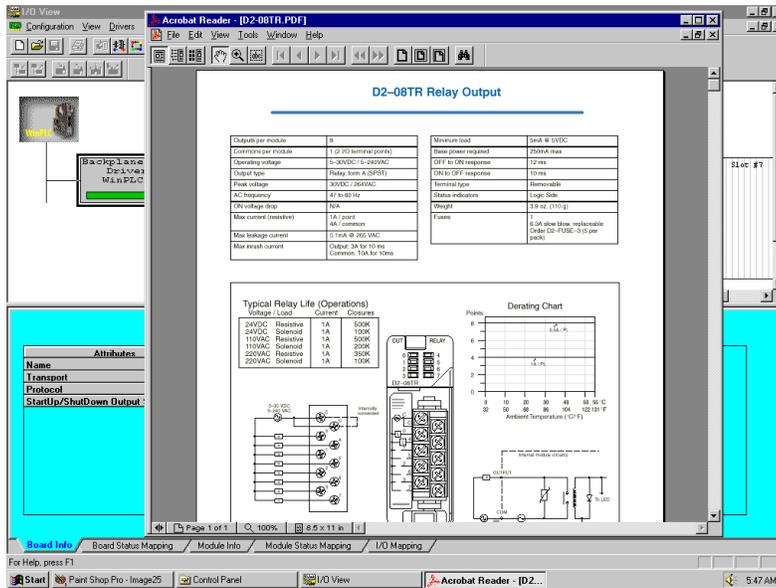
When I/O View is not connected to the I/O system, you can access the *Devices* toolbar buttons (shown at right). It will let you *Add*, *Insert*, *Remove*, or *Replace* I/O modules or bases in the configuration. This allows you to create and save I/O configurations before you have the actual I/O attached!

The example below shows an *Add Device* operation when the configuration was empty. I/O View first has you add a WinPLC. A description field is included.
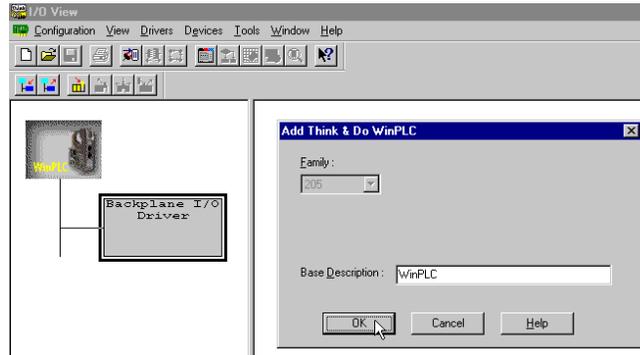
After the base is configured, select *Add Device* again to begin adding I/O modules in the selected slot positions. I/O View lists the available modules for the current base type.

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

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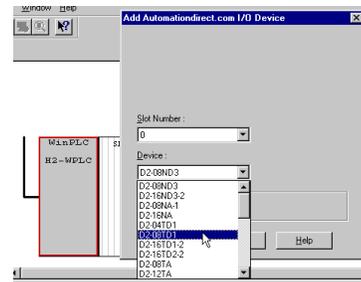- From the *Configuration* menu, select *Close*. I/O View will ask if you want to save the changes to "I/O View1." Select *No*.
- From the *Configuration* menu, select *Exit*, which returns to the Windows desktop.

7

End I/O Checkout

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 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.

The following sections show how to use the WinPLC serial port, and how to manage projects on your Windows CE target devices.
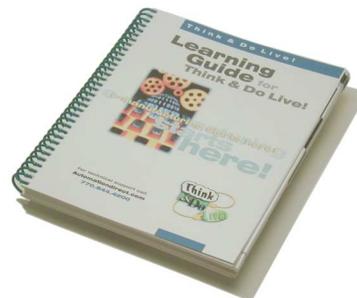
Using the WinPLC Serial Port

In the I/O Checkout procedure, you used the backplane driver in I/O View with the WinPLC to control/monitor its discrete I/O. This section shows how to use the serial driver to access to the WinPLC's RS-232 port from your project. The serial port connects to barcode readers, operator panels, weigh scales, and other serial devices.

1

Configure the Serial Driver

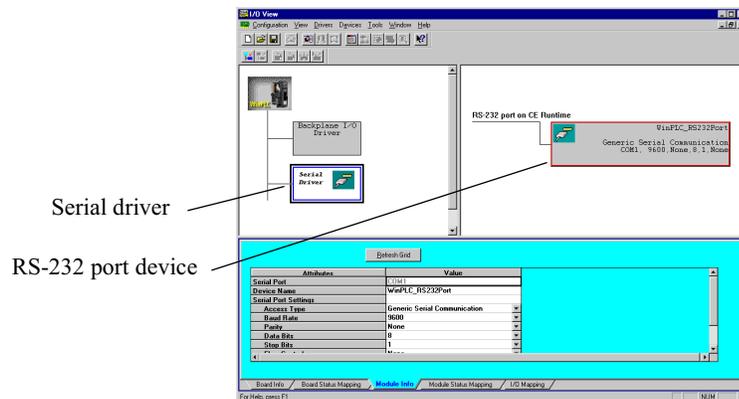**Step 1:** When your select the WinPLC as the runtime target in I/O View, the serial driver is automatically included in the I/O configuration. In this step you will explore the serial driver.

   a. Click the serial driver symbol in the left pane of I/O View. Notice the module pane now shows the RS-232 port as an I/O device.

Serial driver

RS-232 port device

NOTE: The modules shown in the Module View pane (upper right) are associated with the driver selected in the Board View (upper left) pane. When you select a driver (will be highlighted), the Module View graphic will change to show the devices connected to that board/driver combination.

The tabs at the bottom of the I/O View window present configuration data associated with the serial port.

   b. Click the Module Info tab. It includes basic settings for serial port operation, including baud rate, parity, flow control, and so on. You will need to adjust these settings to permit the WinPLC to communicate with a specific serial external device.
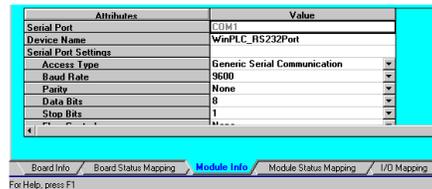
The Module Status Mapping tab and I/O mapping tab will contain actual tagname assignments when you create a project that uses the WinPLC's serial port. The tagname mapping is not required when performing an I/O checkout (test) procedure.

TIP: Details on the board and module status items are found in Online Help. Double-click the Help tool and click the Find tab (enter the driver name for the status items).

2

Connect the Serial Device

Step 2: Be sure to check the pin-outs of the WinPLC's RS-232 port, shown to the right.

**CAUTION:** The +5V on the WinPLC's serial port gets its power from the DL205 base power supply. Verify the base supply has the power budget to supply the +5VDC requirements of the external serial device.

Pin	Signal	Description
1	0V	Power (–) GND
2	5V	Power (+) 5VDC
3	RXD	Receive data (RS-232C)
4	TXD	Transmit data (RS-232C)
5	RTS	Request to Send
6	0V	Power (-) GND

Pin-out of RS232 port on WinPLC (front view)

3
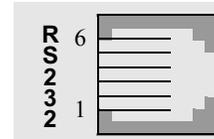
Scan the Serial Device

Step 3: In this step you will use I/O View to send/receive serial data to/from an external device. When the serial device is physically connected to the WinPLC, you can use I/O View to manually communicate with the device. This feature is useful for debug or to test the connection before creating a project that uses the port.

  a. From the I/O View toolbar, click the Connect button (or from the main menu, click Configuration > Connect).

  b. Verify that the status bars on the two drivers and the RS232-port device are green. If they are red, fix the problem with the configuration or the connection before proceeding.

  c. From the I/O View toolbar, click the Scan button (or from the main menu, click Configuration > Scan). The Serial Port Scanning dialog will appear.

  d. Send characters to the serial device by typing in the Transmit Data field. received characters will appear above in the Received data field.

You can connect many types of devices to the serial port, including EZTouch panels from *Automationdirect.com*.
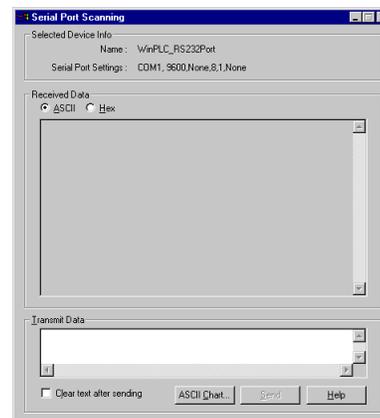
Windows CE Target Options

Project Settings for CE Runtimes

After you have finished developing a project, you have some options for sending it to the Think & Do WinPLC target runtime system. You can download only the files needed to run the project—or, you can also download compressed source files. You can even password protect the source files so they cannot be uncompressed by unauthorized personnel.

From the ProjectBinder *Project* menu, select the *Settings* command.

When the *Project Settings* dialog opens, you'll see the Runtime Target specified in the first field. At the bottom of the dialog are Windows CE target options. If you check *Enable Instant Recall*, the project source files will be downloaded to the WinPLC along with the runtime files. Instant Recall is the name of the feature that stores and retrieves the project's editable source files in compressed format in the Windows CE device's FLASH memory.
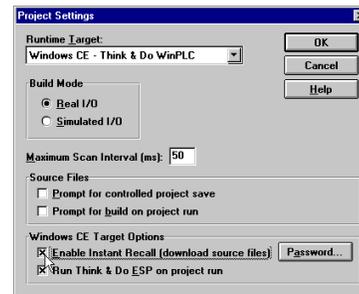
If you choose, you can password protect the downloaded files. Click the *Password...* button to open the *Compressed Source File Password* dialog and enter a password of up to 15 characters. You'll need to confirm the password before it is set.

You can optionally run Think & Do ESP whenever you launch a project. ESP provides a handy interface between the WinPLC and your Windows NT workstation, and helps you manage your project. It will run whenever the project runs if you choose this option in the *Settings* dialog. In order to use this option, your WinPLC must be connected to your Windows NT workstation while the project is running.

It is not required that you run ESP every time the project runs. Rather than checking the target option in the *Project Settings* dialog, you can launch ESP from the ProjectBinder Tools menu at any time. As long as there is a network connection between the WinPLC and the Windows NT workstation, ESP will run.

**Using
Think & Do ESP**

As an embedded controller, the WinPLC is designed to run a project indefinitely. It can run a project after each powerup, even without a connection to your Windows NT station or network. You may want to monitor its progress anyway—and the best way to do this is with the Think & Do ESP. The previous section described how to automatically run Think & Do ESP whenever the project runs (but the project can also run without ESP). Some features of Think & Do ESP include:

- Shows you the current runtime statistics
- Set the scan interval (This is a temporary setting. The permanent scan time setting is done in ProjectBinder – the default scan time each time the project starts.)
- Load and start a project, and stop a project
- Clear files (erase project files on the WinPLC)
- Lock the project, so a password is required to start or stop it

Before ESP can do project operations such as load, start, etc. You must have a connection between the NT workstation and the WinPLC.

The *Think & Do Project* tab provides runtime statistics and buttons that allow you to interact with the project that is currently running. The buttons at the bottom of the dialog let you stop, restart, load and start a project, and upload project runtime files.

Runtime Files – After uploading project runtime files, you can use *Load and Start* to send the project to other WinPLCs.

Source Files – Project source (editable) files are automatically uploaded to your Windows NT workstation if present.

- Source files will only be present on the WinPLC if ProjectBinder's project settings enabled the *Instant Recall* feature at the time of the project download.
- The *Load and Start* command can automatically send uploaded source files with runtime files to other WinPLCs. Use ESP to select the WinPLC station.
- ESP does not uncompress source files for editing when they are uploaded.
- You must uncompress the source files if you want to edit them with Think & Do development tools. Alternatively, use ProjectBinder's *Instant Recall* to open (and uncompress) the source files directly from the WinPLC.

The *Think & Do Station* tab provides basic information about the Think & Do WinPLC station itself. The station name, IP address, network connection status and description, if any, is displayed. The center portion of the dialog shows the Think & Do version and the available RAM and storage. The *Switches* area at the bottom of the dialog refers to the DIP switch positions on the WinPLC. See page 6 for switch configuration instructions.
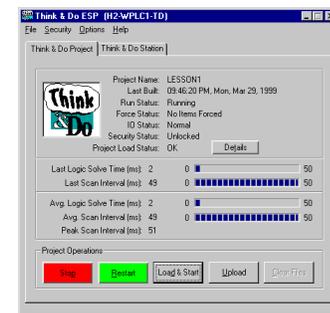
# Think & Do WinPLC Starter Kit Windows NT Project

Perhaps you'd like to have some fun seeing just what the WinPLC can do by viewing an example written by one of our expert programmers. This "Starter Kit" example project is specifically designed to help you explore the starter kit hardware and software components.

This example is really two-projects-in-one: both your WinPLC and Windows NT workstation will be running separate projects. The Windows NT project has some HMI screens which provide a graphical interface for monitoring your WinPLC and DL205 I/O. Let's get started!

1

Connect to the WinPLC

Step 1: In this step, you will establish (or re-establish) the connection between the Windows NT workstation and the WinPLC.
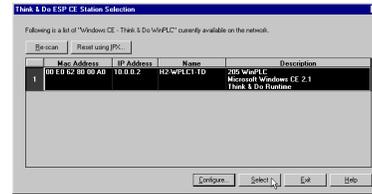
a. From the Windows NT desktop, select *Start* menu > *Programs > Think & Do > T&D ESP.* This will launch Think & Do ESP utility for managing a project on the WinPLC.

b. In the Think & Do ESP window, select the Think & Do Station tab. If a prior connection is restored, the logo will be animated and the name of your WinPLC will be displayed. If so, skip to Step 2.

c. If the connection is not made automatically, click the *Select CE Station* button to open the *Think & Do ESP Station Selection* dialog. If the name of your WinPLC is on the list displayed, select (highlight) it and click the *Select* button, and skip to Step 2. If it is not listed, continue below.

d. Click the Reset using IPX button. In the dialog provided, enter the MAC ID of your WinPLC (see page 6). Then you will be asked to power cycle the WinPLC.
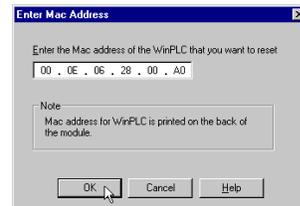
e. After power cycling the WinPLC, you will see a *Reset WinPLC using IPX protocol* dialog. Click the *IP Address* tab, and select *Specify an IP address*. Enter 10.0.1.1 as the default, and enter a Subnet Mask 255.0.0.0. Click *Apply*, then *OK*.
At this point, the Run LED on the WinPLC will flash rapidly (indication means it's communicating in IPX mode rather than TCP/IP). Power cycle the WinPLC again to reset it and restore TCP/IP communications, and the Run LED will remain off.

f. The WinPLC name should appear in the list in the Think & Do Station selection dialog. Click the *Select* button at the bottom of the dialog. Now you will see the animated logo in the *Think & Do Station* tab of the ESP dialog if the network status indication is "Connected." Now you're ready to load the example project to the WinPLC.

2

Load and Start the WinPLC Project

Step 2: The example project files are installed on your PC's hard drive during the Think & Do Live! installation from CD-ROM. Project runtime files have the file extension ".cfg." In this step, you will load the Windows CE example project from the following path:

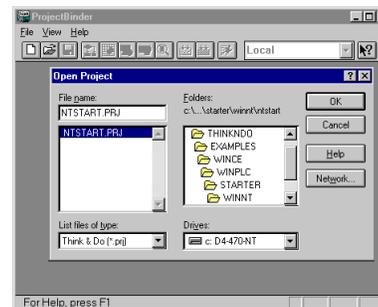C:\thinkndo\Examples\WinCE\WinPLC\Starter\WinPLC\Starter\Starter.cfg

a. In the ESP window, select the *Think & Do Project* tab, and click the *Load & Start* button at the bottom of the dialog. The *Open* dialog will then let you select the filename.

b. Use the dialog to select the "starter.cfg" filename in the path listed above. Then click *Open*. A confirmation dialog ("Are you sure...") will appear; click *Yes*. Then, Think & Do loads the project to the WinPLC and tells it to run the project. If so, the logo in the *Think & Do Project* tab will be animated. Check the scan monitor for details. Leave the Think & Do ESP running!

3

Load and Start the Windows NT Project

Step 3: In this step, you will load the Windows NT example project from the following path:

C:\thinkndo\examples\wince\winplc\starter\winnt\NTSTART.PRJ

a. From the Windows NT desktop, launch Think & Do ProjectBinder. Select *File* menu > *Open...* The *Open Project* dialog will let you select the filename.

b. Use the *Open Project* dialog to select the "NTSTART.PRJ" filename in the path listed above. Then click *OK*. Then Think & Do loads the project for your Windows NT workstation. ProjectBinder automatically selected the "Windows NT Certified PC" workstation as the target type, since the source file contained that information.

c. When the project loads, click the *Flowcharts* tab and the *Screens* tab to explore the names of project flowcharts and screens.

NOTE: Verify that the target field is set to "Local" so you will run the PC's project.

d. Then click the *Run Project* button in the ProjectBinder toolbar. The *Runtime* window for the NT system will open. Now you can see status of both projects running using the NT runtime window and the ESP *Think & Do Project* tab.
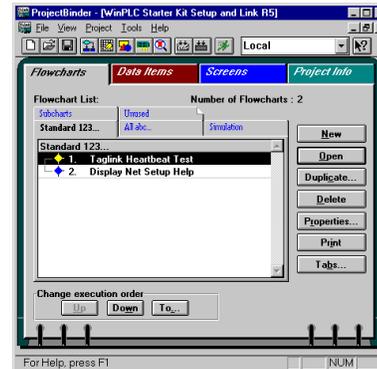
The WinPLC and Windows NT workstation are running separate projects that communicate data between them using the tag link driver (refer to the Learning Guide, Chapter 7, Communications for more details on the tag link driver).

4

Explore the Example!

Step 4: The Windows NT project will display HMI screens in the ScreenView window when the project is running. It provides a user interface for exploring the WinPLC project. The initial screen displays topics that include project information, a help section, and a WinPLC monitoring section.

Think & Do WinPLC Starter Kit WinNT Project

This project runs on Think & Do for Windows NT.

There is an accompanying Starter Kit project for the WinPLC that can be found in the same examples directory. Look in the WinPLC folder.

This project provides 3 components:

- An information section.
- A help section.
- A WinPLC monitoring section.

Please click one of the 3 choices to continue.

Disclaimer: This program is provided "as is" and is meant only as an example of some of the capabilities of Think & Do and flowchart programming. Think & Do Software makes no claim as to its suitability for any particular application.

After exploring this project, you can learn how to create your own projects via a step-by-step example in the Learning Guide, Chapter 3, Creating a Project.