

# EMBEDDED PLC

## EMBEDDED PLC™ Application Kit Getting Started

Dear Customer,

Thank you for purchasing the EMBEDDED PLC Application Kit. This Kit provides all the necessary tools to program the BL2500 Single Board Computer (SBC) via the ISaGRAF® Soft Logic package.

This document will help you to quickly install the necessary software to run a PLC sample application on the BL2500 target using the ISaGRAF Workbench. Read this document thoroughly since it also contains important information about licensing your product.

### Application Kit Contents

- EMBEDDED PLC BL2500 CD-ROM, with complete product documentation on disk.
- BL2500 Single Board Computer with Ethernet capability pre-loaded with the EMBEDDED PLC Firmware Kernel.
- A bag of terminals and interconnecting cables.
- 1.27mm programming cable.
- Ethernet crossover cable.
- Getting Started instructions (this document).
- EMBEDDED PLC – ISaGRAF V3.50 Workbench License Registration form.

### Important Information

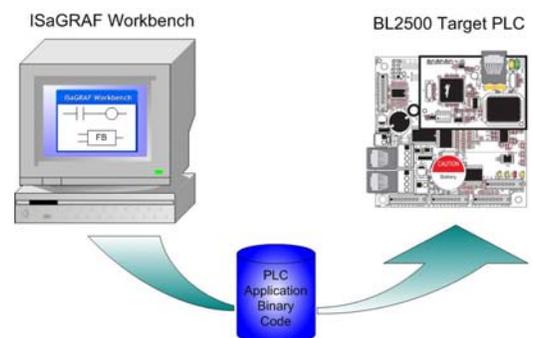
The EMBEDDED PLC Application Kit does not support the use of Dynamic C. Also, the programming cable supplied in this Kit must be used with **caution**.

Use of Dynamic C along with the PROG header of the programming cable, can **erase** the Firmware Kernel loaded in your BL2500. If you require changing the configuration of the Target PLC, use the DIAG header instead.

### Overview

The EMBEDDED PLC system turns a Rabbit Single-Board-Computer, such as the Coyote BL2500, into a high performance and yet inexpensive Programmable Logic Controller (PLC). The PLC can be programmed using the EMBEDDED PLC – ISaGRAF Workbench in any of the standardized automation control programming languages IEC 61131-3: Sequential Function Chart (SFC), Function Block Diagram (FBD), Ladder Diagram (LD), Structured Text (ST) and Instruction List (IL). The ISaGRAF Workbench also provides full simulation, program debugging tools and on-line monitoring of the PLC applications.

The Single Board Computer, or the Target, comes pre-loaded with the EMBEDDED PLC Firmware Kernel which executes the application generated by the ISaGRAF Workbench. The Firmware Kernel also provides the communication interface between the Target and the Workbench.



## Installation of the Software

Insert the EMBEDDED PLC BL2500 CD-ROM and install the *ISaGRAF Workbench V3.50*:

1. Open **ISaGRAF\_V3.50** folder and double-click on **ISaGRAF.EXE** to launch the ISaGRAF installation wizard. Follow the instructions provided by the wizard to proceed with the installation.
2. Once all the ISaGRAF files have been copied, the ISaGRAF Projects Manager icon is added to your desktop and the ISaGRAF Program Group is added to your main Programs group.

Install the *EMBEDDED PLC Board Support Package for BL2500*:

1. Go back to root directory of the CD-ROM, open BL2500C\_BSP\_V1.04\_9-0003-006\ISaGRAF folder and double-click on INSTALL.EXE to launch the ISaGRAF installation wizard.
2. Enter the location where the ISaGRAF Workbench was installed (default is **C:\ISAWIN**) and press **Install** button. The installation wizard will update the ISaGRAF directory with the I/O boards, C functions, C function blocks and sample applications for the EMBEDDED PLC BL2500 target.

## Licensing the ISaGRAF Workbench

The Application Kit entitles you to a 32 I/O points ISaGRAF V3.50 Workbench software license. To obtain the software license follow these instructions:

1. Open the ISaGRAF License Manager (**Start** menu → **Programs** → **ISaGRAF 3.5** → **Licensing**). On the Available Components select **ISaGRAF 3 Software License** and press **Add** button. Click Option **32** on **Number of IO Variables** box and press **OK** button. The Setup Code **SET: WDX32-WDE15** will be displayed in the Setup Code box.
2. If you have access to the Internet and have an e-mail account:
  - 2.1. Press Proceed... button. A new e-mail message will be displayed. Fill out the information on the message body: Contact details and Workbench Serial Number (located on the License Registration Form), and send it to [support@oem.net.au](mailto:support@oem.net.au). The e-mail client must be running before pressing Proceed... button.
  - 2.2. Alternatively, you can compose manually a new e-mail message indicating the Workbench Serial Number that appears in the License Registration Form, User Code 1, User Code 2, and Contact details, and send it to [support@oem.net.au](mailto:support@oem.net.au).
3. If you do not have an e-mail address or access to the Internet, copy the User Code 1 and User Code 2 into the ISaGRAF License Registration Form and send the completed form to OEM Technology Solutions by fax (Fax Number: +61 2 9966 9429).



Setup Code: SET:WDX32-WDE15  
User Code 1: 256058298  
User Code 2: 954669

### Note:

You can use ISaGRAF Workbench for a trial period of 30 days before requiring licensing. When not licensed, you can not create, modify or export IEC programs to a library, or export variables to ASCII text file.

4. The ISaGRAF software license consists of two sets of 4 Registration Keys. Upon reception of the software license, open License Manager and follow the instructions on Step 1. Make sure Setup Code is **SET: WDX32-WDE15**.
5. Enter the first set of Registration Keys and press **Register** button. Setup Code will change to **SET: WDE15**. Enter the second set of Registration Keys and press **Register** button again. In the Selected Components **ISaGRAF 3 Software License (Active) – WDX32** (in grey) will be listed. Press **Close** button to close the License Manager. Congratulations! Your ISaGRAF Workbench is now licensed.



Setup Code: SET:WDX32-WDE15  
User Code 1: 256058298  
User Code 2: 954669  
Proceed...

Registration

Registration Key 1:   
Registration Key 2:   
Registration Key 3:   
Registration Key 4:   
Register

## Hardware Connections

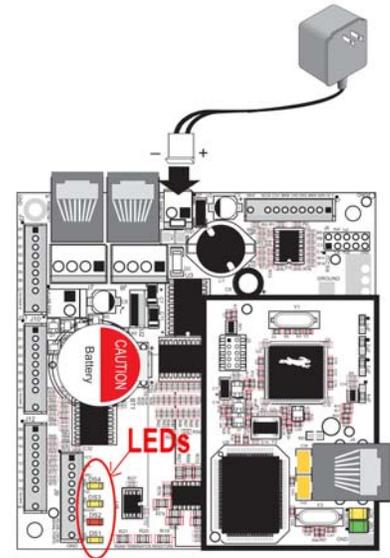
### Connect Power Supply

Connect the AC adapter to header J2 on the BL2500 as shown in the figure. Match the friction lock tab on the friction-lock connector to the back of header J2 on the BL2500 as shown. The friction-lock connector will only fit one way. Plug in the AC adapter.

Application Kits sold outside North America include a friction-lock connector that can be connected to header J2 on the BL2500. Connect the leads from your power supply to the friction-lock connector to preserve the polarity indicated in the figure. The power supply should deliver 8 – 40 VDC at 500 mA.

DS1 (yellow) and DS2 (red) LEDs indicate the Firmware Kernel status after the board has been powered up. If after 10 seconds DS2 (red) is turned off and DS1 (yellow) starts blinking, the Firmware Kernel is licensed and active.

If DS2 (red) remains turned on during more than 10 seconds, it indicates that Kernel requires licensing. If DS1 and DS2 are off after powered-up, it indicates that the board has no EMBEDDED PLC Firmware Kernel loaded. In both cases, contact your local distributor.



### Connect Ethernet Cable

The BL2500 comes pre-configured to use TCP/IP protocol and with the following settings:

IP address = 192.168.1.100

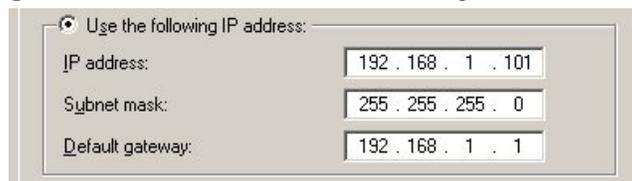
Netmask = 255.0.0.0

Default Gateway = 192.168.1.1.

Use the Ethernet crossover cable supplied in this Kit to connect the RJ-45 Ethernet port on the BL2500 (header J4 on the RabbitCore module) to the RJ-45 Ethernet port on your PC. If your PC is currently connected to a LAN, disconnect it and connect the Ethernet crossover cable between the BL2500 target and your PC.

To configure your PC with the IP address and netmask to be used by the sample program follow these instructions (you might need Administrator privileges to perform these steps):

1. Go to Control Panel (**Start** button → **Settings** → **Control Panel**) and start **Network Connections**.
2. Select **Local Area Connection** and choose Properties (**File** menu → **Properties**).
3. Select **Internet Protocol (TCP/IP)** and press **Properties** button.
4. Click on **Use the following IP Address** and fill in the following fields:



5. Press **OK** button to close the **Internet Protocol (TCP/IP) Properties** window. Press **OK** button to close the **Local Area Connection Properties** and to update the new TCP/IP values.
6. To verify the communication between your PC and the BL2500 use the **ping** command. Open a Command Prompt window (**Start** button → **Programs** → **Accessories** → **Command Prompt**) and type

```
C:\>ping 192.168.1.100
```

The command output should display the replies from the BL2500 target.

#### **Note:**

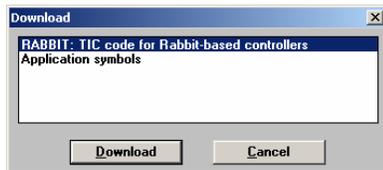
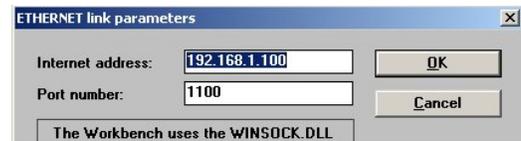
If you want to use a different IP address on the BL2500, The *EMBEDDED PLC BL2500 User's Manual* provides complete information about configuring the BL2500 communication parameters.

## Running a Sample Program

Once you have established connection between your PC and the Target PLC, follow these instructions to run the SORTING sample application. This sample application displays a SpotLight which shows different tokens being sorted depending on size and colour (see the Project Description at the bottom of the Projects Management window):

1. Start ISaGRAF Workbench by double-clicking on the ISaGRAF 3.5 shortcut on your desktop. On the **Projects Management** window, double-click on the *sorting* project.

2. Select **Debug** menu → **Link setup**. On the **PC-PLC link parameters** window check the Target Slave Number is set to 1 and ETHERNET communication port is selected. Press **Setup** button and check the IP address of the BL2500 target is set to 192.168.1.100. Press **OK** button to close this window.

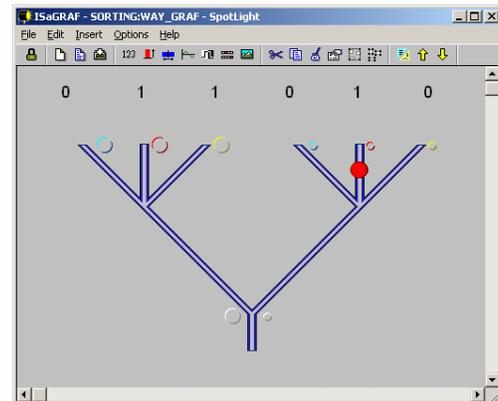


3. Select **Debug** menu → **Debug** to open the **Debugger** window. The **Debugger** window will display “No application” message. On **Debugger** window, select **File** menu → **Download**. Select “RABBIT: TIC code for Rabbit-based controllers” on the Download window and press **Download** button.

### Note:

If the **Debugger** window indicates that an application is running (<application name> active), stop it before downloading a new one. Press **Stop** button  on the toolbar or select **File** menu → **Stop application**.

4. A progress bar on the **Debugger** window will show the progress of the downloading process. Once the downloading is completed the application will run immediately and the **SpotLight** window shown on the left will be displayed.



## TROUBLED?

If you experienced problems running this application, such as an error message “Cannot install communication”, make sure that the TCP/IP connection between the Target PLC and your PC is alive (use ping command). See previous section on how to configure TCP/IP parameters. If connection is alive, repeat in the same order the step-by-step instructions in this section.

If you still can not run this sample application, go to Chapter 7 (FAQ and Troubleshooting) of the EMBEDDED PLC BL2500 User’s Manual, which contains more information about how to troubleshoot your particular problem.

## Where Do I Go From Here?

Chapter 3 of the *EMBEDDED PLC BL2500 User’s Manual* provides step-by-step instructions on how to run other sample applications and create a simple PLC application. The User’s Manual also contains a complete software and hardware reference for the BL2500 running the EMBEDDED PLC system. This document is located in the **Documentation** folder of the CD-ROM (**EmbeddedPLC\_BL2500UM\_V4.pdf**).

The *ISaGRAF User’s Manual* describes in detail how to use the ISaGRAF Workbench. It includes also a complete reference of the IEC 61131-3 programming languages. This document can be obtained from the CD-ROM (**ISaGRAF.pdf**, located in the **Documentation** folder).

If there are any problems:

- Check the FAQ and Troubleshooting chapter of the *EMBEDDED PLC BL2500 User’s Manual*.
- Contact OEM Technology Solutions Technical Support ([support@oem.net.au](mailto:support@oem.net.au)).