USER'S MANUAL

Revision: 0

LEAD FREE
Pb
RoHS
COMPLIANT

HEC-P2000 Series Harsh Environment Controllers

Covered Models:

HEC-P2000
HEC-P2001
HEC-P2010

Divelbiss CORPORATION

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WARNING!!

The HEC-P2xxx, as with other programmable controllers must not be used alone in applications which could be hazardous to personnel in the event of failure of this device. Precautions must be taken by the user to provide mechanical and/or electrical safeguards external to this device. This device is NOT APPROVED for domestic or human medical use.

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Getting Started

This section explains how to read this manual and understand the symbols and information that it contains.

To begin using your HEC Controller, you will need to follow these steps:

- Install the P-Series EZ LADDER Toolkit if not already installed (not included).
- Configure the HEC Controller in the EZ LADDER Toolkit Project Settings.
- Using purchased or self-made cables, connect the Input Power and Programming Port.
- Write a ladder diagram program.
- Install the HEC Kernel if this is a new unit from the factory.
- Download and run the program on the HEC Controller.

Refer to the appropriate sections of this manual for details on the above items.

How to Use this Manual

In this manual, the following conventions are used to distinguish elements of text:

BOLD	Denotes labeling, commands, and literal portions of syntax that must appear exactly as shown.
italic	Used for variables and placeholders that represent the type of text to be entered by the user.
SMALL CAPS	Used to show key sequences or actual buttons, such as OK, where the user clicks the OK button.

In addition, the following symbols appear periodically in the left margin to call the readers attention to specific details in the text:

Warns the reader of a potential danger or hazard associated with certain actions.

Appears when the text contains a tip that is especially useful.

Indicates the text contains information to which the reader should pay particularly close attention.

All Specifications and Information Subject to Change without Notice

The HEC-P2xxx Controller Overview

The HEC-P2xxx Harsh Environment Controller is a power P-Series Harsh Environment Controller in the original smaller harsh environment package. The HEC-P2xxx is based on the P-Series PLC on a Chip™. This P-Series PLC on a Chip™ combines the easy to use functionality of the original PLC on a Chip with new exciting features and possibilities.

The HEC-P2xxx boasts the following capabilities based on the model:

- 8 to 32VDC Operation
- -40°C to 80°C Operating Temperature Range
- 8 Digital Inputs, Sinking or Sourcing (in groups)
- 3 Digital Inputs may be used as High Speed Counter Inputs with Software De-bounce Control
- 3 Digital Inputs may be used as a Quadrature Inputs with Software De-bounce Control
- 8 Digital Outputs, rated 2 Amps DC, All Support Pulse Width Modulation (PWM)
- Dual Serial Port Capability (RS232 / RS485)
- Wi-Fi Communications via Modbus TCP, Programming Port, Webserver or Cloud Portal Solutions
- Cellular Data Connectivity for Cloud Portal Solutions
- GPS Functionality using GPS Port and External GPS Module
- Supports Multiple Modbus Ports
- Internal Micro SD Card
- Single CAN Port, Support Divelbiss OptiCAN, SAE J1939, NMEA 2000
- One Programmable LEDs and Status/Watchdog LED
- Real Time Clock
- Retentive Memory, FRAM and EEPROM Storage

Some of the features listed above are based on the HEC-P2xxx model purchased. To gain the use of some features, other features may become unusable or not available. Refer to the table below and the individual feature sections in this manual for details.

The HEC-P2xxx Models & Features Overview

The following table will identify which features and options are supported based on the model of the HEC-P2xxx controller.

Model	Features				
	Wi-Fi	Cellular	GPS	Webserver	Cloud Portals
HEC-P2000	X	X	●	X	X
HEC-P2001	●	X	●	●	●
HEC-P2010	X	●	●	X	●

X = Not Supported / Not Installed
● = Supported / Installed

FCC Certifications & Labeling

Both the Cellular (HEC-P2010) and Wi-Fi (HEC-P2001) equipped models are shpped with required labeling attached for FCC compliance based on the certifications of the installed communications modules. Each of the following are the same as found on the controllers based on model.

HEC-P2001 FCC LABEL

Contains FCC ID: 2AC7Z-ESP32WROOM32U
The enclosed device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) This device must accept any interference received, including interference that may cause undesired operation.

HEC-P2010 FCC LABEL

Device Uses Approved Radio: NL-SW-LTE-S7618RD
Contains FCC ID: N7NHL7618RD
The enclosed device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) This device must accept any interference received, including interference that may cause undesired operation.

IMEI_____

Configuring the HEC-P2xxx Target in EZ LADDER Toolkit

Before you can program and use the HEC-P2xxx Controller, it must be configured as a target within the P-Series EZ LADDER Toolkit. For help with installing or using P-Seriesl EZ LADDER, please refer to the P-Series EZ LADDER Toolkit User's Manual.

1. In EZ LADDER, from the File Menu at the top, click **PROJECT** then **SETTINGS**. This will open the *Project Settings* Window. Select **HEC-P2000** as the target from the choices. Refer to Figure 1.1. Verify the Port is correct and the baud rate is 57600.

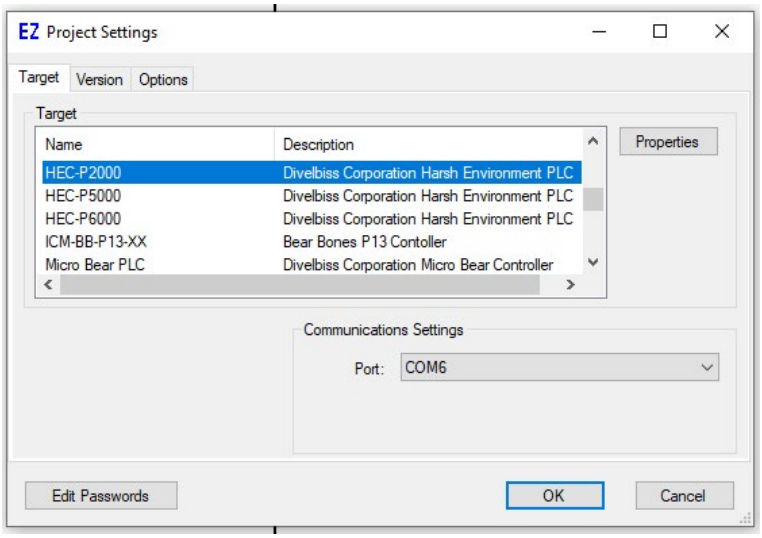


Figure 1.1 - Project Settings Window

2. Click the **PROPERTIES** button to open the *HEC-P2000 properties* window.

3. Using the drop-down menu, select the model of the HEC-P2000 Series Controller (HEC-P2000, HEC-P2001 or HEC-P2010). Refer to Figure 1.2. Click **OK** to close the HEC-P2000 Properties window and the click **OK** to close the Project Settings window. Additional configuration settings are available from these sub-menus.

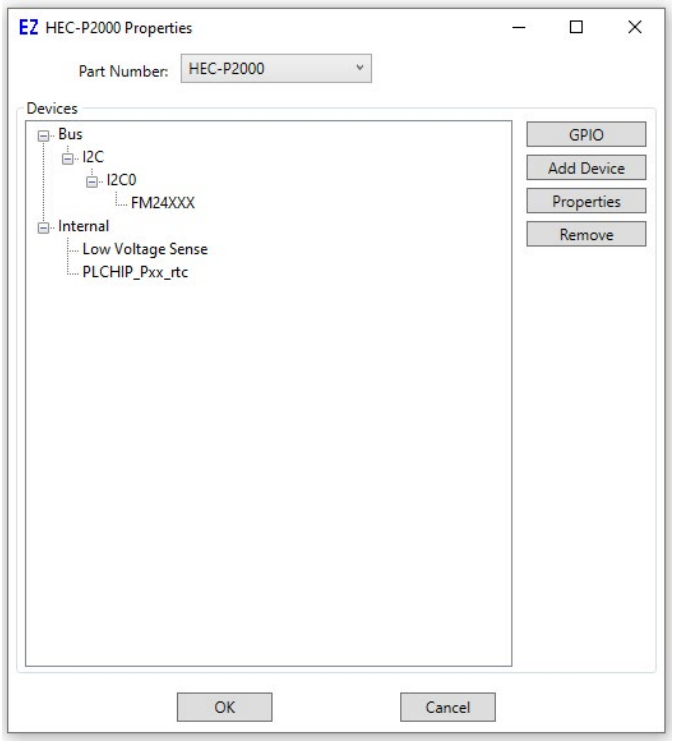


Figure 1.2 - HEC-P2000 Properties Window

Loading the HEC-P2xxx Kernel

THE HEC-P2XXX WILL NOT FUNCTION UNLESS THIS STEP (KERNEL LOADING) IS COMPLETED.

The kernel is the firmware for the controller and to provide greater flexibility and reliability, HEC Controller shipments are factory shipped **without** a kernel. If this is a new unit from the factory, it will be necessary to load the kernel before a ladder program can be downloaded. If the kernel is already loaded, this step is not required. To upgrade a kernel, see the P-Series EZ LADDER Toolkit User's Manual.

To install the HEC-P2xxx's kernel:

1. Verify the target has been configured (see ***Configuring the HEC-P2xxx Target in EZ LADDER Toolkit***).

2. Connect the Programming cable(s) from the computer to the HEC-P2xxx. See the ***Programming Port*** section.

3. Create a small one-rung program with a normally open (direct contact) and an output tied together. You may also open a pre-existing program for the HEC. EZ LADDER Toolkit includes a sub-directory (...EZ LADDER\Kernel Install Start Programs\)which has starter programs for each target to load the kernel. Choose ***GetStarted_HEC-P2xxx.dld***.

4. Click the 

(Compile) button

5. Click the 

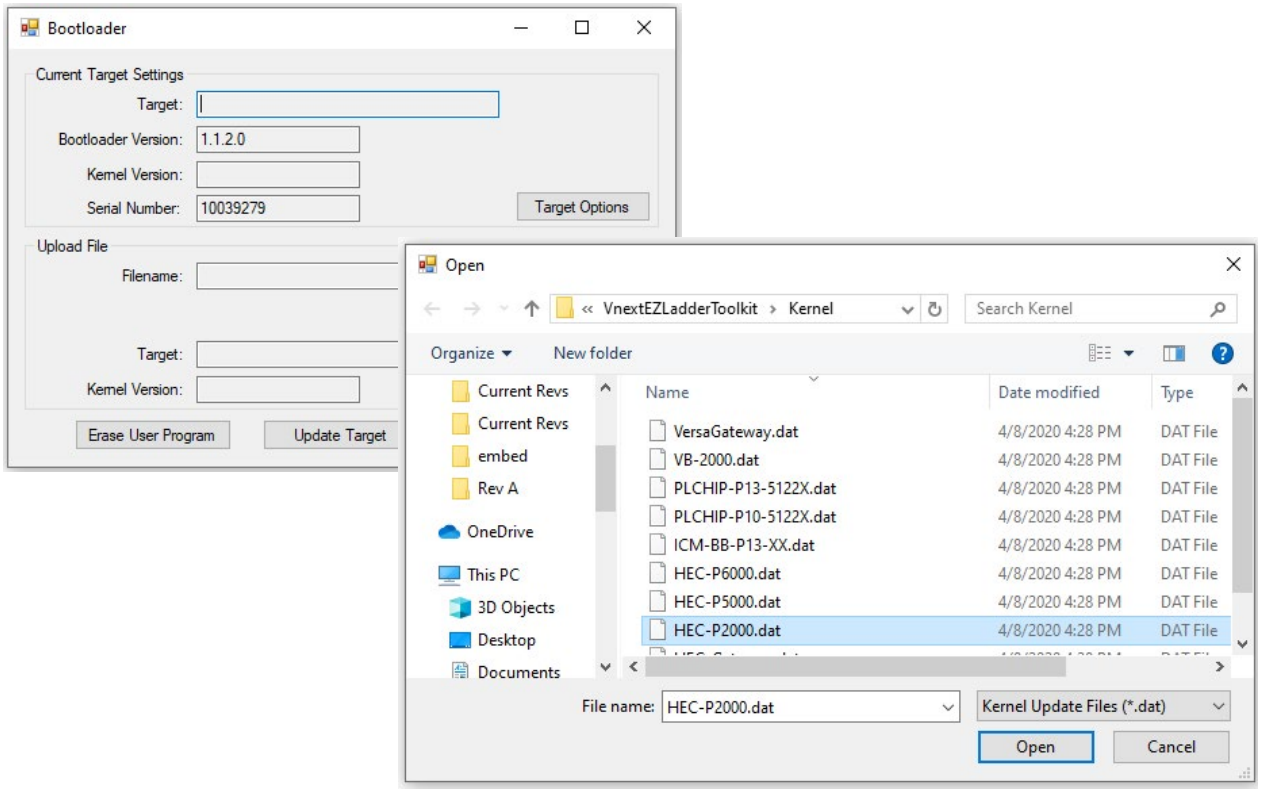
(Monitor) button to change from the *Edit* to *Monitor* Mode.

6. Click the 
(Connect) button to connect to the target. A dialog will appear automatically when no kernel is loaded. If this dialog does not appear, click **PROJECT** then **BOOTLOADER**.

7. Click the **BROWSE** button and select the target's kernel (by partnumber) located by default at C:\Program Files\EZ Ladder\Kernel\

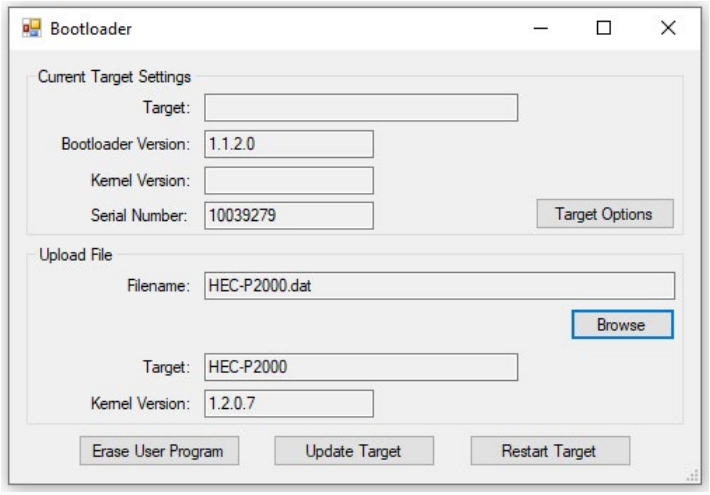
The following are kernel names and descriptions:

File Name	Description	To be Used on (Partnumber)
HEC-P2000.dat	Kernel for HEC-P2xxx	HEC-P2000, HEC-P2001, HEC-P2010



8. Click the **OPEN** button to finish the kernel selection. Make sure the correct kernel is chosen.

9. Click the **UPDATE TARGET** button to install the kernel.



10. A dialog box will appear to show the status of the kernel installation. This could take a couple of minutes to install.

11. When the dialog windows close, the installation is complete. The HEC-P2xxx is ready to use and may be connected to and programs may be downloaded.

Getting to Know the HEC-2xxx

The HEC-P2xxx Controller is designed to provide powerful programmable features in a tough, harsh environment resistant package. The main features of the HEC-P2xxx are accessed via sealed Deutsch connectors that will be referred to as the 'A' connector which is grey and the 'B' connector which is black. Additional Serial Port (RS232/RS485) Connections are available via an 8 pin M12 cable from betwen the A and B connectors.

Refer to Figure 1.3, it it illustrates the HEC-P2xxx Controller.

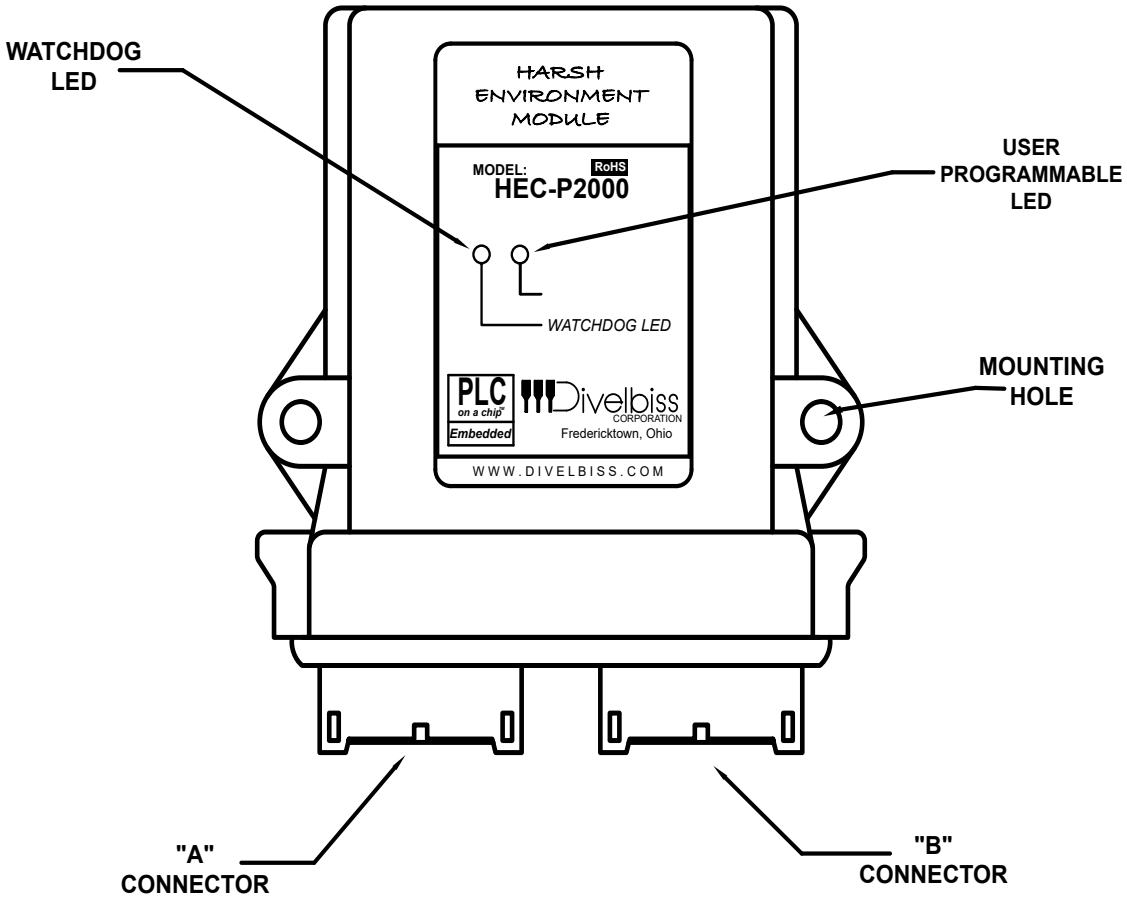


Figure 1.3 - HEC-P2xxx Product Drawing

Each HEC connector is a Deutsch sealed connector with 12 connections each.

The mating connectors for the HEC's connectors are sold separately. Connectors may be purchased as kits or cable assemblies may be purchased with the mating connectors pre-wired with flying leads on one end.

In addition to connectors and kits for standard wiring, several programming break-out cable assemblies may be purchased.

Refer to Figure 1.4 for the HEC-P2xxx A and B connector front view Pin Assignments.

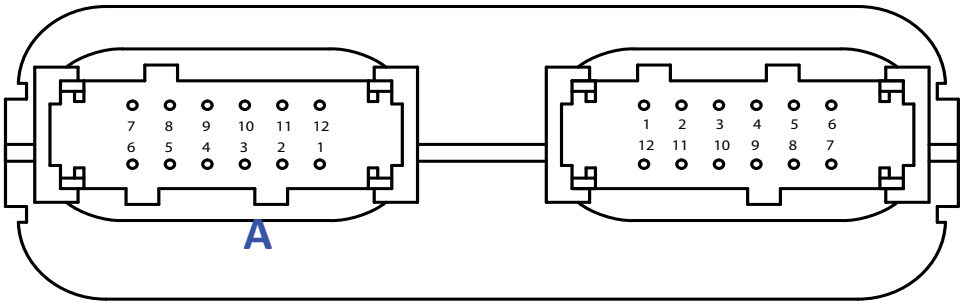


Figure 1.4 - HEC-P2xxx A / B Connector Front View

A and B Connector Pin Functions

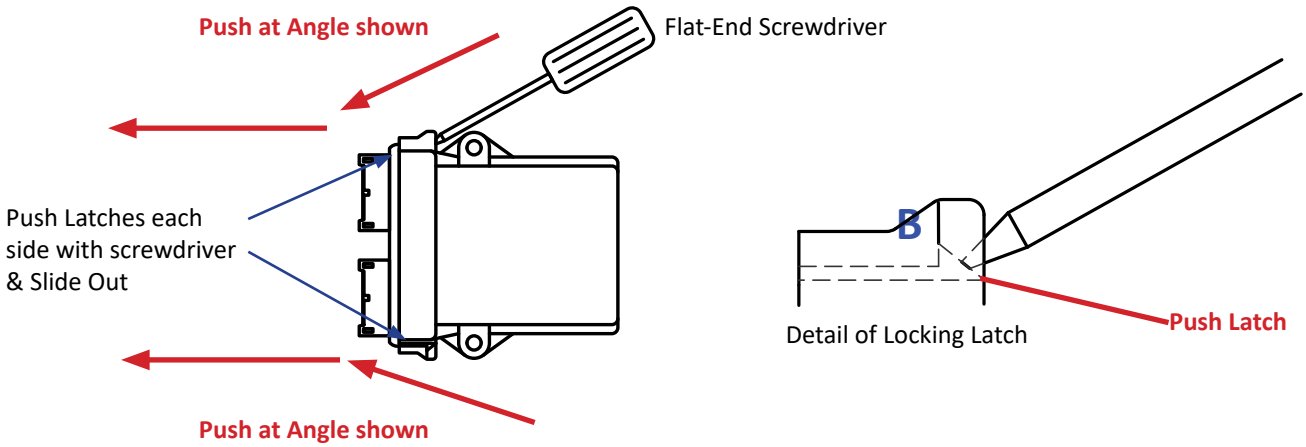
	CONNECTOR 'A' (GRAY)		CONNECTOR 'B' (BLACK)
Pin 1	Input 4 (GPI4)	Pin 1	Output 0 / PWM 0 (GPO0/PWM0)
Pin 2	Input 5 (GPI5)/CNTR2/QUAD IDX	Pin 2	Output 1 / PWM 1 (GPO1/PWM1)
Pin 3	CAN Hi	Pin 3	Output 2 / PWM 2 (GPO2/PWM2)
Pin 4	CAN Low	Pin 4	Output 3 / PWM 3 (GPO3/PWM3)
Pin 5	Programming Port TX	Pin 5	Output 4 / PWM 4 (GPO4/PWM4)
Pin 6	Programming Port RX	Pin 6	Output 5 / PWM 5 (GPO5/PWM5)
Pin 7	+VDC Input Power	Pin 7	Input 0 (GPI0)
Pin 8	+VDC Input Power	Pin 8	Input 1 (GPI1/)
Pin 9	+VDC Input Power	Pin 9	Input 2 (GPI2)
Pin 10	-DC / Input Power Common	Pin 10	Input 3 (GPI3)
Pin 11	Input 7 (GPI7)/CNTR1/QUAD PHA	Pin 11	Output 7 / PWM7 (GPO7/PWM7)
Pin 12	Input 6 (GPI6)/CNTR0/QUAD PHB	Pin 12	Output 6 / PWM6 (GPO6/PWM6)

Assembling / Dis-Assembling the HEC-P2xxx

To dis-assemble the HEC Controller you will need a flat-head screwdriver.

1. Place the screwdriver as shown, press in on the locking latch (of the connector assembly) and push forward gently simultaneously to slide the locking latch out of the enclosure .

2. Repeat this for the second side and slide the entire connector assembly with the printed circuit board out of the enclosure taking care not to tangle or break the serial wires or any antenna connections (if so equiped - Wi-Fi or Cellular).



To assemble the HEC Controller:

1. Align the connector assembly with printed circuit board into the enclosure. The printed circuit board wil align with the slots in the enclosure.

2. Slide the assembly completely into the enclosure until the locking latches are secure. Make sure the serial board and antennal wires do not interfere or get caught on the enclosure's LED pipes (clear plastic tubes).

The HEC-P2xxx Internal Jumpers and Switches

Several of the HEC-P2xxx Controller features have configuration options that must be set by switches or jumpers. These jumpers and switches are internal to the HEC-P2xxx Controller. See ***Assembling/Dis-Assembling the HEC-P2xxx*** Section of this manual for details on how to gain access to these jumpers and switches. Refer ti Figure 1.5 for Dip Switch and Jumper Locations.

Configuration Jumpers			
J1	GPI0-GPI4 Sink/ Source Select	Jumper pin 1 to pin 2 for sourcing inputs.	Jumper pin 2 to pin 3 for sinking inputs.

Configuration Dip Switches			
SW1-1	CAN Port Terminating Resistor	Open/Off: NO Terminating Resistor	Closed/On: Terminating Resistor Installed
SW1-2	RS485 Port Terminating Resistor	Open/Off: NO Terminating Resistor	Closed/On: Terminating Resistor Installed
SW1-3	Real Time Clock Battery Enable	Open/Off: Battery Not Enabled	Closed/On: Battery Enabled
SW2-1	GPI5 NPN/PNP Select	Open/Off: PNP Operation	Closed/On: NPN Operation
SW2-2	GPI6 NPN/PNP Select	Open/Off: PNP Operation	Closed/On: NPN Operation
SW2-3	GPI7 NPN/PNP Select	Open/Off: PNP Operation	Closed/On: NPN Operation

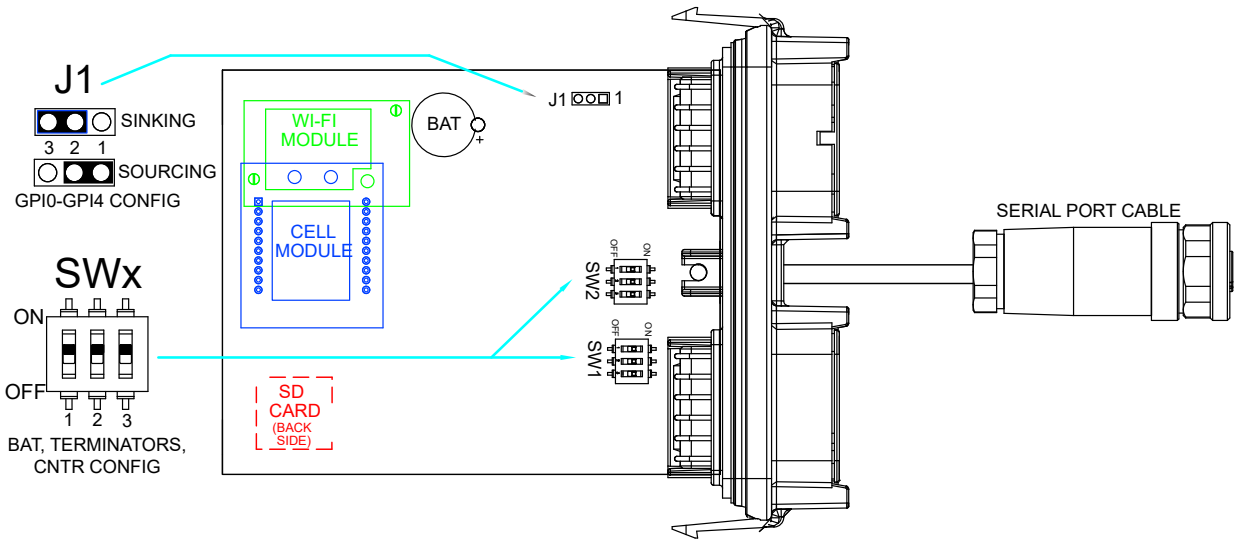


Figure 1.5 - HEC-P2xxx Jumpers, Switches and Features

HEC-P2xxx Features

This section explains the Harsh Environment Controller (HEC-P2000 Series) hardware features, options and information regarding P-Series EZ LADDER Toolkit for basic operation.

Programming Port

The HEC-P2xxx is programmed using its Programming Port (COM 0). This RS232 serial port is only to be used for program ming using Divelbiss P-Series EZ LADDER Toolkit software. This is not a general purpose port and may not be used in any other capacity than programming the controller itself.

The Programming Port defaults to:

Baud:	57600
Parity:	None
Data Bits:	8
Stop Bits :	1

The HEC-P2xxx Programming Port is wired through the A Connector just as other features. The Programming Port requires a NULL MODEM cable or connection to the computer to establish communications between P-Series EZ LADDER Toolkit and the HEC Controller.

This connection may be made by manufacturing your own programming cable. The mating connector for the HEC-P2xxx Programming Port may be purchased as a kits (HEC-10, Requires special Crimp Tool) or a complete pre-wired assembly for the A Connector (HEC-100). Ideally, the best option is to purchase the HEC-910 Breakout Cable Assembly. This cable assembly connects in-line with all connected devices and provides an RS232 9-pin D Male connector as the interface. This also requires a null modem cable (ICM-CA-34) that connects from the HEC-910 to the computer serial port. While this is the most commonly used programming cable set, other programming cable set options are available. In addition, a USB to Serial converter is required if your comptuer does not have a serial port.

It is highly recommended to purchase the HEC break-out cable (HEC-910) and the Null-modem cable from Divelbiss to ensure proper pin-out and connections. Most connection issues are a result of incorrect self-made programming cables. It is also recommended to purchase the USB to Serial converter from Divelbiss, as the converters we offer have been tested and are known to function properly.

Refer to Figure 2.1 for Direct Connections and Figure 2.2 for the HEC-900 Break-out method.

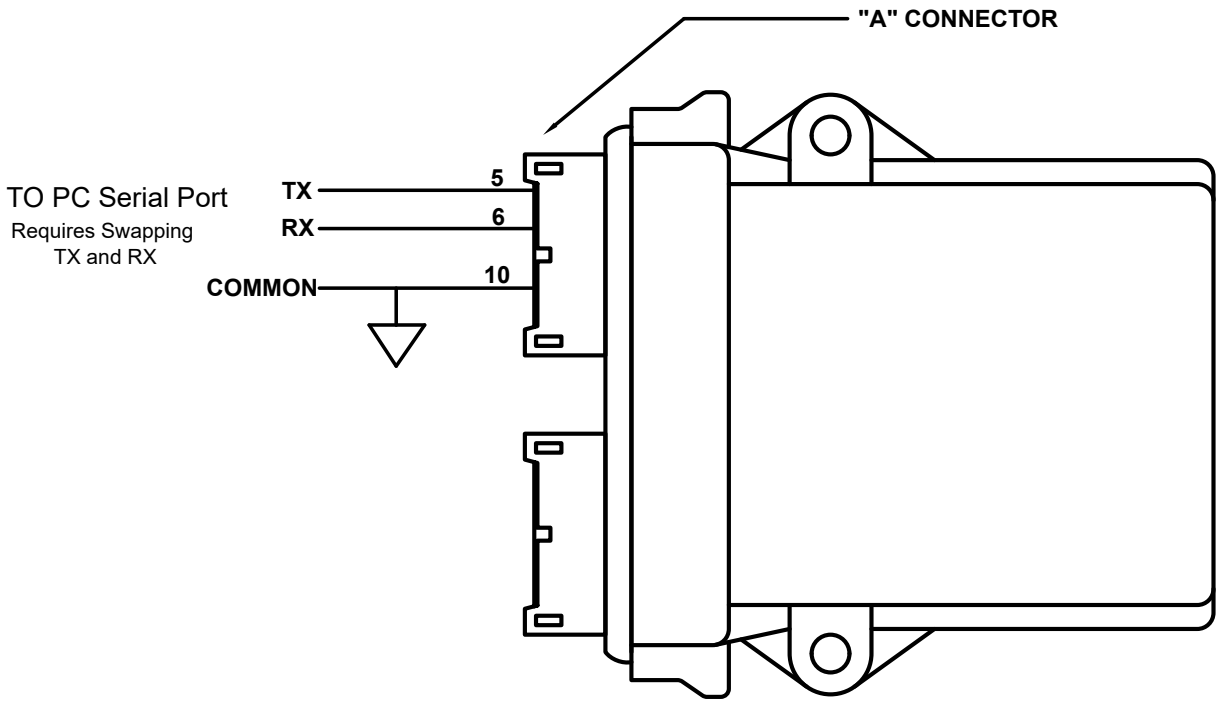


Figure 2.1 - Programming Port Direct Connection

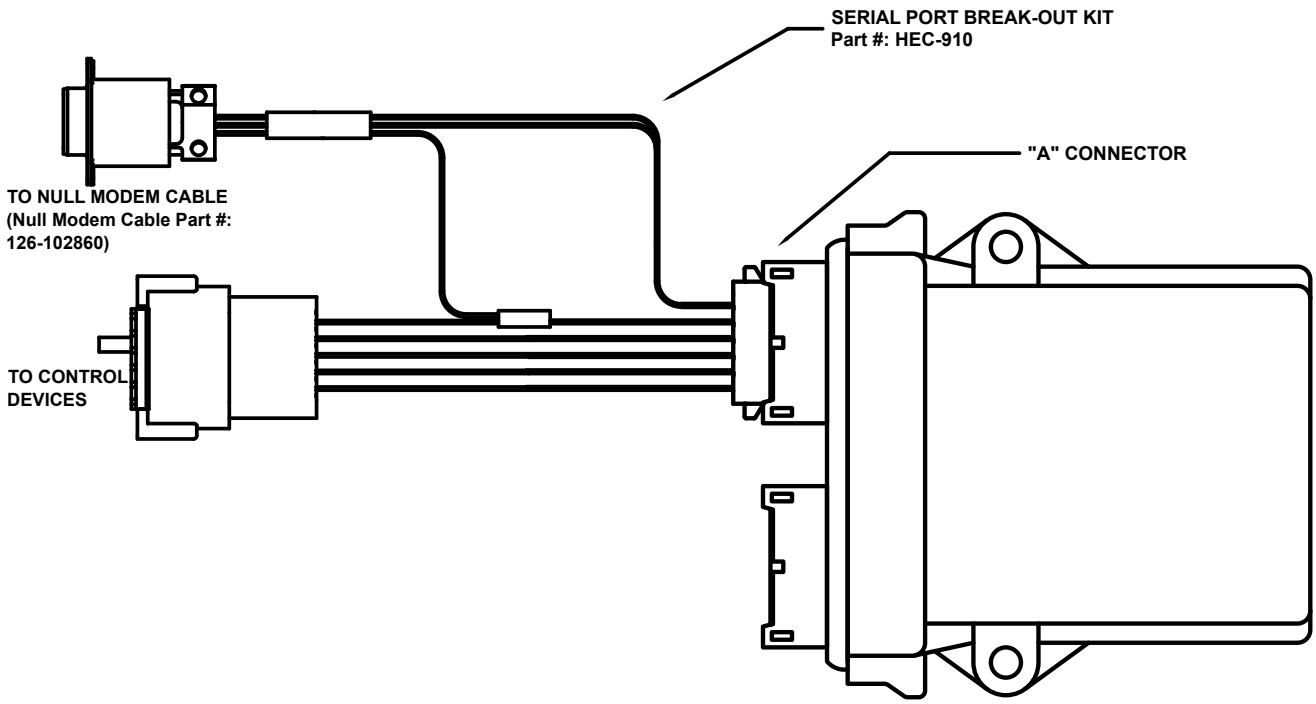


Figure 2.2 - Programming Port Break-out Connections

Watchdog LED

The operating status of the HEC-P2xxx can be determined the by Watchdog LED. When the Watchdog LED is flashing at a slow rate, approximately once per second, then there is no ladder program executing. When the Watchdog LED is flashing at a fast rate (several times per second), a program has been loaded and it is executing.

If the Watchdog appears to be flickering at a very fast rate, the Kernel is not running. Either the kernel needs to be installed or the controller reset to restart the kernel if it is installed.

Should the Watchdog LED not flash at all, first check the input power. If the input power is correct and there is still no Watchdog LED, contact Divelbiss Technical Services.

Status LED

The HEC-P2xxx provides a programmable status LED that can be seen from the front of the unit. This LED is programmed in the ladder diagram by using the STATUS variable that is automatically created when the target is selected.

Input Power

The HEC-P2xxx may be powered using 9-32VDC. The input power must be of sufficient supply to drive the HEC control ler and all the digital outputs (based on the load currents for each). Due to wire size limitations of the HEC-200x-E-R connectors, multiple input power pins are provided to allow for *parallel* input power lines to increase the amount of cur rent (for heavier output loads). For an input power wiring diagram, refer to Figure 2.3.

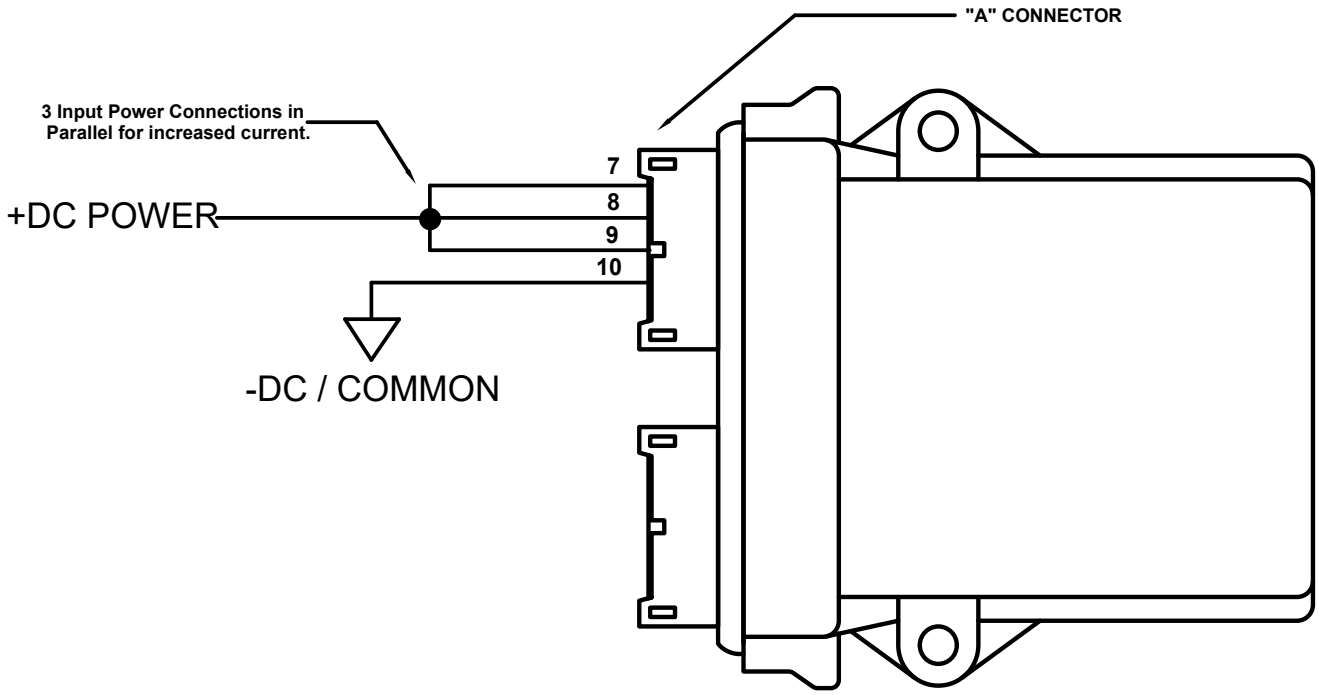


Figure 2.3 - Input Power Connections

Mounting

The HEC-P2xxx mounts simply using two mounting screws. The HEC can easily accept mounting screws up to 1/4" in diameter.

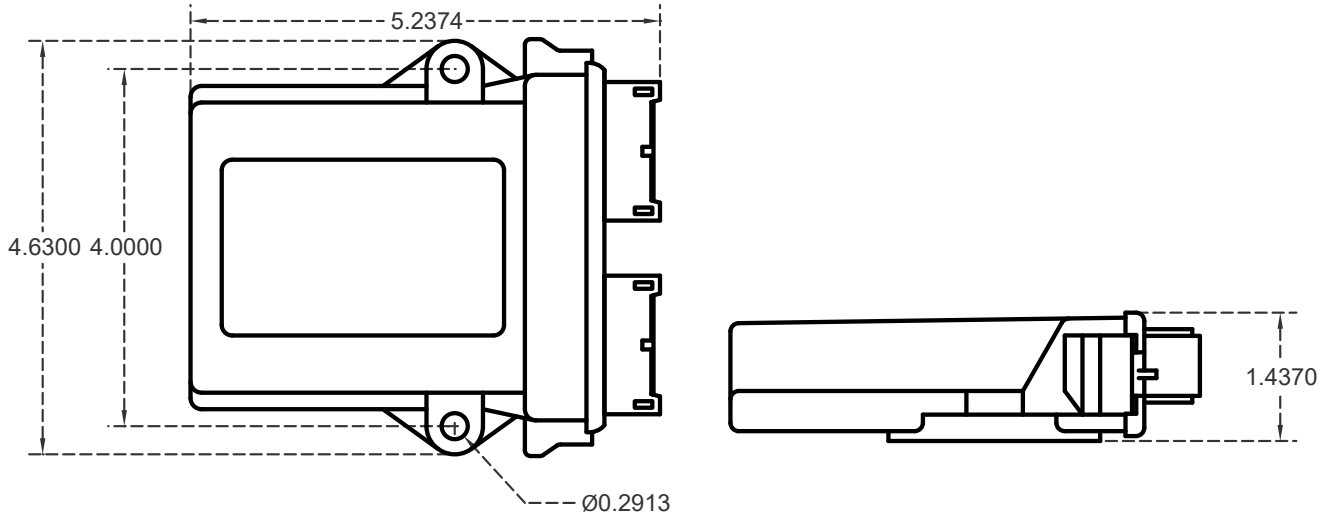


Figure 2.4 - HEC-P2xxx Mounting

Digital Inputs

The HEC-P2xxx includes 8 on-board digital inputs. They are identified in EZ LADDER Toolkit and this manual as GPI0 through GPI7. Each digital input can accept an input voltage of 8-32VDC.

GPI5 - GPI7 may be implemented as three different features: digital inputs, hight speed counter inputs and quadrature inputs (phase A, phase B and Index); while GPI0 - GPI4 can only be used as general purpose digital inputs. For information on using GPI5 - GPI7 as high speed counter inputs, refer the ***Counter Inputs*** Section of this User's Manual. For information on using GPI5 - GPI7 as quadrature inputs, refer the ***Quadrature Inputs*** Section of this User's Manual.

GPI0-GPI4 Digital Inputs

GPI0-GPI4 digital inputs may be configured as sinking or sourcing via an internal jumper (J1) as a group (all 5 inputs are sinking or all 5 inputs are sourcing). When configured for Sinking, all digital inputs are referenced to the HEC-P2xxx GND input pin (A connector). Figure 2.5 is a typical connection diagram for sinking inputs. When configured for Sourcing, all digital inputs source power from the HEC-P2xxx +V input pins (A connector). Figure 2.6 is a typical connection diagram for sourcing inputs. Figure 2.7 is the typical input circuit schematic for GPI0-GPI4).

See the ***HEC-P2xxx Internal Jumpers and Switches*** section for the location of the J1 Jumper (Figure 1.5).

Each digital input (GPI0-GPI4) has built-in de-bounce circuitry.

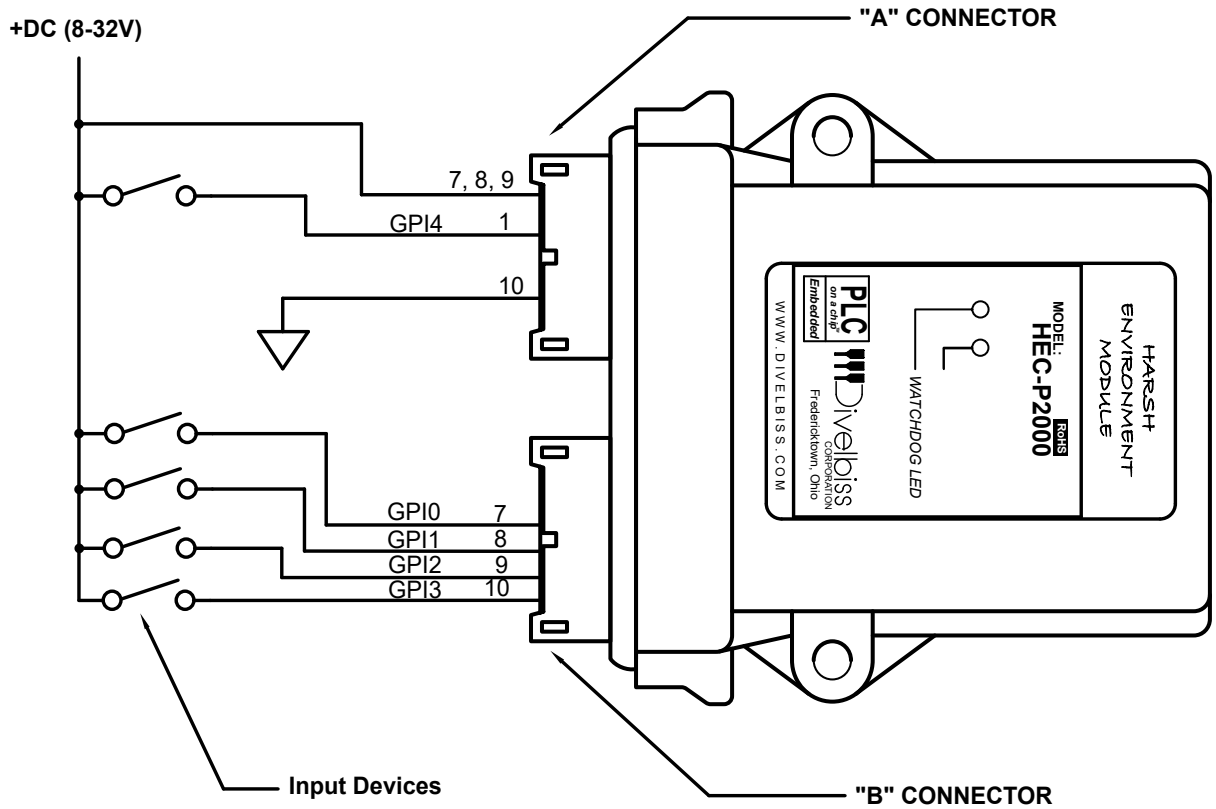


Figure 2.5 - Sinking Inputs Diagram (GPI0-GPI4)

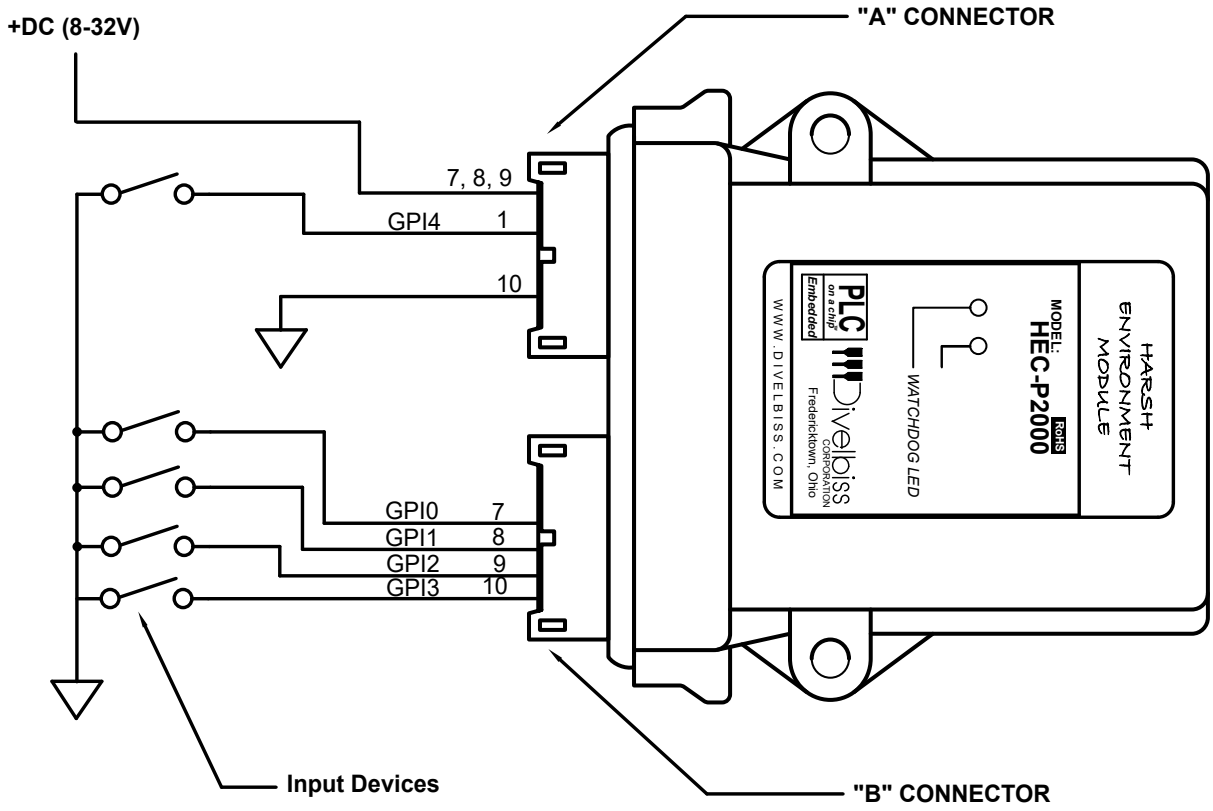


Figure 2.6 - Sourcing Inputs Diagram (GPI0-GPI4)

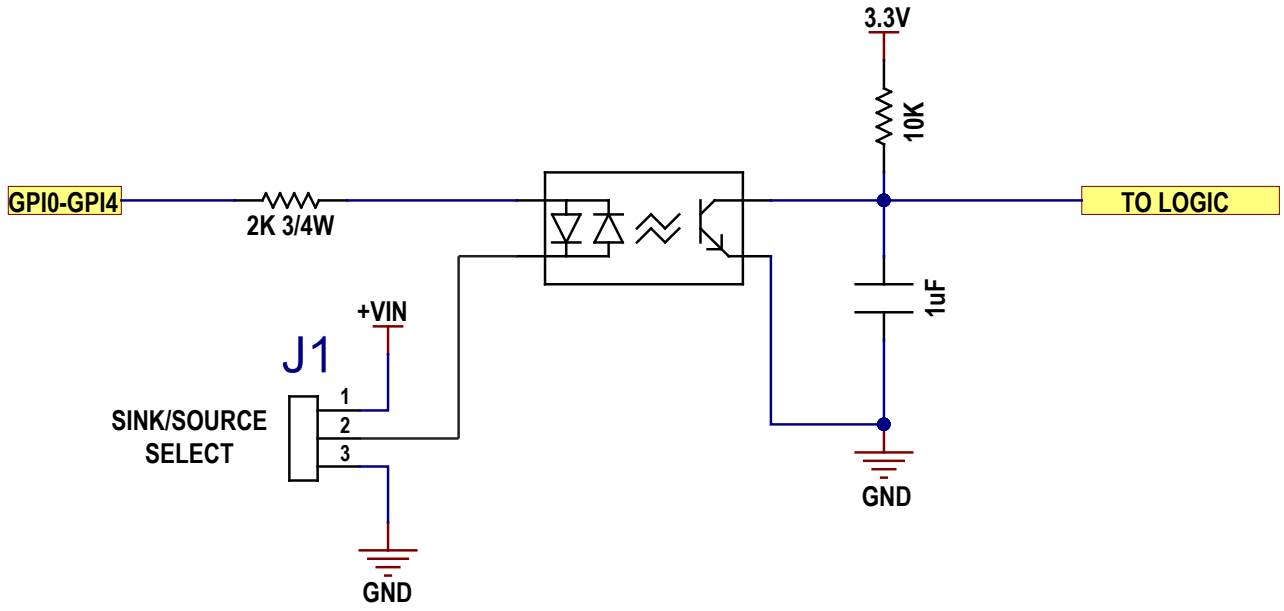


Figure 2.7 - Input Circuit Schematic (GPI0-GPI4)

GPI5-GPI7 Digital Inputs

GPI5 - GPI7 digital inputs are individually configurable (per channel) as PNP or NPN operation. This allows each channel to be configured to operate as a standard sinking (PNP) input (sinks voltage supplied by the external device) or sourcing (NPN) input (that supplies voltage to external devices - ideal for open-collector output devices). Each channel is configured individually by internal DIP Switches.

SW1-1 OFF sets GPI5 to PNP, SW1-1 ON sets GPI5 to NPN.
SW1-2 OFF sets GPI6 to PNP, SW1-2 ON sets GPI6 to NPN.
SW1-3 OFF sets GPI7 to PNP, SW1-3 ON sets GPI7 to NPN.

See the ***HEC-P2xxx Internal Jumpers and Switches*** section for the location of the Dip Switches (Figure 1.5).

Each of the GPI5-GPI7 digital inputs have software controlled de-bounce circuitry. They are controlled by boolean variable (outputs) in the ladder program named GPI5DEB, GPI6DEB, GPI7DEB respectively for GPI5-GPI7. The variables are auto matically created when the target (HEC-P2xxx) is selected. By default, the de-bounce circuitry is OFF. To enable de-bounce for any of these inputs, the corresponding debounce variable (output) must be true. De-bounce is recommended when using the GPI5-GPI7 digital inputs as actual digital inputs to prevent false contact closure readings.

Figure 2.8 is a typical connection diagram for PNP inputs (GPI5-GPI7). Inputs configured for PNP sink to the controller ground (power ground).

Figure 2.9 is a typical connection diagram for NPN inputs (GPI5-GPI7). Inputs configured for NPN are internally pulled to the +V (controller input voltage) via a 1.5K resistor.

Figure 2.10 is the typical input circuit schematic for GPI5-GPI7).

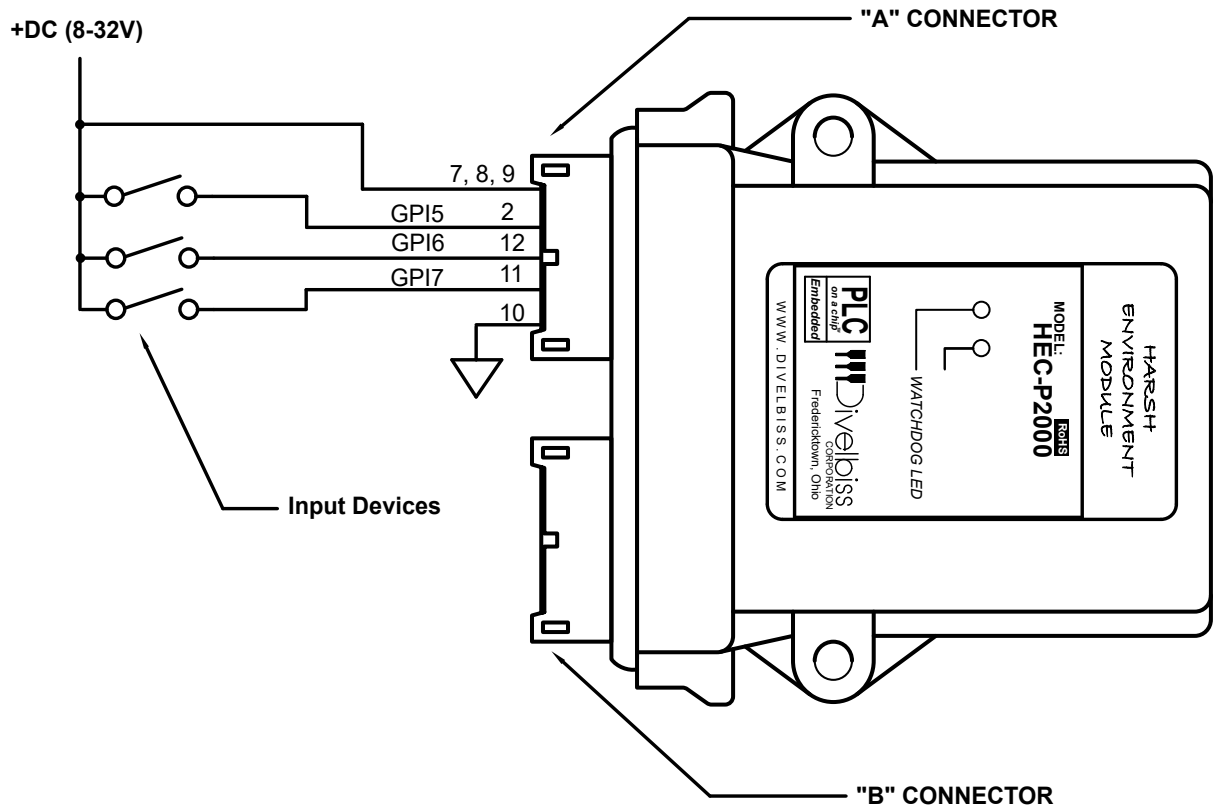


Figure 2.8 - PNP Inputs Diagram (GPI5-GPI7)

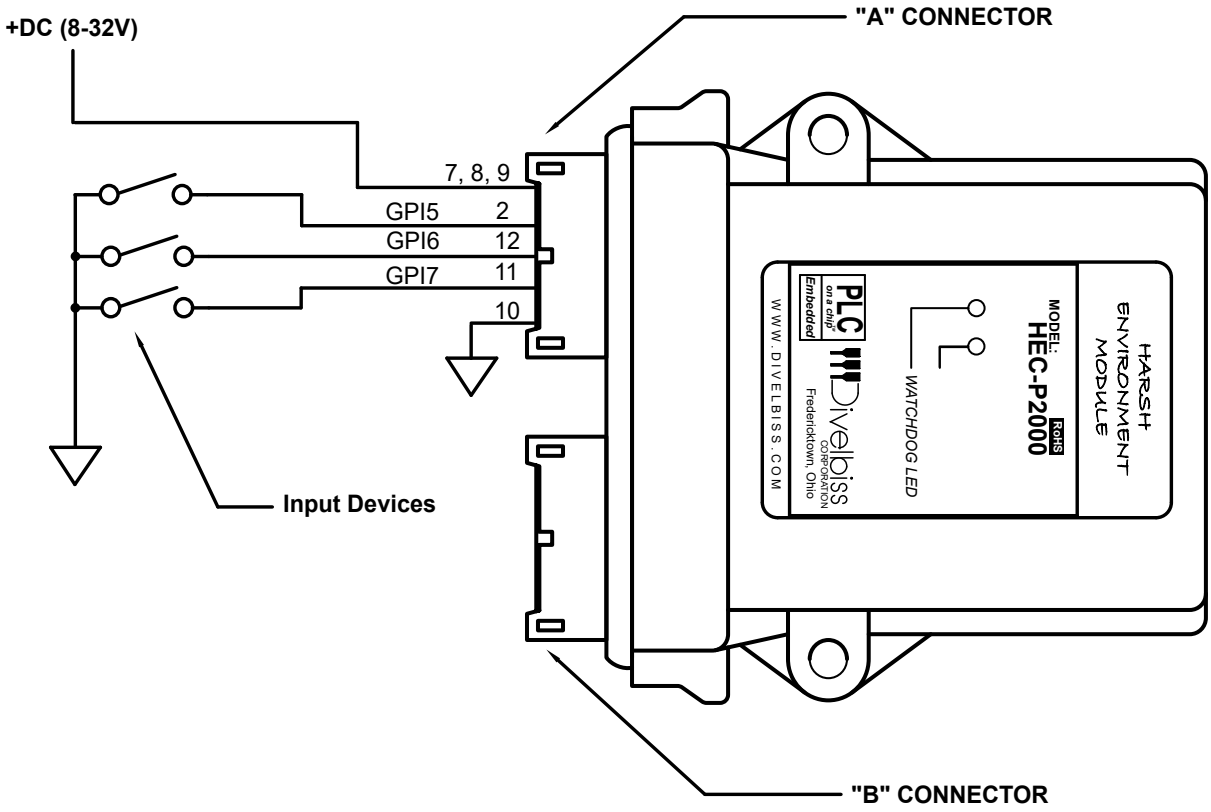


Figure 2.9 - NPN Inputs Diagram (GPI5-GPI7)

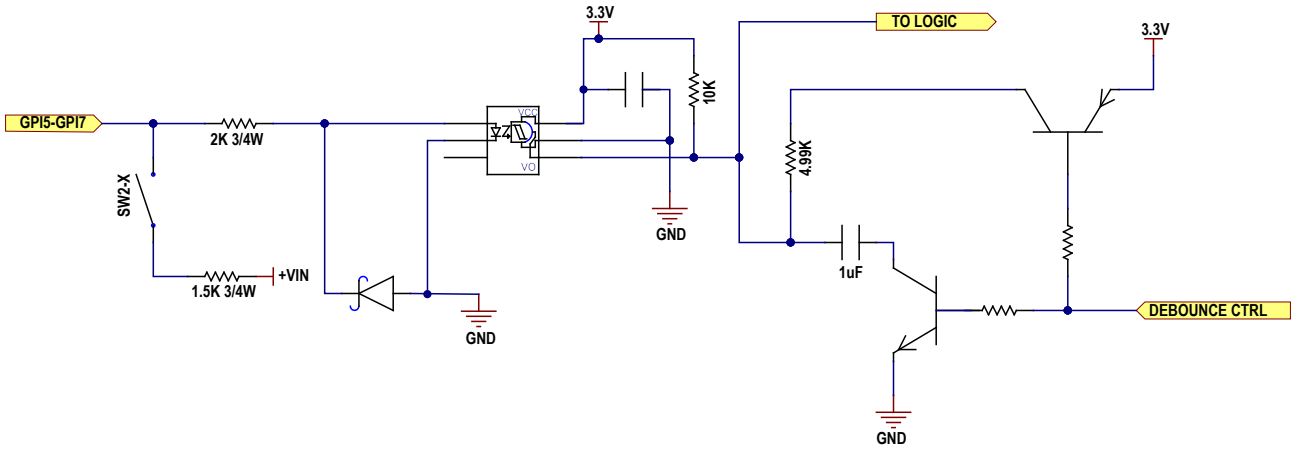


Figure 2.10 - Input Circuit Schematic (GPI5-GPI7)

Using Digital Inputs in the Ladder Diagram

To read a digital input status in a ladder diagram, place and connect the appropriate contact for your needs. The DIRECT CONTACT and INVERTED CONTACT functions are used to read digital inputs in the ladder diagram. When placing the contact, verify you select the correct input address (GPI0 - GPI7) from the provided drop-down menu.

Counter Inputs

As was noted in the ***Digital Inputs*** Section, three of the digital inputs (GPI5 - GPI7) may be utilized as high speed counters. These counters may be configured in EZ LADDER to operate as an up counters, free running timers and triggered timers. These inputs will accept a maximum frequency of 100KHz and are optically isolated to promote noise immunity. These inputs are ideal for anywhere that high speed counting is required; such as calculating RPM, batch counting and more

The counter inputs (GPI5-GPI7) are individually configurable (per channel) as PNP or NPN operation. This allows each channel to be configured to operate as a standard sinking (PNP) input (sinks voltage supplied by the external device) or sourcing (NPN) input (that supplies voltage to external devices - ideal for open-collector output devices). Each channel is configured individually by internal DIP Switches.

SW1-1 OFF sets CNTR2 to PNP, SW1-1 ON sets CNTR2 to NPN.
SW1-2 OFF sets CNTR0 to PNP, SW1-2 ON sets CNTR0 to NPN.
SW1-3 OFF sets CNTR1 to PNP, SW1-3 ON sets CNTR1 to NPN.

See the ***HEC-P2xxx Internal Jumpers and Switches*** section for the location of the Dip Switches (Figure 1.5).

Each of the counter inputs have software controlled de-bounce circuitry. They are controlled by boolean variable (outputs) in the ladder program named GPI5DEB, GPI6DEB, GPI7DEB respectively for GPI5-GPI7. The variables are automatically created when the target (HEC-P2xxx) is selected. By default, the de-bounce circuitry is OFF. To enable de-bounce for any of these inputs, the corresponding debounce variable (output) must be true. De-bounce is typically disabled (off) during counting operations.

Typical High Speed Counter connections are shown in Figure 2.11. Actual connections can vary based on configuration of counter inputs (NPN or PNP).

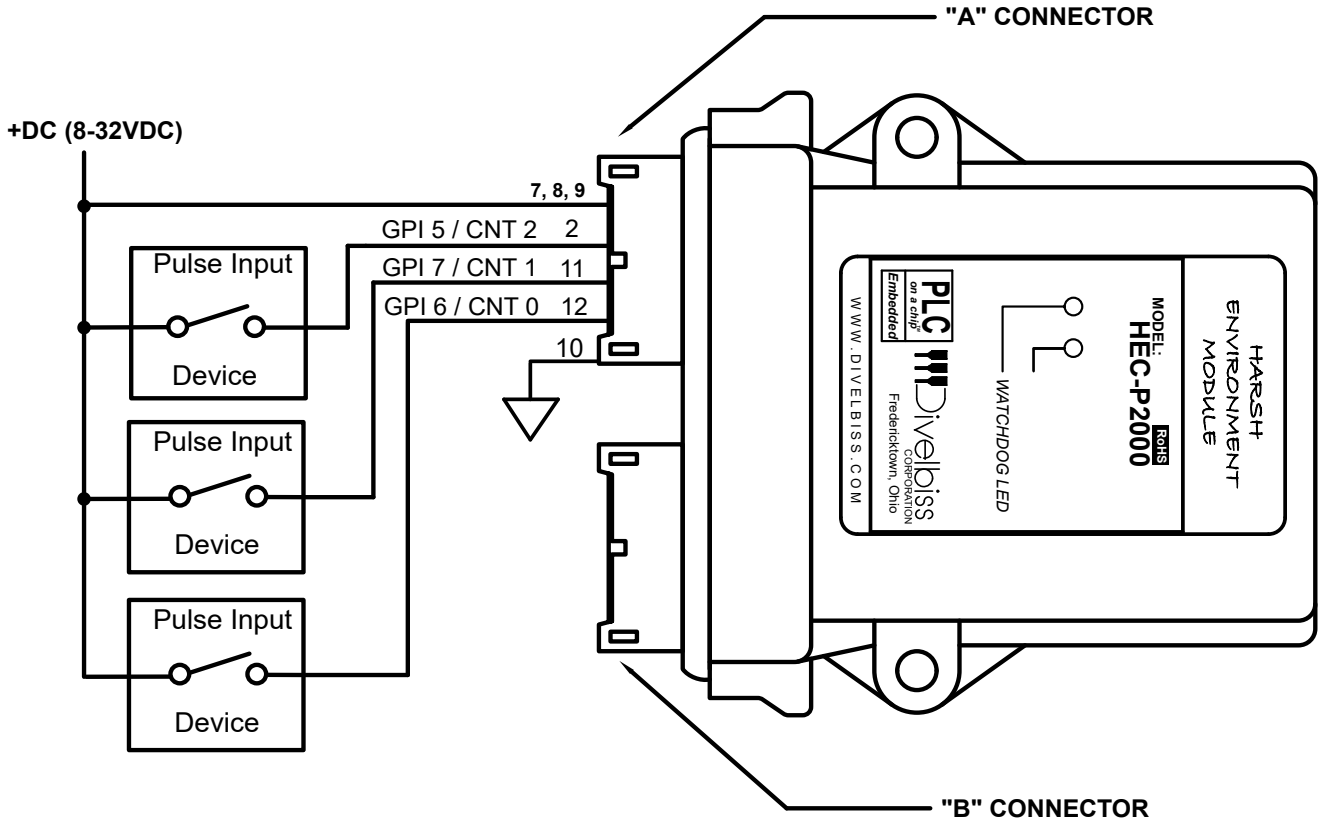


Figure 2.11 - Typical Counter Input Connections (PNP)

Prior to using the high speed counter / timer inputs in the ladder diagram, the counter / timer functionality must be installed and configured in the ladder diagram's Project Settings.

The first step to installing the counter / timer functionality is to install the TimerCounter feature. Using menu, click **PROJECT** then **SETTINGS** to open the *Project Settings* window. With the target **HEC-P2000** selected still, click the **PROPERTIES** button. The HEC-*P2000 Properties* Window will open. Verify the proper actual part number is selected in the Drop-down Part Number select box. Under the Devices, Internal section, if the counter / timer were installed, it would be listed.

To install the counter / timer, click the **ADD DEVICE** button. From the available devices, select **TimerCounter** and click **OK**. Refer to Figure 2.12.

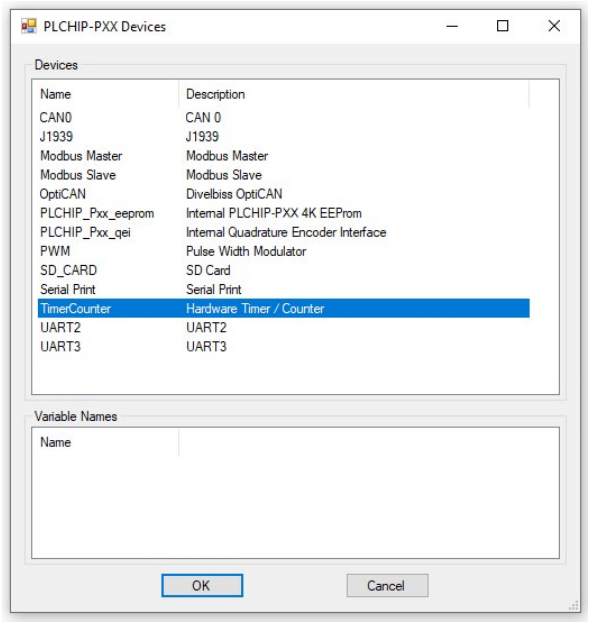


Figure 2.12 - Installing Timer/Counter Device

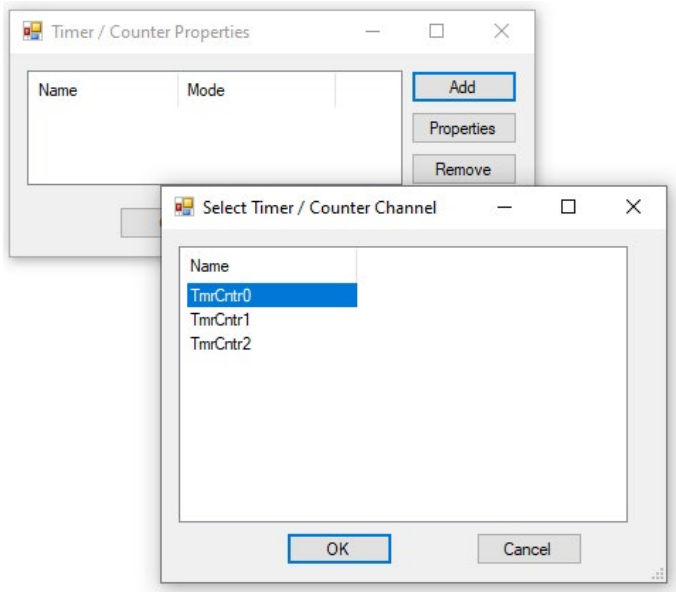


Figure 2.13 - Selecting Counter / Timer Channel

The *Timer / Counter* Properties window will now appear. From this window, the actual counter/timer channel hardware will be installed. Click the **ADD** button. The *Select Timer/Counter Channel* window will appear. From the list provided, select the counter / timer channel to use. Refer to Figure 2.13. When selected, click **OK**.

1. TmrCntr0 is GPI6
2. TmrCntr1 is GPI7
3. TmrCntr2 is GPI5

The *Tmr/Cntr* Channel properties window will now open. Using the Drop-down Mode select box, select the type of operation for this particular counter / timer input. The choices are:

Free Running Timer

The input when configured as a Free Running Timer actually has no input functionality external to the HEC-P2xxx. The counter/ timer channel on the PLC on a Chip™ uses an internal 1MHz reference clock and will count up at a 1 micro-second resolution. The **TimerCounter** function block in EZ LADDER provides additional controls for the timer/counter functionality.

When the Free Running Timer mode is selected, no other configuration is required. Refer to Figure 2.14.

When the free-running timer reaches it's upper counting limit, it will wrap negative and begin counting toward zero. This can be avoided by resetting the timer using the function block.

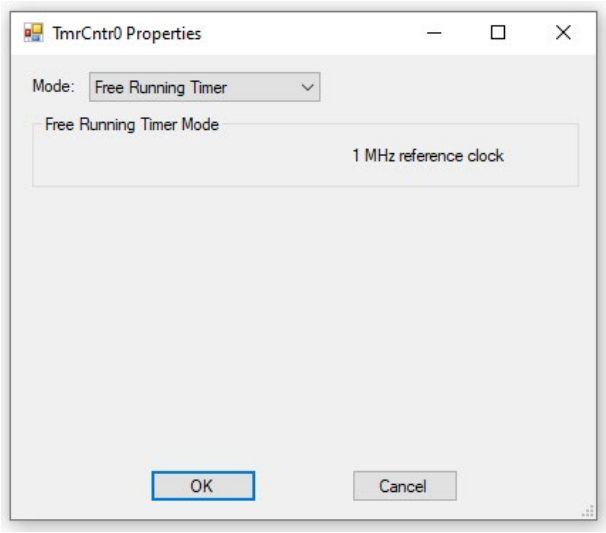


Figure 2.14 - Timer/Counter as Free Running Timer

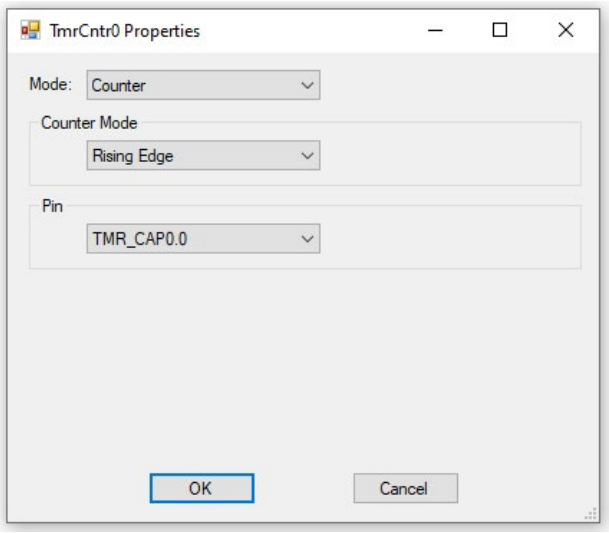


Figure 2.15 - Timer/Counter as Counter

Counter

When configured as a counter, this input will count in the up direction. The **Counter Mode** can be configured for Rising Edge, Falling Edge or Both Edges. The number of counts per pulse on the input depends on the *Counter Mode* configuration.

Select the Counter Mode using the provided Drop-down *Counter Mode* select box. Refer to Figure 2.15. The Pin should be set to the appropriate input (TMR_CAP0.0 for GPI6, TMR_CAP1.0 for GPI7 and TMR_CAP2.0 for GPI5).

If the number of input pulses exceeds the counter's upper counting limit, it will wrap negative and begin counting towards zero. This can be avoided by resetting the counter using the function block.

Timer

When configured as a timer, frequency or period may be measured of the signal to the input. This signal is referenced to a 24MHz clock internally. The operation is dependent on the configuration of the **Timer Mode**.

Select the Timer Mode using the provided Drop-down *Timer Mode* select box. Selecting *Frequency* will configure for measuring the frequency of the signal on the input while selecting *Period* will configure for measuring period. Refer to Figure 2.16.

Click **OK**. the number of times necessary to close and save all the configurations. You should return to the EZ LADDER Toolkit's Edit workspace by clicking **OK**. the number of times required. Remember to Save your ladder diagram using the menu **FILE** and **SAVE** or **SAVE AS.**

To use GPI5 - GPI7 as counters in a ladder diagram, you must use the TIMERCOUNTER function block. This block, when placed in the ladder diagram, will provide a drop-down menu to select which counter to use. Refer to the P-Series EZ LADDER Toolkit User's Manual for details on the TIMERCOUNTER and other function blocks. TmrCntr 0 is GPI6, TmrCntr1 is GPI7 and TmrCntr2 is GPI5.

Individually, the GPI5-GPI7 inputs are designed to be used as a digital input only, high speed counter/timer input only or quadrature input only. EZ LADDER will allow the placement of contacts and /or TIMERCOUNTER functions in any program. Therefore, you can place and use the contacts and the TIMERCOUNTER function block in the same program with the same digital input selected. This can be useful in some programs based on the application, but it is important to know that input contacts will only operate at a fraction of the frequency that the TIMERCOUNTER function block can accurately read.

Each GPi5-GPI7 input can be field selected as either PNP (current sinking) or NPN (to accept signals from open-collector output devices). The type of device is selected by internal dip-switch settings on the HEC-P2xxx. To gain access to these dip-switches, the HEC-P2xxx must be dis-assembled. See the *Assembling / Dis-assembling the HEC-P2xxx* and the *HEC-P2xxx Internal Jumpers and Switches* sections of this manual. Refer to Figure 2.10 in the *Digital Inputs* section of this manual for a schematic diagram of the GP5-GPI7 inputs.

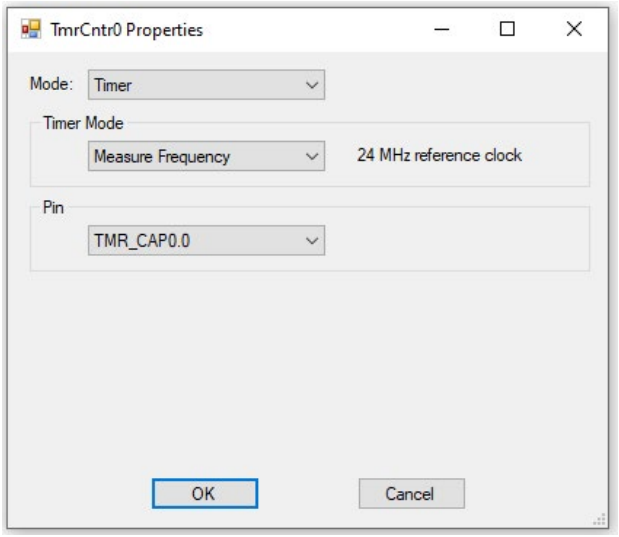


Figure 2.16 - Timer/Counter Timer

Each of the GPI5-GPI7 inputs have software controlled de-bounce circuitry. This circuitry typically should be enabled when these inputs are being used as digital inputs. When configured as counter/timer inputs, the de-bounce should typically be disabled.

The de-bounce circuits for each input (GPI5-GPI7) are enabled and disabled by using the variables (coils) named GPI5DEB, GPI6DEB and GPI7DEB respectively. When the variable (coil) is true, the de-bounce circuit is enabled and when the coil is false, the de-bounce circuit is disabled. The variables GPI5DEB, GPI6DEB and GPI7DEB are automatically created by EZ LADDER when the HEC-P2000 target is selected.

Deleting the de-bounce variables from the program will cause the de-bounce circuit to be enabled. This will reduce the frequency the input can read, resulting in inputs not operating properly depending upon the application.

Quadrature Input

As was noted in the *Digital Inputs* Section, three of the digital inputs (GPI5-GPI7) may be utilized together as a quadrature input that can accept signals from a quadrature encoder. When configured as quadrature inputs (GPI6, GPI7 and GPI5 as CHA, CHB and INDEX respectively), can accept frequencies up to 100KHz. Each input is optically isolated to promote noise immunity.

Each of the GPI5-GPI7 inputs have software enabled de-bounce circuitry. This circuitry typically should be enabled when these inputs are being used as digital inputs. When configured as quadrature inputs, the de-bounce should typically be disabled.

The de-bounce circuits for each input (GPI5-GPI7 are enabled and disabled by using the variables (coils) named GPI5DEB, GPI6DEB and GPI7DEB respectively. When the variable (coil) is true, the de-bounce circuit is enabled and when the coil is false, the de-bounce circuit is disabled. The variables GPI5DEB, GPI6DEB and GPI7DEB are automatically created by EZ LADDER when the HEC-P2000 target is selected.

Deleting the de-bounce variables from the program will cause the de-bounce circuit to be enabled. This will reduce the frequency the input can read, resulting in inputs not operating properly depending upon the application.

Prior to using the quadrature inputs in the ladder diagram, the Quadrature Encoder Interface functionality must be installed and configured in the ladder diagram's Project Settings.

The first step to installing the quadrature encoder interface is to install the PLCHIP_Pxx_qei (Internal Quadrature Encoder Interface) feature. Using menu, click **PROJECT** then **SETTINGS** to open the *Project Settings* window. With the target **HEC-P2000** selected still, click the **PROPERTIES** button. The *HEC-P2000 Properties* Window will open. Verify the proper actual part number is selected in the Drop-down Part Number select box. Under the Devices, Internal section, if the quadrature encoder interface were installed, it would be listed.

To install the Quadrature Encoder Interface, click the **ADD DEVICE** button. From the available devices, select **PLCHIP_Pxx_qei** and click **OK**. Refer to Figure 2.17. The *PLCHIP_Pxx_qei Properties* window will now open. See Figure 2.18.

The PLCHIP_Pxx_qei Properties window is used to configure the quadrature encoder interface for GPI4-GPI7. Some of the common and simple settings such as **Quadrature Mode** and **Flags** are set in this window. Other additional settings are available for configuration. Refer to the P-Series EZ LADDER Toolkit User's Manual for details on the Quadrature Encoder Interface configurations.

Select the **Quadrature Mode** and any other required settings. Click **OK**. the number of times necessary to close and save all the configurations. You should return to the EZ LADDER Toolkit's Edit workspace by clicking **OK**. the number of times required. Remember to Save your ladder diagram using the menu **FILE** and **SAVE** or **SAVE AS.**

To use GPI5-GPI7 in a ladder diagram as a quadrature encoder interface, you must use the CNTR_PXX_QEI, CNTR_PXX_QEI_CMP or CNTR_PXX_QEI_VEL function blocks. Each block has a specific function and relationship to the quadrature encoder interface inputs. Refer to the P-Series EZ LADDER Toolkit User's Manual for details on each of these function blocks.

Each GPi5-GPI7 input can be field selected as either PNP (current sinking) or NPN (to accept signals from open-collector output devices). The type of device is selected by internal dip-switch settings on the HEC-P2xxx. To gain access to these dip-switches, the HEC-P2xxx must be dis-assembled. See the *Assembling / Dis-assembling the HEC-P2xxx* and the *HEC-P2xxx Internal Jumpers and Switches* (Figure 1.5) sections of this manual. Refer to Figure 2.10 in the *Digital Inputs* section of this manual for a schematic diagram of the GP5-GPI7 inputs.

SW1-1 OFF sets INDEX (IDX) to PNP, SW1-1 ON sets Index (INDEX) to NPN.
SW1-2 OFF sets CHA (PHA) to PNP, SW1-2 ON sets CHA (PHA) to NPN.
SW1-3 OFF sets CHB (PHB) to PNP, SW1-3 ON sets CHB (PHB) to NPN.

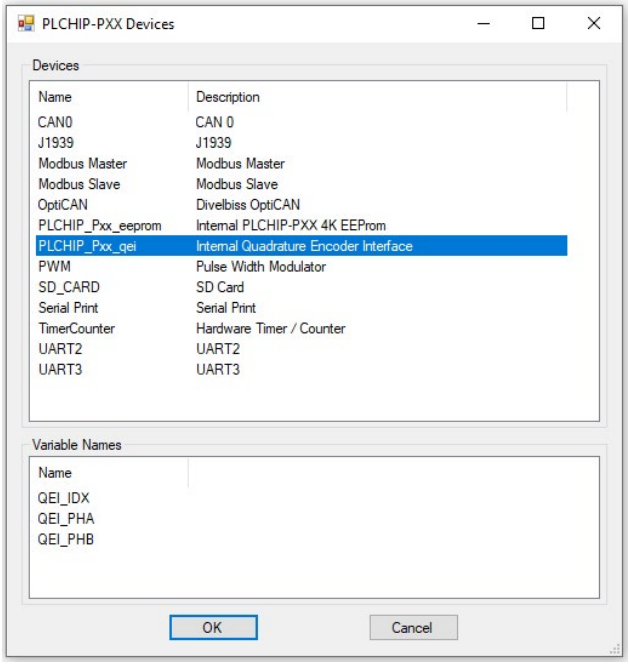


Figure 2.17 - Installing Quadrature Encoder Interface

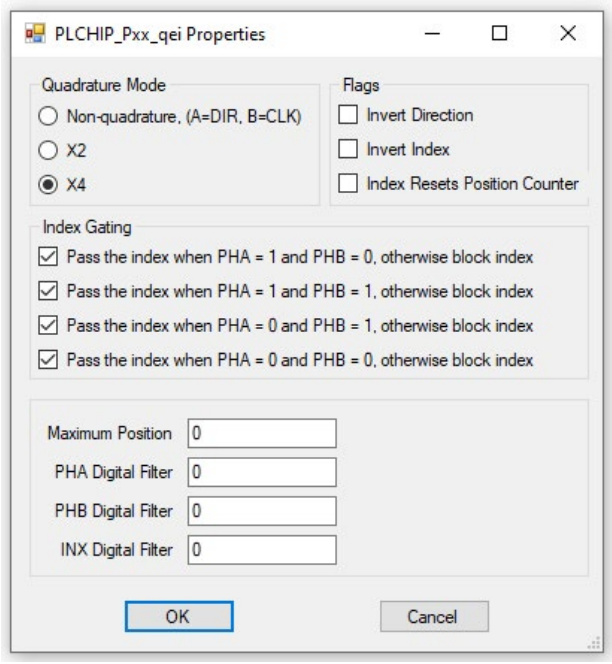


Figure 2.18 - Quadrature Encoder Properties

Digital Outputs

The HEC-200x-E-R includes 8 on-board digital outputs. They are identified in the EZ LADDER Toolkit and this manual as GPO0 - GPO7. These outputs are sourcing, therefore an energized output will source an output voltage equal to the controller input voltage. Refer to Figure 2.19 for typical output connections.

Each output can drive a load up to maximum current rating listed in the specifications section and includes an automatic over-current shutdown safety. In the event an over current condition exists, the output will shut down. This shut down condition is reset when the output is turned off (set to false) in the ladder diagram.

Each output requires a minimum load to operate correctly. Depending upon the device connected to an output, a minimum load resistor may be required. If the output is ON or true regardless of the ladder diagram program, connect a 470Ω to 1KΩ load from the output to input power common.

Each digital output may be configured and used as a digital output or as a Pulse Width Modulation (PWM). Each output may only be used as either digital output or PWM output only. For information on using digital outputs as PWM outputs, refer to the *Pulse Width Modulation Outputs* Section of this manual.

To control a digital output in a ladder diagram, place and connect the appropriate coil for your needs. The DIRECT COIL and INVERTED COIL functions are used to control digital outputs in the ladder diagram. When placing the coil, verify you select the correct output address (GPO0 - GPO7) from the provided drop-down menu.

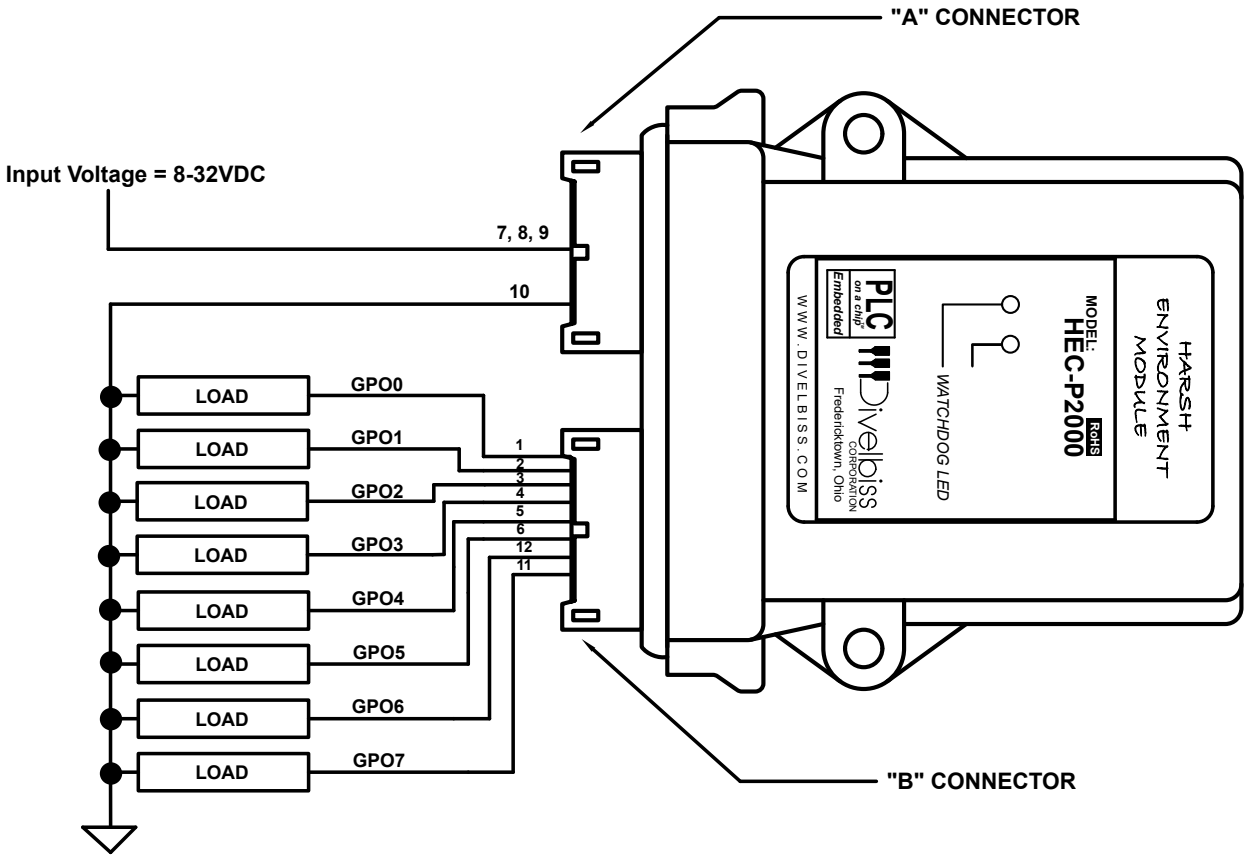


Figure 2.19 - Typical Digital Output Connections

Pulse Width Modulation Outputs

As previously noted, the HEC-P2xxx provides 8 digital outputs of which all may be configured individually and exclusively as either digital outputs or pulse width modulation outputs; therefore, each output may only be used once - as either digital output or PWM output. As the Digital Outputs and PWM outputs are one and the same, refer to Figure 2.19 for typical PWM (Digital Output) output connections.

The PWM channels frequency control is divided into two groups. Group 1 consists of the base frequency for GPO0-GPO5 (PWM0 to PWM5) while group 2 consists of the base frequency for GPO6-GPO7 (PWM6 to PWM7). This allows two frequencies to be used as the base frequency for PWM outputs.

Before Pulse Width Modulation outputs may be used in the ladder diagram, the Pulse Width Modulation Properties must be configured in EZ LADDER Toolkit. To Configure Pulse Width Modulation (PWM) Outputs in EZ LADDER Toolkit:

In EZ LADDER, from the File Menu at the top, click **PROJECT** then **SETTINGS**. This will open the *Project Settings* Window. The **HEC-P2000** was previously selected.

Click the **PROPERTIES** button. The *HEC-P2000 Properties* Window will open. Under the Devices, Internal section, if the Pulse Width Modulator were installed, it would be listed. Click the **ADD DEVICE** button. This will open the *PLCHIP-PXX Devices* window. Select **PWM** (Pulse Width Modulator) from the Devices pane. See Figure 2.20. Click **OK.** The *PWM Properties* window will open.

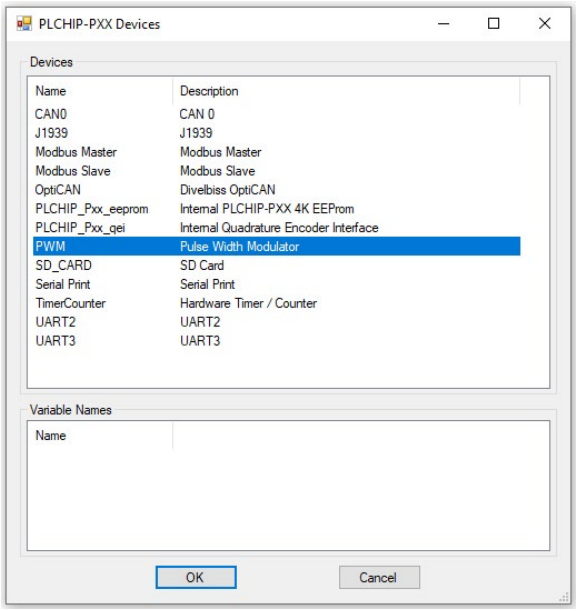


Figure 2.20 - Install PWM Device

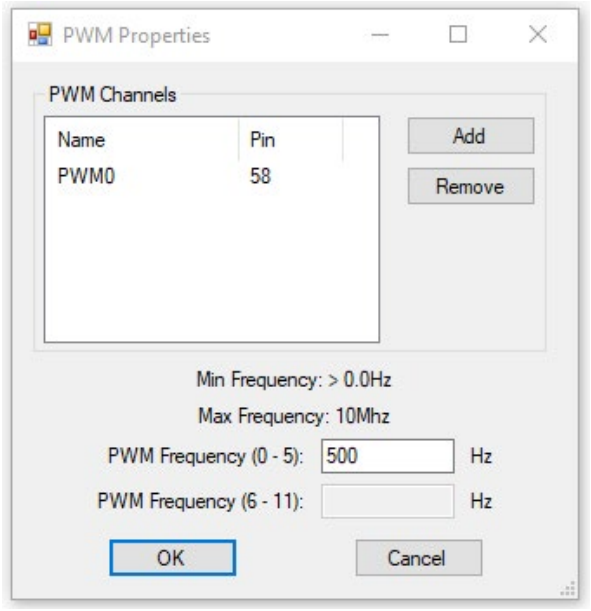


Figure 2.21 - Add Channels & Set Frequency

In the PWM Properties Window, using the **ADD** or **REMOVE** buttons, add the channels of the Outputs that you desire to operate as PWM. Each PWM channel is the same as each GPO channel (GPO0 is the same as PWM0, etc.).

Enter the desired base frequency for the PWM output group (if used). The frequency must be greater than 0 and not more than 10MHz. This frequency is set per each group (of 6 PWM outputs and 2 PWM outputs). See Figure 2.21. Once all the desired channels are added and frequencies set, click **OK** the number of times required to close each of the open windows until you have returned to the main EDIT workspace. Remember to Save your ladder diagram using the menu **FILE** and **SAVE** or **SAVE AS.**

Due to limitations of hardware, the Desired Frequency and Actual Frequency may vary. The Actual Frequency will be the closest attainable frequency to the entered Desired Frequency.

To operate PWM outputs, use the PWM and PWM_FREQ function blocks. For details on using function blocks, refer to the P-Series EZ LADDER User's Manual

General Purpose Serial Ports

The HEC-P2xxx includes two general purpose serial ports; 1 RS232 and 1 RS485. These serial ports may be used for communications via Modbus Master/Slave and custom protocols using Structured Text. In addition, the HEC-P2xxx is compatible with the HEC-GPS module; allowing for GPS positioning (using the RS232 port). See the ***GPS Functionality*** section of the is manual.

The RS232 serial port is accessed in the ladder diagram / project as UART2. The RS485 serial port is accessed in the ladder diagram / project as UART3.

The general purpose serial port connection is achieved by a factory installed cable with an industry standard M12 connector. Figure 2.22 illustrates the general purpose serial port cabling. For cable pin assignments, refer to Figure 2.23.

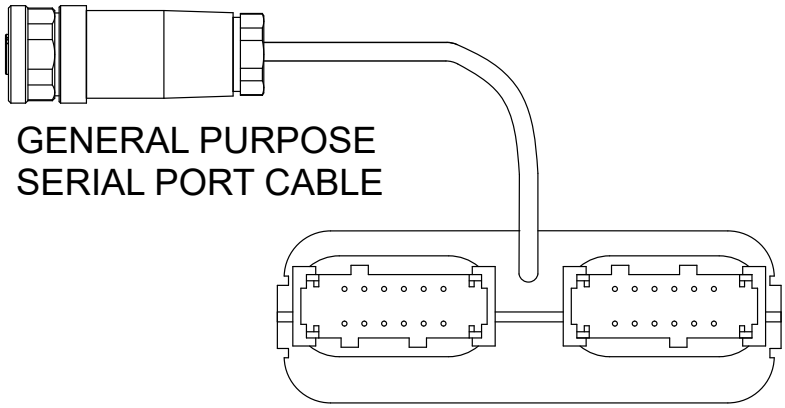
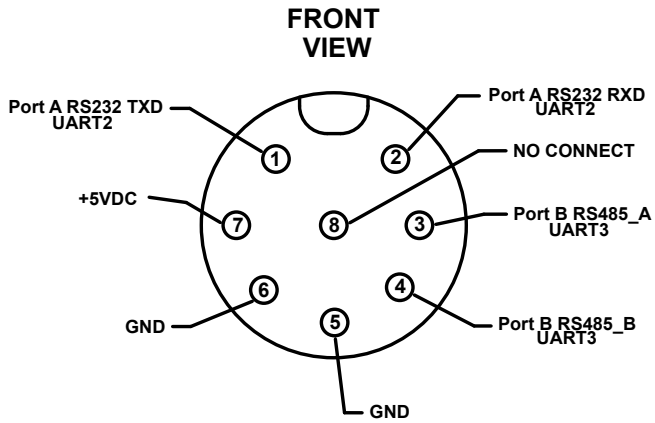


Figure 2.22 - General Purpose Serial Port Cable



Serial Port Connector is an M-12, 8 Pin Connector.

Mfg: TE Connectivity (or similar)
P/N: T4110002081-000 (or similar)

Use compatible Mate as needed.

Figure 2.23 - Cable / Serial Port Pin-Out

When using RS485 (UART3), internal terminating resistors may be used by configuring the internal dip switche SW1-2. When SW1-2 is ON (closed), the terminating resistor is enabled. When SW1-2 is OFF (open), the terminating resistor is disabled. See the *HEC-P2xxx Internal Jumpers and Switches* (Figure 1.5) section for the location of the dip switch.

With the wiring and configuration complete, to use one or more serial ports, they must be installed in the EZ LADDER diagram project and configured.

In EZ LADDER, from the File Menu at the top, click **PROJECT** then **SETTINGS**. This will open the *Project Settings* Window. The **HEC-P2000** was previously selected.

Click the **PROPERTIES** button. The *HEC-P2000 Properties* Window will open. Under the Devices, Bus section, if any UART ports are installed, they would be listed. Click the **ADD DEVICE** button. This will open the *PLCHIP-PXX Devices* window. Select either **UART2** or **UART3** for Port A (RS232) or Port B (RS485) from the Devices pane. See Figure 2.24. When the required UART port has been selected, click **OK.** The *UART Properties* Window will open.

Configure the Serial Port (UART) as required for your application. See Figure 2.25.

The RTS GPIO Pin is only used for RS485. If using RS485, click the drop down and select the only pin listed. This is used for RS485 transmit control.

The Enable ST Buffers check box identifies to enable the structured text UART buffers. This should only be used when using structured text for communications. When enabled, the buffer size must be completed.

When complete, click **OK** the number of times required to close the windows and return to the EDIT workspace. The serial port is now ready to be used. Remember to Save your ladder diagram using the menu **FILE** and **SAVE** or **SAVE AS.**

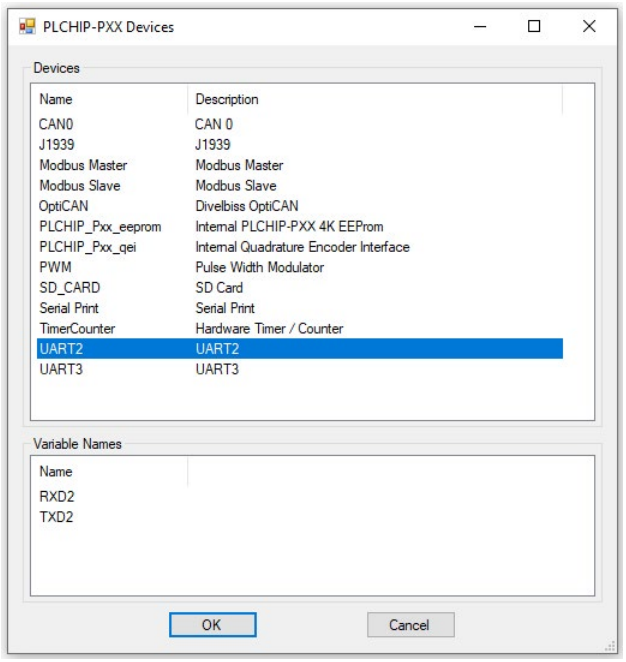


Figure 2.24- Add UART (Serial Port) Device

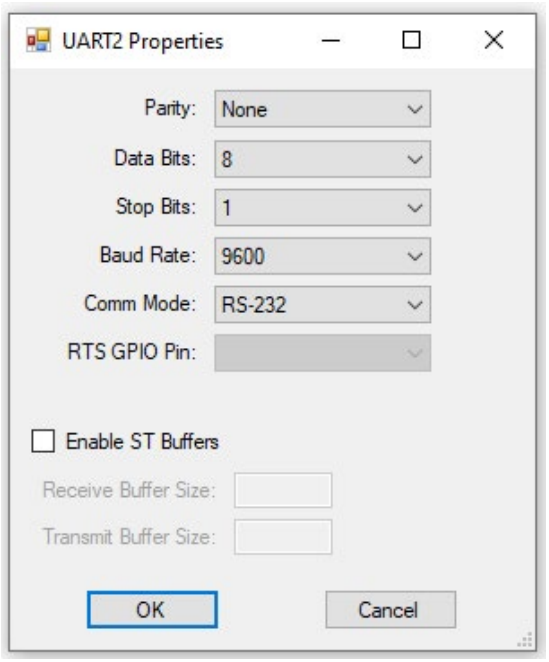


Figure 2.25- UART (Serial Port) Properties

To use Modbus with the Serial Port (UART) as either master or slave, the Modbus feature must be installed similarly as the actual UART was just installed, See the *Modbus Master/Slave* section of the manual.As modbus is a software protocol, it is not covered in detail in this hardware manual - only installing the feature. For details on using Modbus networking, refer to the P-Series EZ LADDER Toolkit Manual.

Additional serial functionality is available when using Structured Text. For details on using Structured Text, refer to the P-Series EZ LADDER Toolkit Manual.

Modbus Master / Slave (Serial Ports)

Modbus Master or Slave may be utilized with the Serial Ports (UARTs). To use Modbus Master or Slave over Serial Ports, Modbus Master/Slave must be installed and configured in the ladder diagram project.

Serial Port(s) (UARTs) must be installed prior to installing or configuring the Modbus Master / Slave using serial ports. Refer to the *General Serial Ports* Section of this manual for details on installing the Serial Ports.

To use the HEC-P2xxx Serial Ports for Modbus, in EZ LADDER Toolkit, from the File Menu at the top, click PROJECT then SETTINGS. This will open the *Project Settings* Window. The **HEC-P2000** was previously selected

Click the **PROPERTIES** button. The *HEC-P2000 Properties* Window will open. Under the Devices, *Internal* section, if Modbus Master or Slave is installed, it will be listed. Click the **ADD DEVICE** button. This will open the *PLCHIP-PXX Devices* window. See Figure 2-26. Select **Modbus Master** or **Modbus Slave** from the choices. Click **OK.** The *Modbus Slave or Modbus Master Properties* window will open depending on the type of Modbus port you selected. See Figure 2-27. Click the **ADD** button to open the *Add Interface* window.

For Modbus Slave, see Figure 2-28. Select **UART#** from the Interface Drop-down select box. Set the **Slave ID #.** This should be the network ID for this HEC-P2xxx controller on the Modbus network. Select **RTU** as the type and leave the other fields as default set.

For Modbus Master, see Figure 2-29. Select **UART#** from the Interface Drop-down select box. Set the **Response Timeout(ms).** This should delay time for a slave to respond in milliseconds. Select **RTU** as the type.

Click **OK** the number of times required to save the Modbus Settings and return to the EDIT workspace. Remember to Save your ladder diagram using the menu **FILE** and **SAVE** or **SAVE AS.**

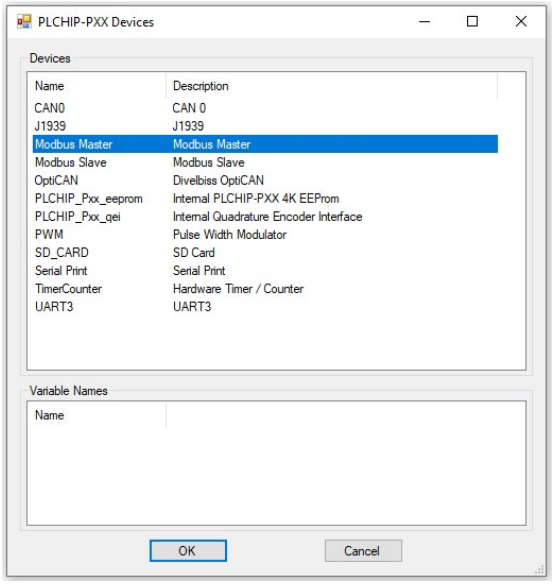


Figure 2-26 - Selecting Modbus

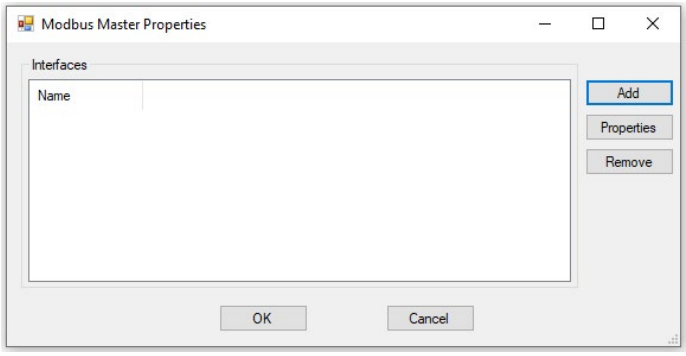


Figure 2-27 - Modbus Properties

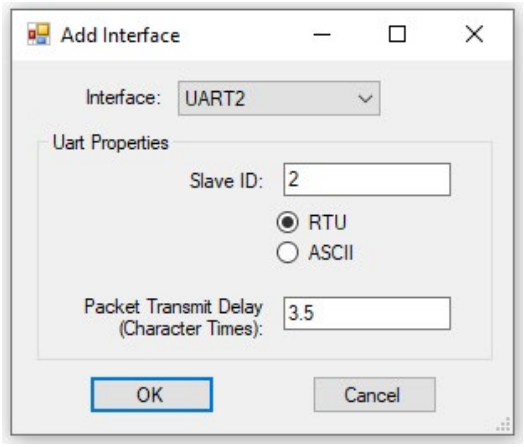


Figure 2-28 - Add UART Interface - Slave

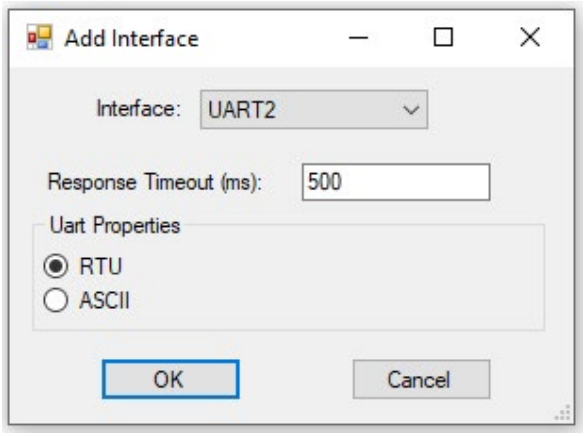


Figure 2-29 - Add UART Interface - Master

Modbus Master / Slave is now installed and configured to use in the ladder diagram program on the HEC-P2xxx controller.

For detailed information on how to configure variables and use Modbus in EZ LADDER Toolkit, refer to the P-Series EZ LADDER Toolkit Manual It contains information how to use Modbus Master and Slave using variables and function blocks.

GPS Functionality

HEC-P2xxx controllers support a GPS (Global Positioning Satellite) option via the General Purpose Serial port (RS232) using the HEC-GPS (sold separately). The GPS option allows for identifying the current location of the HEC-P2xxx controller (and any equipment connected to it). This is especially useful in the case of locating mobile equipment (when combined with Cloud Portal Solutions). For details on the general purpose serial ports, see the ***General Purpose Serial Ports*** section of this manual. The GPS may also be used to set/sync the Real Time Clock.

For GPS functionality, the GPS Module (purchased separately) must be installed (connected) to the HEC-P2xxx controller's 8-pin serial connector (M12, 8 Pins). In addition to the GPS Module, the second serial port (RS485) is wired with flying leads that may be used for any other purpose.

The HEC-GPS module is mounted using it's magnetic base and can be attached to most any metal surface. The GPS module must be mounted in a location that can receive satellite transmissions. Care should be taken to test and install the module in the appropriate location for optimal results.

With the GPS module properly installed and connected, the GPS option must be installed / enabled in EZ LADDER Toolkit using the Project Settings Menu.

CONFIGURING GPS IN EZ LADDER TOOLKIT

1. In EZ LADDER, from the File Menu at the top, click **PROJECT** then **SETTINGS**. This will open the *Project Settings* Window. Select **HEC-P2000** as the target from the choices.

2. Click the **PROPERTIES** button to the right side of the window. The *HEC-P2000 Properties* Window will open. Make sure the proper model is selected in the drop-down menu.

3. Click the **ADD DEVICE** button. The *PLCHIP-PXX Devices* window will open. Locate the **GPS** in the Devices pane of this window.

4. Click / select **GPS** (highlight). Refer to Figure 2-30. Click **OK**. The *GPS Properties* window will open identifying UART2 as the interface for the GPS. Click **OK**.

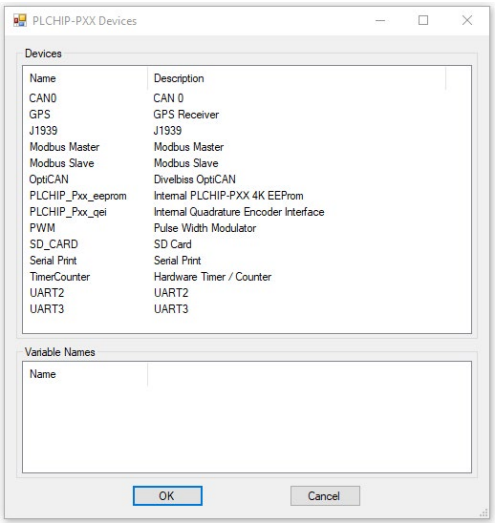


Figure 2-30- PLCHIP-PXX Devices - GPS

5. Click **OK** to as needed to close each of the open windows including the *HEC-P2000 Properties* window.

6. Save your ladder diagram using the menu **FILE** and **SAVE** or **SAVE AS** to save the current settings in your program.

The GPS option is now installed and ready to used in the ladder diagram program / structured text.

To use the GPS option to identify location and other information, it must be accessed via Structured Text. Several Target specific structured text functions are used: EZ_GPS_GetDateTimeUTC, EZ_GPS_GetMovement, EZ_GPS_GetPosition and EZ_GPS_GetPrecision. Refer to the P-Series EZ LADDER Toolkit Manual for details on how these target specifics function, how to use GPS and using Structured Text. **GPS functionality Structured text examples are available for download from our website: http://www.divelbiss.com.**

CAN Networking Ports

The HEC-P2xxx provides one on-board CAN bus interface port. This CAN port may be used for additional communications and networking using SAE J1939, NMEA 2000 and OptiCAN Networking. For details on using and implementing these networks, refer to the P-Series EZ LADDER Toolkit Manual.

The on-board CAN port is CAN0. To use the HEC-P2xxx's CAN port for OptiCAN, SAE J1939 or NMEA 2000, it will be necessary to install the CAN Port and configure certain parameters.

The CAN port should be wired according to established practices for CAN networks. Figure 2.32 illustrates typical CAN Port connections. Ideally, it is best to use the wiring requirements and practices for as needed for the specific network (SAE J1939, NMEA 2000 or OptiCAN). Refer to SAE 1939 and NMEA 2000 sources for network wiring requirements. Refer to the P-Series EZ LADDER Toolkit Manual for the OptiCAN requirements.

As shown in Figure 2.32, when devices are at the end of the communications lines, 120 ohm terminating resistors are required for correct functionality. The HEC-P2xxx includes an optionally enabled terminating resistor for the CAN port. Internal dip switch SW1-1 sets the terminating resistor state. When SW1-1 is OFF (open), the terminating resistor is not enabled and when SW1-1 is ON (closed), the terminating resistor is enabled. See the ***HEC-P2xxx Internal Jumpers and Switches*** section for the location of the dip switch.

To use the CAN ports in an EZ LADDER diagram project, the actual CAN port Device must be installed.

In EZ LADDER, from the File Menu at the top, click **PROJECT** then **SETTINGS**. This will open the *Project Settings* Window. The **HEC-P2000** was previously selected.

Click the **PROPERTIES** button. The *HEC-P2000 Properties* Window will open. Under the Devices, Bus section, if the CAN port is installed, it would be listed. Click the **ADD DEVICE** button. This will open the *PLCHIP-PXX Devices* window. Select **CAN0** from the Devices pane. See Figure 2.31. When the required CAN port has been selected,click **OK** the number of times required to close the windows and return to the EDIT workspace. Remember to Save your ladder diagram using the menu **FILE** and **SAVE** or **SAVE AS.**

If OptiCAN, J1939 or NMEA 2000 is to be used, it must be installed using similar steps. For detailed information on installing and using SAE J1939, NMEA 2000 or OptiCAN, refer to the P-Series EZ LADDER Toolkit Manual for details.

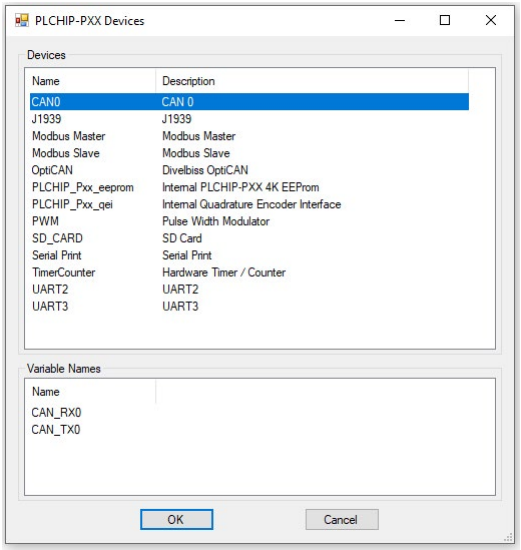


Figure 2.31 - Install CAN Port Device

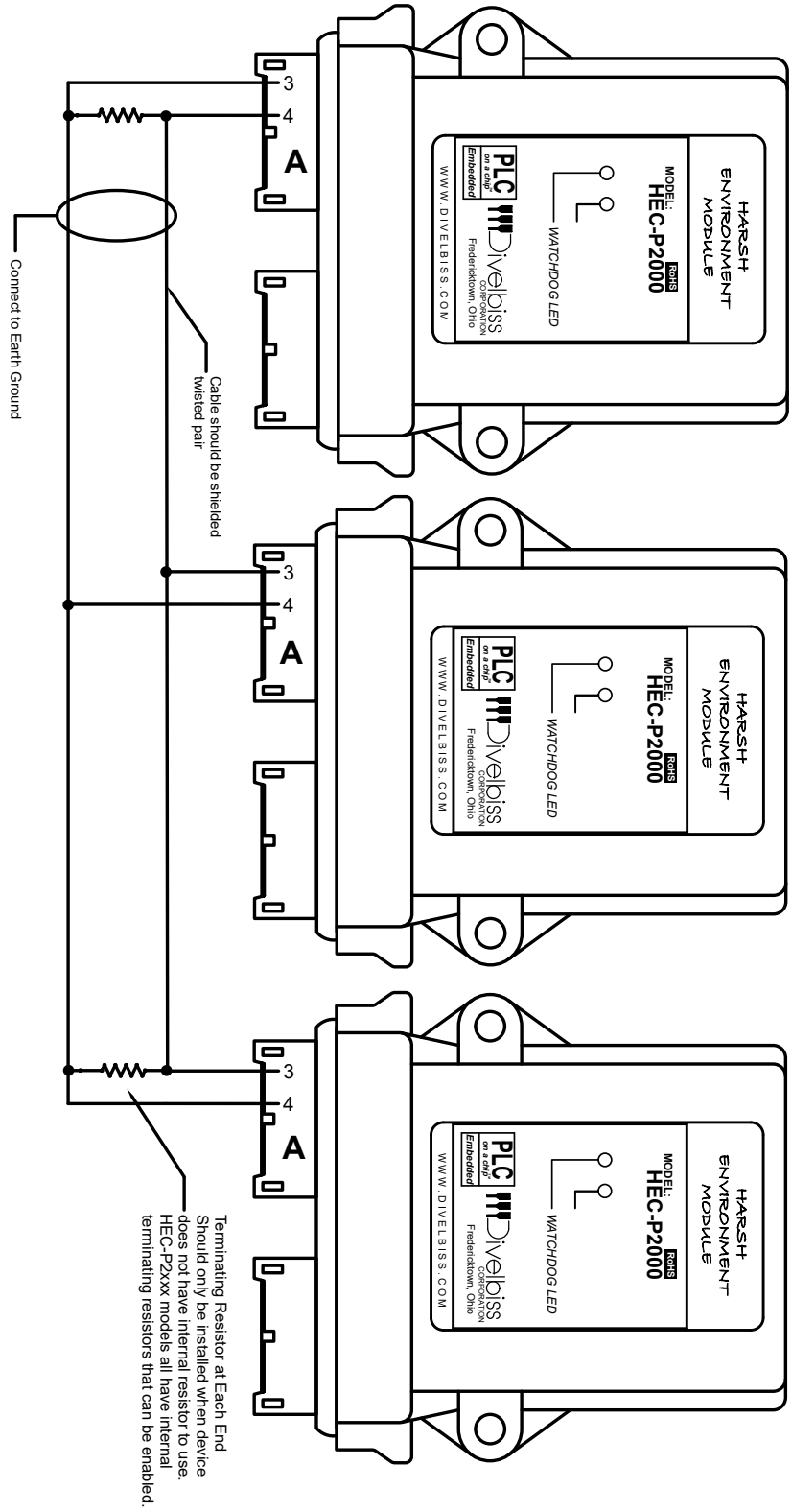


Figure 2.32- Typical CAN Port Connections

EEPROM Memory

As one of the standard features of P-Series PLC on a Chip™ and EZ LADDER Toolkit, the HEC-P2xxx supports the use EEPROM memory. The EEPROM memeory may be used in two ways. One is to use the EEPROM (or part of) to store ladder diagram program variables (controlled from the lader diagram or structured text). The second is to use the EEPROM (or part of) as the repository for the Retentive Memory feature to store variable configured as retentive on power loss. For more details on using Retentive Memory, see the the P-Series EZ LADDER Toolkit Manual.

EEPROM memory is a relatively slow writing device (in terms of milliseconds) and has limitations. This EEPROM memory is located on the PLC on a Chip itself (PLCHIP-P13-51220).

Boolean, integer, real and timer values may be stored to and read from the EEPROM in the ladder diagram and structured text. This feature allows for storing field adjustable set points and more.

EEPROM memory should not be used in applications where the values are updated (causing the stored value to update) often; such as a process variable. While EEPROM memory has a long life, repeated writing (thousands of times) can cause a memory location to fail. EEPROM memory is more oriented to be used for storage of menu changeable set points that may change, but infrequently.

The HEC-P2xxx supports 3500 bytes of EEPROM memory. This memory is accessed in the ladder diagram using the EEPROM_READ and EEPROM_WRITE Function blocks or from Structured Text using commands. The same variable type that writes to the EEPROM location should be used to read the EEPROM location.

A memory map is recommended for organizing variables stored in EEPROM to prevent overwriting already stored addresses or reading from incorrect addresses. Writing or reading an incorrect address will result in incorrect or corrupted data.

Before the EEPROM memory can be used in the HEC-P2xxx or EZ LADDER Toolkit, it must be configured in the target using the Project Settings menu as it will be used (EEPROM or Retentive). The defines how the EEPROM memory is allocated.

CONFIGURING THE EEPROM

The EEPROM (PLCHIP_PXX_eeprom) is installed automatically when the HEC-P2000 controller is selected in the Project Settings. By default, it is configued as all EEPROM. To reconfigure the EEPROM allocation:

1. In EZ LADDER, from the File Menu at the top, click **PROJECT** then **SETTINGS**. This will open the *Project Settings* Window. Select **HEC-P2000** as the target from the choices.

2. Click the **PROPERTIES** button to the right side of the window. The *HEC-P2000 Properties* Window will open. Make sure the proper model is selected in the drop-down menu.

3. In the *Devices* Pane, select (highlight) the **PLCHIP_PXX_eeprom** (from the Internal *heading*). Click the **PROPERTIES** button. The *PLCHIP_PXX_eeprom Properties* dialog will open.

4. Enter the number of retentive bytes to use in the target in the **Num Retentive Bytes** box. The maximum available to use is 3500 bytes. Refer to Figure 2-33. Any bytes not configured for retentive will be used as **EEPROM memory bytes**. (displayed as Num User Bytes).

   While the number of bytes configured for Retentive can be set to the maximim (3500), the actual retentive feature will not function. For retentive memory to function, it requires a certain amount of time per byte to store and the EEPROM is a relatively slow device. The HEC-P2xxx will likely support a few variable (at 4 bytes each). Use of the EEPROM for retentive with additional bytes will likely result in values not being stored on power loss. **It is recommneded to use the FRAM for retentive memory on the HEC-P2xxx controller.**

5. Click **OK** to close the *PLCHIP_PXX_eeprom Properties* dialog.

6. Click **OK** to close the *HEC-P2000 Properties.*

7. Save your ladder diagram using the menu **FILE** and **SAVE** or **SAVE AS** to save the current settings in your program.

The EEPROM memory size is now configured in the ladder diagram program and may be used as retentive (limited and not recommended) and as non-volatile storage using hte EEPROM_READ and EEPROM_WRITE function blocks.

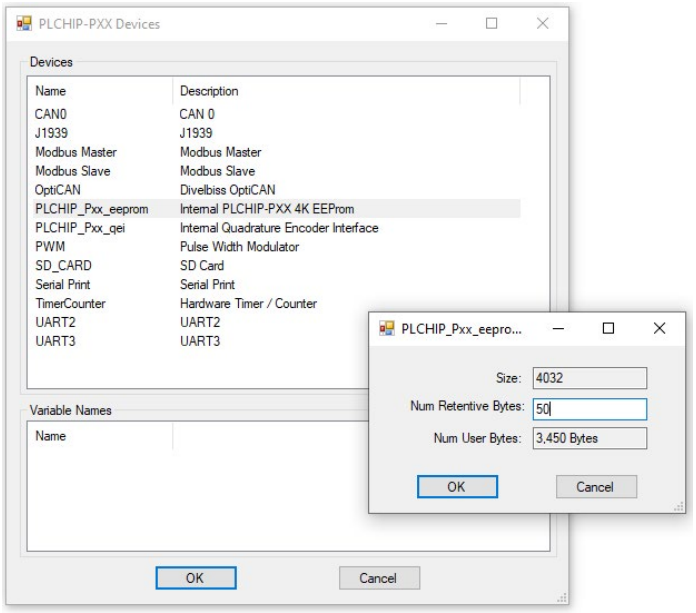


Figure 2.33 - Configure EEPROM Memory

FRAM

The HEC-P2xxx controllers provides on-board FRAM non-volatile memory. The FRAM is an independent device that can store data to address locations. Unlike the EEPROM, the FRAM is a faster writing device, making it more suitable for Retentive Memory.

In addition, the FRAM may also be used as non-volatile memory like the EEPROM, using the EEPROM_WRITE and EEPROM_READ function blocks.

FRAM is the memory that is recommended to store all *Retentive* variables in the ladder program. Retentive variables automatically store their values into the FRAM device when a power loss is detected and then the values are read from FRAM and restored automatically when power is restored.

When the HEC-P2xxx is selected in the Project Settings, the FRAM (FM24CL04) device is automatically installed as well as any required devices necessary for retentive memory to operate. The amount of retentive memory may be changed, but is default to 100 bytes

To use the retentive features, variables (and/or function blocks) must be flagged as retentive items when they are placed in the ladder diagram. For more details on using retentive variables, refer to the P-Series EZ LADDER Toolkit manual.

The HEC-P2xxx supports 480 bytes of (FRAM) non-volatile memory. This memory is split between the retentive memory and the user memory (accessed using EEPROM_READ, EEPROM_WRITE function blocks). The amount of retentive memory may be configured in the Project Settings menu for the project. All FRAM memory not configured as retentive will be configured as user memory (EEPROM type). The default configuration for a new EZ LADDER project for the HEC-P2xxx is 100 bytes of retentive memory and 380 bytes of user memory.

Retentive memory is automatically used and variables stored (if configured as retentive) on a power loss. For EEPROM type use, the FRAM is addressed similar to the PLCHIP-PXX_eeprom. When using the EEPROM_READ and EEPROM_WRITE function blocks, the device to use (either PLCHIP_PXX_eeprom or FRAM) is selected when the block is placed.

CONFIGURING FRAM MEMORY

The retentive memory is installed automatically when the HEC-P2XXX controller is selected in the Project Settings. To adjust the amount of retentive memory, it must be configured in the program's target settings using the EZ LADDER Toolkit's Project Settings Menu.

1. In EZ LADDER, from the File Menu at the top, click **PROJECT** then **SETTINGS**. This will open the *Project Settings* Window. Select **HEC-P2000** as the target from the choices.

2. Click the **PROPERTIES** button to the right side of the window. The *HEC-P2000 Properties* Window will open. Make sure the proper model is selected in the drop-down menu.

3. In the *Devices* Pane, select (highlight) the **FM24XXX** (from the I2C *heading*). Click the **PROPERTIES** button. The *Ramtron FM24xxx Properties* dialog will open.

4. Enter the number of retentive bytes to use in the target in the **Num Retentive Bytes** box. The maximum available to use is 480 bytes (defaulted to 100 bytes). Refer to Figure 2-34. Any bytes not configured for retentive may be used as **EEPROM memory bytes**. (displayed as Num User Bytes). **Do not select a different Part Number. Verify it is configured for FM24CL04 only.**

5. Click **OK** to close the *FM24xxx Properties* dialog.

6. Click **OK** to close the *HEC-P2000 Properties.*

7. Save your ladder diagram using the menu **FILE** and **SAVE** or **SAVE AS** to save the current settings in your program.

The Retentive memory size is now configured in the ladder diagram program and may be used by setting variables and functions as retentive. Refer to the P-Series EZ LADDER Toolkit Manual for details on using retentive variables.

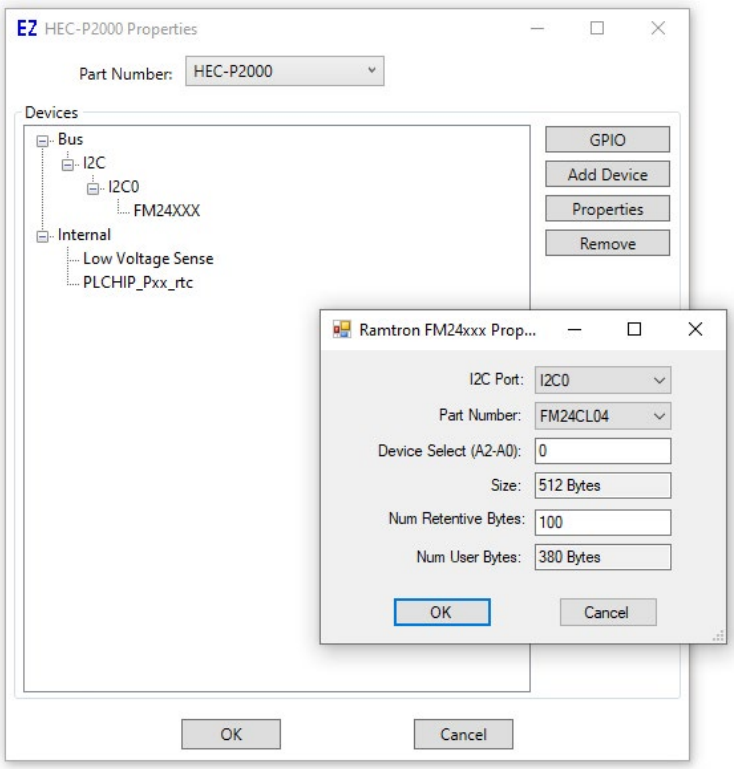


Figure 2.34 - Configure FRAM Memory

Real Time Clock

The HEC-P2xxx supports a Real Time Clockl.The real time clock (after being set) provides the Month, Day, Day of the Week, Year, Hour, Minute and Second. The real time clock maintains time when power is off as long as the internal lithium battery is good. The real time clock device is automatically installed and enabled when the HEC-P2000 target is selected.

The battery for the real time clock generally has years of life before replacement is needed. Should the battery need to be replaced, contact product support for service. The battery is not field replaceable.

To use the Real Time Clock functionality in a ladder diagram, several function blocks are available. To read current Time or Date, use the GETTIME and GETDATE function blocks. To set the current Time or Date, use the SETTIME and SETDATE function blocks. For details on using function blocks, refer to the P-Series EZ LADDER User's Manual

The HEC-P2xxx ships from the factory with the real time clock battery disabled (SW1-3 OFF) to conserve battery life. You must enable the battery by configuring the battery switch SW1-3 to ON. To gain access to these dip-switches, the HEC-P2xxx must be dis-assembled. See the ***Assembling / Dis-assembling the HEC-P2xxx*** section of this manual. See the ***HEC-P2xxx Internal Jumpers and Switches*** section for the location of the dip switch.

Failure to enable the battery will result in loss of actual date and time when unit is not powered.

SD Card

The HEC-P2xxx can accept a Micro SD Flash card. This card currently may be used to install / update the HEC-P2000's kernel, compiled ladder diagram, use the file system to read and write data (using structured text) or as a webserver. Installation/update of Kernel and Ladder Diagram project will only occur on power up of the HEC-P2xxx (when the SD Card is enabled and configured as such).

For SD Card updates to work, the SD card must have a directory named "update". In this update directory, the kernel (.dat) and the ladder diagram compiled programs (.hex) must be placed for the SD card to update the HEC-P2xxx.

The kernel and ladder diagrams are only updated after an SD card is inserted by cycling power. Updates are only performed during the controller's power up.

Refer to the P-Series EZ LADDER Toolkit for details using the SD Card to install or update kernels and ladder diagrams and how to use the file system for read / write access to the SD Card.

The SD Card may be used for reading and writing data using the file system. This file system is accessed using structured text commands only. Refer to the EZ LADDER Toolkit manual for details on how to use the File system and structured text.

Before the SD Card may be used to install or update the kernel or EZ LADDER compiled project to the HEC-P2xxx, it must be configured to do so. This configuration must be done in the **Bootloader** screen. The Bootloader screen will only operate if EZ LADDER is connected to an actual HEC-P2xxx controller.

To Access the Bootloader:

1. Verify the target has been configured (see ***Configuring the HEC-P2xxx Target in EZ LADDER Toolkit section***).

2. Connect the Programming cable(s) from the computer to the HEC-P2xxx. See ***Programming Port*** section.

3. Create a small one-rung program with a normally open (direct contact) and an output tied together. You may also open a pre-existing program for the HEC. EZ LADDER includes a sub-directory (...EZ LADDER\Kernel Install Start Programs\)which has starter programs for each target to load the kernel. Choose ***GetStarted_HEC-2xxx.dld***

4. Click the C (Compile) button.

5. Click the MON (Monitor) button to change from the *Edit* to *Monitor* Mode.

6. Click the (Connect) button to connect to the target.

7. Using the menu, click **PROJECT** then **BOOTLOADER.** You may see a window momentarily while EZ LADDER connects to the HEC-P2xxx's bootloader. The Bootloader window will open. See Figure 2.35.

8. Click the **TARGET OPTIONS** button. The Target Options window will open. There will be two tabs in this window. Click the **SD CARD OPTIONS** tab. See Figure 2.36.

9. Check boxes are provided to configure the SD Card features. Check the boxes that apply to your needs.

SD Card Enabled: This enables the SD Card functionality. This box must be checked if the SD Card features are to be implemented.

Allow Kernel Updates: When selected, this box will cause the kernel to be updated to the kernel on the SD card (if present). This only occurs on the HEC-P2xxx power up.

Allow LD Updates: When selected, this box will cause the compiled Ladder Diagram Project to be updated to the Ladder Diagram Project on the SD card (if present). This only occurs on the HEC-P2xxx power up.

10. When all the SD Card features are configured, click **OK** to save the settings of the SD Card and close the Target Options window. Click the **RESTART TARGET** button to exit the bootloader and restart the HEC-P2xxx.

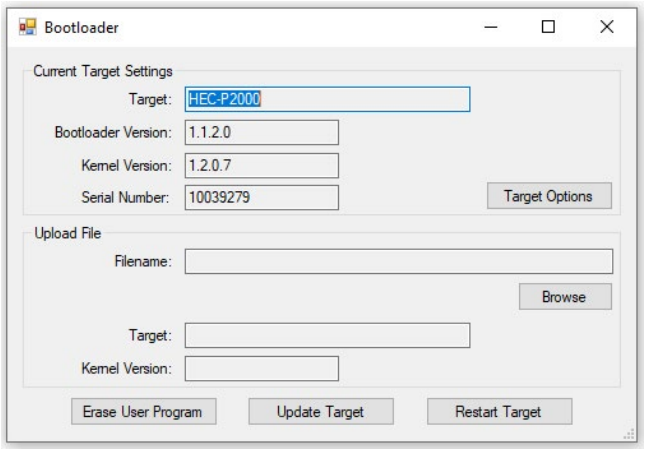


Figure 2.35- HEC-P2xxx Bootloader

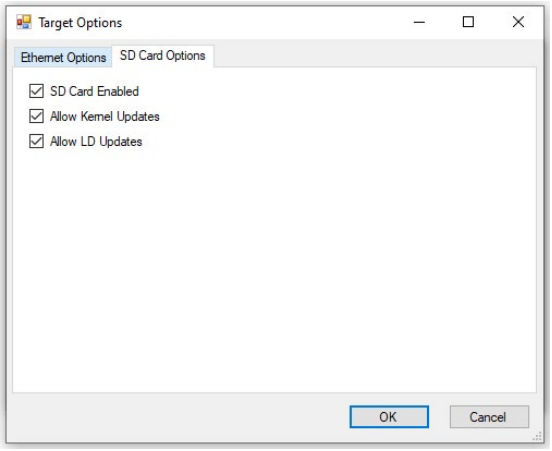


Figure 2.36 - HEC-P2xxx SD CARD OPTIONS

The SD Card is configured to operate and load the kernel and ladder diagram automatically on power-up. The SD card can also be used for webserver and file operations. For these operations, the SD Card will need to be installed in the Project Settings.

ADDING THE SD CARD TO THE PROJECT

The SD card can be used for webserver and file operations. For these operations, the SD Card will need to be installed in the Project Settings.

1. In EZ LADDER, from the File Menu at the top, click **PROJECT** then **SETTINGS**. This will open the *Project Settings* Window. Select **HEC-P2000** as the target from the choices.

2. Click the **PROPERTIES** button to the right side of the window. The *HEC-P2000 Properties* Window will open. Make sure the proper model is selected in the drop-down menu.

3. Click the **ADD DEVICE** button. The *PLCHIP-PXX Devices* window will open. Locate the **SD CARD** in the Devices pane of this window.

4. Click / select **SD CARD** (highlight). Refer to Figure 2-37. Click **OK**.

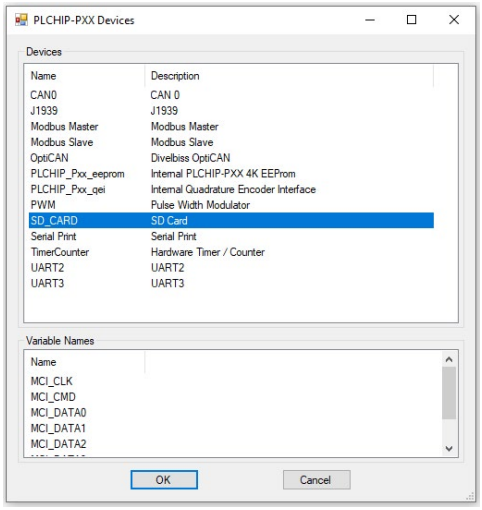


Figure 2.37 - Install CAN Port Device

5. Click **OK** to as needed to close each of the open windows including the *HEC-P2000 Properties* window.

6. Save your ladder diagram using the menu **FILE** and **SAVE** or **SAVE AS** to save the current settings in your program.

The SD card can be used for webserver and file operations. Refer the P-Series EZ LADDER Toolkit, other documentation and appnotes for more details.

WI-FI Option

For HEC-P2xxx models that support Wi-Fi, the Wi-Fi connection is available for using Modbus TCP, Programming Port or Cloud Portal Solutions.

WI-FI ANTENNA

For Wi-Fi supporting models of HEC-P2xxx, the units ship an internal antenna. If the HEC-P2xxx is mounted in an open-air environment or an plastic / fiberglass enclosure, the internal antenna should be sufficient for most connectivity.

If the HEC-P2xxx is to mounted in a metal enclosure (or any box/enclosure that may block the Wi-Fi signal), the antenna will need to be mounted external to the box / enclosure that could block the Wi-Fi signal. Contact Divelbiss support for availability of an external antenna connection model HEC-P2000 Series controller.

INSTALLING WI-FI IN EZ LADDER TOOLKIT

For Wi-Fi supporting models of HEC-P2xxx, EZ LADDER Toolkit (PLC on a Chip) utilize the Wi-Fi connection as an **Ethernet** connection.

As the Wi-Fi is utilized as an Ethernet connection, the Ethernet feature must be installed in the hardware target (HEC-P2xxx) before the Wi-Fi can be used. The WI-FI will also require additional configuration and installation in the project settings after the Ethernet is installed in the hardware target.

The Ethernet feature is installed in the HEC-P2xxx target (enabled) in the **Bootloader** screen. The Bootloader screen will only operate if EZ LADDER is connected to an actual HEC-P2xxx controller, as bootloader is actually on the HEC-P2xxx controller (but is accessed via EZ LADDER's bootloader menu).

To Access the Bootloader:

1. Verify the target has been configured (see ***Configuring the HEC-P2xxx Target in EZ LADDER Toolkit***).

2. Connect the Programming cable(s) from the computer to the HEC-P2xxx. See the ***Programming Port*** section.

3. Create a small one-rung program with a normally open (direct contact) and an output tied together. You may also open a pre-existing program for the HEC. EZ LADDER includes a sub-directory (...EZ LADDER\Kernel Install Start Programs\)which has starter programs for each target to load the kernel. Choose ***GetStarted_HEC-2xxx.dld***.

4. Click the 

(Compile) button.

5. Click the 

(Monitor) button to change from the 'Edit' to 'Monitor' Mode.

6. Click the 
(Connect) button to connect to the target.

7. Using the menu, click **PROJECT** then **BOOTLOADER.** You may see a window momentarily while EZ LADDER connects to the HEC-P2xxx's bootloader. The Bootloader window will open. See Figure 2.38.

8. Click the **TARGET OPTIONS** button. The Target Options window will open. There will be two tabs in this window. Click the **ETHERNET OPTIONS** tab. See Figure 2.39.

9. To enable the Ethernet, click the **Ethernet Enabled** check box.

10. Enter a Host Name for this HEC-P2xxx Controller in the **Host Name** box. This name is used to identify this controller on an Ethernet network.

11. It is recommended that the **DHCP Enabled** and **IP v4 auto Config** check boxes be left in their default condition (checked). This allows the HEC-P2xxx to get its IP (Internet Protocol) from the network DHCP server. If you require a static IP address, un-check both boxes and enter the static IP information in the **Static IP Options** section.

12. It is generally recommended to keep the **Enable Ethernet in Bootloader** and **Enable EZ Ladder Ethernet Communications** check boxes be checked. The Enable Ethernet in Bootloader when unchecked prevents the bootloader screen that you are in from being accessed via Ethernet (Wi-FI). The Enable EZ Ladder Ethernet Communications when unchecked prevents the Ethernet (WI-FI) port from functioning as a programming port within EZ LADDER.

13. The **Wi-Fi** checkbox should be checked to Enable the Wi-Fi.

14. When all the Ethernet Options are configured, click **OK** to save the settings of the Ethernet and close the Target Options window. Click the **RESTART TARGET** button to exit the bootloader and restart the HEC-P2xxx.

The HEC-P2xxx's Ethernet Port is now enabled. It can be now used to communicate to EZ LADDER Toolkit without additional configurations by changing the COM (serial) port in the Target Settings to Eth: xxxxxx. To use the Ethernet Port for Modbus TCP, a webserver or Cloud Portal Solutions, additional configuration is required.

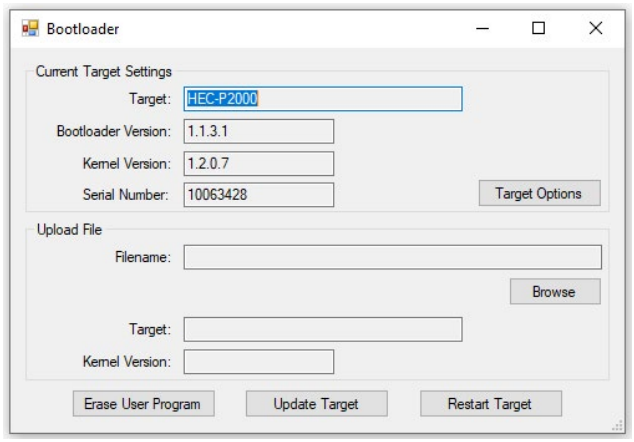


Figure 2.38 - HEC-P2xxx Bootloader

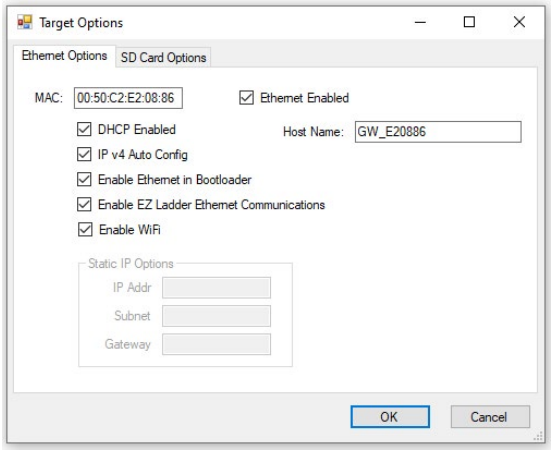


Figure 2.39 - HEC-P2xxx ETHERNET OPTIONS

The Cellular Modem feature is not availble on Wi-Fi enabled models.

With the Ethernet (WI-FI) installed in the actual HEC-P2xxx controller, the WI-IF must now be configured to operate (network information, etc).

TO CONFIGURE A WI-FI NETWORK

1. Open a program or create a simple program and Compile the program (if necessary). Make sure the WI-IF power control output (WFPWR) is true for the internal WI-FI module to be powerd ON.
2. Change EZ LADDER to the Monitor mode by clicking the MON button.
3. Make sure the HEC-P2xxx is connected to the computer and click the button to connect EZ LADDER Toolkit to the hardware the HEC-P2xxx target.
4. From the menu at the top, select **PROJECT** then select **WIFI SETUP.** Refer to Figure 2-40.

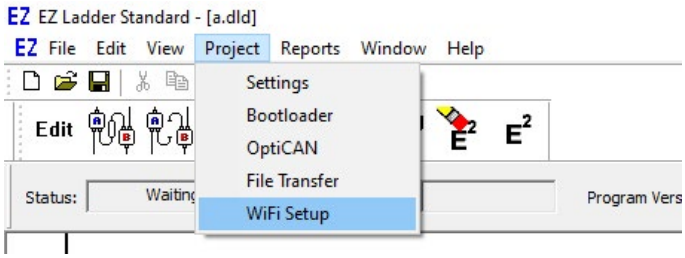


Figure 2-40 - Access WiFi Setup

5. The *WiFi Setup and Status* window will open. An intermediate temporary dialog may be seen while the Wi-Fi module is accessed and the current Wi-Fi setup read. Refer to Figure 2-41.
6. Referring to Figure 2-41, the *Currently Visible Access Points* (item A) pane shows all the networks currently in-range for the Wi-Fi to detect. **The network must be in-range to be configured**.
7. In the Access Points Settings, enter the **SSID** and **Passcode** in their respective places (item B). It will be necessary to double-click to enter the values. Refer to Figure 2-41.

8. Select the **Security Type** for the network (item B).

9. With the information entered, click the **SAVE SETTINGS** button (Item C) to save the current settings for the Wi-Fi network.

Multiple Wi-Fi networks may be saved by adding them to list shown in Figure 2-41. Each setting is stored in the on-board Wi-Fi module and is maintained during a power loss. The priority of Wi-Fi network to connect to is based on the priority number in the list.

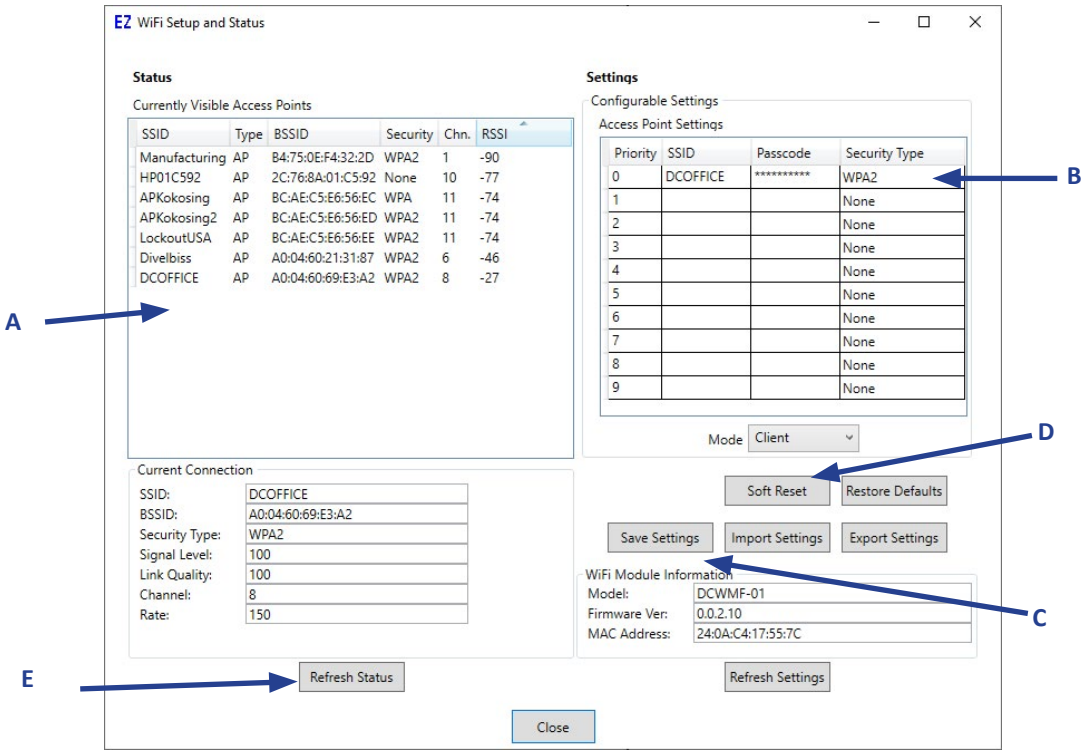


Figure 2-41 - WiFi Setup and Status

Up to 10 SSID / Passwords may be saved on the on-board Wi-Fi module. The module searches through the list for in-range SSIDs (APs) and attempts to connect with them based on priority. When removing (deleting) SSIDs, the list should be edited as all remaining SSIDs are listed beginning with the top and leaving no empty spaces in the list. When operating, the module searches the list in order, if an empty location is detected, the module will stop searching for an SSID match. There should be no empty locations except at the end of the list (if less than 10 entries).

10. Click the **SOFT RESET** button (Item D). This forces the Wi-Fi connectivity to reset. After the reset, the HEC-P2xxx should connect to the Wi-Fi network.

11. Click the **REFRESH STATUS** button (Item E). The information under the ***Current Connection*** should update and show the network currently connected to.

12. Click **CLOSE** to close the WiFi Setup and Status window.

The Wi-Fi connectivity is now configured and connected to Wi-Fi network and can be used as the programming port. For Modbus TCP, webserver or Cloud Portal Solutions, additional configuration is required.

Wi-Fi connectivity depends upon the target being in range, with sufficient signal strength and being configured properly for communications over the Wi-Fi network.

For more information regarding installing, configuring and using Wi-Fi including as a programming port, Webserver or Cloud Portal Solutions, refer to the P-Series EZ LADDER Toolkit Manual or www.divelbiss.com.

The Wi-Fi may also be configured in Host mode. Refer to the P-Series EZ LADDER Toolkit Manual for details on Host Mode and other additional configuration items.

Modbus TCP

The HEC-P2xxx Controller models with WI-FI support Modbus TCP over the WI-FI connection The Modbus TCP connection is implemented as a Modbus Master or Modbus Slave and is IP address based.

To use the **HEC-P2xxx** Wi-Fi connection for Modbus, in EZ LADDER Toolkit, from the File Menu at the top, click PROJECT then SETTINGS. This will open the *Project Settings* Window. The **HEC-P2000** should have been previously selected.

Click the **PROPERTIES** button. The *HEC-P2000 Properties* Window will open. Using the Part Number drop down - select **HEC-P2001** (for Wi-Fi enabled model). Refer to Figure 2-42.

Under the Devices, *Internal* section, if Ethernet is installed, it will be listed. Click the **ADD DEVICE** button. This will open the *PLCHIP-PXX Devices* window. Refer to figure 2-43. Select **Ethernet** and click **OK.** A new dialog will pen with Ethernet properties. No items are editable in this screen. Click **OK.** Refer to Figure 2-44.

Under the Devices, *Internal* section, if Modbus Master or Slave is installed, it will be listed. Click the **ADD DEVICE** button. This will open the *PLCHIP-PXX Devices* window. See Figure 2-45. Select **Modbus Master** or **Modbus Slave** from the choices. Click **OK.** The Modbus Slave or Modbus Master Properties window will open depending on the type of Modbus port you selected. See Figure 2-46.

For purposes of configuration, the Slave option will be shown. For Modbus Master configuration details, refer to the P-Series EZ LADDER Toolkit Manual

Click the **ADD** button to open the ***Add Interface*** window. See Figure 2-47. Select **Ethernet** (for WI-FI)from the Interface Drop-down select box. For Modbus Slave, Set the **Number of TCP Sockets**. The default is 1. For Modbus Master, set the **Response Timeout** (ms).

Note: For Wi-Fi models, the PLC on a Chip on-board processor utilizes Wi-Fi as an Ethernet connection; therefore, when the Wi-Fi communication interface is to be used for Modbus, Cloud Portal Solutions or other communications, the Ethernet option is elected (because Ethernet is used in place of Wi-Fi / there is no Wi-Fi option).

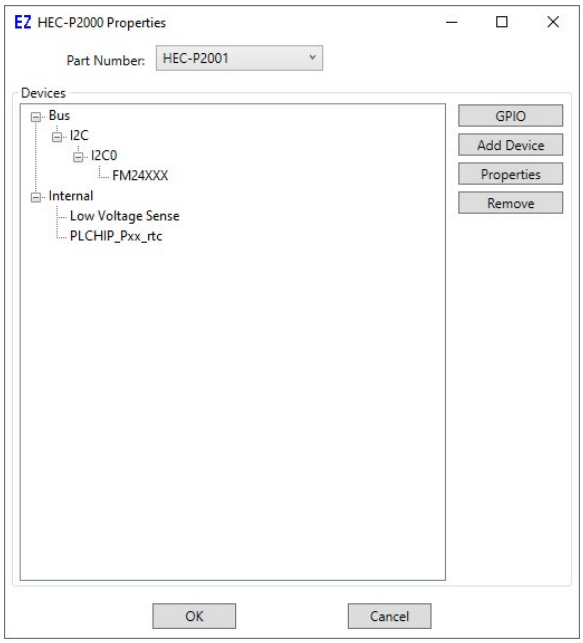


Figure 2-42 - Model Selection

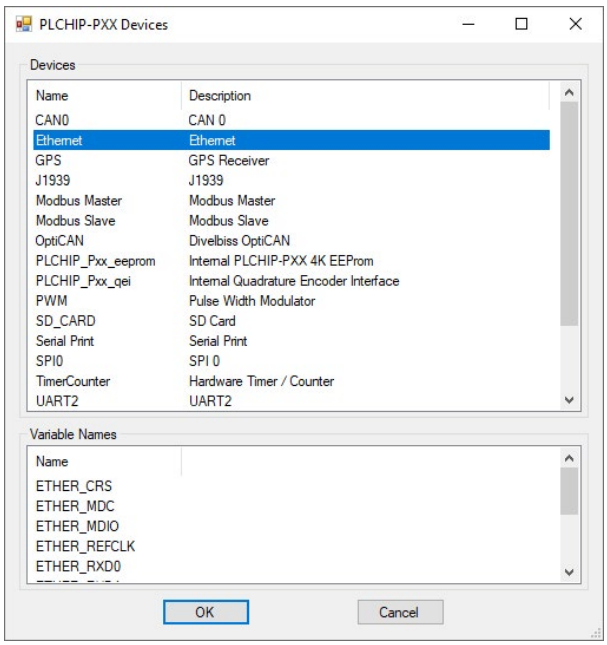


Figure 2-43 - Add Ethernet

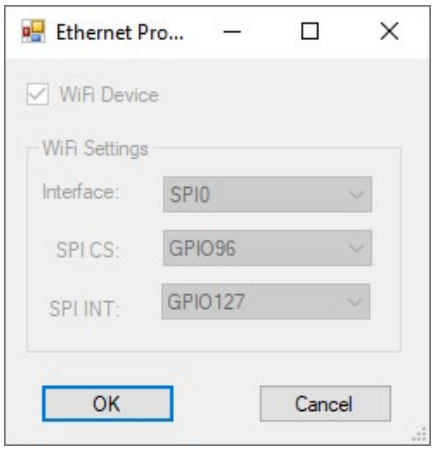


Figure 2-44 - Ethernet Properties

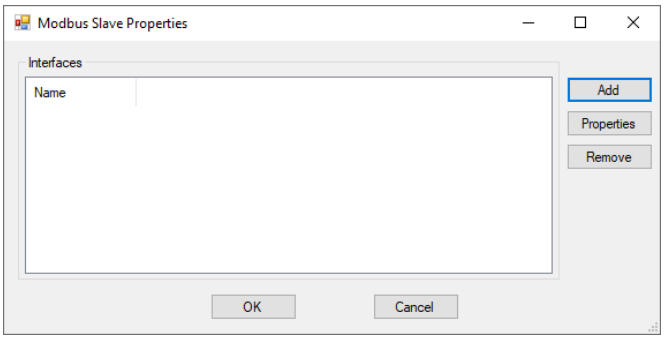


Figure 2-46 - Modbus Properties

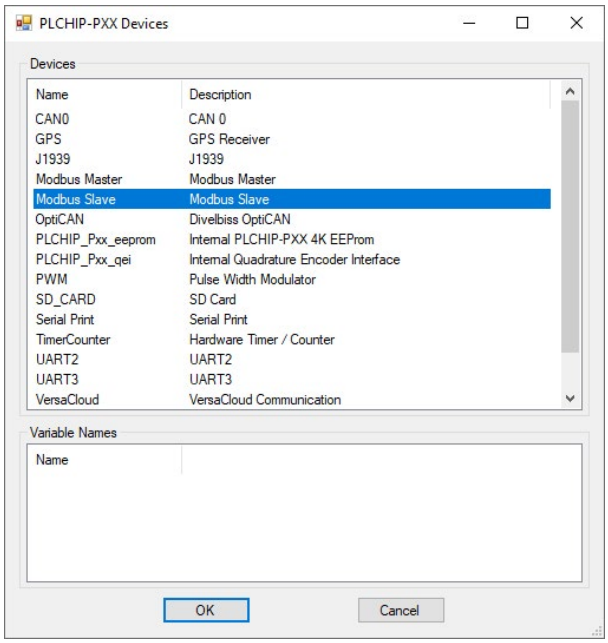


Figure 2-45 - Add Modbus Master/Slave

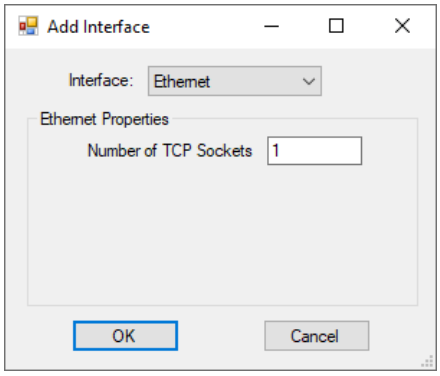


Figure 2-47 - Add Interface

Click **OK** the number of times required to save the Modbus Settings and return to the EDIT workspace. Remember to Save your ladder diagram using the menu **FILE** and **SAVE** or **SAVE AS.**

Modbus TCP (over Wi-Fi) is now ready to be used on the HEC-P2xxx. Several additional function blocks are used with the Modbus TCP Ethernet port in the ladder diagram project. More on Modbus and the required function blocks is detailed in the P-Series EZ LADDER Toolkit Manual.

For details on configuring and using Modbus TCP (Master or Slave), refer to the P-Series EZ LADDER Toolkit Manual. It contains in-depth information regarding using variables and Modbus.

Cellular Data Option

The HEC-P2xxx optionally supports an internal Cellular Data Modem (model dependent). This internal cellular data option is designed to operate with Cloud Portal Solutions. The purpose of the cellular data feature is to allow for remote reporting, control and configuration of equipment in areas that may not have adequate communications avenues such as broadband (Wi-Fi). This cellular data option provides a communications path to common Clouid Portal protocols via cellular coverage.

The Cellular Data option requires cellular data coverage. Monthly fees and data usage charges apply. As data fees apply, consideration should be made during the application ladder diagram program development to limit the amount and size of data to only what is required to reduce cost.

CELLULAR ANTENNA

For Cellular connection supporting models of HEC-P2xxx controller, the unit ships with a loose - packed antenna that must be installed before the Cellular connection will be able to function. This antenna uses a standard SMA connection.

It is recommended to only use the supplied antenna. Using another antenna may void the FCC certification / approval.

If the HEC-P2xxx will be installed in an open-air environment or an plastic / fiberglass enclosure, the antenna may be directly mounted to the HEC-P2xxx. Screw the antenna into position (See Figure 2-48).

If the HEC-P2xxx is to mounted in a metal enclosure (or any box/enclosure that may block the Cellular signal), the antenna will need to be mounted external to the box / enclosure that could block the Cellular signal. Externally connecting the antenna in this method will require additional cables and a bulk-head fitting (not included). Refer to Figure 2-48 for mounting method examples. Kits (sold separately) are availble for remote mounting the antenna.

When mounting antennas, Antennas must be electrically isolated from panel ground / common. If not isolated, damage to the HEC-P2xxx controller will result.

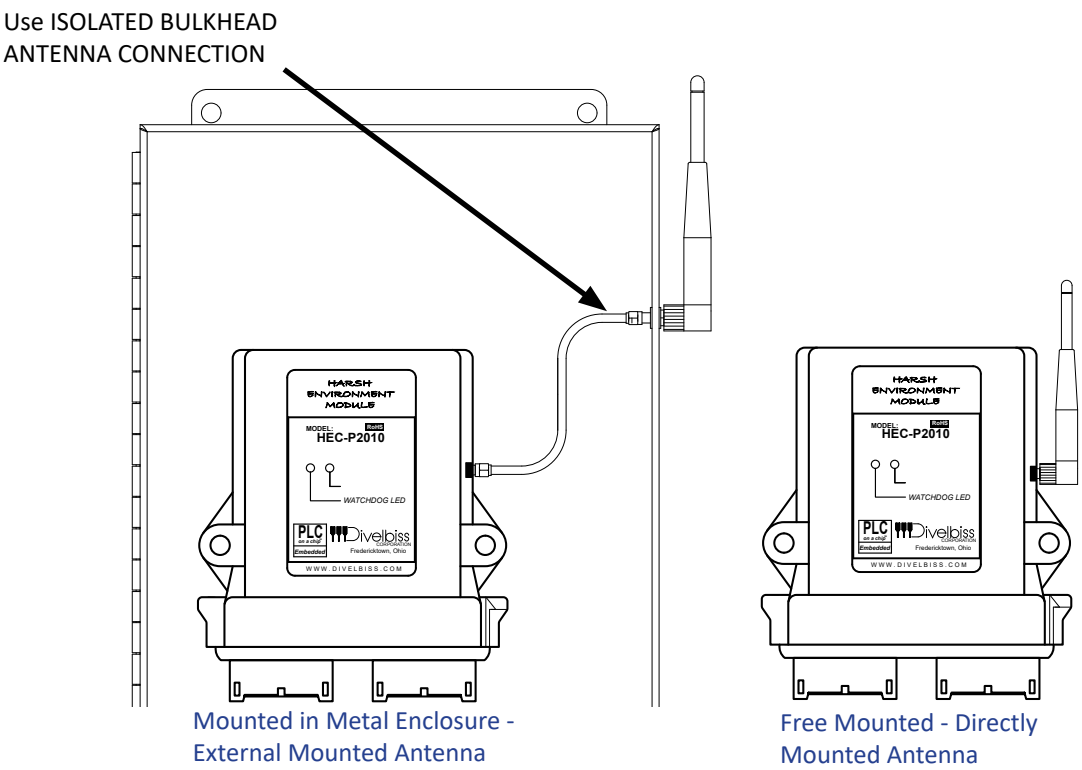


Figure 2-48 -Antenna Mounting Options

CELLULAR POWER CONTROL

The internal Cellular modem has a software controlled on/off power control This allows the Cellular modem to be turned on and off. By default, the Cellularmodem power is set to OFF

The Cellular modem power is controlled from the ladder diagram / Structured text using the **EZ_Cell_ApplyPower** (Structued Text function). When the control bit to this function is true, the Cellular modem will power on (and stay on). When the control bit to this functio is false, the Cellular modem will power off (and stay off). For any Cellular functionality, the Cellular modem powered on. The EZ_Cell_ApplyPower function include additional feedback for the status of the cellulare modem. Refer to the P-Series EZ LADDER Toolkit for more details.

As with any cellular connection, powering on will require reconnection to a cellular network and may take several seconds.

The Wi-Fi feature is not available on Cellular Modem models.

With the antenna properly installed and the Cellular power control understood, the Cellular Data option must be installed / enabled in EZ LADDER Toolkit using the Project Settings Menu.

CONFIGURING THE CELLULAR DATA IN EZ LADDER TOOLKIT

1. In EZ LADDER, from the File Menu at the top, click **PROJECT** then **SETTINGS**. This will open the *Project Settings* Window. Select **HEC-P2000** as the target from the choices.

2. Click the **PROPERTIES** button to the right side of the window. The *HEC-P2000 Properties* Window will open. Select the **HEC-P2010** model (for Cellular Modem model).

3. Click the **ADD DEVICE** button. The *PLCHIP-PXX Devices* window will open. Locate the **Cellular** in the Devices pane of this window.

4. Click / select **Cellular** (highlight). Refer to Figure 2-49. Click **OK**. The *Cellular Properties* window will open identifying UART1 as the interface for the Cellular Modem. Click **OK**.

5. Click **OK** to as needed to close each of the open windows including the *HEC-P2000 Properties* window.

6. Save your ladder diagram using the menu **FILE** and **SAVE** or **SAVE AS** to save the current settings in your program.

The Cellular Data option is now installed and ready to used in the ladder diagram program / structured text.

To use the Cellular data option, the cellular modem must be controlled using Structured Text. There are several target specific Structured Text functions including: EZ_Cell_Activate, EZ_Cell_ApplyPower, EZ_Cell_Connect, EZ_GetICCID, EZ_Cell_GetIMEI, EZ_Cell, GetIpV4Addr, EZ_Cell_GetModelName, EZ_Cell_GetRegistration, EZ_Cell_GetSignalStrength, EZ_Cell_GetState. These are used in Structured text to control the cellular modems functionality (turn on, off, etc). Refer to the P-Series EZ LADDER Toolkit for more detailed information regarding the Cellular data option and Structured Text. **Cellular Data functionality Structured text examples are available for download**.

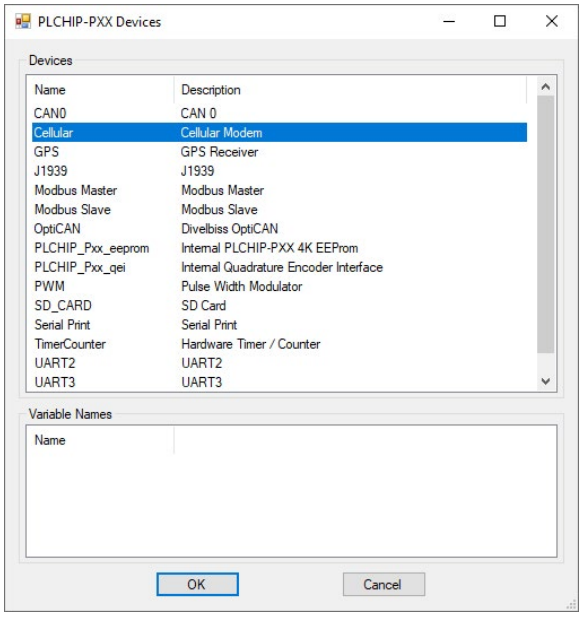


Figure 2-49 - PLCHIP-PXX Devices - Cellular

Cloud Portal Solutions

Cloud Portal Solutions refer to the ability to send and receive data from to internet Cloud server / Cloud Portals. The HEC-P2000 supports using standard protocols such as MQTT and COAP to send data. Included function blocks and Structured Text functions are provided to communicate to cloud portals. The P-Series EZ LADDER Toolkit Manual has more detail on using these functions and function blocks.

Refer to www.divelbiss.com or contact Divelbiss for details on the Cloud Portal Solutions.

Cloud Portal solutions recommended are based on many factors including types of data, number of remote devices reporting, etc.

Specifications

Processor:	P-Series PLC on a Chip™ ,PLCHIP-P13-51220
Memory:	ON-CHIP: 256K User Program Flash, 32K RAM, 3500 Bytes EEPROM FRAM: 480 Bytes EEPROM/Retentive Memory
SD Card:	1 MicroSD Card socket for Program/Kernel Loading, Webserver and File Operations
Serial Ports:	1 Programming Port (Max baud: 57.6K); 1 Multipurpose Port, RS232 1 Multipurpose Port, RS485 Dirct Plug-in for HEC-GPS module
Networking:	1 CAN Port for Divelbiss OptiCAN, SAE J1939 and NMEA 2000 Communications Modbus Master/Slave via Serial Ports Modbus TCP via WI-FI SEE NOTE 1
WI-FI Connectivity:	via Internal WI-IF Module SEE NOTE 1 Programming, Modbus TCP, Cloud Portal Solutions Internal Antenna (External Antenna Option available)
Cellular Modem:	via Internal Cellular Modem SEE NOTE 1 For Cloud Portal Solutions Antenna Provided SMA Connection
LED Indicators	Watchdog LED (status of operation) Programmble LED
Digital inputs:	8 Inputs, rated 8-32VDC Inputs 1-5 Sink/Source as a Group (internal jumper) Inputs 6-8 PNP / NPN Operation Individually (Internal Dip Switches)
Counter Inputs:	3 Channels, Count Up/, 100KHz Max. (using inputs 5-8) 3 Channels, Quadrature A,B, Index (using inputs 5-8), X1, X4
Digital Outputs:	8 Outputs rated 2A Max Each Over-current protected Output Voltage = Input Power Pulse Width Modulation all Channels, 1Hz to 1KHz
Real Time Clock:	Month, Day, Year, Hour, Minute, Second Battery Retained Battery Enable/Disable Dip Switch
Input Power:	9-32VDC 30mA @ 24VDC / 50mA @ 12VDC (no loads, cellular or Wi-Fi)
Operating Temp:	-40-80° C
Program Language:	Ladder Logic, Structured Text using Divelbiss EZ LADDER Toolkit.
Dimensions:	4.63” Wide x 5.24” Length x 1.43” Tall.
Mounting:	Panel Mount using screws
Type:	Enclosed, Sealed Plastic Housing
Storage Temperature:	-40-85°C

NOTE 1: For Models with WI-FI and / or Cellular Modem Feature (model dependent).