# PROLOGIC

## Modular PLC CPU & I/O Modules


# Catalog and Design Guide

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# 1. AN OVERVIEW OF THE PROLOGIC SYSTEM

## 1.1 Introduction

PROLOGIC is an innovative modular PLC system which provides a simple low cost solution for distributed I/O requirements where control is required.

The PROLOGIC system consists of Digital and Analog Input and Output modules which are plugged together on a DIN rail .

The first module is the CPU or interface module. This module connects the Ethernet network to the internal bus which communicates with the I/O modules. This module also provides power to the I/O modules.

The modules communicate using the high speed built in communications bus. A 32bit ARM CPU is used in the modules to provide high speed data processing and fast communication turnaround times.

All PROLOGIC modules plug directly onto an industry standard DIN rail. All modules have a minimum isolation of 1000VAC rms between the field and logic.

The modules have been equipped with status led's which are used to indicate the status of the Inputs or outputs. This visual indication assists with fault finding and diagnostics.

## 1.2 Module Selection Table

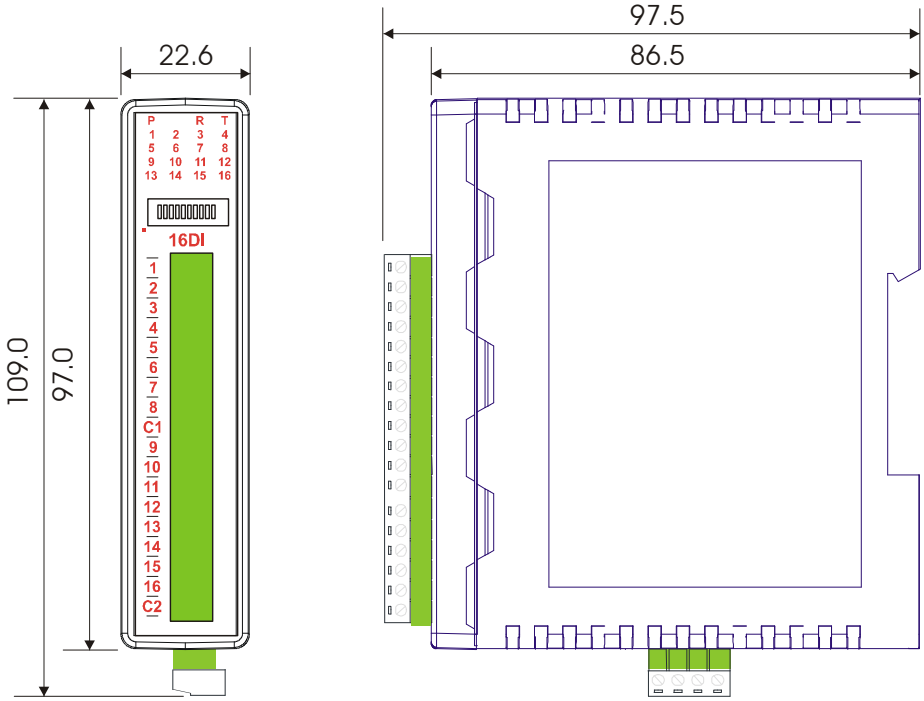
| MODEL | MODULE TYPE |
|---|---|
| | |
| **I/O MODULES** | |
| PL16DI | 16 DIGITAL INPUT MODULE INCLUDING COUNTERS |
| PL16DI-110 | 16 DIGITAL INPUT MODULE INCLUDING COUNTERS (110VAC I/P) |
| PL16DI-220 | 16 DIGITAL INPUT MODULE INCLUDING COUNTERS (220VAC I/P) |
| PL16DO | 16 DIGITAL OUTPUT MODULE |
| PL4RO | 4 RELAY OUTPUT MODULE |
| PL8DIO | 8 DIGITAL INPUT / 8 DIGITAL OUTPUT MODULE |
| PL8AI/I | 8 ANALOG INPUT 0 - 20mA / 4 - 20mA |
| PL8AI/V | 8 ANALOG INPUT 0 - 5V / 1 - 5V / 0 - 10V / 2 - 10V |
| PL8AI/I ISO | 8 ANALOG INPUT 0 - 20mA / 4 - 20mA / ±20mA FULLY ISOLATED |
| PL8AI/V ISO | 8 ANALOG INPUT 0 - 1V / 0 - 10V / ±1V / ±10V FULLY ISOLATED |
| PL8TC | 8 THERMOCOUPLE INPUT MODULE INCL. 0 - 50mV & ±100mV I/P |
| PL8TCISO | 8 TC INPUT MODULE INCL. 0 - 50mV & ±100mV I/P FULLY ISOLATED |
| PL6RTD | 6 RTD INPUT MODULE - PT100, Ni120, PT1000, Ni1000, Ni1000LG & Ohms |
| PLDAIO | 2 RTD I/P, 2 ANALOG INPUT 0(4) - 20mA / 0(2) - 10V, 1 ANALOG OUTPUT 0(4) - 20mA / 0(2) - 10V, 4 DIGITAL INPUTS, 2 DIGITAL OUTPUTS |
| PLDAIO2 | 2 ANALOG INPUT 0 - 20mA / 0 - 10V, 2 ANALOG OUTPUT 0 - 20mA, 4 DIGITAL INPUTS, 4 DIGITAL OUTPUTS |
| PL8AO | 8 ANALOG OUTPUT MODULE 0(4) – 20mA |
| PL8VO | 8 ANALOG OUTPUT MODULE 0(2) – 10V |
| | |
| **CONVERTER** | |
| PL100 | Ethernet Interface |
| | |
| **PLC CPU** | |
| PL101 | PLC CPU Module with Ethernet, RS232 and RS485 |
| | |

# 2. PROLOGIC GENERAL INFORMATION

## 2.1 Physical Dimensions

The PROLOGIC enclosure is shown below. The module clips directly onto an industry standard DIN rail. Field wiring is on the front of the module via a separate plug in connector. The module power and RS485 communications wiring is on a separate plug in connector on the underside of the housing.

Allow at least 25mm on front and below the module to accommodate the wiring. Ensure that enough space to kept above and below the module for good ventilation.




## 2.2 Grounding/Shielding

In most cases, PROLOGIC modules will be installed in an enclosure along with other devices which generate electromagnetic radiation. Examples of these devices are relays and contactors, transformers, motor controllers etc. This electromagnetic radiation can induce electrical noise into both power and signal lines, as well as direct radiation into the module causing negative effects on the system. Appropriate grounding, shielding and other protective steps should be taken at the installation stage to prevent these effects. These protective steps include control cabinet grounding, module grounding, cable shield grounding, protective elements for electromagnetic switching devices, correct wiring as well as consideration of cable types and their cross sections.

## 2.3 Network Termination

Transmission line effects often present a problem on data communication networks. These problems include reflections and signal attenuation.

To eliminate the presence of reflections from the end of the cable, the cable must be terminated at both ends with a resistor across the line equal to its characteristic impedance. Both ends must be terminated since the direction of propagation is bi-directional. In the case of an RS485 twisted pair cable this termination is typically 120 ohms.

## 2.4 RS485 Network Wiring

RS485 is designed to be used with a single twisted pair cable. One of the restrictions of this system is that the common mode voltages of the nodes on the network should not exceed -7V or +10V. In order to ensure that this condition is met, it is recommended that the 0V connections on the modules be connected together. For modules that are far apart, a second twisted pair should be used as the 0V link.

In certain applications where there are strong possibilities of an earth loop being caused by the 0V link, the link should be tied to the 0V terminal on each module through a 100ohm resistor, to limit the earth loop current.

Where earth loop problems exist, it may be necessary to isolate the RS485 network either using optical fiber or an isolated RS485 repeater.

## 2.5 RS485 Network Protection

Being used in an industrial environment, the RS485 network could pick up electrical noise from other machinery or even lightening. In this case it is advised that an RS485 network protection device be used at the entry point to the panel where the PROMUX modules are housed.

## 2.6 Setting the Modbus Node ID

### 2.6.1 Node ID Table

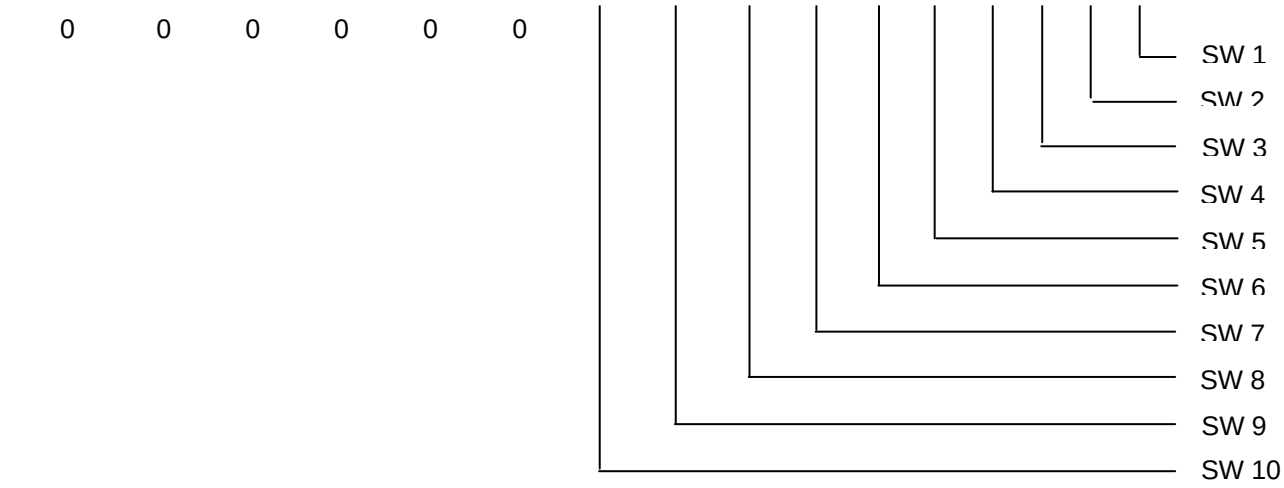
The following table assists with the setting up of DIP switches for the required NODE ID.

| NODE ID | DIP SWITCH SETTINGS | | | | | | |
|---|---|---|---|---|---|---|---|
| | SW1 | SW2 | SW3 | SW4 | SW5 | SW6 | SW7 |
| 1 | ON | OFF | OFF | OFF | OFF | OFF | OFF |
| 2 | OFF | ON | OFF | OFF | OFF | OFF | OFF |
| 3 | ON | ON | OFF | OFF | OFF | OFF | OFF |
| 4 | OFF | OFF | ON | OFF | OFF | OFF | OFF |
| 5 | ON | OFF | ON | OFF | OFF | OFF | OFF |
| 6 | OFF | ON | ON | OFF | OFF | OFF | OFF |
| 7 | ON | ON | ON | OFF | OFF | OFF | OFF |
| 8 | OFF | OFF | OFF | ON | OFF | OFF | OFF |

### 2.6.2 DIP Switch Status Register.

Each module uses register 30100 to store the status of the DIP switches.

| MSB | | | | | | **DIP SWITCH REGISTER** LSB | | | | | | | | | | ADDRESS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| 32768 | 16384 | 8192 | 4096 | 2048 | 1024 | 512 | 256 | 128 | 64 | 32 | 16 | 8 | 4 | 2 | 1 | 30100 |




## 2.7 Communications Settings

The data in the modules is stored in 16 bit registers. These registers are accessed over the network using the MODBUS **RTU** communication protocol.

### 2.7.1 Communications Settings with DIP Switch 10 On

This setting enables the high speed data communications bus and must be in the ON position.

### 2.7.2 Modbus Register Types

There are 4 types of variables which can be accessed from the module. Each module has one or more of these data variables.

| Type | Start Address | Variable | Access |
|---|---|---|---|
| 1 | 00001 | Digital Outputs | Read & Write |
| 2 | 10001 | Digital Inputs | Read Only |
| 3 | 30001 | Input registers (Analog) | Read Only |
| 4 | 40001 | Output registers (Analog) | Read & Write |

Note: The Modbus message length must be limited to 100 consecutive read or write registers. If more registers are required then a new poll group must be added for the next xxx registers.

# 3. PROLOGIC MODULES

## 3.1 PL100 – Ethernet Interface Module

### 3.1.1 Description


The PL100 is an Ethernet to serial converter and connects the PROLOGIC modules to a 10/100 Base-TX Ethernet network.

The PL100 includes a web server which enables access to internal parameters for configuration. This allows configuration of IP address, default gateway IP address and subnet mask. The web server can be accessed by most web browsers.

The PL100 is factory programmed with a default IP address of 169.254.111.111. This address must be changed before the converter is added to an existing network.

The web page address for viewing the setup parameters is http://169.254.111.111/index.htm The web page address for configuring the converter is http://169.254.111.111/ip.htm

The master device which is polling the modules must be configured with the IP address of the PL100 and with the modbus ID of the PROLOGIC modules. As each PROLOGIC communications bus is separate, it is possible to have repeated Modbus ID's on the PROLOGIC modules provided they are attached to a different PL100. The IP address differentiates between the different PROLOGIC systems. Consequently, many hundreds of PROLOGIC modules may be added to a Ethernet network.

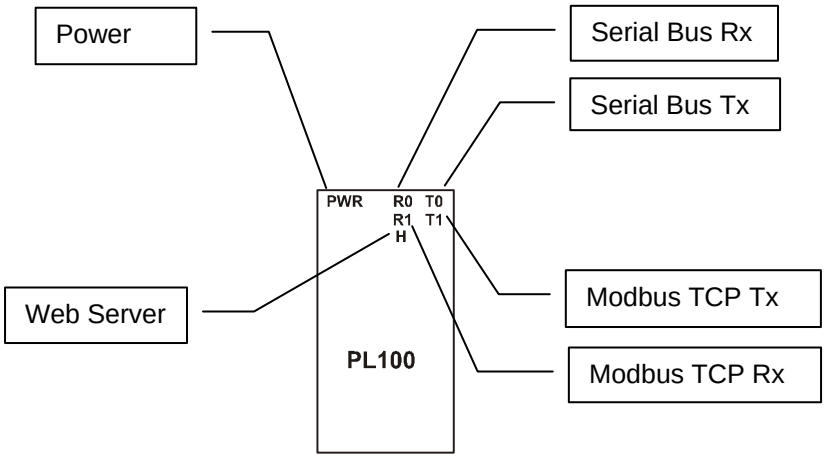
The PL100 is a Modbus gateway and the client must be configured to use **Port 502.** This is a reserved port number for Modbus TCP applications and informs the PL100 that it must implement the protocol conversion from Modbus TCP on the Ethernet network to Modbus RTU on the PROLOGIC serial communications bus.

### 3.1.2 Technical Specification of PL100

| | | |
|---|---|---|
| **Power Supply** | Logic Supply Voltage | 12 -24 Vdc |
| | Logic Supply Power | 0.8VA |
| **Ethernet** | 10/100 Mbits/s | 10/100Base-TX |
| | Connector | RJ45 |
| **Temperature** | Operating Temperature. | -40°C to + 80°C |
| | Storage Temperature | -40°C to + 85°C |
| **Connectors** | Power. | 4 way screw connector |
| **Humidity** | | Up to 95% non condensing. |
| | | |

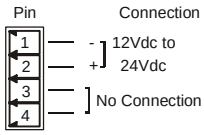
### 3.1.3 Status Indicators

| | |
|---|---|
| **Power:** | Flashes to indicate the CPU is running. |
| **Serial Bus Rx:** | Flashes to indicate the unit has received a valid Modbus message from a PROLOGIC module. |
| **Serial Bus Tx:** | Flashes to indicate the unit has sent a Modbus message to a PROLOGIC module. |
| **Modbus TCP Rx:** | Flashes to indicate the unit has received a valid Modbus message on the Ethernet network. |
| **Modbus TCP Tx:** | Flashes to indicate the unit has transmitted a Modbus message on the Ethernet network. |
| **Web Server:** | Flashes to indicate the HTTP web server is being accessed. |




### 3.1.4 Wiring

The following diagram shows the wiring for the power.



### 3.1.5 Configuration

#### 3.1.5.1 Power Connections.

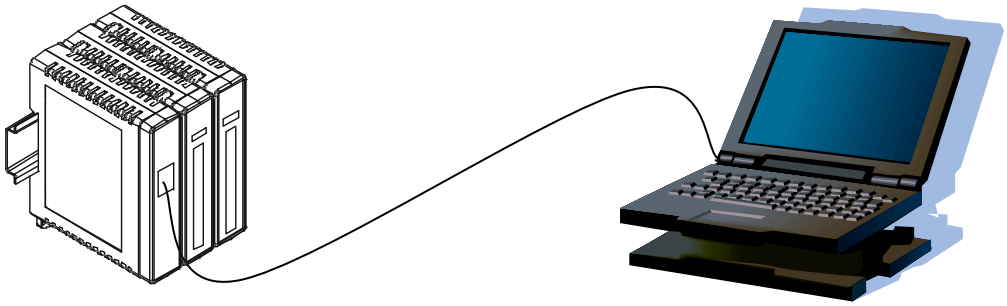
The PL100 Module must be clipped onto a DIN rail. Power for the PL100 must be applied to terminal 2 (+12/24VDC) and terminal 1 (0V). The power LED will flash and all LED's will be off.

#### 3.1.5.2 Ethernet Connection.

Next the Ethernet connection is required, either through a network or directly to a PC. The Ethernet interface uses a standard RJ45 connector.

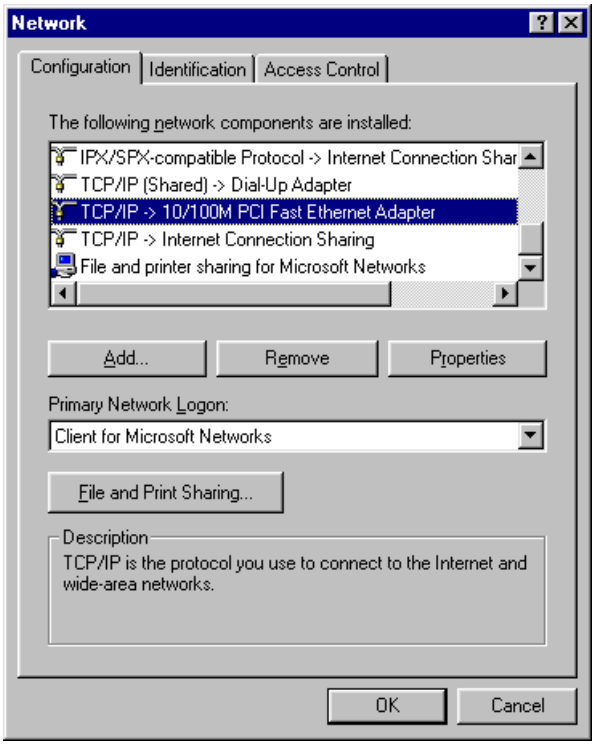
#### 3.1.5.3 Connecting To a PC which is not Connected to a Network.

If the PC is equipped with an Ethernet card but not connected to a network, a local network address should be used for communication between the PL100 and the PC. The PL100 is shipped with a default IP address 169.254.111.111. This address is in the address area reserved for local networks not connected to the Internet. For direct connection between the PC and the PL100, a crossover Ethernet cable is required.

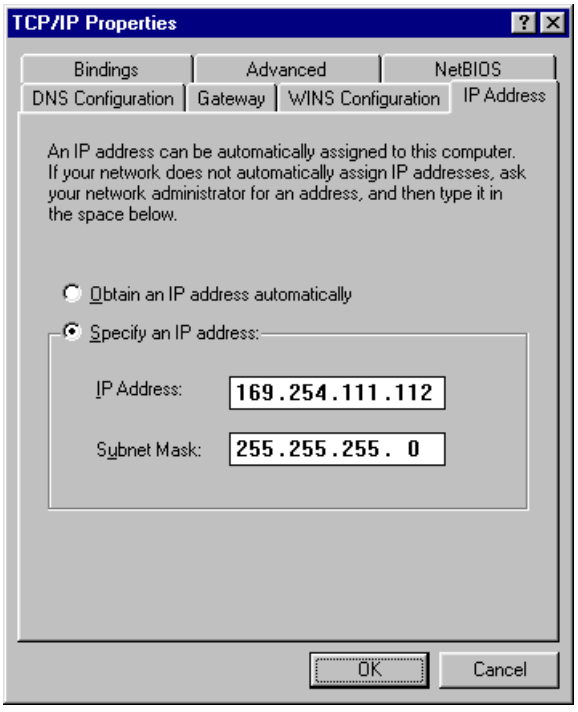


To setup your PC to connect directly to the PL100, an IP address in the same range as the PL100 must be assigned to the PC. In Windows environments, this should be done as follows:

- Connect the PC and the PL100 together using a crossover cable
- Open the Windows Control Panel
- Select Network
- Select TCP/IP -> the PC's Ethernet adaptor from the Configuration tab as shown below



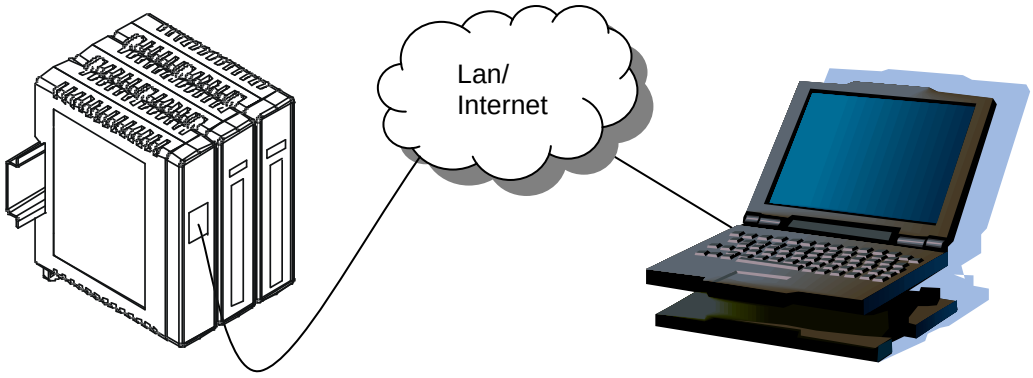

- Click the properties button. A TCP/IP Properties box similar to the one below should appear




- Select the IP Address tab
- Choose to Specify an IP address as shown in the figure
- Insert the IP address 169.254.111.112 and the corresponding subnet mask as shown
- Save your settings by pressing OK in both TCP/IP properties and Network properties
- Reboot your PC

### 3.1.5.4 Connecting to a PC which is Connected to a Network.

If there is an Ethernet network available, the PL100 can be connected to any Ethernet connection or hub belonging to the network. If the PC is connected to a network, there is a strong possibility that the default IP address of the PL100 is outside the range of the network (the address doesn't belong to the IP subset of the network). If the Ethernet network is connected to the Internet, this is certain. In this case a new IP address for the PL100 is required. Contact the local network administrator to be assigned a free IP address for the PL100. The new IP address is programmed into the PL100 using a Web browser software such as Internet explorer. In this case the PL100 must first be connected directly to a PC as described above.




In the remainder of this chapter, the IP address 169.254.111.111 is used as an example. Exchange this IP address with the IP address you have set up in all the occurrences.

### 3.1.5.5 Testing the Connection

To test the connection between the PC and the PL100, a simple program called *ping* can be used. *Ping* sends a number of messages to the specified IP address and displays the response. The ping program can be run from the command line or from a DOS window on the PC, as follows:

- Open the Windows Start Menu
- Click Run
- In the Open box, type: "ping 169.254.111.111"

If the network connection is OK, the program will respond with:
"Reply from 169.254.111.111" and information about the response time.

If there is a problem with the network setup the program will respond:
"**Destination host unreachable**". There may be two solutions to this problem:

- If the PC is connected in a network, change the IP address to an address accessible from the local network.
- If the PL100 is connected directly to the PC(or through a hub), change the PC's IP address to one in the same address range as the PL100.

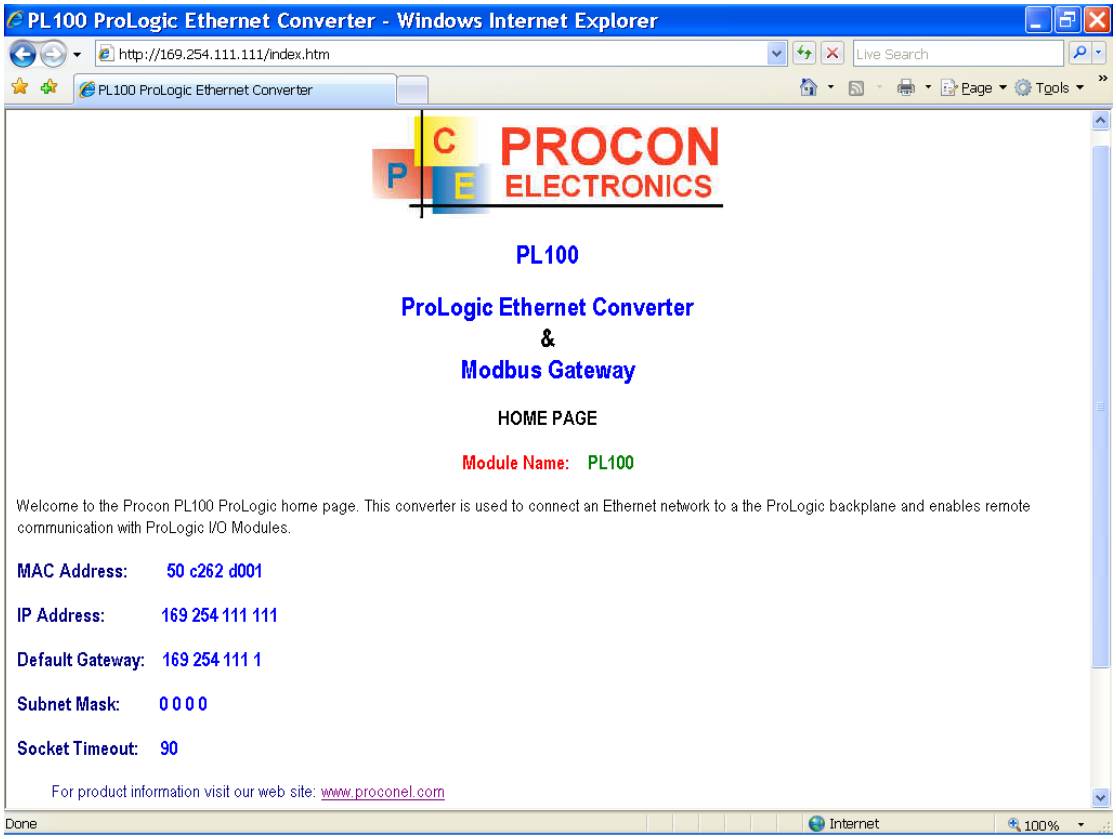
If there is a problem with the PL100 the program will respond:
"**Request timed out**", this means that the PL100 can not respond to messages. Check the power connection. Check that the Link LED is illuminated when the cable is plugged into the RJ45 connector.

### 3.1.6 Viewing Web Pages

The PL100 has built in web pages. These are used for checking the configuration and dynamic data, and for altering the configuration. To view these Web pages, a Web browser such as Internet Explorer or Netscape is needed.

To view the default Web page in PL100, start the Web browser and type "169.254.111.111" into the address line of the browser window. The main page of the PL100 will now be displayed in the browser window.

If no Web page is displayed, go back to testing the network connection to the PL100 by using the ping command. If the PL100 replies to the ping messages, check the setup of the Web browser. If the PL100 is directly connected to the same network as the PC, "direct connection to the network" or "bypass proxy server for local addresses" should be selected in the Web browser configuration menu. If the PL100 is connected to the PC through a firewall, a proxy server should be selected in the configuration menu. Contact the local network administrator for information about the network configuration.

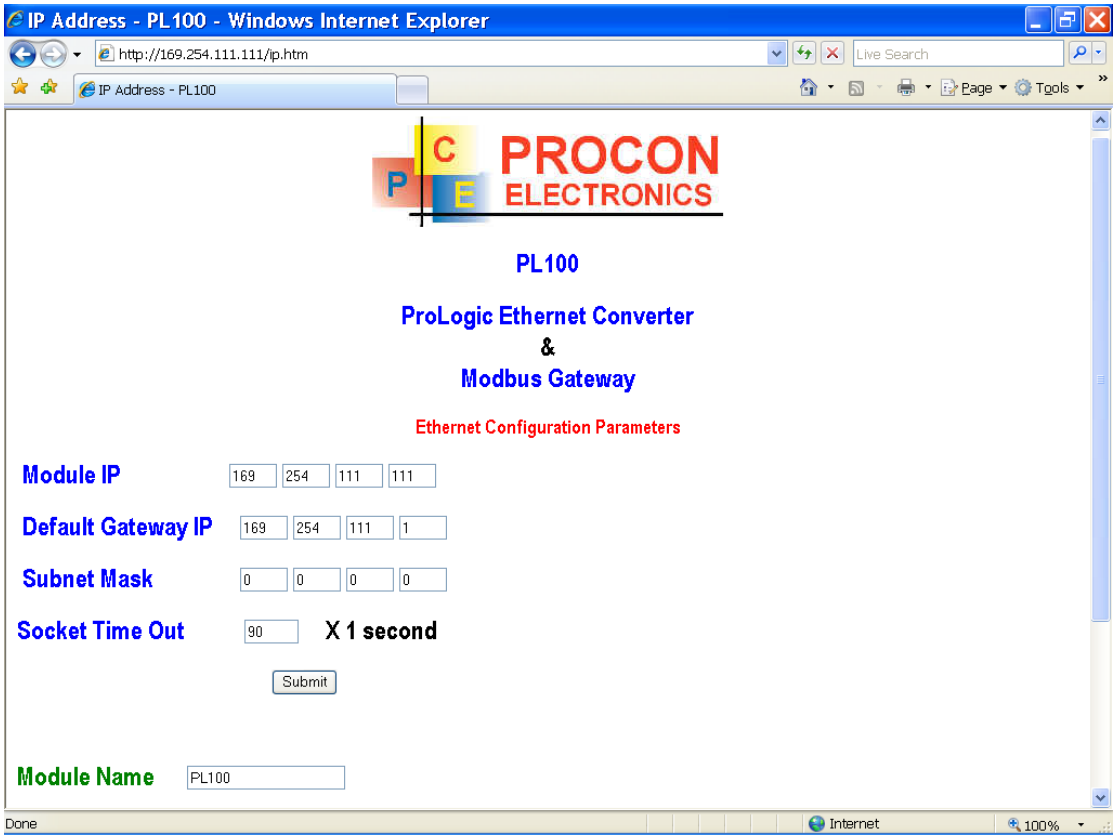


### 3.1.7 Troubleshooting Guide.

| No | Checkpoint | | Solution |
|---|---|---|---|
| | | | |
| 1 | Is the LINK LED on and is the ACTIVITY LED flashing with short pulses? | No | No network connection is detected. The Ethernet cable is either not plugged in or wrong type of cable is used. For connection to a network with a hub or switch, a normal network cable can be used. For direct connection to a PC network card, a twisted cable must be used. |
| | | Yes | A network connection is detected, the PL100 is connected to the network. |
| 2 | Does the PL100 respond to PING requests? | No | Either the PC or the PL100 is setup with wrong IP address.<br>To change the IP address of the PL100 back to the default address, remove the power, open the PL100 housing and remove the jumper labeled DEFAULT IP. Apply power to the PL100 for a short while. Now replace the jumper and close the enclosure.<br>To change the IP address of a PC, use the Windows "control panel -> network -> TCP/IP properties" and setup an IP address close to the PL100 address. The PL100 is shipped with a default IP address of 169.254.111.111, the PC can be setup with an IP address of 169.254.111.112 |
| | | Yes | The PC and PL100 are setup with a correct IP address and they are able to communicate with each other. |
| 3 | Can the default Web page be accessed in a Web browser? | No | This is normally caused by the setup of the Web browser.<br>In the "options" or "preferences" menu, check that the Web browser is configured for direct network connection or local area network and **NOT** using a proxy server. |
| | | Yes | No problems. |

### 3.1.8 Parameter Configuration

The Web page address "169.254.111.111/ip.htm" is entered into the address line of the browser window to access the configuration page. This page allows you to change the IP address of the PL100, Default Gateway, Subnet Mask, and to enter a Module Description Name for identification/maintenance purposes.




- **IP Address:** The new IP address can be entered into the web page as shown above. After this has been done, you must click the Submit button to send the values to the PL100. The screen will now be updated and if successful will continue to display the new IP address. The new IP address will only be effective after the PL100 power has been switched off and on again. This feature allows you to check that the correct IP address has been entered before being activated. If the IP address has been entered incorrectly and the power has not been switched off, it is possible to re-enter the correct IP address. If the power has been switched off and back on again, the PL100 will not communicate until you enter the new IP address into the address line of the browser window.
- **Default Gateway IP Address:** A **default gateway** is a node (a router) on a computer network that serves as an access point to another network. In enterprises, however, the gateway is the computer that routes the traffic from a PC to the outside network that is serving the Web pages. It is only necessary to configure the default gateway IP address if the PC that is accessing the PL100 is on a different network.
- **Subnet Mask:** In computer networks, a **subnetwork** or **subnet** is a range of logical addresses within the address space that is assigned to an organization. The subnet mask is used to inform the PL100 that it must send its replies to the gateway if the IP address of the PC is on a different network. When the subnet mask is set to “0.0.0.0” then it is effectively disabled and the default gateway is not used. A typical subnet mask would be “255.255.255.0”.
- **Socket Timeout:** If a socket connection is broken, say due to a network fault, it must timeout to free it up so that it can be used again. This timer is triggered by activity on

the converter, so if there is no communications activity for longer than the timeout period, the socket will close.

- **Module Name:** This field allows you to enter a module description name into the PL100. This is an identifier for diagnostic/maintenance purposes and is chosen to best describe the PL100 in the system by name or number.

## 3.2 PL101 – PLC Module with Ethernet and Serial Ports

### 3.2.1 Description


The PL101 PLC has been developed as a compact controller with a versatile combination of communication ports. The fact that the controller is programmable enables the user to program their own unique logic requirements and not be restricted by a pre-programmed unit or hardwired relays and timers.

The PROLOGIC modules plug into each other and the module on the left plugs into the PL101. Up to eight modules can plugged together.

The PL101 PLC is programmed in ladder logic. Procon's ProSoft windows-based PC software is used to generate the ladder diagram, compile the program, and then download the program to the PL101 via the Ethernet port on the front of the unit.

The PL101 includes a web server which enables access to internal parameters for configuration. This allows configuration of IP address, default gateway IP address and subnet mask. The web server can be accessed by most web browsers. The PL101 supports the FTP protocol which enables the web pages to be customized if required.

The PL101 is factory programmed with a default IP address of 169.254.111.111. This address must be changed before the converter is added to an existing network.

The web page address for viewing the setup parameters is http://169.254.111.111/index.htm
The web page address for configuring the converter is http://169.254.111.111/ip.htm

The master device which is polling the PL101 must be configured with the IP address of the PL101 and with the Modbus ID of the PROLOGIC modules. The Modbus ID of the PL101 is 0 (zero).

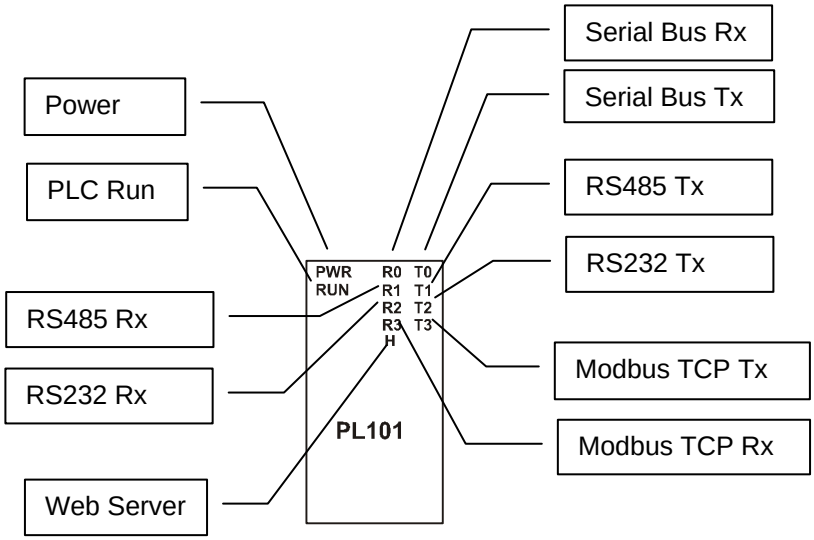
The PL101 communicates using the Modbus TCP protocol and the client must be configured to use **Port 502.** This is a reserved port number for Modbus TCP applications.

### 3.2.2 Technical Specification of PL101

| | | |
|---|---|---|
| **Power Supply** | Logic Supply Voltage | 12 -24 Vdc |
| | Logic Supply Power | 0.8VA |
| **Ethernet** | 10/100 Mbits/s | 10/100Base-TX |
| | Connector | RJ45 |
| **Serial** | RS232 | 3 Wire , TX,RX,GND |
| | RS485 | 2 Wire Multidrop twisted pair |
| | Baud Rate | 2400, 4800, 9600, 19200, 38400, 57600, 115200 |
| | Data Bits | 5, 6, 7, 8 . |
| | Parity | none, even, odd. |
| | Stop Bits | 1, 2. |
| **Temperature** | Operating Temperature. | -30°C to + 80°C |
| | Storage Temperature | -40°C to + 85°C |
| **Connectors** | Power. | 4 way screw connector |
| **Humidity** | | Up to 95% non condensing. |
| | | |

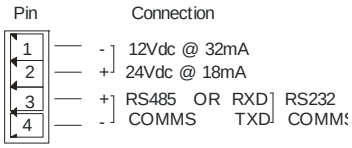
### 3.2.3 Status Indicators

| | |
|---|---|
| **Power:** | Flashes to indicate the CPU is running. |
| **Serial Bus Rx (0):** | Flashes to indicate the unit has received a valid Modbus message from a PROLOGIC module. |
| **Serial Bus Tx (0):** | Flashes to indicate the unit has sent a Modbus message to a PROLOGIC module. |
| **RS485 Rx (1):** | Flashes to indicate the unit has received a valid Modbus message on the RS485 port. (or RS232) |
| **RS485 Tx (1):** | Flashes to indicate the unit has sent a Modbus message on the RS485 port. (or RS232) |
| **RS232 Rx (2):** | Flashes to indicate the unit has received a valid Modbus message on the RS232 port. |
| **RS232 Tx (2):** | Flashes to indicate the unit has sent a Modbus message on the RS485 port. |
| **Modbus TCP Rx(3):** | Flashes to indicate the unit has received a valid Modbus message on the Ethernet network. |
| **Modbus TCP Tx (3):** | Flashes to indicate the unit has transmitted a Modbus message on the Ethernet network. |
| **Web Server:** | Flashes to indicate the HTTP web server is being accessed. |




### 3.2.4 Wiring

The following diagram shows the wiring for the power and RS232/RS485 communications.



### 3.2.5 Configuration

The configuration of the IP Address is done using the web browser. Refer to the section in the PL100 chapter for setting up the TCP communications.

### 3.2.6 PL101 CPU Details.

The CPU (central Processing Unit) performs all of the tasks that are required to make the PLC function and run your ladder program. Some of the tasks include:

1. Reading the status of the inputs from the PROLOGIC modules.
2. Executing the program.
3. Updating the outputs on the PROLOGIC modules.
4. Doing diagnostics.
5. Servicing the communications ports.
6. Running the timers.

### 3.2.7 Program Memory.

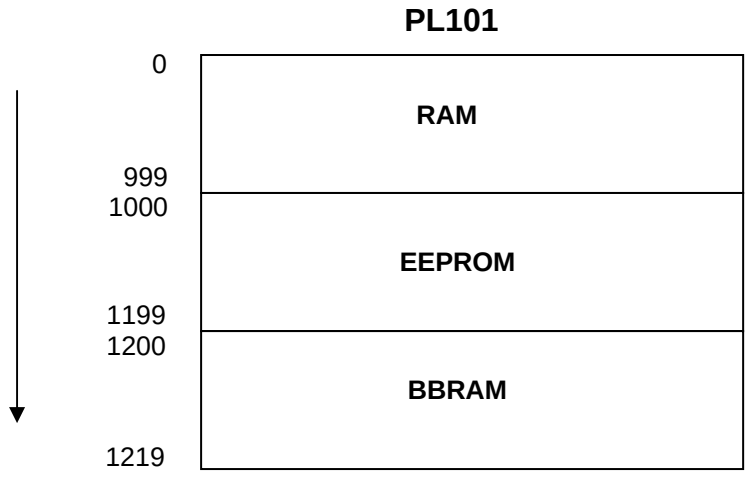
The Ethernet  port or RS232 port (11520 kbaud) are used to program the PLC. The program which is sent from the PC using the ProSoft ladder editor, is stored in FLASH memory. This memory does not get lost when the power fails and so will remain permanently in the PLC until it is reprogrammed.

### 3.2.8 Data Memory.

All the variables used in the program are stored in Data memory. Both the Digital and Analog values are stored in this memory along with the timers, counters, and user memory.

The memory is divided up into 3 sections.

1. RAM – Random Access Memory. This memory is the most widely used memory and is where most of the data is stored. All timers, counters, I/O statuses and system information use this memory. If the power fails then all the information in this memory is lost and is re-initialized to zero when the PLC starts again.
2. EEPROM – This memory is used to store parameters such as set-points and configuration data as it retains its memory when the power is turned off. The one point to remember is that this memory can only be written to 10 000 times before it wears out so you must not write to this memory all the time as you can with RAM.
3. BBRAM – This is battery backed RAM and also retains its memory when the power is switched off. This memory is slow compared to RAM and should not be used where normal RAM can be used. This memory is ideal for storing values such as used in counting applications. The Real time clock is also stored in this memory.



### 3.2.9 Data Memory Map.

All of the variables used in the PLC are stored in data memory. In order for your program to get access to these variables you need to know the memory address. The memory address starts at zero and the size depends on the PLC being used. Each memory location consists of 16 bits. Thus one memory location can be used to store the status of 16 digital I/O points or an analog value from 0 to 65535. Some of the ladder functions use two consecutive memory locations to store larger values. Refer to the ProSoft user manual to find out about the ladder functions.

**PL101 MEMORY MAP**

| Memory Type | Digital Reference | Memory Address | Quantity |
|---|---|---|---|
| Module Type = 121 | - | M0 | 1 |
| Digital Inputs | I1 to I64 | M1 – M8 | 128 |
| Digital Outputs | O1 to O4 | M9 – M16 | 128 |
| Timer Status | T1 to T64 | M17 – M20 | 64 |
| Counter Status | C1 to C64 | M21 – M24 | 64 |
| Control Relays | R1 to R64 | M25 – M28 | 64 |
| System Relays | S1 to S32 | M29 – M30 | 32 |
| Timer Memory | - | M33 – M96 | 64 |
| Counter Memory | - | M97 – M160 | 64 |
| User RAM Memory | - | M161 – M199 | 39 |
| IO Table | - | M200 – M399 | 200 |
| IO Status | - | M400 | 1 |
| User RAM Memory | - | M401 – M999 | 599 |
| User EEPROM | - | M1000 – M1199 | 200 |
| User BBRAM | - | M1200 – M1219 | 20 |

### 3.2.10 Digital Input Map.

The digital input memory addresses correspond to the eight PROLOGIC modules, with the module ID1-8 being read into M1-M8. If the module is not an input module then the corresponding memory location will be unused.

| MSB | | | | | **PL101 Digital Inputs** | | | | | | | | | | | LSB | Address |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | |
| I16 | I15 | I14 | I13 | I12 | I11 | I10 | I9 | I8 | I7 | I6 | I5 | I4 | I3 | I2 | I1 | | M1 |
| I32 | I31 | I30 | I29 | I28 | I27 | I26 | I25 | I24 | I23 | I22 | I21 | I20 | I19 | I18 | I17 | | M2 |
| I48 | I47 | I46 | I45 | I44 | I43 | I42 | I41 | I40 | I39 | I38 | I37 | I36 | I35 | I34 | I33 | | M3 |
| I64 | I63 | I62 | I61 | I60 | I59 | I58 | I57 | I56 | I55 | I54 | I53 | I52 | I51 | I50 | I49 | | M4 |
| I80 | I79 | I78 | I77 | I76 | I75 | I74 | I73 | I72 | I71 | I70 | I69 | I68 | I67 | I66 | I65 | | M5 |
| I96 | I95 | I94 | I93 | I92 | I91 | I90 | I89 | I88 | I87 | I86 | I85 | I84 | I83 | I82 | I81 | | M6 |
| I112 | I111 | I110 | I109 | I108 | I107 | I106 | I105 | I104 | I103 | I102 | I101 | I100 | I99 | I98 | I97 | | M7 |
| I128 | I127 | I126 | I125 | I124 | I123 | I122 | I121 | I120 | I119 | I118 | I117 | I116 | I115 | I114 | I113 | | M8 |

### 3.2.11 Digital Output Map.

The digital output memory addresses correspond to the eight PROLOGIC modules, with the module ID1-8 being written from M9-M16. If the module is not an output module then the corresponding memory location will be unused.

| MSB | | | | | | | **PL101 Digital Outputs** | | | | | | | | LSB | Address |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| O16 | O15 | O14 | O13 | O12 | O11 | O10 | O9 | O8 | O7 | O6 | O5 | O4 | O3 | O2 | O1 | M9 |
| O32 | O31 | O30 | O29 | O28 | O27 | O26 | O25 | O24 | O23 | O22 | O21 | O20 | O19 | O18 | O17 | M10 |
| O48 | O47 | O46 | O45 | O44 | O43 | O42 | O41 | O40 | O39 | O38 | O37 | O36 | O35 | O34 | O33 | M11 |
| O64 | O63 | O62 | O61 | O60 | O59 | O58 | O57 | O56 | O55 | O54 | O53 | O52 | O51 | O50 | O49 | M12 |
| O80 | O79 | O78 | O77 | O76 | O75 | O74 | O73 | O72 | O71 | O70 | O69 | O68 | O67 | O66 | O65 | M13 |
| O96 | O95 | O94 | O93 | O92 | O91 | O90 | O89 | O88 | O87 | O86 | O85 | O84 | O83 | O82 | O81 | M14 |
| O112 | O111 | O110 | O109 | O108 | O107 | O106 | O105 | O104 | O103 | O102 | O101 | O100 | O99 | O98 | O97 | M15 |
| O128 | O127 | O126 | O125 | O124 | O123 | O122 | O121 | O120 | O119 | O118 | O117 | O116 | O115 | O114 | O113 | M16 |

### 3.2.12 Timer Map.

| MSB | | | | | | | **PL101 Timer status** | | | | | | | | LSB | Address |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| T16 | T15 | T14 | T13 | T12 | T11 | T10 | T9 | T8 | T7 | T6 | T5 | T4 | T3 | T2 | T1 | M17 |
| T32 | T31 | T30 | T29 | T28 | T27 | T26 | T25 | T24 | T23 | T22 | T21 | T20 | T19 | T18 | T17 | M18 |
| T48 | T47 | T46 | T45 | T44 | T43 | T42 | T41 | T40 | T39 | T38 | T37 | T36 | T35 | T34 | T33 | M19 |
| T64 | T63 | T62 | T61 | T60 | T59 | T58 | T57 | T56 | T55 | T54 | T53 | T52 | T51 | T50 | T49 | M20 |

### 3.2.13 Counter Map.

| MSB | | | | | | | **PL101 Counter status** | | | | | | | | LSB | Address |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| C16 | C15 | C14 | C13 | C12 | C11 | C10 | C9 | C8 | C7 | C6 | C5 | C4 | C3 | C2 | C1 | M21 |
| C32 | C31 | C30 | C29 | C28 | C27 | C26 | C25 | C24 | C23 | C22 | C21 | C20 | C19 | C18 | C17 | M22 |
| C48 | C47 | C46 | C45 | C44 | C43 | C42 | C41 | C40 | C39 | C38 | C37 | C36 | C35 | C34 | C33 | M23 |
| C64 | C63 | C62 | C61 | C60 | C59 | C58 | C57 | C56 | C55 | C54 | C53 | C52 | C51 | C50 | C49 | M24 |

### 3.2.14 Control Relay Map.

| MSB | | | | | | | **PL101 Control Relays** | | | | | | | | LSB | Address |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| R16 | R15 | R14 | R13 | R12 | R11 | R10 | R9 | R8 | R7 | R6 | R5 | R4 | R3 | R2 | R1 | M25 |
| R32 | R31 | R30 | R29 | R28 | R27 | R26 | R25 | R24 | R23 | R22 | R21 | R20 | R19 | R18 | R17 | M26 |
| R48 | R47 | R46 | R45 | R44 | R43 | R42 | R41 | R40 | R39 | R38 | R37 | R36 | R35 | R34 | R33 | M27 |
| R64 | R63 | R62 | R61 | R60 | R59 | R58 | R57 | R56 | R55 | R54 | R53 | R52 | R51 | R50 | R49 | M28 |

### 3.2.15 System Relay Map.

| MSB | | | | | | | | PL101 System Relays | | | | | | | LSB | Address |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| S16 | S15 | S14 | S13 | S12 | S11 | S10 | S9 | S8 | S7 | S6 | S5 | S4 | S3 | S2 | S1 | M29 |
| S32 | S31 | S30 | S29 | S28 | S27 | S26 | S25 | S24 | S23 | S22 | S21 | S20 | S19 | S18 | S17 | M30 |

| Bit Number | Digital Input Number | Description |
|---|---|---|
| 0 | S1 | ON |
| 1 | S2 | 1st Scan |
| 2 | S3 | 0.1 Second Clock Period |
| 3 | S4 | 1 Second Clock Period |
| 4 | S5 | 1 Minute Clock Period |
| 5 | S6 | CMP < MEM/K |
| 6 | S7 | CMP = MEM/K |
| 7 | S8 | CMP > MEM/K |
| 8 | S9 | PLC Running |
| 9 | S10 | PLC Re-Program Request |
| 10 | S11 | PLC Re-Program Acknowledge |
| 11 | S12 | - |
| 12 | S13 | - |
| 13 | S14 | Comm 1 Ready |
| 14 | S15 | Comm 1 Error |
| 15 | S16 | TCP Comm Ready |
| 16 | S17 | TCP Comm Error |

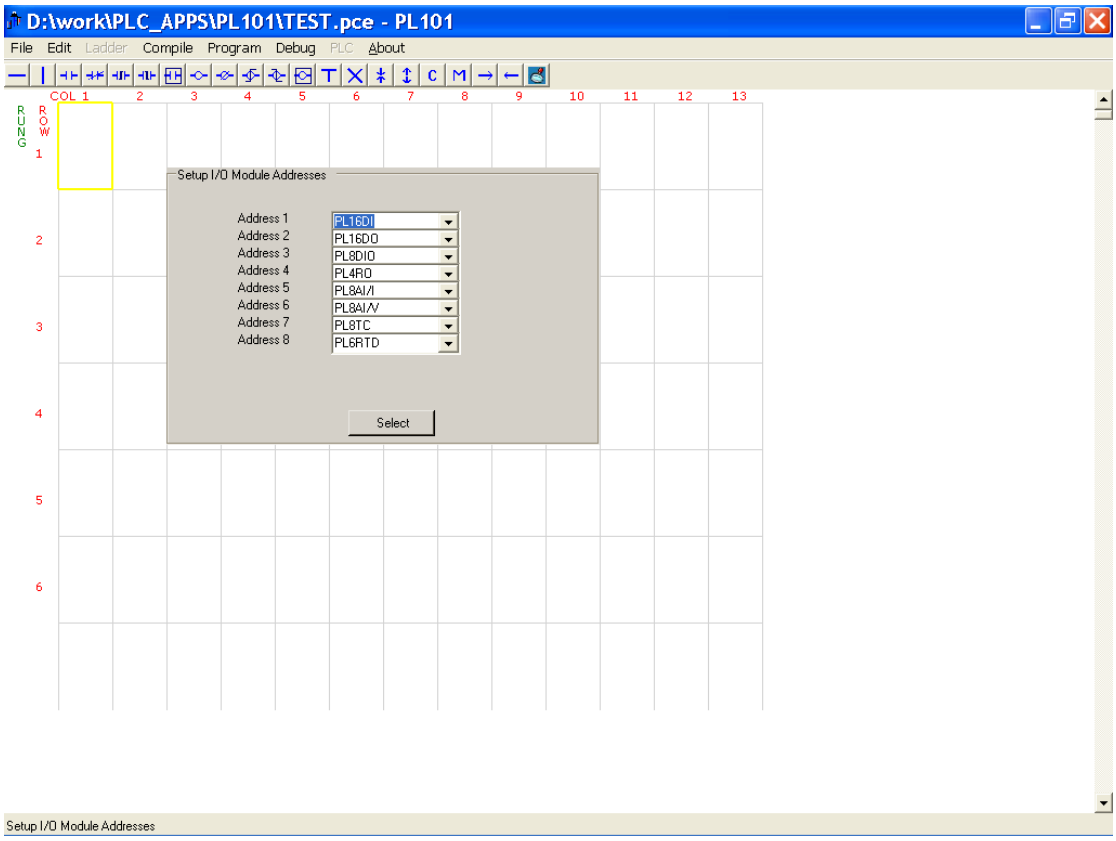
### 3.2.16 IO Table

If you click the mouse pointer on the **EDIT->I/O Module Addresses** menu item in the ProSoft program, a box will open which shows a list of the 8 I/O modules. By clicking on the pull down tab, you can select the module type that is assigned to the module ID 1 to 8.

The modules that can be selected are as follows:

1. PL16DI
2. PL16DO
3. PL8DIO
4. PL4RO
5. PL8AI/I
6. PL8AI/V
7. PL8TC
8. PL8TC ISO
9. PL8AI/I ISO
10. PL8AI/V ISO
11. PL6RTD
12. PL8AO
13. PL8VO
14. PLDAIO
15. PLDAIO2
16. PL16DI110
17. PL16DI220

Once you have selected the modules to be used in your application, ensure that the DIP switch is setup on each module with the correct Modbus address. It is good practice to start numbering from left to right.




Once the ladder program is compiled and downloaded to the PL101, the PLC program will automatically start reading the modules and will check the module type against the configuration table. If the type does not match the table then a status error will be indicated in the I/O Status memory register **M400**. The bit in the register is set if the type check is OK, otherwise the bit is cleared. The format of the I/O Status register is as follows:

| MSB | | | | | **I/O Module Status Register** | | | | | | | | | | LSB | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | Address |
| 32768 | 16384 | 8192 | 4096 | 2048 | 1024 | 512 | 256 | 128 | 64 | 32 | 16 | 8 | 4 | 2 | 1 | M400 |

0 0 0 0 0 0 0 0

Module 1
Module 2
Module 3
Module 4
Module 5
Module 6
Module 7
Module 8

If the module type does not match the configuration table or the module is not present, the PLC software continues to scan the module every 2 seconds and updates the I/O table status register.

If the module type matches the configuration table, the PLC starts reading or writing the module either on every PLC ladder scan, on a change of state or on a timer, depending on the module type.

The following table describes the reading/writing of the modules:

| Module Type | Read/Write Mode |
|---|---|
| | |
| PL16DI | Inputs read at the beginning of every PLC ladder cycle. |
| PL16DO | Outputs written at the end of the PLC ladder cycle if there was a change of state. |
| PL8DIO | Inputs read at the beginning of every PLC ladder cycle.<br>Outputs written at the end of the PLC ladder cycle if there was a change of state. |
| PL4RO | Outputs written at the end of the PLC ladder cycle if there was a change of state. |
| PL8AI/I | Inputs read every 0.5 second at the beginning of PLC ladder cycle. |
| PL8AI/V | Inputs read every 0.5 second at the beginning of PLC ladder cycle. |
| PL8TC | Inputs read every 1.0 second at the beginning of PLC ladder cycle. |
| PL8TC ISO | Inputs read every 1.0 second at the beginning of PLC ladder cycle. |
| PL8AI/I ISO | Inputs read every 1.0 second at the beginning of PLC ladder cycle. |
| PL8AI/V ISO | Inputs read every 1.0 second at the beginning of PLC ladder cycle. |
| PL6RTD | Inputs read every 1.0 second at the beginning of PLC ladder cycle. |
| PL8AO | Outputs written at the end of the PLC ladder cycle if there was a change of state in the I/O table. Only from Version 6. |
| PL8VO | Outputs written at the end of the PLC ladder cycle if there was a change of state in the I/O table. Only from Version 6. |
| PLDAIO | Inputs read every 0.1 second at the beginning of PLC ladder cycle. Digital Outputs written at the end of the PLC ladder cycle if there was a change of state. Analog Outputs written at the end of the PLC ladder cycle if there was a change of state in the I/O table. Only from Version 6. |
| PLDAIO2 | Inputs read every 0.1 second at the beginning of PLC ladder cycle. Digital Outputs written at the end of the PLC ladder cycle if there was a change of state. Analog Outputs written at the end of the PLC ladder cycle if there was a change of state in the I/O table. Only from Version 6. |
| PL16DI110 | Inputs read at the beginning of every PLC ladder cycle. |
| PL16DI220 | Inputs read at the beginning of every PLC ladder cycle. |
| | |

Note 1: Digital outputs can only be changed by using the Outputs in the ladder logic program in ProSoft. Do not write directly to the I/O table as the ladder logic program will overwrite these outputs.

Note 2: For PL101 Software version less than 6, Analog output registers must be written to using the function REGW. For software version 6 and above the Analog output values can be written directly to the I/O table.

The format of the I/O Table

- The memory address of the I/O Table is fixed starting at M200.
- The table is divided into eight blocks, one for each module.
- Each block consists of 25 registers.
- The first register in each block contains the software version and module type identifier for that module.
- The remaining 24 registers contain the data that is read from the module. The modules do not use all of the registers. The number of registers used depends on the specific module.

| Memory Address | Module Number |
|---|---|
| M200 | Start of module 1. |
| - | |
| M224 | End of module 1. |
| | |
| M225 | Start of module 2. |
| - | |
| M249 | End of module 2. |
| | |
| M250 | Start of module 3. |
| - | |
| M274 | End of module 3. |
| | |
| M275 | Start of module 4. |
| - | |
| M299 | End of module 4. |
| | |
| M300 | Start of module 5. |
| - | |
| M324 | End of module 5. |
| | |
| M325 | Start of module 6. |
| - | |
| M349 | End of module 6. |
| | |
| M350 | Start of module 7. |
| - | |
| M374 | End of module 7. |
| | |
| M375 | Start of module 8. |
| - | |
| M399 | End of module 8. |
| | |
| M400 | Module status register. |

### 3.2.16.1 I/O table register layout

| Memory Offset | PL16DI | PL16DO | PL8DIO | PL4RO |
|---|---|---|---|---|
| 0 | S/W Ver / Module Type | S/W Ver / Module Type | S/W Ver / Module Type | S/W Ver / Module Type |
| 1 | Digital Inputs | Digital Outputs | Digital Inputs | Relay Outputs |
| 2 | | | Digital Outputs | |
| 3 | | | | |
| 4 | | | | |
| 5 | | | | |
| 6 | | | | |
| 7 | | | | |
| 8 | | | | |
| 9 | | | | |
| 10 | | | | |
| 11 | | | | |
| 12 | | | | |
| 13 | | | | |
| 14 | | | | |
| 15 | | | | |
| 16 | | | | |
| 17 | | | | |
| 18 | | | | |
| 19 | | | | |
| 20 | | | | |
| 21 | | | | |
| 22 | | | | |
| 23 | | | | |
| 24 | | | | |

| Memory Offset | PL8AI/I, PL8AI/V, PL8AI/IISO, PL8AI/VISO | PL8TC & PL8TC ISO | PL6RTD | PL8AO & PL8VO |
|---|---|---|---|---|
| 0 | S/W Ver / Module Type | S/W Ver / Module Type | S/W Ver / Module Type | S/W Ver / Module Type |
| 1 | Analog Input 1 | Thermocouple Input 1 | RTD Input 1 | Analog Output 1 |
| 2 | Analog Input 2 | Thermocouple Input 2 | RTD Input 2 | Analog Output 2 |
| 3 | Analog Input 3 | Thermocouple Input 3 | RTD Input 3 | Analog Output 3 |
| 4 | Analog Input 4 | Thermocouple Input 4 | RTD Input 4 | Analog Output 4 |
| 5 | Analog Input 5 | Thermocouple Input 5 | RTD Input 5 | Analog Output 5 |
| 6 | Analog Input 6 | Thermocouple Input 6 | RTD Input 6 | Analog Output 6 |
| 7 | Analog Input 7 | Thermocouple Input 7 | RTD Input Status | Analog Output 7 |
| 8 | Analog Input 8 | Thermocouple Input 8 | | Analog Output 8 |
| 9 | Analog Input Status | CJC Temperature | | Analog Output Status |
| 10 | | TC Input Status | | |
| 11 | | | | |
| 12 | | | | |
| 13 | | | | |
| 14 | | | | |
| 15 | | | | |
| 16 | | | | |
| 17 | | | | |
| 18 | | | | |
| 19 | | | | |
| 20 | | | | |
| 21 | | | | |
| 22 | | | | |
| 23 | | | | |
| 24 | | | | |

| Memory Offset | PLDAIO | PLDAIO2 | PL16DI110 | PL16DI220 |
|---|---|---|---|---|
| 0 | S/W Ver / Module Type | S/W Ver / Module Type | S/W Ver / Module Type | S/W Ver / Module Type |
| 1 | Digital Inputs | Digital Inputs | Digital Inputs | Digital Inputs |
| 2 | Digital Outputs | Digital Outputs | | |
| 3 | RTD Input 1 | Analog Input 1 | | |
| 4 | RTD Input 2 | Analog Input 2 | | |
| 5 | Analog Input 1 | Analog Output 1 | | |
| 6 | Analog Input 2 | Analog Output 2 | | |
| 7 | Analog Output 1 | | | |
| 8 | | | | |
| 9 | | | | |
| 10 | | | | |
| 11 | | | | |
| 12 | | | | |
| 13 | | | | |
| 14 | | | | |
| 15 | | | | |
| 16 | | | | |
| 17 | | | | |
| 18 | | | | |
| 19 | | | | |
| 20 | | | | |
| 21 | | | | |
| 22 | | | | |
| 23 | | | | |
| 24 | | | | |

### 3.2.17 RS232/RS485 Modbus Communications

#### 3.2.17.1 Modbus Master.

The RS232/RS485 communications port can be configured to function as a Modbus master device. To enable this mode you must make sure that the Modbus Master tick box is selected in Procon's ProSoft PLC programming software.

In this mode, you can configure the PL101 to read a range of registers from a remote Modbus slave or you can write a range of registers to a remote slave. You can configure up to 20 of these communications blocks.

The setup parameters are as follows:

- **Remote ID**. This is the network ID of the Modbus slave device.
- **Function**. You must enter a value of 3 to read a range of registers and a value of 16 to write to a range of registers. Function 3 reads registers in the slave and stores them in memory in the PL101. Function 16 reads memory in the PL101 and writes them to registers in the slave device.
- **Local Address**. This is the memory location in the PL101 where the data will be read from or written to. For example, if you want to access memory M1 them you must put a 1 into the local address field. ( Do not put the Modbus address 30002 ).
- **Range**. This is the number of consecutive memory locations that will be transmitted.
- **Remote Address**. This is the register location in the slave device where data will be written to or read from. If you want to access a modbus register for example 40010 in the remote slave device, then you must put a value of 9 into this field.

#### 3.2.17.2 Modbus Slave.

The RS232/RS485 communications port can be configured to function as a Modbus slave device.

When configured as a modbus slave, the PL101 will respond to network requests from a modbus master on the network. This could be another PL101.

The modbus functions supported are as follows:

**PL101 Modbus Slave Commands**

| Modbus Function | Description | Memory start | Memory end | Max. Range |
|---|---|---|---|---|
| 1or2 | Reads a range of bits from any part of RAM | M0 | M999 | 1600 |
| 3or4 | Reads a range of registers from RAM, EEPROM and BBRAM. | M0 | M1219 | 100 |
| 5 | Writes a single Bit to any part of RAM | M0 | M999 | 1 |
| 6 | Writes a single register to RAM, EEPROM and BBRAM. | M0 | M1219 | 1 |
| 15 | Writes a range of bits to RAM. | M9 | M999 | 1600 |
| 16 | Writes a range of registers to RAM, EEPROM and BBRAM. | M9 | M1219 | 100 |

### 3.2.18 Modbus Memory Map ( MODULE TYPE = 121)

| Modbus Address | Mem Addr | Register Name | Low Limit | High Limit | Access | Comments |
|---|---|---|---|---|---|---|
| 10017 | 1.1 | Digital Input 1 | 0 | 1 | R | Status of Digital Inputs 1. |
| “ | “ | “ | “ | “ | “ | “ |
| 10144 | 8.16 | Digital Input 128 | 0 | 1 | R | Status of Digital Inputs 128. |
| 00145 | 9.1 | Digital Output 1 | 0 | 1 | R/W | Status of Digital Outputs 1. |
| “ | “ | “ | “ | “ | “ | “ |
| 00272 | 16.16 | Digital Output 128 | 0 | 1 | R/W | Status of Digital Outputs 128. |
| 00273 | 17.1 | Timer 1 | 0 | 1 | R/W | Status of Timer 1. |
| “ | “ | “ | “ | “ | “ | “ |
| 00336 | 20.16 | Timer 64 | 0 | 1 | R/W | Status of Timer 64. |
| 00337 | 21.1 | Counter 1 | 0 | 1 | R/W | Status of Counter 1. |
| “ | “ | “ | “ | “ | “ | “ |
| 00400 | 24.16 | Counter 64 | 0 | 1 | R/W | Status of Counter 64. |
| 00401 | 25.1 | Control Relay 1 | 0 | 1 | R/W | Status of Control relay 1. |
| “ | “ | “ | “ | “ | “ | “ |
| 00464 | 28.16 | Control Relay 64 | 0 | 1 | R/W | Status of Control relay 64. |
| 00465 | 29.1 | System Relay 1 | 0 | 1 | R/W | Status of System relay 1. |
| “ | “ | “ | “ | “ | “ | “ |
| 00496 | 30.16 | System Relay 32 | 0 | 1 | R | Status of System relay 32. |
| | | | | | | |
| 30001 | 0 | S/W Version / Module Type | N/A | N/A | R | High Byte = Software Version Low Byte = 121 |
| 30002 | 1 | Digital Inputs | N/A | N/A | R | Digital Inputs in 16 bits – Module 1. |
| 30003 | 2 | Digital Inputs | N/A | N/A | R | Digital Inputs in 16 bits – Module 2. |
| 30004 | 3 | Digital Inputs | N/A | N/A | R | Digital Inputs in 16 bits – Module 3. |
| 30005 | 4 | Digital Inputs | N/A | N/A | R | Digital Inputs in 16 bits – Module 4. |
| 30006 | 5 | Digital Inputs | N/A | N/A | R | Digital Inputs in 16 bits – Module 5. |
| 30007 | 6 | Digital Inputs | N/A | N/A | R | Digital Inputs in 16 bits – Module 6. |
| 30008 | 7 | Digital Inputs | N/A | N/A | R | Digital Inputs in 16 bits – Module 7. |
| 30009 | 8 | Digital Inputs | N/A | N/A | R | Digital Inputs in 16 bits – Module 8. |
| 40010 | 9 | Digital Outputs | N/A | N/A | R/W | Digital Outputs in 16bits– Module1. |
| 40011 | 10 | Digital Outputs | N/A | N/A | R/W | Digital Outputs in 16bits– Module2. |
| 40012 | 11 | Digital Outputs | N/A | N/A | R/W | Digital Outputs in 16bits– Module3. |
| 40013 | 12 | Digital Outputs | N/A | N/A | R/W | Digital Outputs in 16bits– |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | | | Module4. |
| 40014 | 13 | Digital Outputs | N/A | N/A | R/W | Digital Outputs in 16bits– Module5. |
| 40015 | 14 | Digital Outputs | N/A | N/A | R/W | Digital Outputs in 16bits– Module6. |
| 40016 | 15 | Digital Outputs | N/A | N/A | R/W | Digital Outputs in 16bits– Module7. |
| 40017 | 16 | Digital Outputs | N/A | N/A | R/W | Digital Outputs in 16bits– Module8. |
| 40018 | 17 | Timer Status | N/A | N/A | R/W | Timer Status 16 – 1 |
| 40019 | 18 | Timer Status | N/A | N/A | R/W | Timer Status 32 – 17 |
| 40020 | 19 | Timer Status | N/A | N/A | R/W | Timer Status 48 – 33 |
| 40021 | 20 | Timer Status | N/A | N/A | R/W | Timer Status 64 – 49 |
| 40022 | 21 | Counter Status | N/A | N/A | R/W | Counter Status 16 – 1 |
| 40023 | 22 | Counter Status | N/A | N/A | R/W | Counter Status 32 – 17 |
| 40024 | 23 | Counter Status | N/A | N/A | R/W | Counter Status 48 – 33 |
| 40025 | 24 | Counter Status | N/A | N/A | R/W | Counter Status 64 – 49 |
| 40026 | 25 | Control Relay | N/A | N/A | R/W | Control Relay 16 – 1 |
| 40027 | 26 | Control Relay | N/A | N/A | R/W | Control Relay 32 – 17 |
| 40028 | 27 | Control Relay | N/A | N/A | R/W | Control Relay 48 – 33 |
| 40029 | 28 | Control Relay | N/A | N/A | R/W | Control Relay 64 - 49 |
| 40030 | 29 | System Relay | N/A | N/A | R/W | System Relay 16 – 1 |
| 40031 | 30 | System Relay | N/A | N/A | R/W | System Relay 32 – 17 |
| - | 31 | - | N/A | N/A | - | Do not use – System only |
| - | 32 | - | N/A | N/A | - | Do not use – System only |
| 40034 | 33 | Timer 1 Value | 0 | 65535 | R/W | Timer range 0 to 65535. |
| “ | “ | “ | “ | “ | “ | “ |
| 40097 | 96 | Timer 64 Value | 0 | 65535 | R/W | Timer range 0 to 65535. |
| 40098 | 97 | Counter 1 Value | 0 | 65535 | R/W | Counter range 0 to 65535. |
| “ | “ | “ | “ | “ | “ | “ |
| 40161 | 160 | Counter 64 Value | 0 | 65535 | R/W | Counter range 0 to 65535. |
| 40162 | 161 | User Memory | 0 | 65535 | R/W | 0 to 65535. |
| “ | “ | “ | “ | “ | “ | “ |
| 40200 | 199 | User Memory | 0 | 65535 | R/W | 0 to 65535. |
| 40201 | 200 | IO Table | 0 | 65535 | R/W | 0 to 65535. |
| “ | “ | “ | “ | “ | “ | “ |
| 40400 | 399 | IO Table | 0 | 65535 | R/W | 0 to 65535. |
| 40401 | 400 | IO Module Status | 0 | 65535 | R/W | 0 to 65535. |
| 40402 | 401 | User Memory | 0 | 65535 | R/W | 0 to 65535. |
| “ | “ | “ | “ | “ | “ | “ |
| 41000 | 999 | User Memory | 0 | 65535 | R/W | 0 to 65535. |
| 41001 | 1000 | User EEPROM | 0 | 65535 | R/W | User EEPROM |
| “ | “ | “ | “ | “ | “ | “ |
| 41170 | 1169 | User EEPROM | 0 | 65535 | R/W | User EEPROM |
| 41171 | 1170 | Comms Settings | - | - | - | Do Not Use |
| “ | “ | “ | “ | “ | “ | “ |
| 41200 | 1199 | Comms Settings | - | - | - | Do Not Use |

| | | | | | | |
|---|---|---|---|---|---|---|
| 41201 | 1200 | Seconds | 0 | 59 | R/W | RTC Seconds |
| 41202 | 1201 | Minutes | 0 | 59 | R/W | RTC Minutes |
| 41203 | 1202 | Hours | 0 | 23 | R/W | RTC Hours |
| 41204 | 1203 | Day | 1 | 7 | R/W | RTC Day |
| 41205 | 1204 | Date | 1 | 31 | R/W | RTC Date |
| 41206 | 1205 | Month | 1 | 12 | R/W | RTC Month |
| 41207 | 1206 | Year | 0 | 100 | R/W | RTC Year |
| 41208 | 1207 | User BBRAM | 0 | 65535 | R/W | User BBRAM |
| “ | “ | “ | “ | “ | “ | “ |
| 41220 | 1219 | User BBRAM | 0 | 65535 | R/W | User BBRAM |

### 3.2.19 Ladder Logic Function Blocks

The function blocks supported by the PL101 are listed below:

| PL101 Function Blocks | |
|---|---|
| **Function** | **Function Block Description** |
| Timer 0.1Sec | Single input timer with 0.1 Second time base. The timer will run as long as the input is on. The timer will be reset to zero when the input is off. |
| Timer 0.01Sec | Single input timer with 0.01 Second time base. The timer will run as long as the input is on. The timer will be reset to zero when the input is off. |
| TimerA 0.1Sec | Accumulating timer with 0.1 Second time base. The timer will run as long as the input is on and stops when the input is removed. The timer will continue when the input is on again. The timer will be reset to zero when the reset input is on. |
| TimerA 0.01Sec | Accumulating timer with 0.01 Second time base. The timer will run as long as the input is on and stops when the input is removed. The timer will continue when the input is on again. The timer will be reset to zero when the reset input is on. |
| Counter | Up counter with reset input. The counter will count up when the count input goes from off to on. The counter will be reset to zero when the reset input is on. The counter output will go on when the count value is greater or equal to the preset value. The counter memory is addressed as the counter number + an offset |
| Counter Up/Dn | Up/Down counter with reset input. The counter will count up when the Up count input goes from off to on. The counter will count down when the Down count input goes from off to on. The counter will be reset to zero when the reset input is on. The counter output will go on when the count value is greater or equal to the preset value. The counter memory is addressed as the counter number + an offset of 16, so for example the value for counter 1 is in memory 17 |
| NOP | This is a no operation function. |
| END | Placing this output function in the ladder program will indicate the end of the program. Any ladder after this function will not be run. |
| LD | Load the accumulator from memory(M) or with a constant(K). |
| LDD | The Load Double loads the accumulator with a 32 bit value from memory(M) or with a constant(K). The memory used is the two consecutive 16 bit memory locations, M & M+1. |
| LDF | The Load Float loads the accumulator with a float value from memory(M) or with a constant(F). The memory used is the two consecutive 16 bit memory locations, M & M+1. |
| OUT | Outputs the accumulator to memory(M). |
| OUTD | Outputs the 32 bit accumulator to two consecutive memory locations, M & M+1. |
| OUTF | Outputs the float accumulator to two consecutive memory locations, M & M+1. |
| AND | AND the accumulator with memory(M) or with a constant(K). |
| ANDD | AND the 32 bit accumulator with memory(M) or with a constant(K). The memory used is the two consecutive 16 bit memory locations, M & M+1. |
| OR | OR the accumulator with memory(M) or with a constant(K). |
| ORD | OR the 32 bit accumulator with memory(M) or with a constant(K). The memory used is the two consecutive 16 bit memory locations, M & M+1. |
| XOR | Exclusive OR the accumulator with memory(M) or with a constant(K). |
| | |
| XORD | Exclusive OR the 32 bit accumulator with memory(M) or with a |

| PL101 Function Blocks | |
|---|---|
| **Function** | **Function Block Description** |
| | constant(K). The memory used is the two consecutive 16 bit memory locations, M & M+1. |
| CMP | Compare the accumulator lower 16 bits with memory(M) or with a constant(K). If the value in the accumulator is less than the value in memory/constant then system bit S6 is turned on. If the value in the accumulator is equal to the value in memory/constant then system bit S7 is turned on. If the value in the accumulator is greater than the value in memory/constant then system bit S8 is turned on. |
| CMPD | Compare the 32 bit accumulator with memory(M) or with a constant(K). If the value in the accumulator is less than the value in memory/constant then system bit S6 is turned on. If the value in the accumulator is equal to the value in memory/constant then system bit S7 is turned on. If the value in the accumulator is greater than the value in memory/constant then system bit S8 is turned on. |
| CMPF | Compare the 32 bit accumulator with memory(M) or with a constant(F). If the value in the accumulator is less than the value in memory/constant then system bit S6 is turned on. If the value in the accumulator is equal to the value in memory/constant then system bit S7 is turned on. If the value in the accumulator is greater than the value in memory/constant then system bit S8 is turned on. |
| ADD | Add the memory(M) or constant(K) to the accumulator. The result is stored in the accumulator. |
| ADDD | Add the memory(M) or constant(K) to the 32 bit accumulator. The result is stored in the accumulator. The memory used is the two consecutive 16 bit memory locations, M & M+1. |
| ADDF | Add the memory(M) or constant(F) to the float accumulator. The result is stored in the float accumulator. The memory used is the two consecutive 16 bit memory locations, M & M+1. |
| SUB | Sub the memory(M) or constant(K) from the accumulator. The result is stored in the accumulator |
| SUBD | Sub the memory(M) or constant(K) from the 32 bit accumulator. The result is stored in the accumulator. The memory used is the two consecutive 16 bit memory locations, M & M+1. |
| SUBF | Sub the memory(M) or constant(F) from the float accumulator. The result is stored in the float accumulator. The memory used is the two consecutive 16 bit memory locations, M & M+1. |
| MUL | Multiply the accumulator with the memory(M) or constant(K). The result is stored in the accumulator |
| MULD | Multiply the 32 bit accumulator with the memory(M) or constant(K). The result is stored in the accumulator. The memory used is the two consecutive 16 bit memory locations, M & M+1. |
| MULF | Multiply the float accumulator with the memory(M) or constant(F). The result is stored in the float accumulator. The memory used is the two consecutive 16 bit memory locations, M & M+1. |
| DIV | Divide the accumulator by the memory(M) or constant(K). The result is stored in the accumulator. |
| DIVD | Divide the 32 bit accumulator by the memory(M) or constant(K). The result is stored in the accumulator. The memory used is the two consecutive 16 bit memory locations, M & M+1. |
| DIVF | Divide the float accumulator by the memory(M) or constant(F). The result is stored in the float accumulator. The memory used is the two consecutive 16 bit memory locations, M & M+1. |
| INC | Increment the memory(M). The result is stored in the memory(M) |
| INCD | Increment two consecutive memory(M) locations. The result is stored in |

| PL101 Function Blocks | |
|---|---|
| **Function** | **Function Block Description** |
| | the memory M & M+1. |
| DEC | Decrement the memory(M). The result is stored in the memory (M). |
| DECD | Decrement two consecutive memory(M) locations. The result is stored in the memory M & M+1. |
| INV | Invert the bits in the accumulator |
| MOV | Moves a variable in a memory location to a new location. The accumulator must already contain the address of the memory location to be moved. |
| SHL | The bits in the accumulator are shifted left by the memory(M) or constant(K). The lower bits are filled with zeros. |
| SHR | The bits in the accumulator are shifted right by the memory(M) or constant(K). The upper bits are filled with zeros. |
| CALL | This function is used to call a subroutine. The constant(k) is the label of the subroutine. |
| SUBR | This function is the start of a subroutine. The constant(k) is the label of the subroutine which is called by the call function. |
| RET | This function must be placed at the last line of a subroutine. The function can also be used in the subroutine for a conditional return. |
| RAND | A random number from 0 to 100 is placed in the accumulator |
| ACOSF | Arc Cosine of float accumulator |
| ASINF | Arc Sine of float accumulator |
| ATANF | Arc Tangent of float accumulator |
| COSF | Cosine of float accumulator |
| SINF | Sine of float accumulator |
| TANF | Tangent of float accumulator |
| SQRTF | Square Root of float accumulator |
| BTOF | The value in the 32 bit accumulator is converted to a float value and stored in the float accumulator. |
| FTOB | The value in the float accumulator is converted to a binary number and stored in the 32 bit accumulator. |
| RADF | The Radian of the float accumulator. |
| DEGF | The degrees of the float accumulator. |
| LOGF | The log of the float accumulator. |
| EXPF | The exponential of the float accumulator |
| PWRF | The power of the float accumulator. |
| COMM | Communications function. Enter a parameter number to select the data to be saved.<br>0 = Port Number (default = 1)<br>1 = Protocol (default = 0)<br>2 = Slave network ID<br>3 = PLC Memory Address<br>4 = Range<br>5 = Slave Address<br>6 = Timeout<br>7 = Function |
| TCOM | MODBUS TCP/IP Communications. |
| REGR | Read a register from a module. |
| REGRD | Read a Double register from a module. (eg. PL16DI 32 bit Counters) |
| REGW | Write a register from PLC memory to a module. |
| REGWD | Write a Double register from PLC memory to a module. |

## 3.3 PL16DI - DIGITAL INPUTS WITH COUNTERS

### 3.3.1 Description


The PL16DI module is a 16 channel digital input module. The inputs are isolated from the logic by bi-directional opto-couplers. The inputs are divided into 2 isolated groups of 8 inputs each. This allows for many configurations in which the input module may be used. One such configuration could be where one group is connected as common positive and the second group connected as common negative.

The counters operate in three modes.

In **mode 0:** All the counters are disabled.

In **mode 1:** The counters are 32 bit counters allowing a count value from 0 to 4294967295. The count value can be cleared by writing a zero to the associated registers or preset to any other value using the same method.

In **mode 2:** The inputs are connected as up/down counters. Input 1 will increment counter 1 whilst input 2 decrements counter1. In the same way, inputs 3&4 operate counter 2, inputs 5&6 operate counter 3 and inputs 7&8 operate counter 4,etc.

When the input filter is configured for > 10ms (Input Filter > 1), then the 16 counters are saved in non-volatile memory and the count value will be saved when the power fails.

The format of the registers allows the status of the inputs to be read as either single bits or all at once as a single register on the Modbus network.

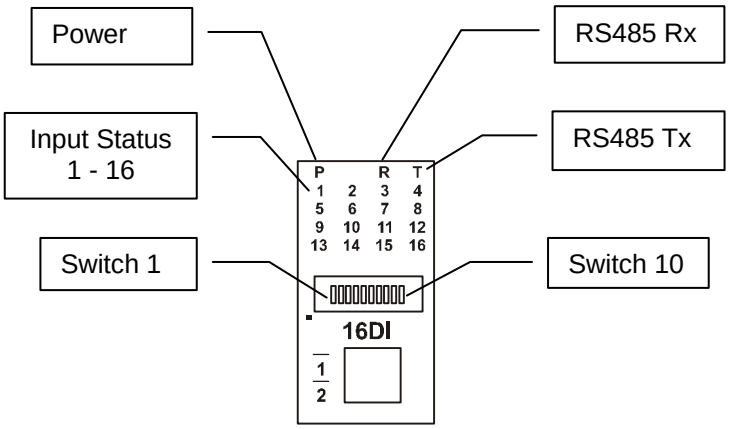
### 3.3.2 Technical Specification of PL16DI

| | | |
|---|---|---|
| **Power Supply** | Logic Supply Voltage | Supplied from Power Bus |
| | Logic Supply Power | 0.3VA |
| **Digital Inputs** | Input Points | 16 |
| | Input Voltage Range | 12 - 24 Vdc |
| | Input Current per input | 5mA @ 12Vdc / 11mA @ 24Vdc |
| | Isolation | 1500Vrms between field and logic |
| **Counters (Filter disabled)** | Inputs | 1 to 16 |
| | Resolution | 32 Bits |
| | Frequency | 1KHz (max) |
| | Pulse Width | 500us (min) |
| **Counters (Filter > 1)** | Inputs | 1 to 16 |
| | Resolution | 32 Bits |
| | Frequency | 25Hz (max) |
| | Pulse Width | 20ms (min) |
| **Temperature** | Operating Temperature. | -40°C to + 80°C |
| | Storage Temperature | -40°C to + 85°C |
| **Connectors** | Logic Power and Comms. | 32 PIN Double Sided DIN Connector |
| | Inputs | 18 Way screw connector on front |
| | | |
| | | |

**Note:** Inputs 1 to 16 are used as both digital inputs and counter inputs.

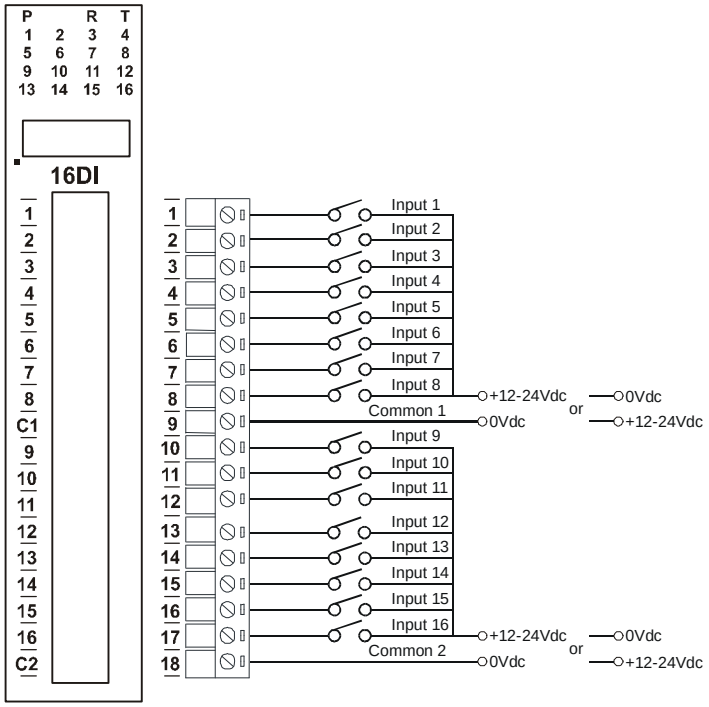
### 3.3.3 Status Indicators

**Power:** Flashes to indicate the CPU is running.
**RS485 Rx:** Flashes to indicate the unit has received a valid Modbus message.
**RS485 Tx:** Flashes to indicate the unit has sent a Modbus message.
**Input Status:** "OFF" when the input is off.
"ON" when the input is on.

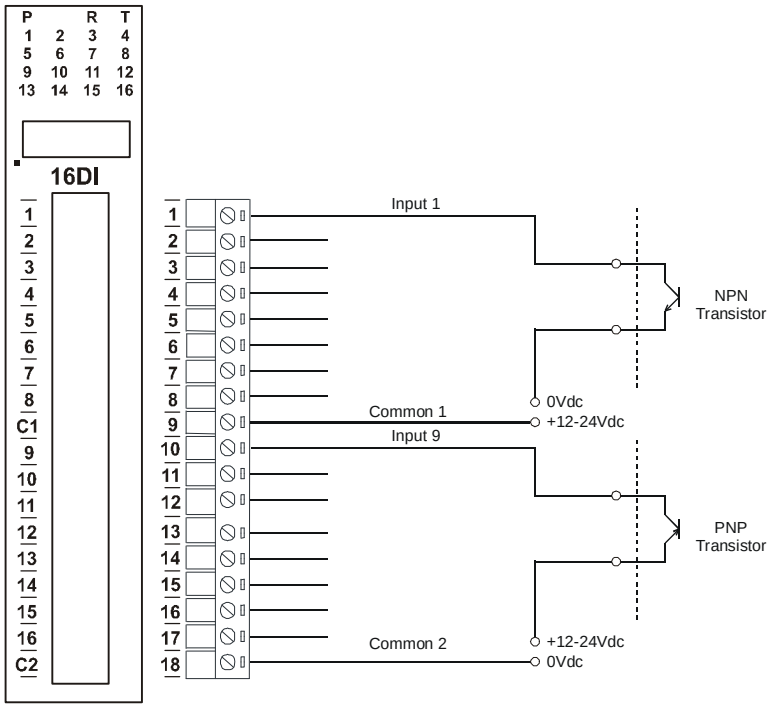



### 3.3.4 Wiring

The following diagram shows how the digital inputs are connected to potential free switches. The common can be connected to positive or negative as indicated.



The following diagram shows how the digital inputs are connected a NPN transistor or a PNP transistor.




### 3.3.5 Switch Settings

| SWITCH | FUNCTION | DESCRIPTION |
|---|---|---|
| | | |
| 1 | NODE ID +1 | Node ID's from 0 to 127 are set up using switches 1 to 7 |
| 2 | NODE ID +2 | " |
| 3 | NODE ID +4 | " |
| 4 | NODE ID +8 | " |
| 5 | NODE ID +16 | " |
| 6 | NODE ID +32 | " |
| 7 | NODE ID +64 | " |
| 8 | INVERT | When switched ON the status of the inputs is inverted in the Modbus status register (30002). |
| 9 | - | Not Used. |
| 10 | BAUD RATE | Must be ON. |

### 3.3.6 PL16DI Data Registers ( MODULE TYPE = 100)

| Modbus Address | Register Name | Low Limit | High Limit | Access | Description |
|---|---|---|---|---|---|
| 10001 | Digital Input 1 | 0 | 1 | R | Status of Digital Inputs. |
| 10002 | Digital Input 2 | 0 | 1 | R | " |
| 10003 | Digital Input 3 | 0 | 1 | R | " |
| 10004 | Digital Input 4 | 0 | 1 | R | " |
| 10005 | Digital Input 5 | 0 | 1 | R | " |
| 10006 | Digital Input 6 | 0 | 1 | R | " |
| 10007 | Digital Input 7 | 0 | 1 | R | " |
| 10008 | Digital Input 8 | 0 | 1 | R | " |
| 10009 | Digital Input 9 | 0 | 1 | R | " |
| 10010 | Digital Input 10 | 0 | 1 | R | " |
| 10011 | Digital Input 11 | 0 | 1 | R | " |
| 10012 | Digital Input 12 | 0 | 1 | R | " |
| 10013 | Digital Input 13 | 0 | 1 | R | " |
| 10014 | Digital Input 14 | 0 | 1 | R | " |
| 10015 | Digital Input 15 | 0 | 1 | R | " |
| 10016 | Digital Input 16 | 0 | 1 | R | " |
| | | | | | |
| 30001 | S/W Version / Module Type | N/A | N/A | R | High Byte = Software Version<br>Low Byte = 100 |
| 30002 | Digital Inputs | N/A | N/A | R | Digital Inputs in 16 bits. 16 - 1. |
| 40003 | Counter 1 MSB | 0 | 65535 | R/W | Counter MSB and LSB combine to give a 32 bit |
| 40004 | Counter 1 LSB | 0 | 65535 | R/W | Counter with range 0 to 4294967295. |
| 40005 | Counter 2 MSB | 0 | 65535 | R/W | " |
| 40006 | Counter 2 LSB | 0 | 65535 | R/W | " |
| 40007 | Counter 3 MSB | 0 | 65535 | R/W | " |
| 40008 | Counter 3 LSB | 0 | 65535 | R/W | " |
| 40009 | Counter 4 LSB | 0 | 65535 | R/W | " |
| 40010 | Counter 4 LSB | 0 | 65535 | R/W | " |
| 40011 | Counter 5 MSB | 0 | 65535 | R/W | " |
| 40012 | Counter 5 LSB | 0 | 65535 | R/W | " |
| 40013 | Counter 6 MSB | 0 | 65535 | R/W | " |
| 40014 | Counter 6 LSB | 0 | 65535 | R/W | " |
| 40015 | Counter 7 MSB | 0 | 65535 | R/W | " |
| 40016 | Counter 7 LSB | 0 | 65535 | R/W | " |
| 40017 | Counter 8 MSB | 0 | 65535 | R/W | " |
| 40018 | Counter 8 LSB | 0 | 65535 | R/W | " |
| 40019 | Counter 9 MSB | 0 | 65535 | R/W | " |
| 40020 | Counter 9 LSB | 0 | 65535 | R/W | " |
| 40021 | Counter 10MSB | 0 | 65535 | R/W | " |
| 40022 | Counter 10LSB | 0 | 65535 | R/W | " |
| 40023 | Counter 11MSB | 0 | 65535 | R/W | " |
| | | | | | |

| Modbus Address | Register Name | Low Limit | High Limit | Access | Description |
|---|---|---|---|---|---|
| 40024 | Counter 11LSB | 0 | 65535 | R/W | Counter MSB and LSB combine to give a 32 bit |
| 40025 | Counter 12MSB | 0 | 65535 | R/W | Counter with range 0 to 4294967295. |
| 40026 | Counter 12LSB | 0 | 65535 | R/W | " |
| 40027 | Counter 13MSB | 0 | 65535 | R/W | " |
| 40028 | Counter 13LSB | 0 | 65535 | R/W | " |
| 40029 | Counter 14MSB | 0 | 65535 | R/W | " |
| 40030 | Counter 14LSB | 0 | 65535 | R/W | " |
| 40031 | Counter 15MSB | 0 | 65535 | R/W | " |
| 40032 | Counter 15LSB | 0 | 65535 | R/W | " |
| 40033 | Counter 16MSB | 0 | 65535 | R/W | " |
| 40034 | Counter 16LSB | 0 | 65535 | R/W | " |
| 40035 | Counter Capture | 0 | 65535 | R/W | Bit1 = 1 to Capture Counter1, Bit2 = 1 to Capture Counter2, etc. |
| 40036 | CCounter 1 MSB | 0 | 65535 | R/W | Capture Counter Registers. MSB and LSB |
| 40037 | CCounter 1 LSB | 0 | 65535 | R/W | combine to give a 32 bit Value. |
| 40038 | CCounter 2 MSB | 0 | 65535 | R/W | Counter with range 0 to 4294967295. |
| 40039 | CCounter 2 LSB | 0 | 65535 | R/W | |
| 40040 | CCounter 3 MSB | 0 | 65535 | R/W | " |
| 40041 | CCounter 3 LSB | 0 | 65535 | R/W | " |
| 40042 | CCounter 4 LSB | 0 | 65535 | R/W | " |
| 40043 | CCounter 4 LSB | 0 | 65535 | R/W | " |
| 40044 | CCounter 5 MSB | 0 | 65535 | R/W | " |
| 40045 | CCounter 5 LSB | 0 | 65535 | R/W | " |
| 40046 | CCounter 6 MSB | 0 | 65535 | R/W | " |
| 40047 | CCounter 6 LSB | 0 | 65535 | R/W | " |
| 40048 | CCounter 7 MSB | 0 | 65535 | R/W | " |
| 40049 | CCounter 7 LSB | 0 | 65535 | R/W | " |
| 40050 | CCounter 8 MSB | 0 | 65535 | R/W | " |
| 40051 | CCounter 8 LSB | 0 | 65535 | R/W | " |
| 40052 | CCounter 9 MSB | 0 | 65535 | R/W | " |
| 40053 | CCounter 9 LSB | 0 | 65535 | R/W | " |
| 40054 | CCounter 10MSB | 0 | 65535 | R/W | " |
| 40055 | CCounter 10LSB | 0 | 65535 | R/W | " |
| 40056 | CCounter 11MSB | 0 | 65535 | R/W | " |
| 40057 | CCounter 11LSB | 0 | 65535 | R/W | " |
| 40058 | CCounter 12MSB | 0 | 65535 | R/W | " |
| 40059 | CCounter 12LSB | 0 | 65535 | R/W | " |
| 40060 | CCounter 13MSB | 0 | 65535 | R/W | " |
| 40061 | CCounter 13LSB | 0 | 65535 | R/W | " |
| 40062 | CCounter 14MSB | 0 | 65535 | R/W | " |
| 40063 | CCounter 14LSB | 0 | 65535 | R/W | " |
| 40064 | CCounter 15MSB | 0 | 65535 | R/W | " |
| 40065 | CCounter 15LSB | 0 | 65535 | R/W | " |
| 40066 | CCounter 16MSB | 0 | 65535 | R/W | " |

| Modbus Address | Register Name | Low Limit | High Limit | Access | Description |
|---|---|---|---|---|---|
| 40067 | CCounter 16LSB | 0 | 65535 | R/W | " |
| 30100 | DIP Switch | 0 | 65535 | R | Status of DIP Switch on Front Panel |
| 40101 | Counter Mode | 0 | 2 | R/W | 0=Disable, 1=Up Counting, 2=Up/Down Count |
| 40102 | Input Filter | 0 | 65535 | R/W | 0 = Disable, >0 = Enable. (x10ms) |
| 40103 | Capture Zero | 0 | 65535 | R/W | 0 = Disabled, bit1 = auto zero counter 1. |

### 3.3.6.1 Digital Input Register.

The digital inputs can be read in a single register as follows:

| MSB | | | | | | | **PL16DI DIGITAL INPUTS** | | | | | | | | LSB | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | ADDRESS |
| 32768 | 16384 | 8192 | 4096 | 2048 | 1024 | 512 | 256 | 128 | 64 | 32 | 16 | 8 | 4 | 2 | 1 | 30002 |

| 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

Digital Input Number

### 3.3.6.2 Counter Registers.

The counters are stored as two 16 bit registers. The first register is the High Register and the second register is the Low Register. To get the actual 32 bit count value the registers must be combined as follows:

Counter High Value = Register 40003.
Counter Low Value = Register 40004.

Counter Value = (Counter High Value X 65535) + Counter Low Value.

### 3.3.6.3 Counter Capture.

To capture a counter a 1 must be written to the corresponding bit position in the Counter Capture Register 40035. For example:

1. Writing 1 to Register 40035 results in Counter 1 value being captured to Counter Capture 1.
2. Writing 2 to Register 40035 results in Counter 2 value being captured to Counter Capture 2.
3. Writing 3 to Register 40035 results in Counter 1 value being captured to Counter Capture 1 and Counter 2 value being captured to Counter Capture 2.

Once the module has Captured the counters the Counter Capture Register 40035 is cleared to zero. It is possible to read this register to get confirmation that the capture is complete before reading the captured counter values.

### 3.3.6.4 Counter Auto Zero.

The counter being captured can be auto zeroed. The purpose of this function is to let the module zero the counter so that no counts get lost due to delays from communication latency, etc.

To ensure that a counter is auto zeroed, a 1 must be written to the corresponding bit position in the Capture Zero Register 40103. For example:

Writing 1 to Register 40103 results in Counter 1 value being zeroed when the Counter Capture bit is 1.

The value in the Capture Zero Register 40103 is permanently stored in memory and only has to be configured once.

## 3.4 PL16DI110 - DIGITAL INPUTS WITH COUNTERS

### 3.4.1 Description


The PL16DI110 module is a 16 channel digital input module. The inputs are isolated from the logic by bi-directional opto-couplers. The inputs are divided into 2 isolated groups of 8 inputs each. The inputs are designed for 110VAC input voltages.

The counters operate in three modes.

In **mode 0:** All the counters are disabled.

In **mode 1:** The counters are 32 bit counters allowing a count value from 0 to 4294967295. The count value can be cleared by writing a zero to the associated registers or preset to any other value using the same method.

In **mode 2:** The inputs are connected as up/down counters. Input 1 will increment counter 1 whilst input 2 decrements counter1. In the same way, inputs 3&4 operate counter 2, inputs 5&6 operate counter 3 and inputs 7&8 operate counter 4,etc.

**Note:** The count values are not battery backed-up and will be lost if power is turned off.

The format of the registers allows the status of the inputs to be read as either single bits or all at once as a single register on the Modbus network.

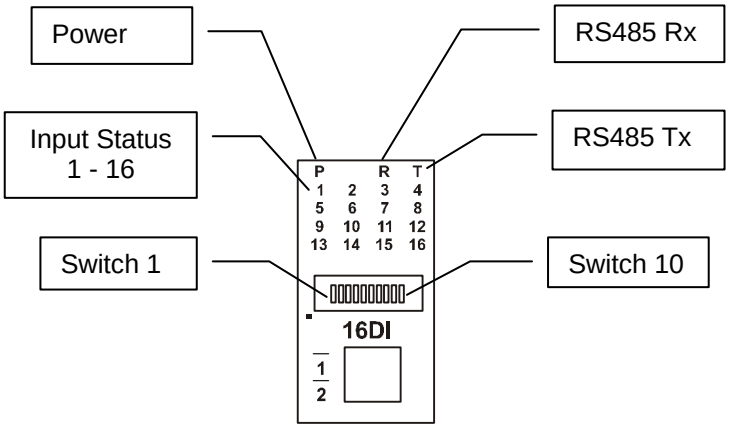
### 3.4.2 Technical Specification of PL16DI110

| | | |
|---|---|---|
| **Power Supply** | Logic Supply Voltage | Supplied from Power Bus |
| | Logic Supply Power | 0.3VA |
| **Digital Inputs** | Input Points | 16 |
| | Input Voltage Range | 100 – 130VAC 50/60Hz |
| | Input Current per input | 2mA |
| | Isolation | 1500Vrms between field and logic |
| **Counters** | Inputs | 1 to 16 |
| | Resolution | 32 Bits |
| | Frequency | 10Hz (max) |
| | Pulse Width | 50ms (min) |
| **Temperature** | Operating Temperature. | -40°C to + 80°C |
| | Storage Temperature | -40°C to + 85°C |
| **Connectors** | Logic Power and Comms. | 32 PIN Double Sided DIN Connector |
| | Inputs | 18 Way screw connector on front |
| | | |
| | | |

**Note:** Inputs 1 to 16 are used as both digital inputs and counter inputs.

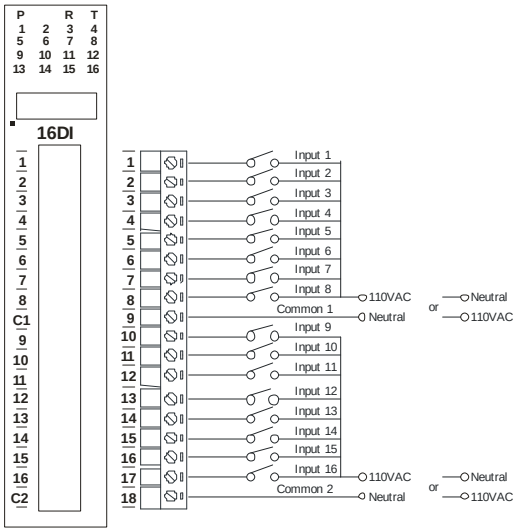
### 3.4.3 Status Indicators

**Power:** Flashes to indicate the CPU is running.
**RS485 Rx:** Flashes to indicate the unit has received a valid Modbus message.
**RS485 Tx:** Flashes to indicate the unit has sent a Modbus message.
**Input Status:** "OFF" when the input is off.
"ON" when the input is on.




### 3.4.4 Wiring

The following diagram shows how the digital inputs are connected to potential free switches. The common can be connected to live or neutral as indicated.



### 3.4.5 Switch Settings

| SWITCH | FUNCTION | DESCRIPTION |
|---|---|---|
| | | |
| 1 | NODE ID +1 | Node ID's from 0 to 127 are set up using switches 1 to 7 |
| 2 | NODE ID +2 | " |
| 3 | NODE ID +4 | " |
| 4 | NODE ID +8 | " |
| 5 | NODE ID +16 | " |
| 6 | NODE ID +32 | " |
| 7 | NODE ID +64 | " |
| 8 | INVERT | When switched ON the status of the inputs are inverted in the Modbus status register (30002). |
| 9 | - | Not Used. |
| 10 | BAUD RATE | Must be ON. |

### 3.4.6 PL16DI110 Data Registers ( MODULE TYPE = 115)

| Modbus Address | Register Name | Low Limit | High Limit | Access | Description |
|---|---|---|---|---|---|
| 10001 | Digital Input 1 | 0 | 1 | R | Status of Digital Inputs. |
| 10002 | Digital Input 2 | 0 | 1 | R | " |
| 10003 | Digital Input 3 | 0 | 1 | R | " |
| 10004 | Digital Input 4 | 0 | 1 | R | " |
| 10005 | Digital Input 5 | 0 | 1 | R | " |
| 10006 | Digital Input 6 | 0 | 1 | R | " |
| 10007 | Digital Input 7 | 0 | 1 | R | " |
| 10008 | Digital Input 8 | 0 | 1 | R | " |
| 10009 | Digital Input 9 | 0 | 1 | R | " |
| 10010 | Digital Input 10 | 0 | 1 | R | " |
| 10011 | Digital Input 11 | 0 | 1 | R | " |
| 10012 | Digital Input 12 | 0 | 1 | R | " |
| 10013 | Digital Input 13 | 0 | 1 | R | " |
| 10014 | Digital Input 14 | 0 | 1 | R | " |
| 10015 | Digital Input 15 | 0 | 1 | R | " |
| 10016 | Digital Input 16 | 0 | 1 | R | " |
| | | | | | |
| 30001 | S/W Version / Module Type | N/A | N/A | R | High Byte = Software Version<br>Low Byte = 115 |
| 30002 | Digital Inputs | N/A | N/A | R | Digital Inputs in 16 bits. 16 - 1. |
| 40003 | Counter 1 MSB | 0 | 65535 | R/W | Counter MSB and LSB combine to give a 32 bit |
| 40004 | Counter 1 LSB | 0 | 65535 | R/W | Counter with range 0 to 4294967295. |
| 40005 | Counter 2 MSB | 0 | 65535 | R/W | " |
| 40006 | Counter 2 LSB | 0 | 65535 | R/W | " |
| 40007 | Counter 3 MSB | 0 | 65535 | R/W | " |
| 40008 | Counter 3 LSB | 0 | 65535 | R/W | " |
| 40009 | Counter 4 LSB | 0 | 65535 | R/W | " |
| 40010 | Counter 4 LSB | 0 | 65535 | R/W | " |
| 40011 | Counter 5 MSB | 0 | 65535 | R/W | " |
| 40012 | Counter 5 LSB | 0 | 65535 | R/W | " |
| 40013 | Counter 6 MSB | 0 | 65535 | R/W | " |
| 40014 | Counter 6 LSB | 0 | 65535 | R/W | " |
| 40015 | Counter 7 MSB | 0 | 65535 | R/W | " |
| 40016 | Counter 7 LSB | 0 | 65535 | R/W | " |
| 40017 | Counter 8 MSB | 0 | 65535 | R/W | " |
| 40018 | Counter 8 LSB | 0 | 65535 | R/W | " |
| 40019 | Counter 9 MSB | 0 | 65535 | R/W | " |
| 40020 | Counter 9 LSB | 0 | 65535 | R/W | " |
| 40021 | Counter 10MSB | 0 | 65535 | R/W | " |
| 40022 | Counter 10LSB | 0 | 65535 | R/W | " |
| 40023 | Counter 11MSB | 0 | 65535 | R/W | " |

| Modbus Address | Register Name | Low Limit | High Limit | Access | Description |
|---|---|---|---|---|---|
| 40024 | Counter 11LSB | 0 | 65535 | R/W | Counter MSB and LSB combine to give a 32 bit |
| 40025 | Counter 12MSB | 0 | 65535 | R/W | Counter with range 0 to 4294967295. |
| 40026 | Counter 12LSB | 0 | 65535 | R/W | " |
| 40027 | Counter 13MSB | 0 | 65535 | R/W | " |
| 40028 | Counter 13LSB | 0 | 65535 | R/W | " |
| 40029 | Counter 14MSB | 0 | 65535 | R/W | " |
| 40030 | Counter 14LSB | 0 | 65535 | R/W | " |
| 40031 | Counter 15MSB | 0 | 65535 | R/W | " |
| 40032 | Counter 15LSB | 0 | 65535 | R/W | " |
| 40033 | Counter 16MSB | 0 | 65535 | R/W | " |
| 40034 | Counter 16LSB | 0 | 65535 | R/W | " |
| 40035 | Counter Capture | 0 | 65535 | R/W | Bit1 = 1 to Capture Counter1, Bit2 = 1 to Capture Counter2, etc. |
| 40036 | CCounter 1 MSB | 0 | 65535 | R/W | Capture Counter Registers. MSB and LSB |
| 40037 | CCounter 1 LSB | 0 | 65535 | R/W | combine to give a 32 bit Value. |
| 40038 | CCounter 2 MSB | 0 | 65535 | R/W | Counter with range 0 to 4294967295. |
| 40039 | CCounter 2 LSB | 0 | 65535 | R/W | |
| 40040 | CCounter 3 MSB | 0 | 65535 | R/W | " |
| 40041 | CCounter 3 LSB | 0 | 65535 | R/W | " |
| 40042 | CCounter 4 LSB | 0 | 65535 | R/W | " |
| 40043 | CCounter 4 LSB | 0 | 65535 | R/W | " |
| 40044 | CCounter 5 MSB | 0 | 65535 | R/W | " |
| 40045 | CCounter 5 LSB | 0 | 65535 | R/W | " |
| 40046 | CCounter 6 MSB | 0 | 65535 | R/W | " |
| 40047 | CCounter 6 LSB | 0 | 65535 | R/W | " |
| 40048 | CCounter 7 MSB | 0 | 65535 | R/W | " |
| 40049 | CCounter 7 LSB | 0 | 65535 | R/W | " |
| 40050 | CCounter 8 MSB | 0 | 65535 | R/W | " |
| 40051 | CCounter 8 LSB | 0 | 65535 | R/W | " |
| 40052 | CCounter 9 MSB | 0 | 65535 | R/W | " |
| 40053 | CCounter 9 LSB | 0 | 65535 | R/W | " |
| 40054 | CCounter 10MSB | 0 | 65535 | R/W | " |
| 40055 | CCounter 10LSB | 0 | 65535 | R/W | " |
| 40056 | CCounter 11MSB | 0 | 65535 | R/W | " |
| 40057 | CCounter 11LSB | 0 | 65535 | R/W | " |
| 40058 | CCounter 12MSB | 0 | 65535 | R/W | " |
| 40059 | CCounter 12LSB | 0 | 65535 | R/W | " |
| 40060 | CCounter 13MSB | 0 | 65535 | R/W | " |
| 40061 | CCounter 13LSB | 0 | 65535 | R/W | " |
| 40062 | CCounter 14MSB | 0 | 65535 | R/W | " |
| 40063 | CCounter 14LSB | 0 | 65535 | R/W | " |
| 40064 | CCounter 15MSB | 0 | 65535 | R/W | " |
| 40065 | CCounter 15LSB | 0 | 65535 | R/W | " |
| 40066 | CCounter 16MSB | 0 | 65535 | R/W | " |

| Modbus Address | Register Name | Low Limit | High Limit | Access | Description |
|---|---|---|---|---|---|
| 40067 | CCounter 16LSB | 0 | 65535 | R/W | " |
| 30100 | DIP Switch | 0 | 65535 | R | Status of DIP Switch on Front Panel |
| 40101 | Counter Mode | 0 | 2 | R/W | 0=Disable, 1=Up Counting, 2=Up/Down Count |
| 40102 | Input Filter | 0 | 65535 | R/W | 0 = Disable, >0 = Enable. (x10ms) |
| 40103 | Capture Zero | 0 | 65535 | R/W | 0 = Disabled, bit1 = auto zero counter 1. |

### 3.4.6.1 Digital Input Register.

The digital inputs can be read in a single register as follows:

| MSB | | | | | **PL16DI DIGITAL INPUTS** | | | | | | | | | | LSB | ADDRESS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| 32768 | 16384 | 8192 | 4096 | 2048 | 1024 | 512 | 256 | 128 | 64 | 32 | 16 | 8 | 4 | 2 | 1 | 30002 |

| 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

Digital Input Number

### 3.4.6.2 Counter Registers.

The counters are stored as two 16 bit registers. The first register is the High Register and the second register is the Low Register. To get the actual 32 bit count value the registers must be combined as follows:

Counter High Value = Register 40003.
Counter Low Value = Register 40004.

Counter Value = (Counter High Value X 65535) + Counter Low Value.

### 3.4.6.3 Counter Capture.

To capture a counter a 1 must be written to the corresponding bit position in the Counter Capture Register 40035. For example:

1. Writing 1 to Register 40035 results in Counter 1 value being captured to Counter Capture 1.
2. Writing 2 to Register 40035 results in Counter 2 value being captured to Counter Capture 2.
3. Writing 3 to Register 40035 results in Counter 1 value being captured to Counter Capture 1 and Counter 2 value being captured to Counter Capture 2.

Once the module has Captured the counters the Counter Capture Register 40035 is cleared to zero. It is possible to read this register to get confirmation that the capture is complete before reading the captured counter values.

### 3.4.6.4 Counter Auto Zero.

The counter being captured can be auto zeroed. The purpose of this function is to let the module zero the counter so that no counts get lost due to delays from communication latency, etc.

To ensure that a counter is auto zeroed, a 1 must be written to the corresponding bit position in the Capture Zero Register 40103. For example:

Writing 1 to Register 40103 results in Counter 1 value being zeroed when the Counter Capture bit is 1.

The value in the Capture Zero Register 40103 is permanently stored in memory and only has to be configured once.

## 3.5 PL16DI220 - DIGITAL INPUTS WITH COUNTERS

### 3.5.1 Description


The PL16DI220 module is a 16 channel digital input module. The inputs are isolated from the logic by bi-directional opto-couplers. The inputs are divided into 2 isolated groups of 8 inputs each. The inputs are designed for 220VAC input voltages.

The counters operate in three modes.

In **mode 0:** All the counters are disabled.

In **mode 1:** The counters are 32 bit counters allowing a count value from 0 to 4294967295. The count value can be cleared by writing a zero to the associated registers or preset to any other value using the same method.

In **mode 2:** The inputs are connected as up/down counters. Input 1 will increment counter 1 whilst input 2 decrements counter1. In the same way, inputs 3&4 operate counter 2, inputs 5&6 operate counter 3 and inputs 7&8 operate counter 4,etc.

**Note:** The count values are not battery backed-up and will be lost if power is turned off.

The format of the registers allows the status of the inputs to be read as either single bits or all at once as a single register on the Modbus network.

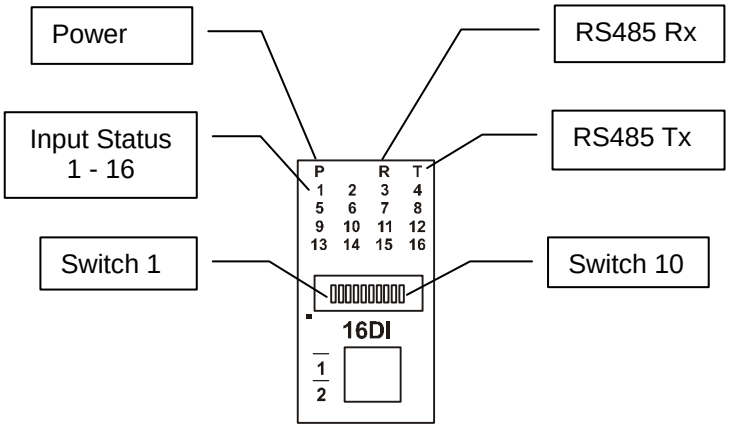
### 3.5.2 Technical Specification of PL16DI220

| | | |
|---|---|---|
| **Power Supply** | Logic Supply Voltage | Supplied from Power Bus |
| | Logic Supply Power | 0.3VA |
| **Digital Inputs** | Input Points | 16 |
| | Input Voltage Range | 200 – 260VAC |
| | Input Current per input | 1mA |
| | Isolation | 1500Vrms between field and logic |
| **Counters** | Inputs | 1 to 16 |
| | Resolution | 32 Bits |
| | Frequency | 10Hz (max) |
| | Pulse Width | 50ms (min) |
| **Temperature** | Operating Temperature. | -40°C to + 80°C |
| | Storage Temperature | -40°C to + 85°C |
| **Connectors** | Logic Power and Comms. | 32 PIN Double Sided DIN Connector |
| | Inputs | 18 Way screw connector on front |
| | | |
| | | |

**Note:** Inputs 1 to 16 are used as both digital inputs and counter inputs.

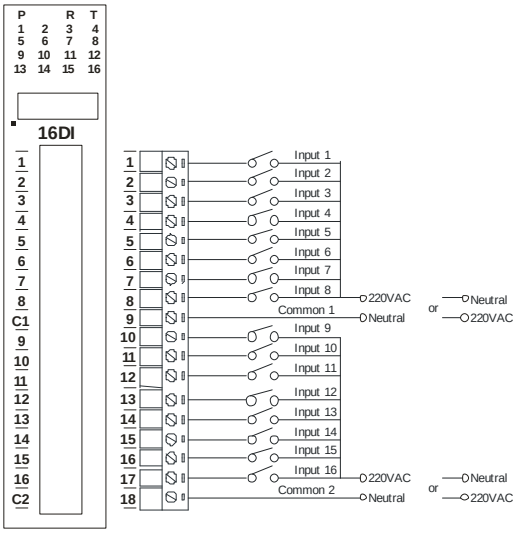
### 3.5.3 Status Indicators

**Power:** Flashes to indicate the CPU is running.
**RS485 Rx:** Flashes to indicate the unit has received a valid Modbus message.
**RS485 Tx:** Flashes to indicate the unit has sent a Modbus message.
**Input Status:** "OFF" when the input is off.
"ON" when the input is on.




### 3.5.4 Wiring

The following diagram shows how the digital inputs are connected to potential free switches. The common can be connected to live or neutral as indicated.



### 3.5.5 Switch Settings

| SWITCH | FUNCTION | DESCRIPTION |
|---|---|---|
| | | |
| 1 | NODE ID +1 | Node ID's from 0 to 127 are set up using switches 1 to 7 |
| 2 | NODE ID +2 | " |
| 3 | NODE ID +4 | " |
| 4 | NODE ID +8 | " |
| 5 | NODE ID +16 | " |
| 6 | NODE ID +32 | " |
| 7 | NODE ID +64 | " |
| 8 | INVERT | When switched ON the status of the inputs are inverted in the Modbus status register (30002). |
| 9 | - | Not Used. |
| 10 | BAUD RATE | Must be ON. |

### 3.5.6 PL16DI220 Data Registers ( MODULE TYPE = 116)

| Modbus Address | Register Name | Low Limit | High Limit | Access | Description |
|---|---|---|---|---|---|
| 10001 | Digital Input 1 | 0 | 1 | R | Status of Digital Inputs. |
| 10002 | Digital Input 2 | 0 | 1 | R | " |
| 10003 | Digital Input 3 | 0 | 1 | R | " |
| 10004 | Digital Input 4 | 0 | 1 | R | " |
| 10005 | Digital Input 5 | 0 | 1 | R | " |
| 10006 | Digital Input 6 | 0 | 1 | R | " |
| 10007 | Digital Input 7 | 0 | 1 | R | " |
| 10008 | Digital Input 8 | 0 | 1 | R | " |
| 10009 | Digital Input 9 | 0 | 1 | R | " |
| 10010 | Digital Input 10 | 0 | 1 | R | " |
| 10011 | Digital Input 11 | 0 | 1 | R | " |
| 10012 | Digital Input 12 | 0 | 1 | R | " |
| 10013 | Digital Input 13 | 0 | 1 | R | " |
| 10014 | Digital Input 14 | 0 | 1 | R | " |
| 10015 | Digital Input 15 | 0 | 1 | R | " |
| 10016 | Digital Input 16 | 0 | 1 | R | " |
| | | | | | |
| 30001 | S/W Version / Module Type | N/A | N/A | R | High Byte = Software Version<br>Low Byte = 116 |
| 30002 | Digital Inputs | N/A | N/A | R | Digital Inputs in 16 bits. 16 - 1. |
| 40003 | Counter 1 MSB | 0 | 65535 | R/W | Counter MSB and LSB combine to give a 32 bit |
| 40004 | Counter 1 LSB | 0 | 65535 | R/W | Counter with range 0 to 4294967295. |
| 40005 | Counter 2 MSB | 0 | 65535 | R/W | " |
| 40006 | Counter 2 LSB | 0 | 65535 | R/W | " |
| 40007 | Counter 3 MSB | 0 | 65535 | R/W | " |
| 40008 | Counter 3 LSB | 0 | 65535 | R/W | " |
| 40009 | Counter 4 LSB | 0 | 65535 | R/W | " |
| 40010 | Counter 4 LSB | 0 | 65535 | R/W | " |
| 40011 | Counter 5 MSB | 0 | 65535 | R/W | " |
| 40012 | Counter 5 LSB | 0 | 65535 | R/W | " |
| 40013 | Counter 6 MSB | 0 | 65535 | R/W | " |
| 40014 | Counter 6 LSB | 0 | 65535 | R/W | " |
| 40015 | Counter 7 MSB | 0 | 65535 | R/W | " |
| 40016 | Counter 7 LSB | 0 | 65535 | R/W | " |
| 40017 | Counter 8 MSB | 0 | 65535 | R/W | " |
| 40018 | Counter 8 LSB | 0 | 65535 | R/W | " |
| 40019 | Counter 9 MSB | 0 | 65535 | R/W | " |
| 40020 | Counter 9 LSB | 0 | 65535 | R/W | " |
| 40021 | Counter 10MSB | 0 | 65535 | R/W | " |
| 40022 | Counter 10LSB | 0 | 65535 | R/W | " |
| 40023 | Counter 11MSB | 0 | 65535 | R/W | " |

| Modbus Address | Register Name | Low Limit | High Limit | Access | Description |
|---|---|---|---|---|---|
| 40024 | Counter 11LSB | 0 | 65535 | R/W | Counter MSB and LSB combine to give a 32 bit |
| 40025 | Counter 12MSB | 0 | 65535 | R/W | Counter with range 0 to 4294967295. |
| 40026 | Counter 12LSB | 0 | 65535 | R/W | " |
| 40027 | Counter 13MSB | 0 | 65535 | R/W | " |
| 40028 | Counter 13LSB | 0 | 65535 | R/W | " |
| 40029 | Counter 14MSB | 0 | 65535 | R/W | " |
| 40030 | Counter 14LSB | 0 | 65535 | R/W | " |
| 40031 | Counter 15MSB | 0 | 65535 | R/W | " |
| 40032 | Counter 15LSB | 0 | 65535 | R/W | " |
| 40033 | Counter 16MSB | 0 | 65535 | R/W | " |
| 40034 | Counter 16LSB | 0 | 65535 | R/W | " |
| 40035 | Counter Capture | 0 | 65535 | R/W | Bit1 = 1 to Capture Counter1, Bit2 = 1 to Capture Counter2, etc. |
| 40036 | CCounter 1 MSB | 0 | 65535 | R/W | Capture Counter Registers. MSB and LSB |
| 40037 | CCounter 1 LSB | 0 | 65535 | R/W | combine to give a 32 bit Value. |
| 40038 | CCounter 2 MSB | 0 | 65535 | R/W | Counter with range 0 to 4294967295. |
| 40039 | CCounter 2 LSB | 0 | 65535 | R/W | |
| 40040 | CCounter 3 MSB | 0 | 65535 | R/W | " |
| 40041 | CCounter 3 LSB | 0 | 65535 | R/W | " |
| 40042 | CCounter 4 LSB | 0 | 65535 | R/W | " |
| 40043 | CCounter 4 LSB | 0 | 65535 | R/W | " |
| 40044 | CCounter 5 MSB | 0 | 65535 | R/W | " |
| 40045 | CCounter 5 LSB | 0 | 65535 | R/W | " |
| 40046 | CCounter 6 MSB | 0 | 65535 | R/W | " |
| 40047 | CCounter 6 LSB | 0 | 65535 | R/W | " |
| 40048 | CCounter 7 MSB | 0 | 65535 | R/W | " |
| 40049 | CCounter 7 LSB | 0 | 65535 | R/W | " |
| 40050 | CCounter 8 MSB | 0 | 65535 | R/W | " |
| 40051 | CCounter 8 LSB | 0 | 65535 | R/W | " |
| 40052 | CCounter 9 MSB | 0 | 65535 | R/W | " |
| 40053 | CCounter 9 LSB | 0 | 65535 | R/W | " |
| 40054 | CCounter 10MSB | 0 | 65535 | R/W | " |
| 40055 | CCounter 10LSB | 0 | 65535 | R/W | " |
| 40056 | CCounter 11MSB | 0 | 65535 | R/W | " |
| 40057 | CCounter 11LSB | 0 | 65535 | R/W | " |
| 40058 | CCounter 12MSB | 0 | 65535 | R/W | " |
| 40059 | CCounter 12LSB | 0 | 65535 | R/W | " |
| 40060 | CCounter 13MSB | 0 | 65535 | R/W | " |
| 40061 | CCounter 13LSB | 0 | 65535 | R/W | " |
| 40062 | CCounter 14MSB | 0 | 65535 | R/W | " |
| 40063 | CCounter 14LSB | 0 | 65535 | R/W | " |
| 40064 | CCounter 15MSB | 0 | 65535 | R/W | " |
| 40065 | CCounter 15LSB | 0 | 65535 | R/W | " |
| 40066 | CCounter 16MSB | 0 | 65535 | R/W | " |

| Modbus Address | Register Name | Low Limit | High Limit | Access | Description |
|---|---|---|---|---|---|
| 40067 | CCounter 16LSB | 0 | 65535 | R/W | " |
| 30100 | DIP Switch | 0 | 65535 | R | Status of DIP Switch on Front Panel |
| 40101 | Counter Mode | 0 | 2 | R/W | 0=Disable, 1=Up Counting, 2=Up/Down Count |
| 40102 | Input Filter | 0 | 65535 | R/W | 0 = Disable, >0 = Enable. (x10ms) |
| 40103 | Capture Zero | 0 | 65535 | R/W | 0 = Disabled, bit1 = auto zero counter 1. |

### 3.5.6.1 Digital Input Register.

The digital inputs can be read in a single register as follows:

| MSB | | | | | **PL16DI220 DIGITAL INPUTS** | | | | | | | | | | LSB | ADDRESS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| 32768 | 16384 | 8192 | 4096 | 2048 | 1024 | 512 | 256 | 128 | 64 | 32 | 16 | 8 | 4 | 2 | 1 | 30002 |

| 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

Digital Input Number

### 3.5.6.2 Counter Registers.

The counters are stored as two 16 bit registers. The first register is the High Register and the second register is the Low Register. To get the actual 32 bit count value the registers must be combined as follows:

Counter High Value = Register 40003.
Counter Low Value = Register 40004.

Counter Value = (Counter High Value X 65535) + Counter Low Value.

### 3.5.6.3 Counter Capture.

To capture a counter a 1 must be written to the corresponding bit position in the Counter Capture Register 40035. For example:

1. Writing 1 to Register 40035 results in Counter 1 value being captured to Counter Capture 1.
2. Writing 2 to Register 40035 results in Counter 2 value being captured to Counter Capture 2.
3. Writing 3 to Register 40035 results in Counter 1 value being captured to Counter Capture 1 and Counter 2 value being captured to Counter Capture 2.

Once the module has Captured the counters the Counter Capture Register 40035 is cleared to zero. It is possible to read this register to get confirmation that the capture is complete before reading the captured counter values.

### 3.5.6.4 Counter Auto Zero.

The counter being captured can be auto zeroed. The purpose of this function is to let the module zero the counter so that no counts get lost due to delays from communication latency, etc.

To ensure that a counter is auto zeroed, a 1 must be written to the corresponding bit position in the Capture Zero Register 40103. For example:

Writing 1 to Register 40103 results in Counter 1 value being zeroed when the Counter Capture bit is 1.

The value in the Capture Zero Register 40103 is permanently stored in memory and only has to be configured once.

## 3.6 PL16DO - DIGITAL OUTPUTS

### 3.6.1 Description


This module has 16 open collector (NPN) digital outputs. The outputs may be used to drive lamps or external relays when more drive capability is required. The outputs are isolated from the logic and they share a common negative terminal.

Each output can be individually switched on or off, or all outputs can be set up at the same time by writing a single number to the output register which represents the status of all outputs.

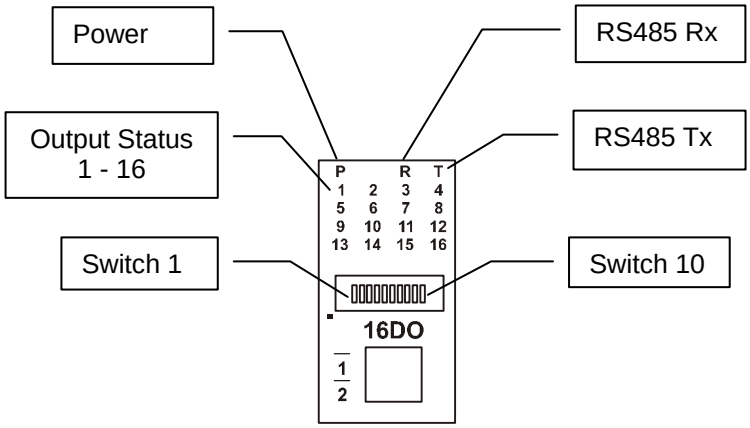
An output watchdog timer can be configured to switch off all the outputs if there has been no communications with the module for up to 255 seconds. A value of 0 seconds will disable this timer and the outputs will remain in the last programmed state.

### 3.6.2 Technical Specification of PL16DO

| | | |
|---|---|---|
| **Power Supply** | Logic Supply Voltage | Supplied from Power Bus |
| | Logic Supply Power | 0.3VA |
| | Field Supply Voltage | 12 -24 Vdc |
| | Field Supply Current | 6mA @ 12V / 6mA @ 24V |
| **Digital Outputs** | Output Points | 16 |
| | Maximum Voltage | 36 Vdc |
| | Maximum Current | 100 mA per output |
| | Vceon | 1.1V Max. |
| | Isolation | 1500Vrms between field and logic |
| **Temperature** | Operating Temperature. | -40°C to + 80°C |
| | Storage Temperature | -40°C to + 85°C |
| **Connectors** | Logic Power and Comms. | 32 PIN Double Sided DIN Connector |
| | Outputs | 18 Way screw connector on front |
| | | |
| | | |

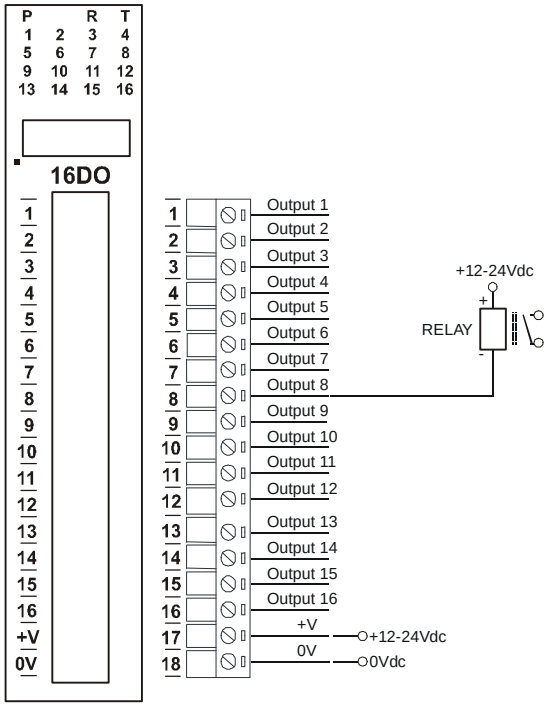
### 3.6.3 Status Indicators

**Power:** Flashes to indicate the CPU is running.
**RS485 Rx:** Flashes to indicate the unit has received a valid Modbus message.
**RS485 Tx:** Flashes to indicate the unit has sent a Modbus message.
**Output Status:** "OFF" when the output is off.
"ON" when the output is on.




### 3.6.4 Wiring

The following diagram shows how the digital outputs are connected to the coil of a relay. The coil is connected to positive and switched to negative.



### 3.6.5 Switch Setting

| SWITCH | FUNCTION | DESCRIPTION |
|---|---|---|
| | | |
| 1 | NODE ID +1 | Node ID's from 0 to 127 are set up using switches 1 to 7 |
| 2 | NODE ID +2 | " |
| 3 | NODE ID +4 | " |
| 4 | NODE ID +8 | " |
| 5 | NODE ID +16 | " |
| 6 | NODE ID +32 | " |
| 7 | NODE ID +64 | " |
| 8 | - | Not Used. |
| 9 | - | Not Used. |
| 10 | BAUD RATE | Must be ON. |

### 3.6.6 PL16DO Data Registers ( MODULE TYPE = 101)

| Modbus Address | Register Name | Low Limit | High Limit | Access | Comments |
|---|---|---|---|---|---|
| 00001 | Digital Output 1 | 0 | 1 | R/W | Status of Digital Outputs. |
| 00002 | Digital Output 2 | 0 | 1 | R/W | " |
| 00003 | Digital Output 3 | 0 | 1 | R/W | " |
| 00004 | Digital Output 4 | 0 | 1 | R/W | " |
| 00005 | Digital Output 5 | 0 | 1 | R/W | " |
| 00006 | Digital Output 6 | 0 | 1 | R/W | " |
| 00007 | Digital Output 7 | 0 | 1 | R/W | " |
| 00008 | Digital Output 8 | 0 | 1 | R/W | " |
| 00009 | Digital Output 9 | 0 | 1 | R/W | " |
| 00010 | Digital Output 10 | 0 | 1 | R/W | " |
| 00011 | Digital Output 11 | 0 | 1 | R/W | " |
| 00012 | Digital Output 12 | 0 | 1 | R/W | " |
| 00013 | Digital Output 13 | 0 | 1 | R/W | " |
| 00014 | Digital Output 14 | 0 | 1 | R/W | " |
| 00015 | Digital Output 15 | 0 | 1 | R/W | " |
| 00016 | Digital Output 16 | 0 | 1 | R/W | " |
| | | | | | |
| 30001 | S/W Version / Module Type | N/A | N/A | R | High Byte = Software Version<br>Low Byte = 101 |
| 40002 | Digital Outputs | N/A | N/A | R/W | Digital Outputs in bits. 16(msb) – 1(lsb). |
| 30100 | DIP Switch | 0 | 65535 | R | Status of DIP Switch on Front Panel |
| 40101 | Watchdog Timer | 0 | 255 | R/W | Timer in seconds. 0 = disabled. 1 - 255 = enabled. |

#### 3.6.6.1 Digital Output Register.

The digital outputs can be read/written in a single register as follows:

| MSB | | | | | **PL16DO DIGITAL OUTPUTS** | | | | | | | | | | LSB | ADDRESS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| 32768 | 16384 | 8192 | 4096 | 2048 | 1024 | 512 | 256 | 128 | 64 | 32 | 16 | 8 | 4 | 2 | 1 | 40002 |

| 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

Digital Output

#### 3.6.6.2 Output Watchdog Timer.

The watchdog timer is used to switch off all of the outputs in the event of a communications failure. When set to zero (register 40101) the watchdog timer is disabled.

## 3.7 PL4RO - RELAY OUTPUTS

### 3.7.1 Description

The MM4RO module has 4 normally open/ normally closed relay outputs. These modules may be used when a higher drive capability is required, or when isolation between outputs are required.

Each output can be individually switched on or off, or all outputs can be set up at the same time by writing a single number to the output register which represents the status of all outputs.

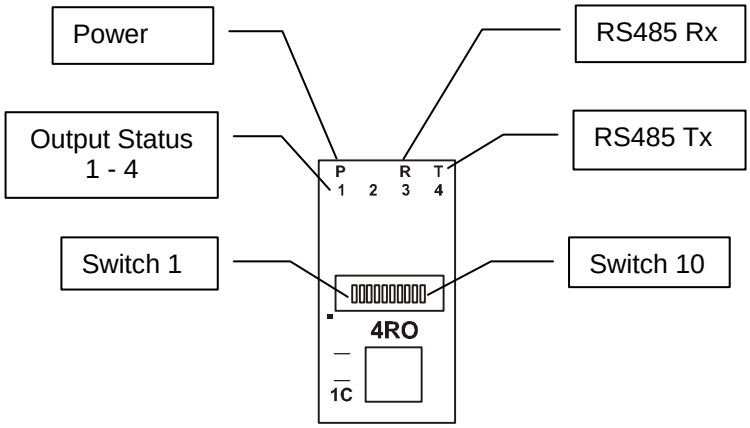
An output watchdog timer can be configured to switch off all the outputs if there has been no communications with the module for up to 255 seconds. A value of 0 seconds will disable this timer and the outputs will remain in the last programmed state.


### 3.7.2 Technical Specification of PL4RO

| | | |
|---|---|---|
| **Power Supply** | Logic Supply Voltage | Supplied from Power Bus |
| | Logic Supply Power | 1.0VA |
| **Relay Outputs** | Output Points | 4 |
| | Maximum Current | 0.5A @ 220VAC / 1A @ 28VDC |
| | Isolation | 1000Vrms between field and logic<br>1000Vrms between outputs |
| **Temperature** | Operating Temperature. | -40°C to + 80°C |
| | Storage Temperature | -40°C to + 85°C |
| **Connectors** | Logic Power and Comms. | 32 PIN Double Sided DIN Connector |
| | Outputs | 18 Way screw connector on front |
| | | |
| | | |

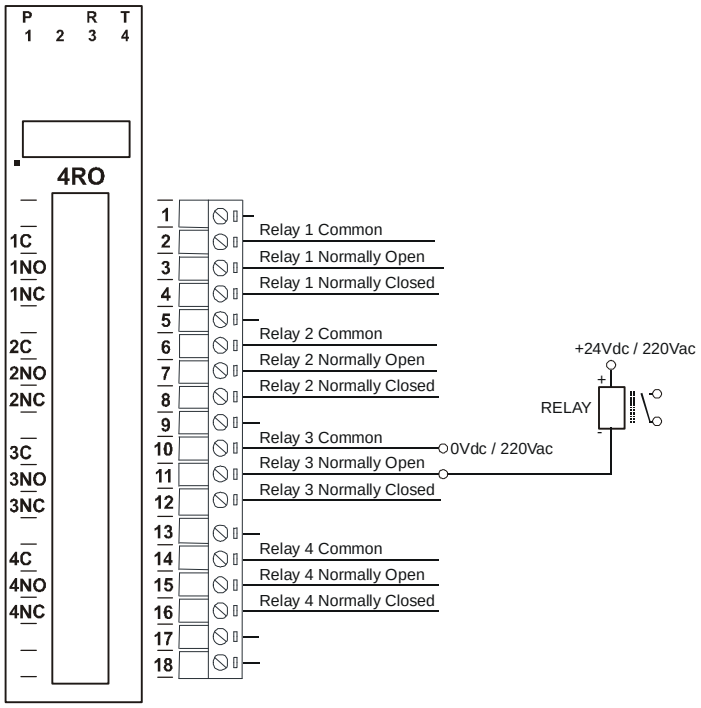
### 3.7.3 Status Indicators

**Power:** Flashes to indicate the CPU is running.
**RS485 Rx:** Flashes to indicate the unit has received a valid Modbus message.
**RS485 Tx:** Flashes to indicate the unit has sent a Modbus message.
**Output Status:** "OFF" when the output is off
"ON" when the output is on.




### 3.7.4 Wiring

The following diagram shows how the digital outputs are connected to the coil of a relay. The coil is connected to positive and switched to negative.



### 3.7.5 Switch Setting

| SWITCH | FUNCTION | DESCRIPTION |
|---|---|---|
| | | |
| 1 | NODE ID +1 | Node ID's from 0 to 127 are set up using switches 1 to 7 |
| 2 | NODE ID +2 | " |
| 3 | NODE ID +4 | " |
| 4 | NODE ID +8 | " |
| 5 | NODE ID +16 | " |
| 6 | NODE ID +32 | " |
| 7 | NODE ID +64 | " |
| 8 | - | Not Used. |
| 9 | - | Not Used. |
| 10 | BAUD RATE | Must be ON. |

### 3.7.6 PL4RO Data Registers ( MODULE TYPE = 113)

| Modbus Address | Register Name | Low Limit | High Limit | Access | Comments |
|---|---|---|---|---|---|
| 00001 | Relay Output 1 | 0 | 1 | R/W | Status of Digital Outputs. |
| 00002 | Relay Output 2 | 0 | 1 | R/W | " |
| 00003 | Relay Output 3 | 0 | 1 | R/W | " |
| 00004 | Relay Output 4 | 0 | 1 | R/W | " |
| | | | | | |
| 30001 | S/W Version / Module Type | N/A | N/A | R | High Byte = Software Version<br>Low Byte = 113 |
| 40002 | Digital Outputs | N/A | N/A | R/W | Digital Outputs in bits. 4(msb) – 1(lsb). |
| 30100 | DIP Switch | 0 | 65535 | R | Status of DIP Switch on Front Panel |
| 40101 | Watchdog Timer | 0 | 255 | R/W | Timer in seconds. 0 = disabled. 1 - 255 = enabled. |

#### 3.7.6.1 Relay Output Register.

The relay outputs can be read/written in a single register as follows:

| MSB | | | | | | | **PL4RO DIGITAL OUTPUTS** | | | | | | | | LSB | ADDRESS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| 32768 | 16384 | 8192 | 4096 | 2048 | 1024 | 512 | 256 | 128 | 64 | 32 | 16 | 8 | 4 | 2 | 1 | 40002 |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| - | - | - | - | - | - | - | - | - | - | - | - | 4 | 3 | 2 | 1 |

Relay Output

#### 3.7.6.2 Output Watchdog Timer.

The watchdog timer is used to switch off all of the outputs in the event of a communications failure. When set to zero (register 40101) the watchdog timer is disabled.

## 3.8 PL8DIO - DIGITAL INPUTS / OUTPUTS

### 3.8.1 Description

The PL8DIO module is an 8 channel digital input and 8 channel digital output module.

The inputs are isolated from the logic by bi-directional opto-couplers. The common is connected internally to either the -volts or +volts field power supply terminals using a jumper link which is situated inside the housing.

The inputs have internal counters associated with them. These counters are 32 bit counters allowing a count value from 0 to 4294967295. The count value can be cleared by writing a zero to the associated registers or preset to any other value using the same method. The counters can also be reset automatically when read. This is done by setting on DIP switch 9 on the front panel.

**Note:** The count values are not battery backed-up and will be lost if power is turned off.

The format of the registers allows the status of the inputs to be read as either single bits or all at once as a single register on the Modbus network.

The 8 digital outputs are open collector (NPN). The outputs may be used to drive lamps or external relays when more drive capability is required. The outputs are isolated from the logic and they share a common negative terminal.

Each output can be individually switched on or off, or all outputs can be set up at the same time by writing a single number to the output register which represents the status of all outputs.

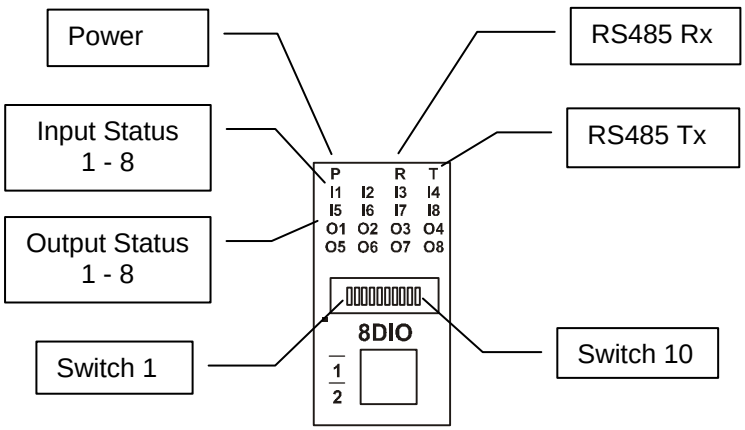
### 3.8.2 Technical Specification of PL8DIO

| | | |
|---|---|---|
| **Power Supply** | Logic Supply Voltage | Supplied from Power Bus |
| | Logic Supply Power | 0.3VA |
| | Field Supply Voltage | 12 -24 Vdc |
| | Field Supply Current | 6mA @ 12V / 6mA @ 24V |
| **Digital Inputs** | Input Points | 8 |
| | Input Voltage Range | 12 -24 Vdc |
| | Input Current per input | 5mA@12Vdc / 11mA @24Vdc |
| | Isolation | 1500Vrms between field and logic |
| **Digital Outputs** | Output Points | 8 |
| | Maximum Voltage | 36 Vdc |
| | Maximum Current | 100 mA per output |
| | Vceon | 1.1V Max. |
| | Isolation | 1500Vrms between field and logic |
| **Counters** | Inputs | 1 to 16 |
| | Resolution | 32 Bits |
| | Frequency | 1KHz (max) |
| | Pulse Width | 500us (min) |
| **Temperature** | Operating Temperature. | -40°C to + 80°C |
| | Storage Temperature | -40°C to + 85°C |
| **Connectors** | Logic Power and Comms. | 32 PIN Double Sided DIN Connector |
| | Outputs | 18 Way screw connector on front |
| | | |
| | | |

**Note:** Inputs 1 to 8 are used as both digital inputs and counter inputs.

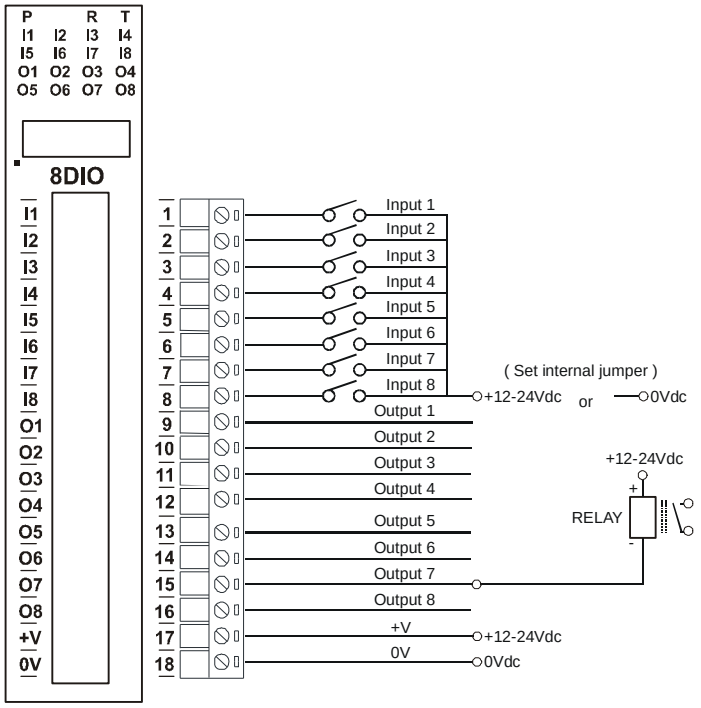
### 3.8.3 Status Indicators

**Power:** Flashes to indicate the CPU is running.
**RS485 Rx:** Flashes to indicate the unit has received a valid Modbus message.
**RS485 Tx:** Flashes to indicate the unit has sent a Modbus message.
**Input Status:** "OFF" when the input is off
"ON" when the input is on.
**Output Status:** "OFF" when the output is off
"ON" when the output is on.



### 3.8.4 Wiring

The following diagram shows how the digital inputs and outputs are connected.

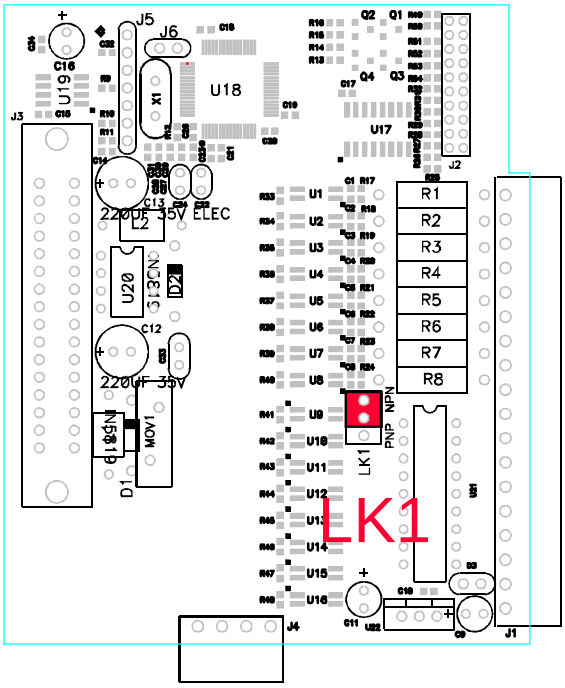



### 3.8.5 Switch Settings

| SWITCH | FUNCTION | DESCRIPTION |
|---|---|---|
| | | |
| 1 | NODE ID +1 | Node ID's from 0 to 127 are set up using switches 1 to 7 |
| 2 | NODE ID +2 | " |
| 3 | NODE ID +4 | " |
| 4 | NODE ID +8 | " |
| 5 | NODE ID +16 | " |
| 6 | NODE ID +32 | " |
| 7 | NODE ID +64 | " |
| 8 | INVERT | When switched ON the status of the inputs is inverted in the Modbus status register (30002). |
| 9 | - | Not Used. |
| 10 | BAUD RATE | Must be ON. |

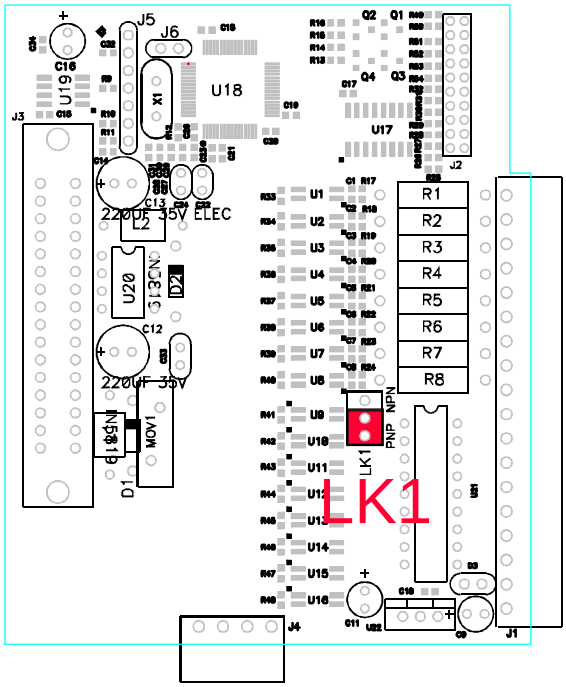
### 3.8.6 Setting the jumpers for NPN inputs.

The Digital inputs can be configured as NPN inputs. This means that the inputs can be operated by switching to 0V. Change the link **LK1** to the NPN position.




### 3.8.7 Setting the jumpers for PNP inputs.

The Digital inputs can be configured as PNP inputs. This means that the inputs can be operated by switching to +12V to +24V. Change the link **LK1** to the PNP position.



### 3.8.8 PL8DIO Data Registers ( MODULE TYPE = 102)

| Modbus Address | Register Name | Low Limit | High Limit | Access | Comments |
|---|---|---|---|---|---|
| 10001 | Digital Input 1 | 0 | 1 | R | Status of Digital Inputs. |
| 10002 | Digital Input 2 | 0 | 1 | R | " |
| 10003 | Digital Input 3 | 0 | 1 | R | " |
| 10004 | Digital Input 4 | 0 | 1 | R | " |
| 10005 | Digital Input 5 | 0 | 1 | R | " |
| 10006 | Digital Input 6 | 0 | 1 | R | " |
| 10007 | Digital Input 7 | 0 | 1 | R | " |
| 10008 | Digital Input 8 | 0 | 1 | R | " |
| 00017 | Digital Output 1 | 0 | 1 | R/W | Status of Digital Outputs. |
| 00018 | Digital Output 2 | 0 | 1 | R/W | " |
| 00019 | Digital Output 3 | 0 | 1 | R/W | " |
| 00020 | Digital Output 4 | 0 | 1 | R/W | " |
| 00021 | Digital Output 5 | 0 | 1 | R/W | " |
| 00022 | Digital Output 6 | 0 | 1 | R/W | " |
| 00023 | Digital Output 7 | 0 | 1 | R/W | " |
| 00024 | Digital Output 8 | 0 | 1 | R/W | " |
| | | | | | |
| 30001 | S/W Version / Module Type | N/A | N/A | R | High Byte = Software Version<br>Low Byte = 102 |
| 30002 | Digital Inputs | N/A | N/A | R | Digital Inputs in lower 8 bits. 8 - 1. |
| 40003 | Digital Outputs | N/A | N/A | R/W | Digital Outputs in lower 8 bits. 8 - 1. |
| 40004 | Counter 1 MSB | 0 | 65535 | R/W | Counter MSB and LSB combine to give a 32 bit |
| 40005 | Counter 1 LSB | 0 | 65535 | R/W | Counter with range 0 to 4294967295. |
| 40006 | Counter 2 MSB | 0 | 65535 | R/W | " |
| 40007 | Counter 2 LSB | 0 | 65535 | R/W | " |
| 40008 | Counter 3 MSB | 0 | 65535 | R/W | " |
| 40009 | Counter 3 LSB | 0 | 65535 | R/W | " |
| 40010 | Counter 4 LSB | 0 | 65535 | R/W | " |
| 40011 | Counter 4 LSB | 0 | 65535 | R/W | " |
| 40012 | Counter 5 MSB | 0 | 65535 | R/W | " |
| 40013 | Counter 5 LSB | 0 | 65535 | R/W | " |
| 40014 | Counter 6 MSB | 0 | 65535 | R/W | " |
| 40015 | Counter 6 LSB | 0 | 65535 | R/W | " |
| 40016 | Counter 7 MSB | 0 | 65535 | R/W | " |
| 40017 | Counter 7 LSB | 0 | 65535 | R/W | " |
| 40018 | Counter 8 MSB | 0 | 65535 | R/W | " |
| 40019 | Counter 8 LSB | 0 | 65535 | R/W | " |
| 30100 | DIP Switch | 0 | 65535 | R | Status of DIP Switch on Front Panel |
| 40101 | Watchdog Timer | 0 | 255 | R/W | Timer in seconds. 0 = disabled. 1 - 255 = enabled. |
| 40105 | Counter Mode | 0 | 2 | R/W | 0=Disable, 1=Up Counting, 2=Up/Down Count |
| 40106 | Input Filter | 0 | 65535 | R/W | 0 = Disable, >0 = Enable. (x10ms) |

### 3.8.8.1 Digital Input Register.

The digital inputs can be read in a single register as follows:

| MSB | | | | | **PL8DIO DIGITAL INPUTS** | | | | | | | | | | LSB | ADDRESS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| 32768 | 16384 | 8192 | 4096 | 2048 | 1024 | 512 | 256 | 128 | 64 | 32 | 16 | 8 | 4 | 2 | 1 | 30002 |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 |

Digital Input Number

### 3.8.8.2 Digital Output Register.

The digital outputs can be read/written in a single register as follows:

| MSB | | | | | **PL8DIO DIGITAL OUTPUTS** | | | | | | | | | | LSB | ADDRESS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| 32768 | 16384 | 8192 | 4096 | 2048 | 1024 | 512 | 256 | 128 | 64 | 32 | 16 | 8 | 4 | 2 | 1 | 40003 |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 |

Digital Output Number

### 3.8.8.3 Counter Registers.

The counters are stored a two 16 bit registers. The first register is the High Register and the second register is the Low Register. To get the actual 32 bit count value the registers must be combined as follows:

Counter High Value = Register 40003.
Counter Low Value = Register 40004.

Counter Value = (Counter High Value X 65535) + Counter Low Value.

### 3.8.8.4 Output Watchdog Timer.

The watchdog timer is used to switch off all of the outputs in the event of a communications failure. When set to zero (register 40101) the watchdog timer is disabled.

## 3.9 PL8AI/I and PL8AI/V - ANALOG INPUTS

### 3.9.1 Description

The Analog Input modules are supplied as either a current input module (PL8AI/I) or a voltage input module (PL8AI/V). The inputs are isolated from the logic and share a common negative terminal.


The standard setting for the PL8AI/I module is 0 - 20mA input current which represents an output value of 0 - 4095 (12 bits) in the corresponding Modbus register. To obtain an output value of 0 to 4095 for an input signal of 4 to 20mA the offset switch is switched on.

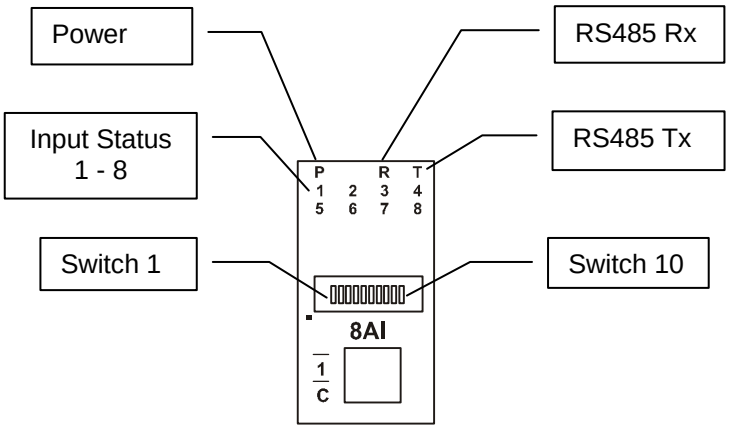
The same applies to the PL8AI/V module. An input voltage of 0 - 10Volts represents an output of 0 - 4095 and 2 volts would give a reading of 819 ± 1LSB. To obtain an output value of 0 to 4095 for an input signal of 2 to 10V the offset switch is switched on. An input range of 0(1) to 5Vdc is available by removing the jumper link located on the analogue board inside the enclosure.

### 3.9.2 Technical Specification of PL8AI

| | | |
|---|---|---|
| **Power Supply** | Logic Supply Voltage | Supplied from Power Bus |
| | Logic Supply Current | 0.3VA |
| | Field Supply Voltage | 12 -24 Vdc |
| | Field Supply Current | 8mA @ 12V / 15mA @ 24V |
| **Voltage Inputs – PL8AI/V** | Input Points | 8 |
| | Input Voltage | 0(2) - 10 Vdc or 0(1) - 5 Vdc |
| | Input Resistance | 20kohms |
| | Resolution | 12 bits |
| | Drift | 50ppm/°C |
| | Accuracy | 0.2% of span |
| | Isolation | 1500Vrms between field and logic |
| **Current Inputs – PL8AI/I** | Input Points | 8 |
| | Input Current | 0(4) - 20 mA |
| | Input Resistance | 250ohms |
| | Resolution | 12 bits |
| | Drift | 50ppm/°C |
| | Accuracy | 0.2% of span |
| | Isolation | 1500Vrms between field and logic |
| **Temperature** | Operating Temperature. | -40°C to + 80°C |
| | Storage Temperature | -40°C to + 85°C |
| **Connectors** | Logic Power and Comms. | 32 PIN Double Sided DIN Connector |
| | Inputs | 18 Way screw connector on front |
| | | |
| | | |

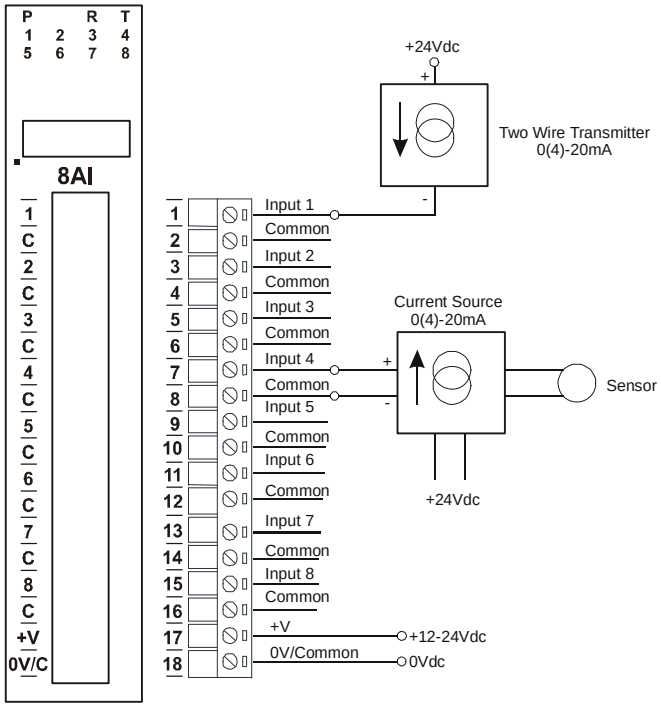
### 3.9.3 Status Indicators

**Power:** Flashes to indicate the CPU is running.
**RS485 Rx:** Flashes to indicate the unit has received a valid Modbus message.
**RS485 Tx:** Flashes to indicate the unit has sent a Modbus message.
**Input Status:** "ON" when the input is zero.
"OFF" when the input is greater than zero and less than 4095.
"Flashing" when the input is over range, greater or equal to 4095.

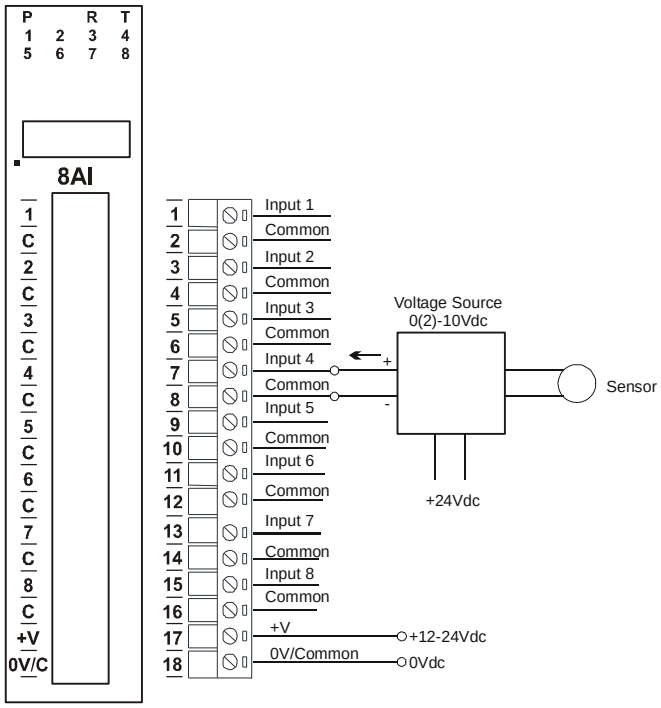



### 3.9.4 Wiring

The following diagram shows how the analog inputs are connected to a 0(4)-20mA source. All of the common terminals are connected together, and are connected to 0V internally.



The following diagram shows how the analog inputs are connected to a 0(2)-10Vdc source. All of the common terminals are connected together, and are connected to 0V internally.




## 3.9.5 Switch Settings

| SWITCH | FUNCTION | DESCRIPTION |
|---|---|---|
| | | |
| 1 | NODE ID +1 | Node ID's from 0 to 127 are set up using switches 1 to 7 |
| 2 | NODE ID +2 | " |
| 3 | NODE ID +4 | " |
| 4 | NODE ID +8 | " |
| 5 | NODE ID +16 | " |
| 6 | NODE ID +32 | " |
| 7 | NODE ID +64 | " |
| 8 | - | Not used. |
| 9 | OFFSET | When switched ON the inputs scaled to accept a 2V or 4mA offset . |
| 10 | BAUD RATE | Must be ON. |

### 3.9.6 PL8AI Data Registers ( PL8AI/I TYPE = 103 / PL8AI/V TYPE = 104)

| Modbus Address | Register Name | Low Limit | High Limit | Access | Description |
|---|---|---|---|---|---|
| 30001 | S/W Version / Module Type | N/A | N/A | R | High Byte = Software Version<br>Low Byte = 103(PL8AI/I) or 104(PL8AI/V) |
| 30002 | Analog Input 1 | 0 | 4095 | R | Analog Input lower 12 Bits |
| 30003 | Analog Input 2 | 0 | 4095 | R | " |
| 30004 | Analog Input 3 | 0 | 4095 | R | " |
| 30005 | Analog Input 4 | 0 | 4095 | R | " |
| 30006 | Analog Input 5 | 0 | 4095 | R | " |
| 30007 | Analog Input 6 | 0 | 4095 | R | " |
| 30008 | Analog Input 7 | 0 | 4095 | R | " |
| 30009 | Analog Input 8 | 0 | 4095 | R | " |
| 30010 | Input Status | 0 | 65535 | R | bit2 = 0(open circuit or < 2), bit2 = 1(over range)<br>bit1 = 0(OK),bit1 = 1(error) |
| 30100 | DIP Switch | 0 | 65535 | R | Status of DIP Switch on Front Panel |

#### 3.9.6.1 Analog Input Registers.

The analog inputs are read as a 12 bit value in the registers as follows:

| MSB | | | | | | | **PL8AI ANALOG INPUTS** | | | | | | | LSB | | ADDRESS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| 32768 | 16384 | 8192 | 4096 | 2048 | 1024 | 512 | 256 | 128 | 64 | 32 | 16 | 8 | 4 | 2 | 1 | 300XX |
| 0 | 0 | 0 | 0 | x | x | x | x | x | x | x | x | x | x | x | x | |

Analog Input: 12 Bit Value (0 - 4095)

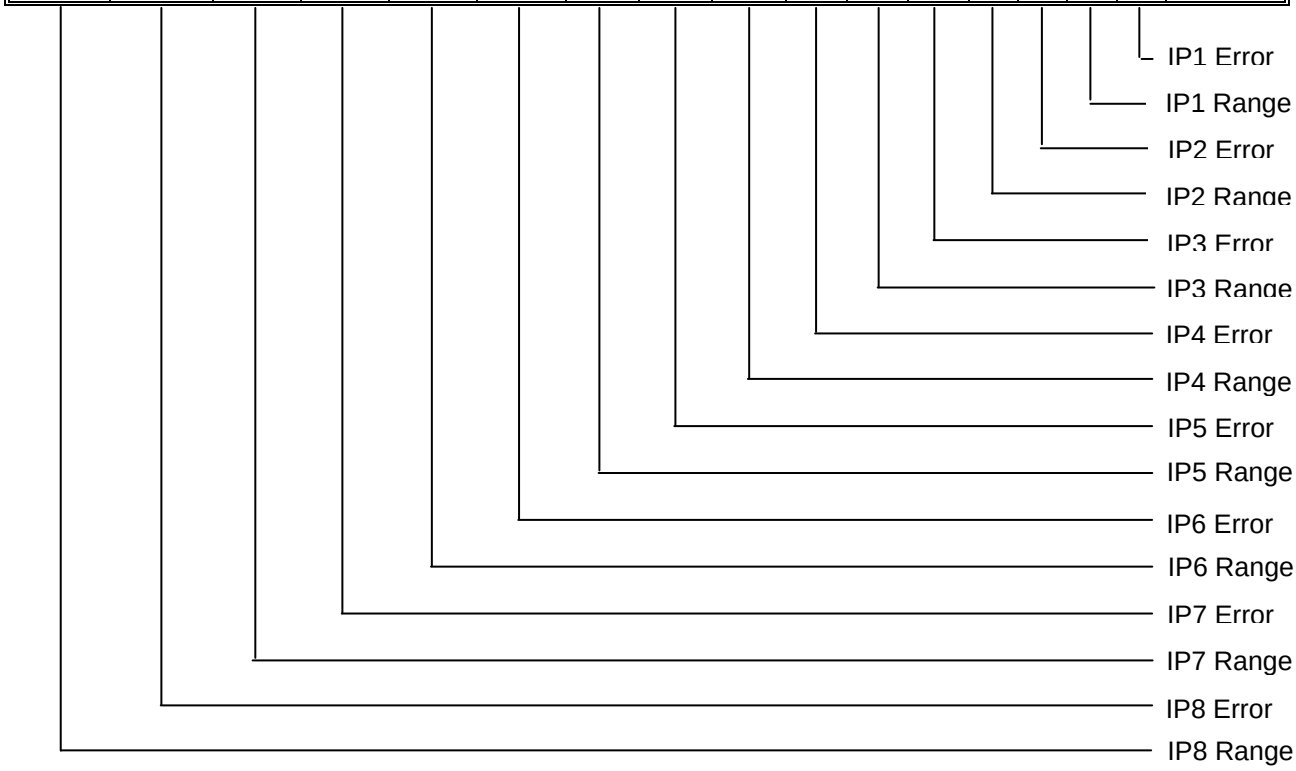
### 3.9.6.2 Analog Input Status.

There are two status bits associated with each analog input. These bits are used to indicate if the input is zero or open circuit , in the working range 0-4095, or over range. If the input is open circuit or over range, then the error bit will be set. When the error bit is set, the range bit is zero if the input is open circuit and set if the input is over range, ie:

| **Bit 1- Error** | **Bit 2-Range** | **Condition** | **Status LED** |
|---|---|---|---|
| 0 | don't care | Input working OK. | (LED OFF) |
| 1 | 0 | Input Open circuit or zero. | (LED ON) |
| 1 | 1 | Input Over range. | (LED FLASH) |

The analog input status can be read in a single register as follows:

| MSB **PL8AI ANALOG INPUT STATUS** LSB | | | | | | | | | | | | | | | | ADDRESS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| 32768 | 16384 | 8192 | 4096 | 2048 | 1024 | 512 | 256 | 128 | 64 | 32 | 16 | 8 | 4 | 2 | 1 | 30010 |



## 3.10 PL8AI/I ISO and PL8AI/V ISO - ISOLATED ANALOG INPUTS

### 3.10.1 Description


The Analog Input modules are supplied as either a current input module (PL8AI/I) or a voltage input module (PL8AI/V). The inputs are fully isolated from input to logic and between inputs. This module is ideal for monitoring existing 4-20mA current loops which are isolated from each other and cannot be connected to a common point of reference.

The standard setting for the PL8AI/I module is 0 - 20mA input current which represents an output value of 0 - 4095 (12 bits) in the corresponding Modbus register. To obtain an output value of 0 to 4095 for an input signal of 4 to 20mA the offset switch is switched on. This module can also be configured for a 0 – 20.000mA input range or +/- 20.000mA input.

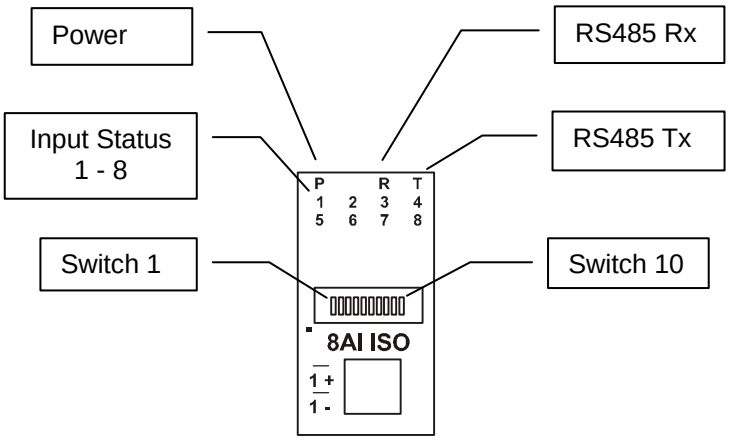
The same applies to the PL8AI/V module. An input voltage of 0 - 10Volts represents an output of 0 - 4095 and 2 volts would give a reading of 819 ± 1LSB. To obtain an output value of 0 to 4095 for an input signal of 2 to 10V the offset switch is switched on. This module can also be configured for a 0 – 10.000V input range or +/- 10.000V input.

## 3.10.2 Technical Specification of PL8AI/I ISO and PL8AI/V ISO

| | | | |
|---|---|---|---|
| **Power Supply** | Logic Supply Voltage | | Supplied from Power Bus |
| | Logic Supply Power | | 0.6VA |
| **Voltage Inputs – PL8AI/V** | Input Points | | 8 |
| | Input Voltage | | 0(2) - 10 Vdc |
| | **InputType** | **Range** | **Resolution** |
| | 1 | 0 – 4095 | 12 bits |
| | 2 | 0 – 10.000 V | 1mV |
| | 3 | +/- 10.000 V | 1mV |
| | 4 | 0 – 1.0000 V | 0.1mV |
| | 5 | +/- 1.0000 V | 0.1mV |
| | Drift | | 100ppm/°C |
| | Isolation | | 1500Vrms between field and logic<br>350Vpeak between each input |
| **Current Inputs – PL8AI/I** | Input Points | | 8 |
| | Input Current | | 0(4) - 20 mA |
| | **InputType** | **Range** | **Resolution** |
| | 1 | 0 – 4095 | 12 bits |
| | 2 | 0–20.000mA | 1uA |
| | 3 | +/-20.000mA | 1uA |
| | Drift | | 100ppm/°C |
| | Isolation | | 1000Vrms between field and logic<br>350Vpeak between each input |
| **Temperature** | Operating Temperature. | | -40°C to + 80°C |
| | Storage Temperature | | -40°C to + 85°C |
| **Connectors** | Logic Power and Comms. | | 32 PIN Double Sided DIN Connector |
| | Inputs | | 18 Way screw connector on front |
| | | | |

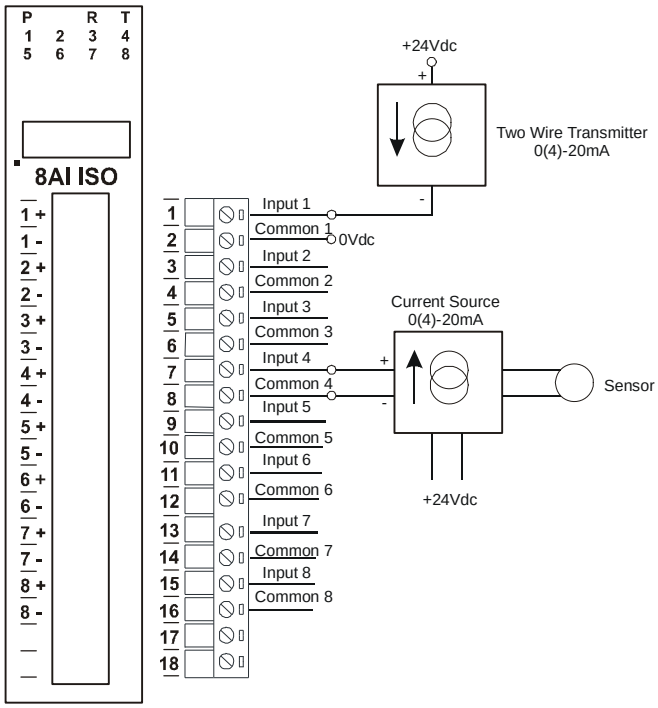
## 3.10.3 Status Indicators

**Power:** Flashes to indicate the CPU is running.
**RS485 Rx:** Flashes to indicate the unit has received a valid Modbus message.
**RS485 Tx:** Flashes to indicate the unit has sent a Modbus message.
**Input Status:** "ON" when the input is zero.
"OFF" when the input is greater than zero and less than 4095.
"Flashing" when the input is over range, greater or equal to 4095.

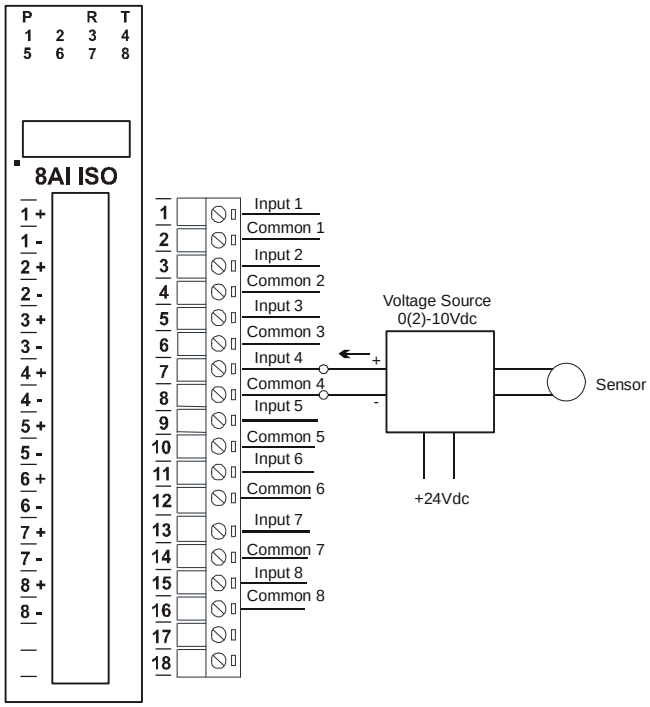


## 3.10.4 Wiring

The following diagram shows how the analog inputs are connected to a 0(4)-20mA source. All of the common terminals are isolated from each other.




The following diagram shows how the analog inputs are connected to a 0(2)-10Vdc source. All of the common terminals are isolated from each other.



### 3.10.5 Switch Settings

| SWITCH | FUNCTION | DESCRIPTION |
|---|---|---|
| | | |
| 1 | NODE ID +1 | Node ID's from 0 to 127 are set up using switches 1 to 7 |
| 2 | NODE ID +2 | " |
| 3 | NODE ID +4 | " |
| 4 | NODE ID +8 | " |
| 5 | NODE ID +16 | " |
| 6 | NODE ID +32 | " |
| 7 | NODE ID +64 | " |
| 8 | OFFSET | When switched ON the inputs scaled to accept a 2V or 4mA offset . |
| 9 | OUT OF RANGE | An out of range is given when the input is too negative or too positive. When switched off the analog value will be loaded with -32767 when out of range. When switched on the analog value will be loaded with 32768 when out of range. |
| 10 | BAUD RATE | Must be ON. |

### 3.10.6 PL8AI ISO Data Registers (8AI/I TYPE = 107/8AI/V TYPE = 108)

| Modbus Address | Register Name | Low Limit | High Limit | Access | Description |
|---|---|---|---|---|---|
| 30001 | S/W Version / Module Type | N/A | N/A | R | High Byte = Software Version<br>Low Byte = 107(PL8AI/I) or 108(PL8AI/V) |
| 30002 | Analog Input 1 | 0 | 4095 | R | Analog Input lower 12 Bits |
| 30003 | Analog Input 2 | 0 | 4095 | R | " |
| 30004 | Analog Input 3 | 0 | 4095 | R | " |
| 30005 | Analog Input 4 | 0 | 4095 | R | " |
| 30006 | Analog Input 5 | 0 | 4095 | R | " |
| 30007 | Analog Input 6 | 0 | 4095 | R | " |
| 30008 | Analog Input 7 | 0 | 4095 | R | " |
| 30009 | Analog Input 8 | 0 | 4095 | R | " |
| 30010 | Input Status | 0 | 65535 | R | bit2 = 0(open circuit or < 2), bit2 = 1(over range)<br>bit1 = 0(OK),bit1 = 1(error) |
| 30100 | DIP Switch | 0 | 65535 | R | Status of DIP Switch on Front Panel |
| 40101 | Input Type | 1 | 5 | R/W | See specification table. |

#### 3.10.6.1 Analog Input Registers.

The analog inputs are read as a 12 bit value in the registers as follows:

| MSB | | | | | | | **PL8AI ANALOG INPUTS** | | | | | | | LSB | | ADDRESS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| 32768 | 16384 | 8192 | 4096 | 2048 | 1024 | 512 | 256 | 128 | 64 | 32 | 16 | 8 | 4 | 2 | 1 | 300XX |
| 0 | 0 | 0 | 0 | x | x | x | x | x | x | x | x | x | x | x | x | |

Analog Input: 12 Bit Value (0 - 4095)

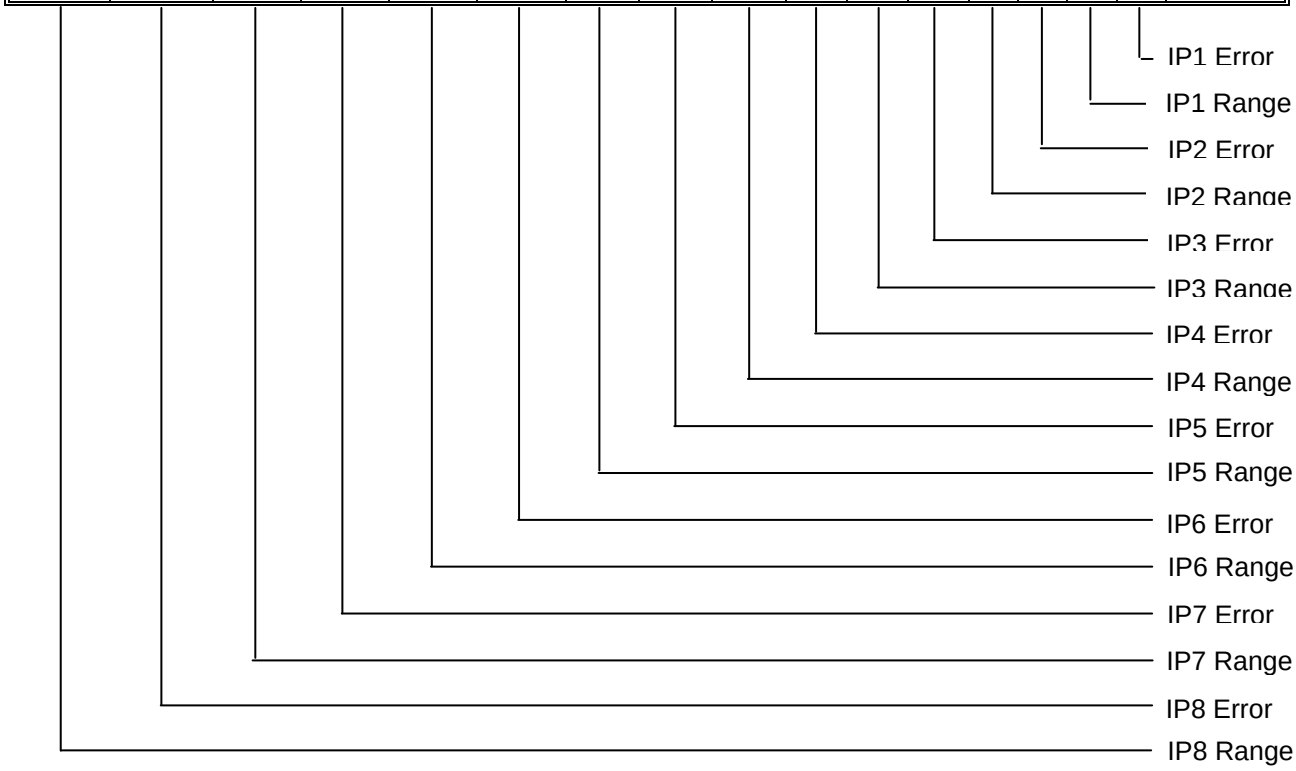
### 3.10.6.2 Analog Input Status.

There are two status bits associated with each analog input. These bits are used to indicate if the input is zero or open circuit , in the working range 0-4095, or over range. If the input is open circuit or over range, then the error bit will be set. When the error bit is set, the range bit is zero if the input is open circuit and set if the input is over range, ie:

| **Bit 1- Error** | **Bit 2-Range** | **Condition** | **Status LED** |
|---|---|---|---|
| 0 | don't care | Input working OK. | (LED OFF) |
| 1 | 0 | Input Open circuit or zero. | (LED ON) |
| 1 | 1 | Input Over range. | (LED FLASH) |

The analog input status can be read in a single register as follows:

| MSB **PL8AI ANALOG INPUT STATUS** LSB | | | | | | | | | | | | | | | | ADDRESS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| 32768 | 16384 | 8192 | 4096 | 2048 | 1024 | 512 | 256 | 128 | 64 | 32 | 16 | 8 | 4 | 2 | 1 | 30010 |



## 3.11 PL8TC - THERMOCOUPLE INPUTS

### 3.11.1 Description


The PL8TC module is a 8 thermocouple input module. The module uses differential inputs to reduce effects of electrical noise and mains pickup. The thermocouple inputs are isolated from the logic. If inter channel isolation is required then the PL8TCISO should be used.

The thermocouple voltage is read by the module circuitry, linearised and converted to degrees Centigrade. No ranging is required as the module covers the full range as indicated in the table of TC types. The value that is read from the Modbus register is the actual temperature in degrees centigrade to 0.1°C resolution. ie: a value of 3451 corresponds to a temperature of 345.1°C.

The thermocouple type is setup by writing a value to the TC Type register . The value is obtained from the table below. For example to select type K thermocouples, the value "2" must be written to the TC Type register. All 8 thermocouple inputs adopt the same TC type.

The DIP switch 9 is used to select upscale or downscale burnout. A value of 32768 is used to indicate upscale burnout and a value of -32767 is used to indicate downscale burnout.

The module has built in Cold Junction Compensation. Use must be made of the correct thermocouple extension wire to avoid reading errors.

The thermocouple module can also be configured for a 0 - 50mV input range. The TC Type register must be set to 9 for this option. The value in the register which is read back over the network is 0 - 50,000.

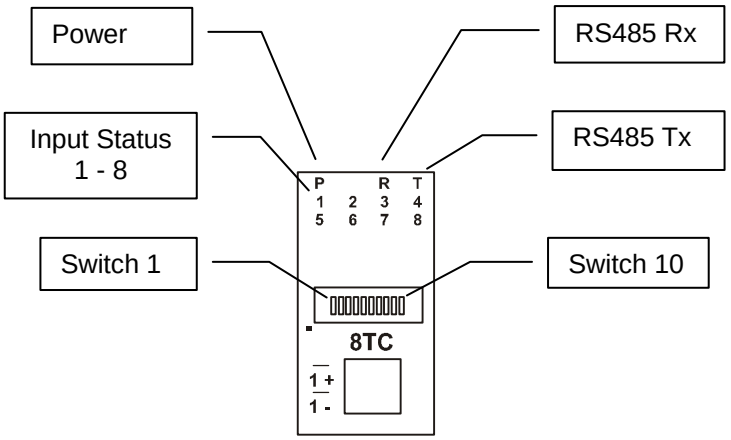
Note: As there is no inter-channel isolation, isolated thermocouples must be used in order to prevent ground loops and reading errors.

### 3.11.2 Technical Specification of PL8TC

| | | | | |
|---|---|---|---|---|
| **Power Supply** | Logic Supply Voltage | | Supplied from Power Bus | |
| | Logic Supply Power | | 0.6VA | |
| **TC Inputs** | Input Points | | 8 | |
| | Resolution | | 0.1°C | |
| | Drift | | 100ppm/°C Typ. | |
| | Isolation | | 1500Vrms between field and logic | |
| **TC Type** | **Number** | **Type** | **Range** | **Accuracy** |
| | 1 | J | -150 to 760 °C | 0.2°C |
| | 2 | K | -200 to 1370 °C | 0.3°C |
| | 3 | E | 0 to 600 °C | 0.1°C |
| | 4 | T | -200 to 400 °C | 0.3°C |
| | 5 | N | 0 to 1300 °C | 0.3°C |
| | 6 | B | 400 to 1820 °C | 0.5°C |
| | 7 | S | -50 to 1767 °C | 0.6°C |
| | 8 | R | -50 to 1767 °C | 0.7°C |
| | 9 | mV | 0 to 50mV | 0.1% |
| | 10 | C | 0 to 2315.5 °C | 0.7°C |
| | 11 | D | 0 to 2315.5 °C | 0.7°C |
| | 12 | G | 0 to 2315.5 °C | 0.9°C |
| | 13 | m V | +/- 100mV | 0.1% |
| **Cold Junction** | CJC Error | | ±0.5°C Typ. After 30 Minutes warm up time. | |
| **Temperature** | Operating Temperature. | | -30°C to + 80°C | |
| | Storage Temperature | | -40°C to + 85°C | |
| **Connectors** | Logic Power and Comms. | | 32 PIN Double Sided DIN Connector | |
| | Inputs | | 18 Way screw connector on front | |
| | | | | |
| | | | | |

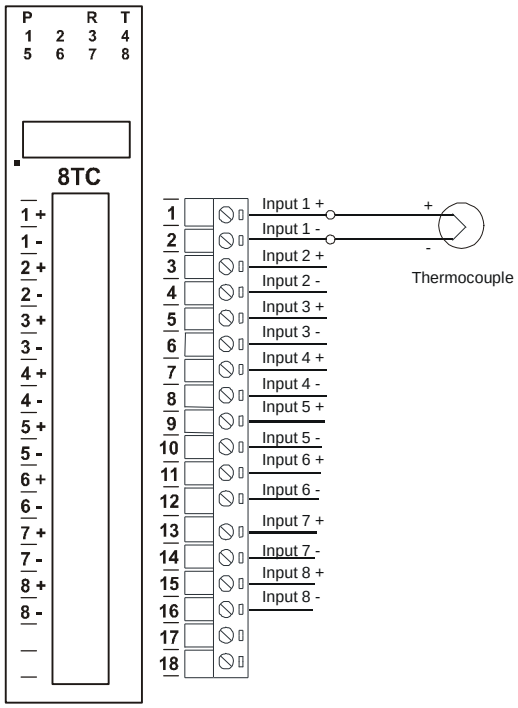
### 3.11.3 Status Indicators

**Power:** Flashes to indicate the CPU is running.
**RS485 Rx:** Flashes to indicate the unit has received a valid Modbus message.
**RS485 Tx:** Flashes to indicate the unit has sent a Modbus message.
**Input Status:** "ON" when the thermocouple is open circuit.
"OFF" when the thermocouple is connected.



### 3.11.4 Wiring

The following diagram shows how the inputs are connected to a thermocouple.




### 3.11.5 Switch Settings

| SWITCH | FUNCTION | DESCRIPTION |
|---|---|---|
| | | |
| 1 | NODE ID +1 | Node ID's from 0 to 127 are set up using switches 1 to 7 |
| 2 | NODE ID +2 | " |
| 3 | NODE ID +4 | " |
| 4 | NODE ID +8 | " |
| 5 | NODE ID +16 | " |
| 6 | NODE ID +32 | " |
| 7 | NODE ID +64 | " |
| 8 | - | Not used. |
| 9 | BREAK | TC break. When switched off the TC value will be loaded with -32767 when the TC is faulty. When switched on the TC value will be loaded with 32768. |
| 10 | BAUD RATE | Must be ON. |

### 3.11.6 PL8TC Data Registers (MODULE TYPE = 105)

| Modbus Address | Register Name | Low Limit | High Limit | Access | Description |
|---|---|---|---|---|---|
| 30001 | S/W Version / Module Type | N/A | N/A | R | High Byte = Software Version<br>Low Byte = 105 |
| 30002 | TC Input 1 | -xxx.x | yyyy.y | R | Thermocouple Inputs. See table for range. |
| 30003 | TC Input 2 | -xxx.x | yyyy.y | R | Resolution in 0.1°C. |
| 30004 | TC Input 3 | -xxx.x | yyyy.y | R | " |
| 30005 | TC Input 4 | -xxx.x | yyyy.y | R | " |
| 30006 | TC Input 5 | -xxx.x | yyyy.y | R | " |
| 30007 | TC Input 6 | -xxx.x | yyyy.y | R | " |
| 30008 | TC Input 7 | -xxx.x | yyyy.y | R | " |
| 30009 | TC Input 8 | -xxx.x | yyyy.y | R | " |
| 30010 | CJC Temp. | -xxx.x | yyyy.y | R | CJC Temperature in 0.1°C resolution. |
| 30011 | Input Status | 0 | 65535 | R | bit1 = 0(OK),bit1 = 1(error or open circuit) |
| 30100 | DIP Switch | 0 | 65535 | R | Status of DIP Switch on Front Panel |
| 40101 | TC Type | 1 | 13 | R/W | See TC Tables. |
| 40102 | Line Frequency | 50 | 60 | R/W | Line Frequency |
| 40103 | CJC Offset | 1 | 199 | R/W | 100 = zero offset (0.0) |
| 40104 | Units Type | 1 | 2 | R/W | 1=°C, 2=°F |

## 3.12 PL8TCISO - ISOLATED THERMOCOUPLE INPUTS

### 3.12.1 Description


The PL8TCISO module is a 8 isolated thermocouple input module. The module uses differential inputs to reduce effects of electrical noise and mains pickup. The thermocouple inputs are isolated from the logic and from each other. This module is operated in an identical way to the PL8TC module and is fully interchangeable.

The thermocouple voltage is read by the module circuitry, linearised and converted to degrees Centigrade. No ranging is required as the module covers the full range as indicated in the TC table. The value that is read from the Modbus register is the actual temperature in degrees centigrade to 0.1°C resolution. ie: a value of 3451 corresponds to a temperature of 345.1°C.

The thermocouple type is setup by writing a value to the TC Type register. The value is obtained from the table below. For example to select type K thermocouples, the value "2" must be written to the TC Type register. All 8 thermocouple inputs adopt the same TC type.

The DIP switch 9 is used to select upscale or downscale burnout. A value of 32768 is used to indicate upscale burnout and a value of -32767 is used to indicate downscale burnout.

The module has built in Cold Junction Compensation. Use must be made of the correct thermocouple extension wire to avoid reading errors.

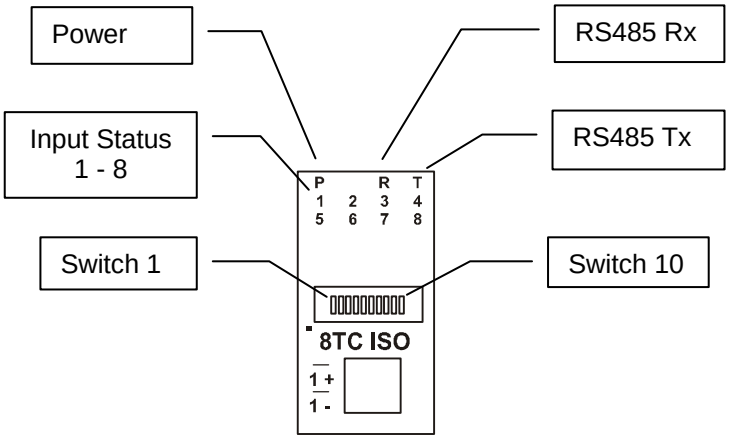
The thermocouple module can also be configured for a 0 - 50mV input range. The TC Type register must be set to 9 for this option. The value in the register which is read back over the network is 0 - 50,000.

### 3.12.2 Technical Specification of PL8TC

| | | | | |
|---|---|---|---|---|
| **Power Supply** | Logic Supply Voltage | | Supplied from Power Bus | |
| | Logic Supply Power | | 0.6VA | |
| **TC Inputs** | Input Points | | 8 | |
| | Resolution | | 0.1°C | |
| | Drift | | 100ppm/°C Typ. | |
| | Isolation | | 1500Vrms between field and logic<br>350Vpeak between each TC input | |
| **TC Type** | **Number** | **Type** | **Range** | **Accuracy** |
| | 1 | J | -150 to 760 °C | 0.2°C |
| | 2 | K | -200 to 1370 °C | 0.3°C |
| | 3 | E | 0 to 600 °C | 0.1°C |
| | 4 | T | -200 to 400 °C | 0.3°C |
| | 5 | N | 0 to 1300 °C | 0.3°C |
| | 6 | B | 400 to 1820 °C | 0.5°C |
| | 7 | S | -50 to 1767 °C | 0.6°C |
| | 8 | R | -50 to 1767 °C | 0.7°C |
| | 9 | mV | 0 to 50mV | 0.1% |
| | 10 | C | 0 to 2315.5 °C | 0.7°C |
| | 11 | D | 0 to 2315.5 °C | 0.7°C |
| | 12 | G | 0 to 2315.5 °C | 0.9°C |
| | 13 | m V | +/- 100mV | 0.1% |
| **Cold Junction** | CJC Error | | ±0.5°C Typ. After 30 Minutes warm up time. | |
| **Temperature** | Operating Temperature. | | -30°C to + 80°C | |
| | Storage Temperature | | -40°C to + 85°C | |
| **Connectors** | Logic Power and Comms. | | 32 PIN Double Sided DIN Connector | |
| | Inputs | | 18 Way screw connector on front | |
| | | | | |
| | | | | |

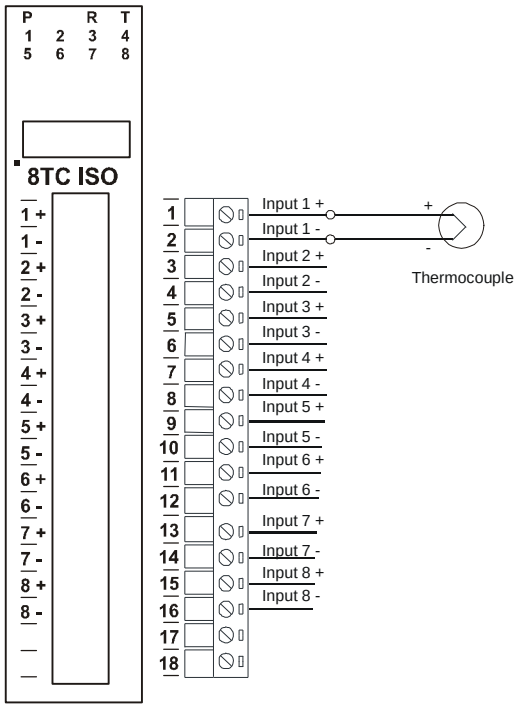
### 3.12.3 Status Indicators

**Power:** Flashes to indicate the CPU is running.
**RS485 Rx:** Flashes to indicate the unit has received a valid Modbus message.
**RS485 Tx:** Flashes to indicate the unit has sent a Modbus message.
**Input Status:** "ON" when the thermocouple is open circuit.
"OFF" when the thermocouple is connected.



### 3.12.4 Wiring

The following diagram shows how the inputs are connected to a thermocouple.




### 3.12.5 Switch Settings

| SWITCH | FUNCTION | DESCRIPTION |
|---|---|---|
| | | |
| 1 | NODE ID +1 | Node ID's from 0 to 127 are set up using switches 1 to 7 |
| 2 | NODE ID +2 | " |
| 3 | NODE ID +4 | " |
| 4 | NODE ID +8 | " |
| 5 | NODE ID +16 | " |
| 6 | NODE ID +32 | " |
| 7 | NODE ID +64 | " |
| 8 | - | Not used. |
| 9 | BREAK | TC break. When switched off the TC value will be loaded with -32767 when the TC is faulty. When switched on the TC value will be loaded with 32768. |
| 10 | BAUD RATE | Must be ON. |

### 3.12.6 PL8TCISO Data Registers (MODULE TYPE = 106)

| Modbus Address | Register Name | Low Limit | High Limit | Access | Description |
|---|---|---|---|---|---|
| 30001 | S/W Version / Module Type | N/A | N/A | R | High Byte = Software Version<br>Low Byte = 106 |
| 30002 | TC Input 1 | -xxx.x | yyyy.y | R | Thermocouple Inputs. See table for range. |
| 30003 | TC Input 2 | -xxx.x | yyyy.y | R | Resolution in 0.1°C. |
| 30004 | TC Input 3 | -xxx.x | yyyy.y | R | " |
| 30005 | TC Input 4 | -xxx.x | yyyy.y | R | " |
| 30006 | TC Input 5 | -xxx.x | yyyy.y | R | " |
| 30007 | TC Input 6 | -xxx.x | yyyy.y | R | " |
| 30008 | TC Input 7 | -xxx.x | yyyy.y | R | " |
| 30009 | TC Input 8 | -xxx.x | yyyy.y | R | " |
| 30010 | CJC Temp. | -xxx.x | yyyy.y | R | CJC Temperature in 0.1°C resolution. |
| 30011 | Input Status | 0 | 65535 | R | bit1 = 0(OK),bit1 = 1(error or open circuit) |
| 30100 | DIP Switch | 0 | 65535 | R | Status of DIP Switch on Front Panel |
| 40101 | TC Type | 1 | 13 | R/W | See TC Tables. |
| 40102 | Line Frequency | 50 | 60 | R/W | Line Frequency |
| 40103 | CJC Offset | 1 | 199 | R/W | 100 = zero offset (0.0) |
| 40104 | Units Type | 1 | 2 | R/W | 1=°C, 2=°F |

## 3.13 PL6RTD - RTD INPUTS

### 3.13.1 Description


The PL6RTD module is a 6 RTD input module. The module can accommodate either 2 or 3 wire RTD sensors. The RTD inputs are isolated from the logic.

The RTD resistance is read by the module circuitry, linearised and converted to degrees Centigrade. No ranging is required as the module covers the full range of the RTD as indicated in the RTD table. The value that is read from the Modbus register is the actual temperature in degrees centigrade to 0.1°C resolution. ie: a value of 3451 corresponds to a temperature of 345.1°C.

The RTD type is setup by writing a value to the RTD Type register. The value is obtained from the table below. For example to select a PT100 RTD, the value "1" must be written to the RTD Type register. All 6 RTD inputs adopt the same RTD type.

The DIP switch 9 is used to select upscale or downscale burnout for break detection. A value of 32768 is used to indicate upscale burnout and a value of -32767 is used to indicate downscale burnout.

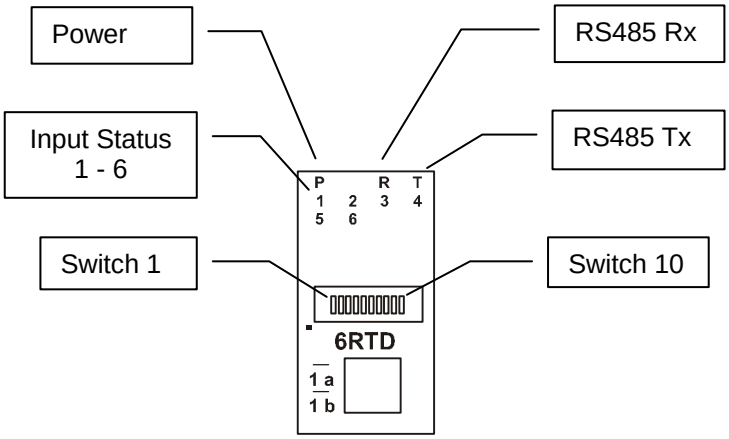
Note: As there is no inter-channel isolation, isolated RTD's must be used in order to prevent ground loops and reading errors.

### 3.13.2 Technical Specification of PL6RTD

| | | | | |
|---|---|---|---|---|
| **Power Supply** | Logic Supply Voltage | | Supplied from Power Bus | |
| | Logic Supply Power | | 0.8VA | |
| **RTD Inputs** | Input Points | | 6 | |
| | RTD Configuration | | 2 or 3 Wire | |
| | Resolution | | 0.1°C | |
| | Drift | | 100ppm/°C Typ. | |
| | Line resistance effect | | < 0.1°C balanced | |
| | Max. line resistance | | 100ohms | |
| | Isolation | | 1500Vrms between field and logic | |
| **RTD Type** | **Number** | **Type** | **Range** | **Accuracy** |
| | 1 | PT100 | -200 to 850°C | 0.3°CIEC 751:1983 |
| | 2 | Ni120 | -80 to 320°C | 0.3°C |
| | 3 | PT1000 | -200 to 850°C | 0.3°C |
| | 4 | Ni1000-DIN | -200 to 850°C | 0.3°C |
| | 5 | Ni1000-Landys&Gyr | -200 to 850°C | 0.3°C |
| | 6 | Ohms | 10 - 400 ohms | |
| | 7 | Ohms | 100-4000ohms | |
| **Temperature** | Operating Temperature. | | -40°C to + 80°C | |
| | Storage Temperature | | -40°C to + 85°C | |
| **Connectors** | Logic Power and Comms. | | 32 PIN Double Sided DIN Connector | |
| | Inputs | | 18 Way screw connector on front | |
| | | | | |

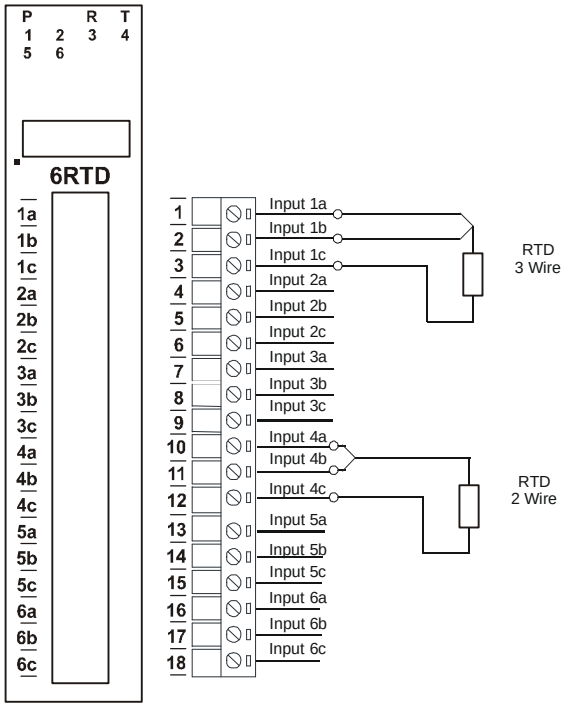
### 3.13.3 Status Indicators

**Power:** Flashes to indicate the CPU is running.
**RS485 Rx:** Flashes to indicate the unit has received a valid Modbus message.
**RS485 Tx:** Flashes to indicate the unit has sent a Modbus message.
**Input Status:** "ON" when the RTD is open circuit.
"OFF" when the RTD is connected.




### 3.13.4 Wiring

The following diagram shows how the inputs are connected to a 2 and 3 wire RTD.



### 3.13.5 Switch Settings

| SWITCH | FUNCTION | DESCRIPTION |
|---|---|---|
| | | |
| 1 | NODE ID +1 | Node ID's from 0 to 127 are set up using switches 1 to 7 |
| 2 | NODE ID +2 | " |
| 3 | NODE ID +4 | " |
| 4 | NODE ID +8 | " |
| 5 | NODE ID +16 | " |
| 6 | NODE ID +32 | " |
| 7 | NODE ID +64 | " |
| 8 | - | Not used. |
| 9 | BREAK | RTD break. When switched off the RTD value will loaded with -32767 when the RTD is faulty. When switched on the RTD value will be loaded with 32768. |
| 10 | BAUD RATE | Must be ON. |

### 3.13.6 PL6RTD Data Registers (MODULE TYPE = 109)

| Modbus Address | Register Name | Low Limit | High Limit | Access | Description |
|---|---|---|---|---|---|
| 30001 | S/W Version / Module Type | N/A | N/A | R | High Byte = Software Version<br>Low Byte = 109 |
| 30002 | RTD Input 1 | -xxx.x | yyyy.y | R | Thermocouple Inputs. See table for range. |
| 30003 | RTD Input 2 | -xxx.x | yyyy.y | R | Resolution in 0.1°C. |
| 30004 | RTD Input 3 | -xxx.x | yyyy.y | R | " |
| 30005 | RTD Input 4 | -xxx.x | yyyy.y | R | " |
| 30006 | RTD Input 5 | -xxx.x | yyyy.y | R | " |
| 30007 | RTD Input 6 | -xxx.x | yyyy.y | R | " |
| 30008 | Input Status | 0 | 65535 | R | bit1 = 0(OK),bit1 = 1(error or open circuit) |
| 30100 | DIP Switch | 0 | 65535 | R | Status of DIP Switch on Front Panel |
| 40101 | RTD Type | 1 | 7 | R/W | See RTD Tables. |
| 40102 | Line Frequency | 50 | 60 | R/W | Line Frequency |
| 40103 | Units Type | 1 | 2 | R/W | 1=°C, 2=°F |

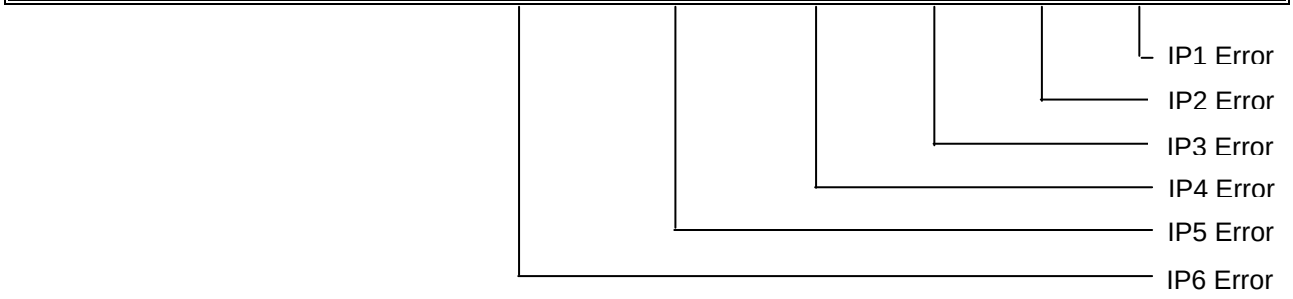
#### 3.13.6.1 RTD Input Status.

There is one status bits associated with each RTD input. These bits are used to indicate if the input is open circuit or over range. If the input is open circuit or over range, then the error bit will be set.

| **Bit 1- Error** | **Bit 2-Not Used** | **Condition** | **Status LED** |
|---|---|---|---|
| 0 | 0 | Input working OK. | (LED OFF) |
| 1 | 0 | Open circuit / Over range. | (LED ON) |

The analog input status can be read in a single register as follows:

| MSB | | | | | **PL6RTD ANALOG INPUT STATUS** | | | | | | | | | | | LSB | ADDRESS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | |
| 32768 | 16384 | 8192 | 4096 | 2048 | 1024 | 512 | 256 | 128 | 64 | 32 | 16 | 8 | 4 | 2 | 1 | | 30008 |



## 3.14 PLDAIO – DIGITAL + ANALOG INPUTS AND OUTPUTS

### 3.14.1 Description


The PLDAIO module is a multipurpose combination of inputs and outputs. The module can accommodate either 2 or 3 wire RTD sensors, current (0-20mA) and voltage (0-10V) inputs, current (0-20mA) or voltage (0-10V) output, and digital inputs and outputs.

**RTD INPUTS:**
There are 2 RTD inputs on the module. The RTD resistance is read by the module circuitry, linearised and converted to degrees Centigrade. No ranging is required as the module covers the full range of the RTD as indicated in the RTD table. The value that is read from the Modbus register is the actual temperature in degrees centigrade to 0.1°C resolution. ie: a value of 3451 corresponds to a temperature of 345.1°C.

The RTD type is setup by writing a value to the RTD Type register. The value is obtained from the table below. For example to select a PT100 RTD, the value "1" must be written to the RTD Type register.

A value of -32767 is used to indicate downscale burnout.

Note: As there is no inter-channel isolation, isolated RTD's must be used in order to prevent ground loops and reading errors.

**ANALOG INPUTS:**

The Analog Inputs (2) can be configured by internal jumpers as either a current input (0-20mA) or a voltage input (0-10V).

An input of 0 - 20mA input current or 0 – 10V input voltage represents an output value of 0 - 4095 (12 bits) in the corresponding Modbus register.

**ANALOG OUTPUT:**

There is a single analog output which can be configured with internal jumpers for a current output (0-20mA) or voltage output (0-10V).

The resolution is 12 bits, so writing a value to the Modbus register for each output of 0 - 4095 would give an output current of 0 - 20mA. A value of 819 ± 1LSB will give a current output of 4mA.

**DIGITAL INPUTS:**

There are 4 digital inputs on the module. The inputs share a common terminal and can be configured for common positive or common negative.

The inputs have got counters associated with them. The counters operate in three modes.

In **mode 0** all the counters are disabled.

In **mode 1** all counters are 32 bit counters allowing a count value from 0 to 4294967295. The count value can be cleared by writing a zero to the associated registers or preset to any other value using the same method.

In **mode 2** the inputs are connected as up/down counters. Input 1 will increment counter 1 whilst input 2 decrements counter1.

**Note:** The count values are not battery backed-up and will be lost if power is turned off.

The format of the registers allows the status of the inputs to be read as either single bits or all at once as a single register on the Modbus network.

**DIGITAL OUTPUTS:**

The module has 2 open collector (NPN) digital outputs. The outputs may be used to drive lamps or external relays when more drive capability is required.

The outputs are written to by the Modbus master device such as a PC or PLC. Each output can be individually switched on or off, or all outputs can be set up at the same time by writing a single number to the output register which represents the status of all outputs.

An output watchdog timer can be configured to switch off all the outputs if there has been no communications with the module for up to 255 seconds. A value of 0 seconds will disable this timer and the outputs will remain in the last programmed state.

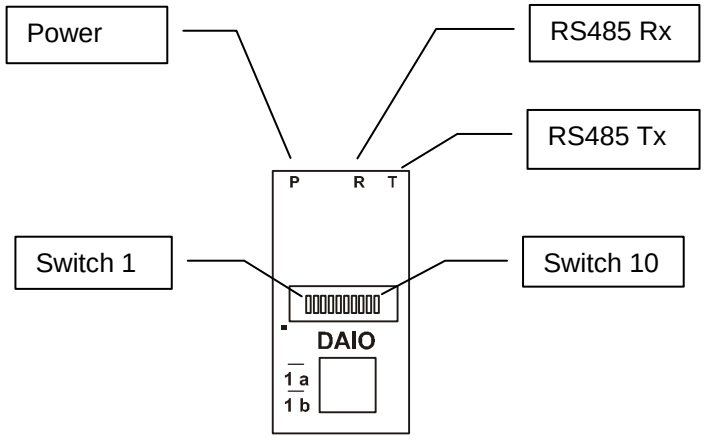
### 3.14.2 Technical Specification of PLDAIO

| | | | | |
|---|---|---|---|---|
| **Power Supply** | Logic Supply Voltage | | Supplied from Power Bus | |
| | Logic Supply Power | | 1.0VA | |
| | Field Supply Voltage | | 24 Vdc | |
| | Field Supply Current | | 25mA | |
| **RTD Inputs** | Input Points | | 2 | |
| | RTD Configuration | | 2 or 3 Wire | |
| | Resolution | | 0.1°C | |
| | Drift | | 100ppm/°C Typ. | |
| | Line resistance effect | | < 0.1°C balanced | |
| | Max. line resistance | | 100ohms | |
| | Isolation | | 1500Vrms between field and logic | |
| **RTD Type** | **Number** | **Type** | **Range** | **Accuracy** |
| | 1 | PT100 | -200 to 850°C | 0.3°CIEC 751:1983 |
| | 2 | Ni120 | -80 to 320°C | 0.3°C |
| | 3 | PT1000 | -200 to 850°C | 0.3°C |
| | 4 | Ni1000-DIN | -200 to 850°C | 0.3°C |
| | 5 | Ni1000-Landys&Gyr | -200 to 850°C | 0.3°C |
| | 6 | Ohms | 10 - 400 ohms | |
| | 7 | Ohms | 100-4000ohms | |
| **Current Inputs** | Input Points | | 2 | |
| | Input Current | | 0(4) - 20 mA | |
| | Input Resistance | | 250ohms | |
| | **InputType** | **Range** | **Resolution** | |
| | 1 | 0 – 4095 | 12 bits | |
| | 2 | 0–20.000mA | 1uA | |
| | 3 | +/-20.000mA | 1uA | |
| | Drift | | 100ppm/°C | |
| | Accuracy | | 0.2% of span | |
| | Isolation | | 1000Vrms between field and logic | |
| **Voltage Inputs** | Input Points | | 2 | |
| | Input Voltage | | 0 - 1 Vdc or 0 – 10 Vdc | |
| | Input Resistance | | 190kohms | |
| | **InputType** | **Range** | **Resolution** | |
| | 4 | 0 – 4095 | 12 bits | |
| | 5 | 0 – 10.000 V | 1mV | |
| | 6 | +/- 10.000 V | 1mV | |
| | 7 | 0 – 1.0000 V | 0.1mV | |
| | 8 | +/- 1.0000 V | 0.1mV | |
| | Drift | | 100ppm/°C | |
| | Accuracy | | 0.2% of span | |
| | Isolation | | 1000Vrms between field and logic | |
| **Current Output** | Output Points | | 1 | |
| | Output Current | | 0(4) - 20 mA | |
| | **OutputType** | **Range** | **Resolution** | |
| | 1 | 0 – 4095 | 12 bits | |
| | Drift | | 100ppm/°C | |
| | Accuracy | | 0.05% of span | |
| | Compliance | | 1000 ohms max. @ 24Vdc<br>500 ohms max. @ 12Vdc | |

| | | | |
|---|---|---|---|
| **Voltage Output** | Output Points | | 1 |
| | Output Voltage | | 0(2) - 10 V |
| | **OutputType** | **Range** | **Resolution** |
| | 2 | 0 – 4095 | 12 bits |
| | Drift | | 100ppm/°C |
| | Accuracy | | 0.05% of span |
| | Compliance | | 2000 ohms min. load |
| **Digital Inputs** | Input Points | | 4 |
| | Input Voltage Range | | 10 - 26 Vdc |
| | Input Current per input | | 4mA@12Vdc / 8mA @24Vdc |
| **Counters** | Inputs | | 1 to 4 |
| | Resolution | | 32 Bits |
| | Frequency | | 1KHz (max) |
| | Pulse Width | | 500us (min) |
| **Digital Outputs** | Output Points | | 2 |
| | Maximum Voltage | | 36 Vdc |
| | Maximum Current | | 100 mA per output |
| | Vceon | | 1.1V Max. |
| **Isolation** | Between field and logic | | 1500Vrms between field and logic |
| **Temperature** | Operating Temperature. | | -40°C to + 80°C |
| | Storage Temperature | | -40°C to + 85°C |
| **Connectors** | Logic Power and Comms. | | 32 PIN Double Sided DIN Connector |
| | Inputs | | 18 Way screw connector on front |
| | | | |
| | | | |

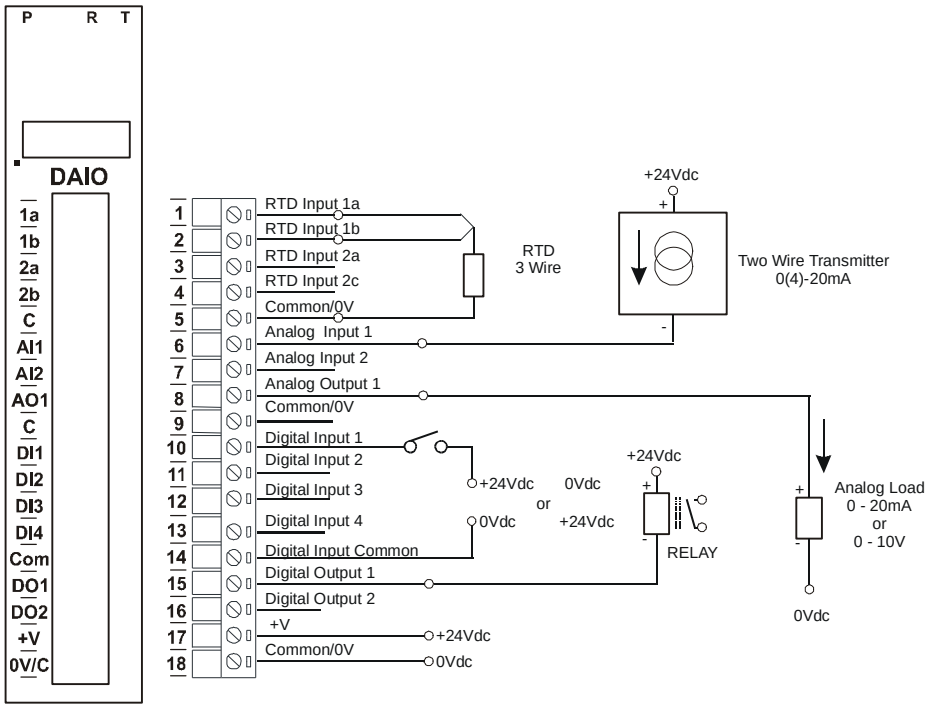
### 3.14.3 Status Indicators

**Power:** "ON" when module has power.
**RS485 Rx:** Flashes to indicate the unit has received a valid Modbus message.
**RS485 Tx:** Flashes to indicate the unit has sent a Modbus message.



### 3.14.4 Wiring

The following diagram shows how the inputs and outputs are connected to the DAIO module.



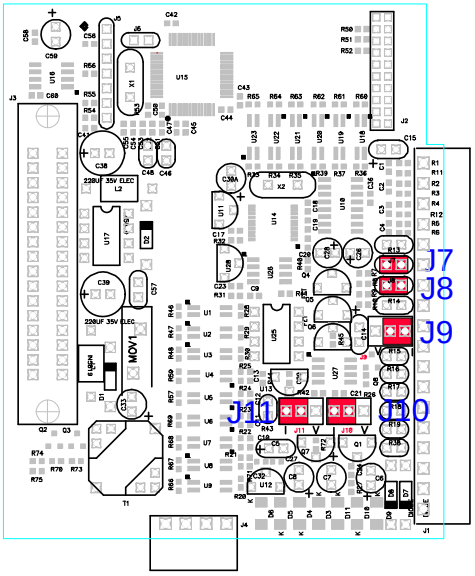

### 3.14.5 Switch Settings

| SWITCH | FUNCTION | DESCRIPTION |
|---|---|---|
| | | |
| 1 | NODE ID +1 | Node ID's from 0 to 127 are set up using switches 1 to 7 |
| 2 | NODE ID +2 | " |
| 3 | NODE ID +4 | " |
| 4 | NODE ID +8 | " |
| 5 | NODE ID +16 | " |
| 6 | NODE ID +32 | " |
| 7 | NODE ID +64 | " |
| 8 | - | Not used. |
| 9 | - | Not used. |
| 10 | BAUD RATE | Must be ON. |

### 3.14.6 Setting the jumpers for Current Input and Output.

The Analog inputs can be configured as a current 0(4)-20mA input by placing the jumper on **J7** for AI1 and **J8** for AI2.

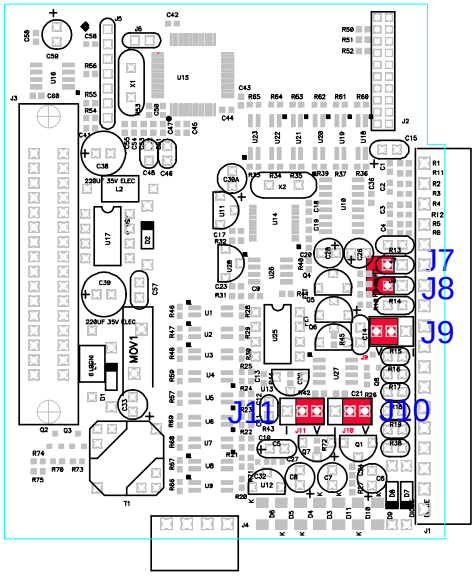
The Analog output can be configured as a current 0(4)-20mA output by placing the jumpers **J9**, J**10** and **J11** on the "**I**" position as shown below.




### 3.14.7 Setting the jumpers for Voltage Input and Output.

The Analog inputs can be configured as a voltage 0-10V input by removing the jumper from **J7** for AI1 and **J8** for AI2.

The Analog output can be configured as a voltage 0-10V output by placing the jumpers **J9**, **J10** and **J11** on the "**V**" position as shown below.




**Note: Remember to change the input and output type in the Modbus registers if you change the jumper settings.**

### 3.14.8 PLDAIO Data Registers (MODULE TYPE = 112)

| Modbus Address | Register Name | Low Limit | High Limit | Access | Comments |
|---|---|---|---|---|---|
| 10001 | Digital Input 1 | 0 | 1 | R | Status of Digital Inputs. |
| 10002 | Digital Input 2 | 0 | 1 | R | " |
| 10003 | Digital Input 3 | 0 | 1 | R | " |
| 10004 | Digital Input 4 | 0 | 1 | R | " |
| 00017 | Digital Output 1 | 0 | 1 | R/W | Status of Digital Outputs. |
| 00018 | Digital Output 2 | 0 | 1 | R/W | " |
| | | | | | |
| 30001 | S/W Version / Module Type | N/A | N/A | R | High Byte = Software Version<br>Low Byte = 112 |
| 30002 | Digital Inputs | N/A | N/A | R | Digital Inputs in lower 8 bits. 8 - 1. |
| 40003 | Digital Outputs | N/A | N/A | R/W | Digital Outputs in lower 8 bits. 8 - 1. |
| 40004 | RTD Input 1 | -xxx.x | yyyy.y | R | RTD Inputs. See table for range. |
| 40005 | RTD Input 2 | -xxx.x | yyyy.y | R | Resolution in 0.1°C. |
| 40006 | Analog Input 1 | 0 | 4095 | R | Analog Input lower 12 Bits |
| 40007 | Analog Input 2 | 0 | 4095 | R | Analog Input lower 12 Bits |
| 40008 | Analog Output 1 | 0 | 4095 | R/W | Analog Output lower 12 Bits |
| 40009 | Counter 1 MSB | 0 | 65535 | R/W | Counter MSB and LSB combine to give a 32 bit |
| 40010 | Counter 1 LSB | 0 | 65535 | R/W | Counter with range 0 to 4294967295. |
| 40011 | Counter 2 MSB | 0 | 65535 | R/W | " |
| 40012 | Counter 2 LSB | 0 | 65535 | R/W | " |
| 40013 | Counter 3 MSB | 0 | 65535 | R/W | " |
| 40014 | Counter 3 LSB | 0 | 65535 | R/W | " |
| 40015 | Counter 4 MSB | 0 | 65535 | R/W | " |
| 40016 | Counter 4 LSB | 0 | 65535 | R/W | " |
| 30100 | DIP Switch | 0 | 65535 | R | Status of DIP Switch on Front Panel |
| 40101 | Watchdog Timer | 0 | 255 | R/W | Timer in seconds. 0 = disabled. 1 - 255 = enabled. |
| 40102 | Counter Mode | 0 | 2 | R/W | 0=Disable, 1=Up Counting, 2=Up/Down Count |
| 40103 | Input Filter | 0 | 65535 | R/W | 0 = Disable, >0 = Enable. (x10ms) |
| 40104 | RTD 1 Type | 1 | 7 | R/W | See RTD Tables. |
| 40105 | RTD 2 Type | 1 | 7 | R/W | See RTD Tables. |
| 40106 | AI 1 Type | 1 | 2 | R/W | 1 = 0-20mA, 2 = 0-10V |
| 40107 | AI 2 Type | 1 | 2 | R/W | " |
| 40108 | AO Type | 1 | 2 | R/W | " |
| 40109 | Line Frequency | 50 | 60 | R/W | Line Frequency |
| 40110 | Units Type | 1 | 2 | R/W | 1=°C, 2=°F |

## 3.15 PLDAIO2 – DIGITAL + ANALOG INPUTS AND OUTPUTS TYPE 2

### 3.15.1 Description


The PLDAIO2 module is a multipurpose combination of inputs and outputs. The module can accommodate either current (0-20mA) or voltage (0-10V) inputs, current (0-20mA) outputs, and digital inputs and outputs.

**ANALOG INPUTS:**

The Analog Inputs (2) can be configured by internal jumpers as either a current input (0-20mA) or a voltage input (0-10V).

An input of 0 - 20mA input current or 0 – 10V input voltage represents an output value of 0 - 4095 (12 bits) in the corresponding Modbus register.

**ANALOG OUTPUTS:**

The analog outputs are current outputs (0-20mA)

The resolution is 12 bits, so writing a value to the Modbus register for each output of 0 - 4095 would give an output current of 0 - 20mA. A value of 819 ± 1LSB will give a current output of 4mA.

**DIGITAL INPUTS:**

There are 4 digital inputs on the module. The inputs share a common terminal and can be configured for common positive or common negative. The inputs have got counters associated with them. The counters operate in three modes.

In **mode 0** all the counters are disabled.
In **mode 1** all counters are 32 bit counters allowing a count value from 0 to 4294967295. The count value can be cleared by writing a zero to the associated registers or preset to any other value using the same method.
In **mode 2** the inputs are connected as up/down counters. Input 1 will increment counter 1 whilst input 2 decrements counter1.

**Note:** The count values are not battery backed-up and will be lost if power is turned off.

The format of the registers allows the status of the inputs to be read as either single bits or all at once as a single register on the Modbus network.

**DIGITAL OUTPUTS:**

The module has 4 open collector (NPN) digital outputs. The outputs may be used to drive lamps or external relays when more drive capability is required.

The outputs are written to by the Modbus master device such as a PC or PLC. Each output can be individually switched on or off, or all outputs can be set up at the same time by writing a single number to the output register which represents the status of all outputs.

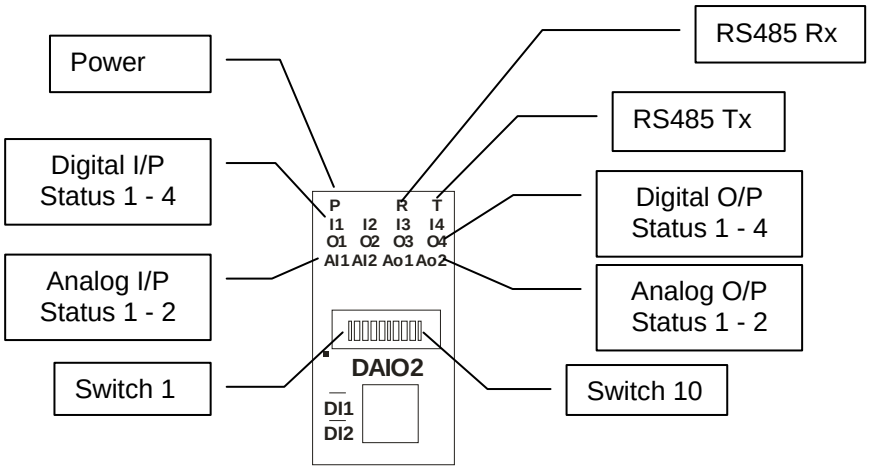
An output watchdog timer can be configured to switch off all the outputs if there has been no communications with the module for up to 255 seconds. A value of 0 seconds will disable this timer and the outputs will remain in the last programmed state.

### 3.15.2 Technical Specification of PLDAIO2

| | | | |
|---|---|---|---|
| **Power Supply** | Logic Supply Voltage | | Supplied from Power Bus |
| | Logic Supply Power | | 1.0VA |
| | Field Supply Voltage | | 24 Vdc |
| | Field Supply Current | | 45mA |
| **Current Inputs** | Input Points | | 2 |
| | Input Current | | 0 - 20 mA |
| | Input Resistance | | 250ohms |
| | **InputType** | **Range** | **Resolution** |
| | 1 | 0 – 4095 | 12 bits |
| | 2 | 0–20.000mA | 1uA |
| | 3 | +/-20.000mA | 1uA |
| | Drift | | 100ppm/°C |
| | Accuracy | | 0.2% of span |
| | Isolation | | 1000Vrms between field and logic |
| **Voltage Inputs** | Input Points | | 2 |
| | Input Voltage | | 0 - 1 Vdc or 0 – 10 Vdc |
| | Input Resistance | | 190kohms |
| | **InputType** | **Range** | **Resolution** |
| | 4 | 0 – 4095 | 12 bits |
| | 5 | 0 – 10.000 V | 1mV |
| | 6 | +/- 10.000 V | 1mV |
| | 7 | 0 – 1.0000 V | 0.1mV |
| | 8 | +/- 1.0000 V | 0.1mV |
| | Drift | | 100ppm/°C |
| | Accuracy | | 0.2% of span |
| | Isolation | | 1000Vrms between field and logic |
| **Current Outputs** | Output Points | | 2 |
| | Output Current | | 0 - 20 mA |
| | **OutputType** | **Range** | **Resolution** |
| | 1 | 0 – 4095 | 12 bits |
| | Drift | | 100ppm/°C |
| | Accuracy | | 0.05% of span |
| | Compliance | | 1000 ohms max. @ 24Vdc<br>500 ohms max. @ 12Vdc |
| **Digital Inputs** | Input Points | | 4 |
| | Input Voltage Range | | 10 - 26 Vdc |
| | Input Current per input | | 4mA@12Vdc / 8mA @24Vdc |
| **Counters** | Inputs | | 1 to 4 |
| | Resolution | | 32 Bits |
| | Frequency | | 1KHz (max) |
| | Pulse Width | | 500us (min) |
| **Digital Outputs** | Output Points | | 4 |
| | Maximum Voltage | | 36 Vdc |
| | Maximum Current | | 100 mA per output |
| | Vceon | | 1.1V Max. |
| **Isolation** | Between field and logic | | 1500Vrms between field and logic |
| **Temperature** | Operating Temperature. | | -40°C to + 80°C |
| | Storage Temperature | | -40°C to + 85°C |
| **Connectors** | Logic Power and Comms. | | 32 PIN Double Sided DIN Connector |
| | I/O | | 18 Way screw connector on front |
| | | | |
| | | | |

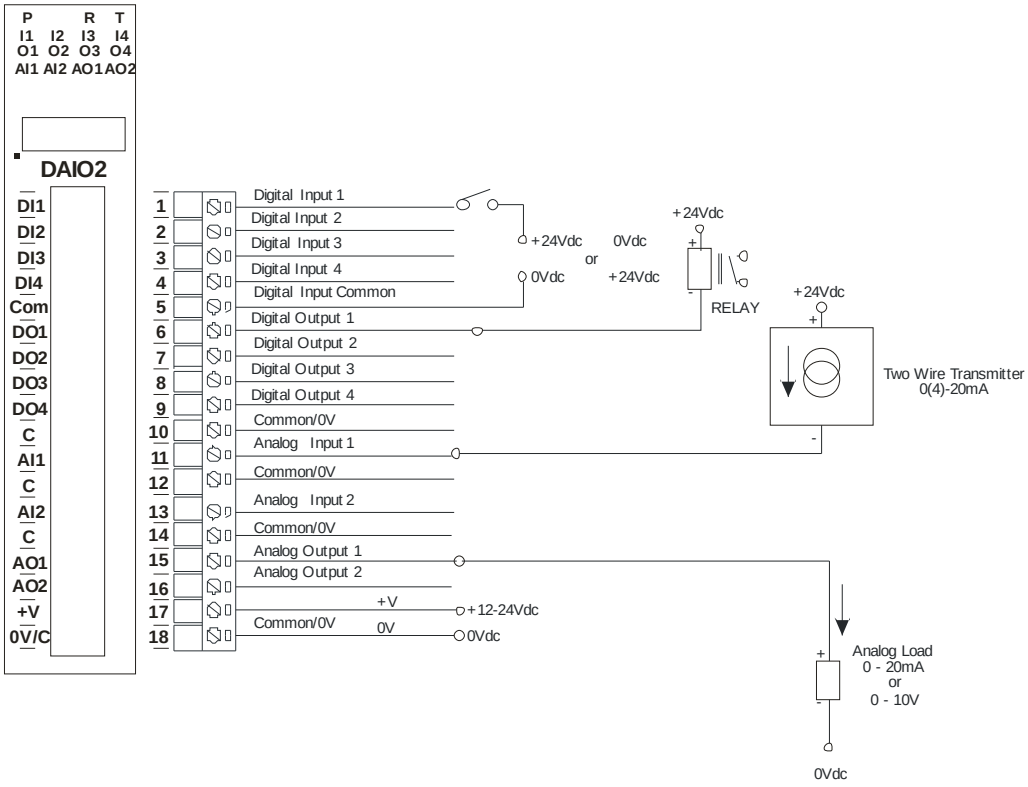
### 3.15.3 Status Indicators

| | |
|---|---|
| **Power:** | "ON" when module has power. |
| **RS485 Rx:** | Flashes to indicate the unit has received a valid Modbus message. |
| **RS485 Tx:** | Flashes to indicate the unit has sent a Modbus message. |
| **Digital I/P Status:** | "OFF" when the input is off<br>"ON" when the input is on. |
| **Digital O/P Status:** | "OFF" when the output is off<br>"ON" when the output is on. |
| **Analog I/P Status:** | "ON" when the input is zero.<br>"OFF" when the input is greater than zero and less than 4095.<br>"Flashing" when the input is over range, greater or equal to 4095. |
| **Analog O/P Status:** | "ON" when the input is zero.<br>"OFF" when the input is greater than zero and less than 4095.<br>"Flashing" when the input is over range, greater or equal to 4095. |



## 3.15.4 Wiring

The following diagram shows how the inputs and outputs are connected to the DAIO2 module.

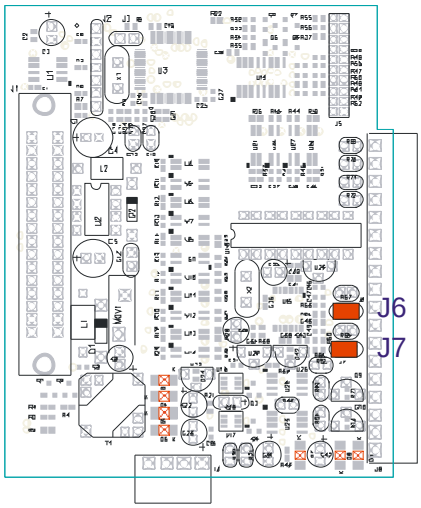



## 3.15.5 Switch Settings

| SWITCH | FUNCTION | DESCRIPTION |
|---|---|---|
| | | |
| 1 | NODE ID +1 | Node ID's from 0 to 127 are set up using switches 1 to 7 |
| 2 | NODE ID +2 | " |
| 3 | NODE ID +4 | " |
| 4 | NODE ID +8 | " |
| 5 | NODE ID +16 | " |
| 6 | NODE ID +32 | " |
| 7 | NODE ID +64 | " |
| 8 | - | Not used. |
| 9 | - | Not used. |
| 10 | BAUD RATE | Must be ON. |

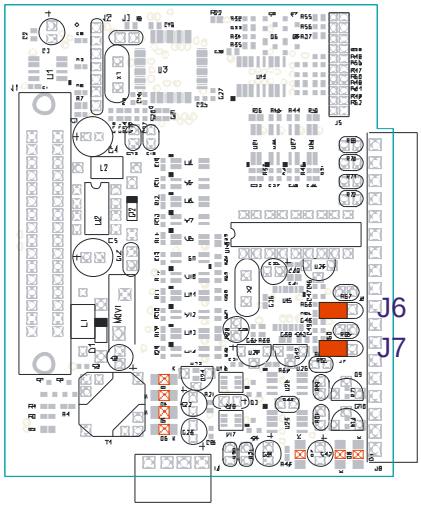
### 3.15.6 Setting the jumpers for Current Input.

The Analog inputs can be configured as a current 0(4)-20mA input by placing the jumper on **J6** for AI1 and **J7** for AI2.




### 3.15.7 Setting the jumpers for Voltage Input.

The Analog inputs can be configured as a voltage 0-10V input by removing the jumper from **J6** for AI1 and **J7** for AI2.




Note: Remember to change the input type in the Modbus registers if you change the jumper settings.

### 3.15.8 PLDAIO2 Data Registers (MODULE TYPE = 119)

| Modbus Address | Register Name | Low Limit | High Limit | Access | Comments |
|---|---|---|---|---|---|
| 10001 | Digital Input 1 | 0 | 1 | R | Status of Digital Inputs. |
| 10002 | Digital Input 2 | 0 | 1 | R | " |
| 10003 | Digital Input 3 | 0 | 1 | R | " |
| 10004 | Digital Input 4 | 0 | 1 | R | " |
| 00017 | Digital Output 1 | 0 | 1 | R/W | Status of Digital Outputs. |
| 00018 | Digital Output 2 | 0 | 1 | R/W | " |
| 00019 | Digital Output 3 | 0 | 1 | R/W | " |
| 00020 | Digital Output 4 | 0 | 1 | R/W | " |
| | | | | | |
| 30001 | S/W Version / Module Type | N/A | N/A | R | High Byte = Software Version<br>Low Byte = 119 |
| 30002 | Digital Inputs | N/A | N/A | R | Digital Inputs in lower 8 bits. 4 - 1. |
| 40003 | Digital Outputs | N/A | N/A | R/W | Digital Outputs in lower 8 bits. 4 - 1. |
| 30004 | Analog Input 1 | 0 | 4095 | R | Analog Input lower 12 Bits |
| 30005 | Analog Input 2 | 0 | 4095 | R | Analog Input lower 12 Bits |
| 40006 | Analog Output 1 | 0 | 4095 | R/W | Analog Output lower 12 Bits |
| 40007 | Analog Output 2 | 0 | 4095 | R/W | Analog Output lower 12 Bits |
| 40008 | Counter 1 MSB | 0 | 65535 | R/W | Counter MSB and LSB combine to give a 32bit counter with range 0 to 4294967295. |
| 40009 | Counter 1 LSB | 0 | 65535 | R/W | " |
| 40010 | Counter 2 MSB | 0 | 65535 | R/W | " |
| 40011 | Counter 2 LSB | 0 | 65535 | R/W | " |
| 40012 | Counter 3 MSB | 0 | 65535 | R/W | " |
| 40013 | Counter 3 LSB | 0 | 65535 | R/W | " |
| 40014 | Counter 4 MSB | 0 | 65535 | R/W | " |
| 40015 | Counter 4 LSB | 0 | 65535 | R/W | " |
| 30016 | Analog Input Status | 0 | 65535 | R | bit2 = 0(open circuit or < 2), bit2 = 1(over range)<br>bit1 = 0(OK),bit1 = 1(error) |
| 30017 | Analog Output Status | 0 | 65535 | R | bit2 = 0(0), bit2 = 1(4095)<br>bit1 = 0(OK),bit1 = 1(error) |
| 30100 | DIP Switch | 0 | 65535 | R | Status of DIP Switch on Front Panel |
| 40101 | Watchdog Timer | 0 | 255 | R/W | Timer in seconds. 0 = disabled. 1 - 255 = enabled. |
| 40102 | Counter Mode | 0 | 2 | R/W | 0=Disable, 1=Up Counting, 2=Up/Down Count |
| 40103 | Input Filter | 0 | 65535 | R/W | 0 = Disable, >0 = Enable. (x10ms) |
| 40104 | AI 1 Type | 1 | 8 | R/W | 1 = 0 – 4095 (mA)<br>2 = 0 – 20.000mA<br>3 = +/- 20.000mA<br>4 = 0 – 4095 (V)<br>5 = 0 – 10.000V<br>6 = +/- 10.000V<br>7 = 0 – 1.0000V<br>8 = +/- 1.0000V |
| 40105 | AI 2 Type | 1 | 8 | R/W | " |

| | | | | | |
|---|---|---|---|---|---|
| 40106 | Line Frequency | 50 | 60 | R/W | Line Frequency (Hz) |

### 3.15.8.1 Digital Input Register.

The digital inputs can be read in a single register as follows:

| MSB | | | | | | | PLDAIO2 DIGITAL INPUTS | | | | | | | | LSB | ADDRESS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| 32768 | 16384 | 8192 | 4096 | 2048 | 1024 | 512 | 256 | 128 | 64 | 32 | 16 | 8 | 4 | 2 | 1 | 30002 |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 3 | 2 | 1 |

Digital Input Number

### 3.15.8.2 Digital Output Register.

The digital outputs can be read/written in a single register as follows:

| MSB | | | | | | | PLDAIO2 DIGITAL OUTPUTS | | | | | | | | LSB | ADDRESS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| 32768 | 16384 | 8192 | 4096 | 2048 | 1024 | 512 | 256 | 128 | 64 | 32 | 16 | 8 | 4 | 2 | 1 | 40003 |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 3 | 2 | 1 |

Digital Output Number

### 3.15.8.3 Counter Registers.

The counters are stored a two 16 bit registers. The first register is the High Register and the second register is the Low Register. To get the actual 32 bit count value the registers must be combined as follows:

Counter High Value = Register 40008.
Counter Low Value = Register 40009.

Counter Value = (Counter High Value X 65535) + Counter Low Value.

### 3.15.8.4 Output Watchdog Timer.

The watchdog timer is used to switch off all of the outputs in the event of a communications failure. When set to zero (register 40101) the watchdog timer is disabled.

### 3.15.8.5 Analog Input Registers.

The analog inputs are read as a 12 bit value in the registers as follows:

| MSB | | | | **PLDAIO2 ANALOG INPUTS** | | | | | | | | | | | LSB | ADDRESS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| 32768 | 16384 | 8192 | 4096 | 2048 | 1024 | 512 | 256 | 128 | 64 | 32 | 16 | 8 | 4 | 2 | 1 | 300XX |
| 0 | 0 | 0 | 0 | x | x | x | x | x | x | x | x | x | x | x | x | |

Analog Input: 12 Bit Value (0 - 4095)

### 3.15.8.6 Analog Input Status.

There are two status bits associated with each analog input. These bits are used to indicate if the input is zero or open circuit , in the working range 0-4095, or over range. If the input is open circuit or over range, then the error bit will be set. When the error bit is set, the range bit is zero if the input is open circuit and set if the input is over range, ie:

| **Bit 1- Error** | **Bit 2-Range** | **Condition** | **Status LED** |
|---|---|---|---|
| 0 | don't care | Input working OK. | (LED OFF) |
| 1 | 0 | Input Open circuit or zero. | (LED ON) |
| 1 | 1 | Input Over range. | (LED FLASH) |

The analog input status can be read in a single register as follows:

| MSB | | | | **PLDAIO2 ANALOG INPUT STATUS** | | | | | | | | | | | LSB | ADDRESS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| 32768 | 16384 | 8192 | 4096 | 2048 | 1024 | 512 | 256 | 128 | 64 | 32 | 16 | 8 | 4 | 2 | 1 | 30016 |

IP1 Error
IP1 Range
IP2 Error
IP2 Range

## 3.16 PL8AO - ANALOG OUTPUTS

### 3.16.1 Description

The PL8AO is a 8 channel current output module. Each channel can be set to output a current in the range 0 - 20mA. The outputs are isolated from the logic and share a common negative terminal.

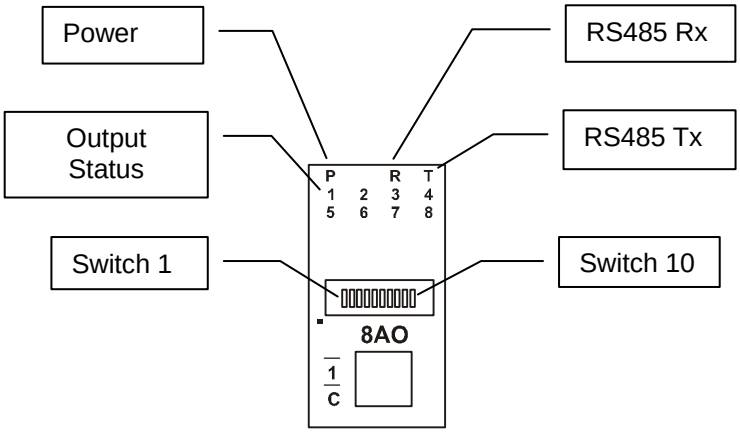
The resolution is 12 bits, so writing a value to the Modbus register for each output of 0 - 4095 would give an output current of 0 - 20mA. A value of 819 ± 1LSB will give a current output of 4mA.


### 3.16.2 Technical Specification of PL8AO

| | | |
|---|---|---|
| **Power Supply** | Logic Supply Voltage | Supplied from Power Bus |
| | Logic Supply Power | 0.3VA |
| | Field Supply Voltage | 24 Vdc |
| | Field Supply Current | 175mA |
| **Current Output** | Output Points | 8 |
| | Output Current | 0(4) - 20 mA |
| | Resolution | 12 bits |
| | Drift | 100ppm/°C |
| | Accuracy | 0.05% of span |
| | Compliance | 1000 ohms max. @ 24Vdc<br>500 ohms max. @ 12Vdc |
| **Isolation** | Between field and logic | 1500Vrms between field and logic |
| **Temperature** | Operating Temperature. | -40°C to + 80°C |
| | Storage Temperature | -40°C to + 85°C |
| **Connectors** | Logic Power and Comms. | 32 PIN Double Sided DIN Connector |
| | Inputs | 18 Way screw connector on front |
| | | |

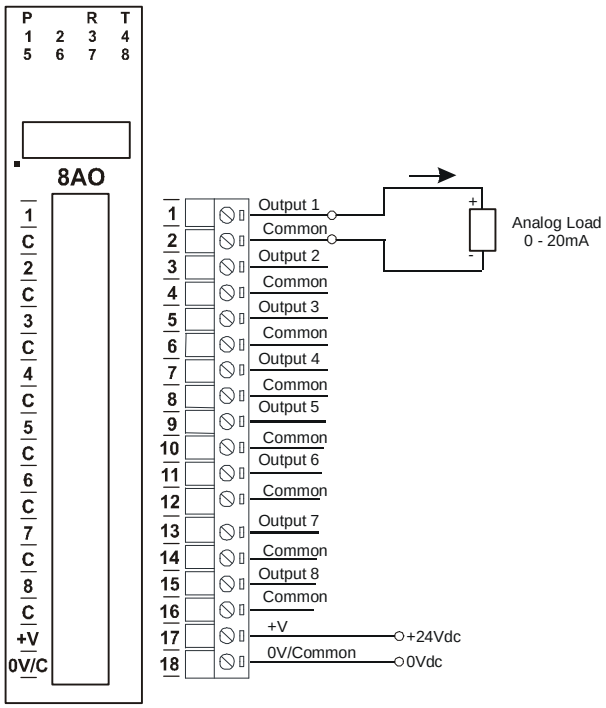
### 3.16.3 Status Indicators

**Power:** Flashes to indicate the CPU is running.
**RS485 Rx:** Flashes to indicate the unit has received a valid Modbus message.
**RS485 Tx:** Flashes to indicate the unit has sent a Modbus message.
**Output Status:** "ON" when the output is zero.
"OFF" when the output is between zero and full scale.
"Flashing" when the output is at full scale.




### 3.16.4 Wiring

The following diagram shows how the analog outputs are connected to a load.



### 3.16.5 Switch Settings

| SWITCH | FUNCTION | DESCRIPTION |
|---|---|---|
| | | |
| 1 | NODE ID +1 | Node ID's from 0 to 127 are set up using switches 1 to 7 |
| 2 | NODE ID +2 | " |
| 3 | NODE ID +4 | " |
| 4 | NODE ID +8 | " |
| 5 | NODE ID +16 | " |
| 6 | NODE ID +32 | " |
| 7 | NODE ID +64 | " |
| 8 | - | Not used. |
| 9 | - | Not used. |
| 10 | BAUD RATE | Must be ON. |

### 3.16.6 PL8AO Data Registers ( MODULE TYPE = 110)

| Modbus Address | Register Name | Low Limit | High Limit | Access | Comments |
|---|---|---|---|---|---|
| 30001 | S/W Version / Module Type | N/A | N/A | R | High Byte = Software Version<br>Low Byte = 110 |
| 40002 | Current Output 1 | 0 | 4095 | R/W | Current Outputs. 0 - 4095 = 0(4) - 20mA. |
| 40003 | Current Output 2 | 0 | 4095 | R/W | " |
| 40004 | Current Output 3 | 0 | 4095 | R/W | " |
| 40005 | Current Output 4 | 0 | 4095 | R/W | " |
| 40006 | Current Output 5 | 0 | 4095 | R/W | " |
| 40007 | Current Output 6 | 0 | 4095 | R/W | " |
| 40008 | Current Output 7 | 0 | 4095 | R/W | " |
| 40009 | Current Output 8 | 0 | 4095 | R/W | " |
| 40010 | Output Status | 0 | 65535 | R | bit2 = 0(0), bit2 = 1(4095)<br>bit1 = 0(OK),bit1 = 1(error) |
| 30100 | DIP Switch | 0 | 65535 | R | Status of DIP Switch on Front Panel |
| 40101 | Watchdog Timer | 0 | 255 | R/W | Timer in seconds. 0 = disabled. 1 -255 = enabled. |

## 3.17 PL8VO - ANALOG OUTPUTS

### 3.17.1 Description

The PL8VO is a 8 channel voltage output module. Each channel can be set to output a voltage in the range 0 – 10V. The outputs are isolated from the logic and share a common negative terminal.

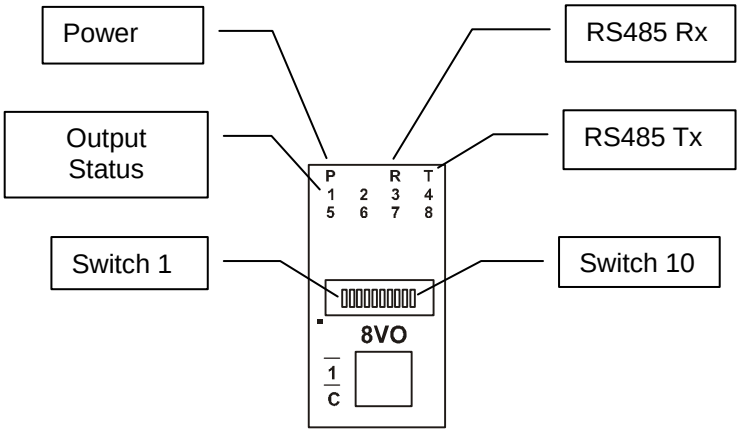
The resolution is 12 bits, so writing a value to the Modbus register for each output of 0 - 4095 would give an output current of 0 – 10V. A value of 819 ± 1LSB will give a current output of 2V.


### 3.17.2 Technical Specification of PL8VO

| | | |
|---|---|---|
| **Power Supply** | Logic Supply Voltage | Supplied from Power Bus |
| | Logic Supply Power | 0.3VA |
| | Field Supply Voltage | 24 Vdc |
| | Field Supply Current | 85 mA max. |
| **Voltage Output** | Output Points | 8 |
| | Output Voltage | 0(2) - 10 V |
| | Resolution | 12 bits |
| | Drift | 100ppm/°C |
| | Accuracy | 0.05% of span |
| | Compliance | 2000 ohms min. load |
| **Isolation** | Between field and logic | 1500Vrms between field and logic |
| **Temperature** | Operating Temperature. | -40°C to + 80°C |
| | Storage Temperature | -40°C to + 85°C |
| **Connectors** | Logic Power and Comms. | 32 PIN Double Sided DIN Connector |
| | Outputs | 18 Way screw connector on front |
| | | |

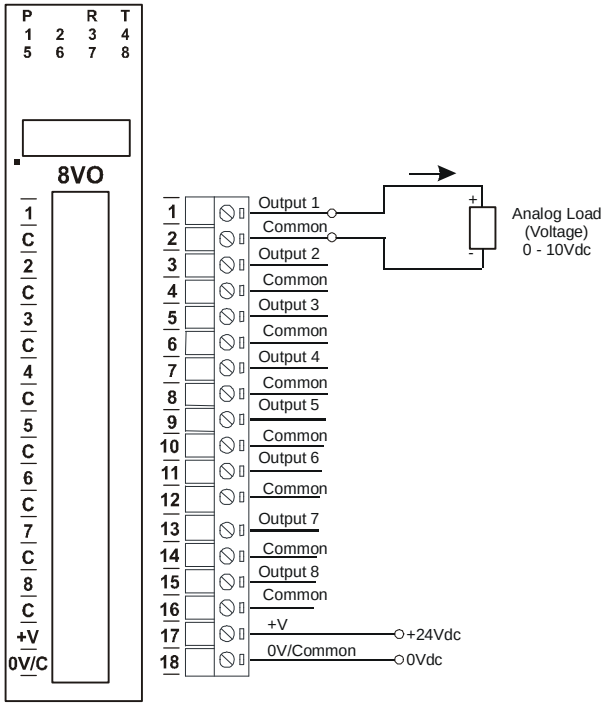
### 3.17.3 Status Indicators

**Power:** Flashes to indicate the CPU is running.
**RS485 Rx:** Flashes to indicate the unit has received a valid Modbus message.
**RS485 Tx:** Flashes to indicate the unit has sent a Modbus message.
**Output Status:** "ON" when the output is zero.
"OFF" when the output is between zero and full scale.
"Flashing" when the output is at full scale.




### 3.17.4 Wiring

The following diagram shows how the analog outputs are connected to a load.



### 3.17.5 Switch Settings

| SWITCH | FUNCTION | DESCRIPTION |
|---|---|---|
| | | |
| 1 | NODE ID +1 | Node ID's from 0 to 127 are set up using switches 1 to 7 |
| 2 | NODE ID +2 | " |
| 3 | NODE ID +4 | " |
| 4 | NODE ID +8 | " |
| 5 | NODE ID +16 | " |
| 6 | NODE ID +32 | " |
| 7 | NODE ID +64 | " |
| 8 | - | Not used. |
| 9 | - | Not used. |
| 10 | BAUD RATE | Must be ON. |

### 3.17.6 PL8VO Data Registers ( MODULE TYPE = 111)

| Modbus Address | Register Name | Low Limit | High Limit | Access | Comments |
|---|---|---|---|---|---|
| 30001 | S/W Version / Module Type | N/A | N/A | R | High Byte = Software Version<br>Low Byte = 111 |
| 40002 | Voltage Output 1 | 0 | 4095 | R/W | Voltage Outputs. 0 - 4095 = 0 - 10V. |
| 40003 | Voltage Output 2 | 0 | 4095 | R/W | " |
| 40004 | Voltage Output 3 | 0 | 4095 | R/W | " |
| 40005 | Voltage Output 4 | 0 | 4095 | R/W | " |
| 40006 | Voltage Output 5 | 0 | 4095 | R/W | " |
| 40007 | Voltage Output 6 | 0 | 4095 | R/W | " |
| 40008 | Voltage Output 7 | 0 | 4095 | R/W | " |
| 40009 | Voltage Output 8 | 0 | 4095 | R/W | " |
| 40010 | Output Status | 0 | 65535 | R | bit2 = 0(0), bit2 = 1(4095)<br>bit1 = 0(OK),bit1 = 1(error) |
| 30100 | DIP Switch | 0 | 65535 | R | Status of DIP Switch on Front Panel |
| 40101 | Watchdog Timer | 0 | 255 | R/W | Timer in seconds. 0 = disabled. 1 -255 = enabled. |

# 4. Using HTML web pages on the PL101

## 4.1 Introduction

The PL101 has a built in web server which enables configuration and dynamic data to be accessed using a web browser on a PC. The data registers in the PL101 can be accessed and displayed on web pages by using tags. This enables the user to create their own custom web pages relating to the application and display live data.

The web pages are stored on the PL101 as .htm files. It is also possible to store .jpg files for displaying pictures and other file types such as .js for JAVA script functions. The JAVA script functions enable variables on the web pages to be automatically updated without having to refresh the whole web page.

The PL101 has a built in flash drive for storing these files. The flash drive consists of a FAT (File allocation table) which stores all of the information used for saving and reading files. The flash drive is accessed (files read or written) by using FTP over the Ethernet network.

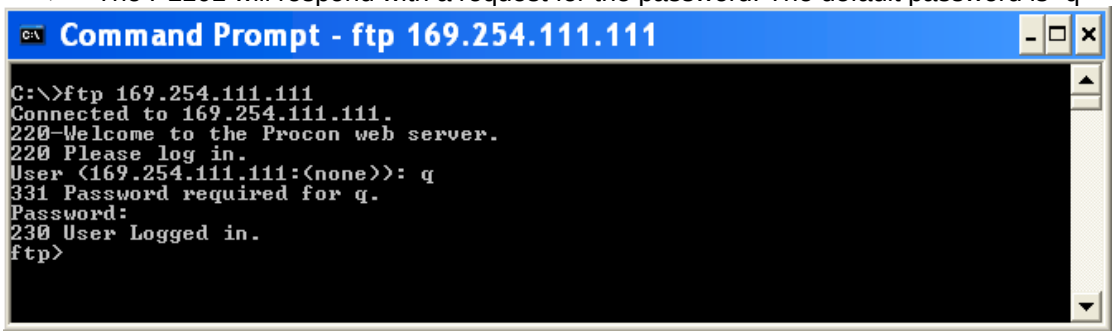
## 4.2 Using FTP

The first step is to learn how to access the flash drive. This can be done using the dos program “ftp” from a dos prompt, through explorer, or any other commercially available ftp program.

This example uses the ftp command from a dos prompt. Open a dos command box on your windows PC by clicking on:

- Start->All Programs->Accessories->Command Prompt.


- To login to the PL101 you must first type in the ftp command and include the IP address of the PL101.
- The PL101 will respond with a request for the user name. The default user name is “q” . Do not include the quotes.
- The PL101 will respond with a request for the password. The default password is “q”




At this point you can now enter commands to access the flash drive on the PL101.

The commands supported are as follows:

**dir** – To display a list of files on the flash drive.

**ls** – To do a short directory list. This is useful as it also indicates the amount of free space on the flash drive.

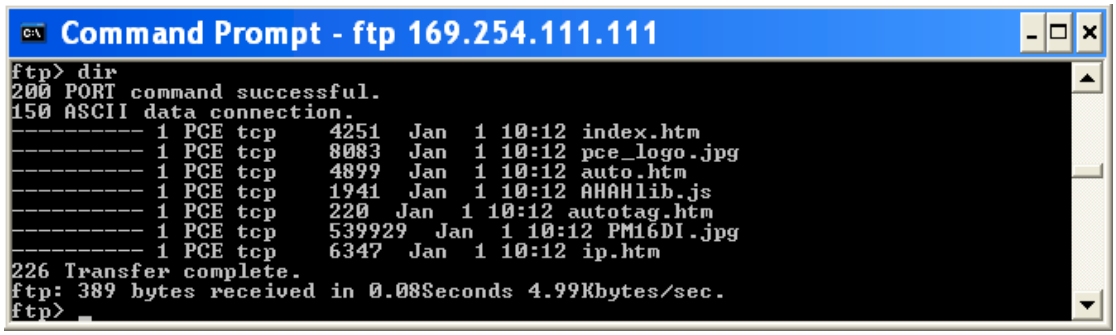
**put** – This command is used to put or save a file onto the flash drive from the current directory of the command prompt. The format of the command is “put filename.htm”

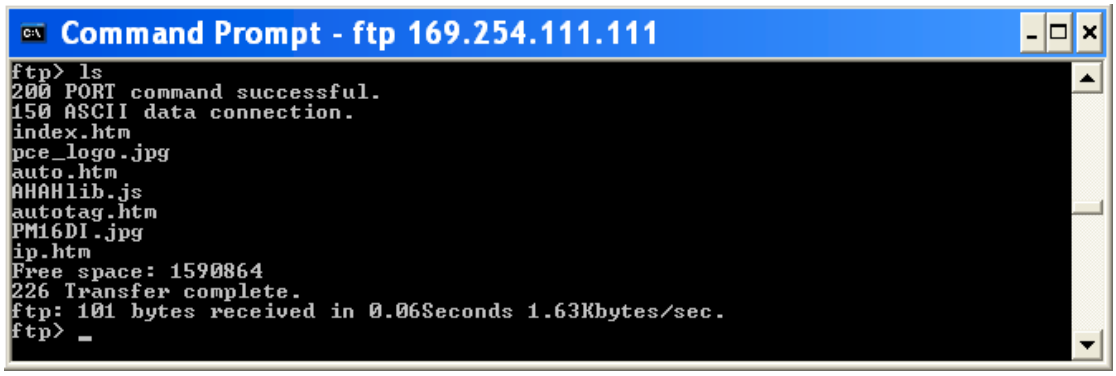
**get** – This command is used to get or retrieve a file from the flash drive and save it on the current directory of the command prompt. The format of the command is “get filename.htm”

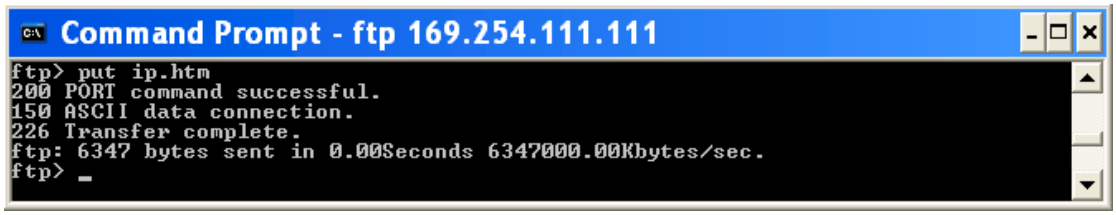
**del** – To delete a file from the flash drive. The format of the command is “del filename.htm”

**bye** – To log off use this command. The ftp program in the PL101 monitors activity and automatically logs off after one minute from the last command.

**NOTE**: The directory structure of the flash drive only allows for the 8.3 filename format. This means that the filename must be no more than 8 characters long and the file extension must be no more than 3 characters long.



## 4.3 Creating and using web pages.

An .htm file is used to store the information for a web page. The format of the information in the file or the programming language used is called HTML which *means HyperText Markup Language*.

If you are new to web page design then it is recommended that you first get a book to read up on HTML as it is beyond the scope of this manual to go into much detail.

### 4.3.1 Writing HTML

The contents of the file may be generated using a text editor such as “NOTEPAD” or a web page editor such as “FrontPage”. It is relatively easy to made a basic web page with a text editor, however adding tables and special effects gets a lot more complicated and a web page editor is recommended.

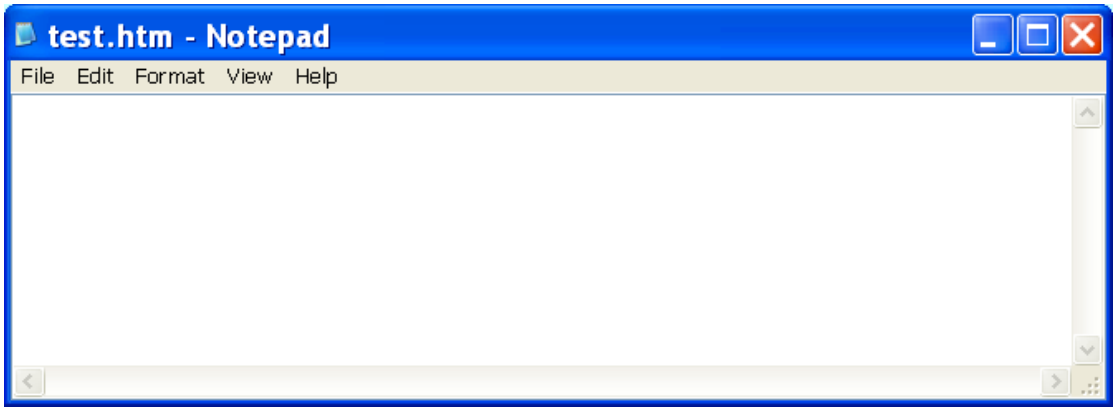
### 4.3.2 HTML tags

HTML tags are commands written between less than (<) and greater than (>) signs and are used to indicate how the browser should display the text. The closing tag must have the same name as the opening tag, however it must also have the (/) to indicate it is a closing tag.

<B> This will be in BOLD </B>

### 4.3.3 Creating a new web page

Using a text editor such as NOTEPAD, open a new file and save it as test.htm.

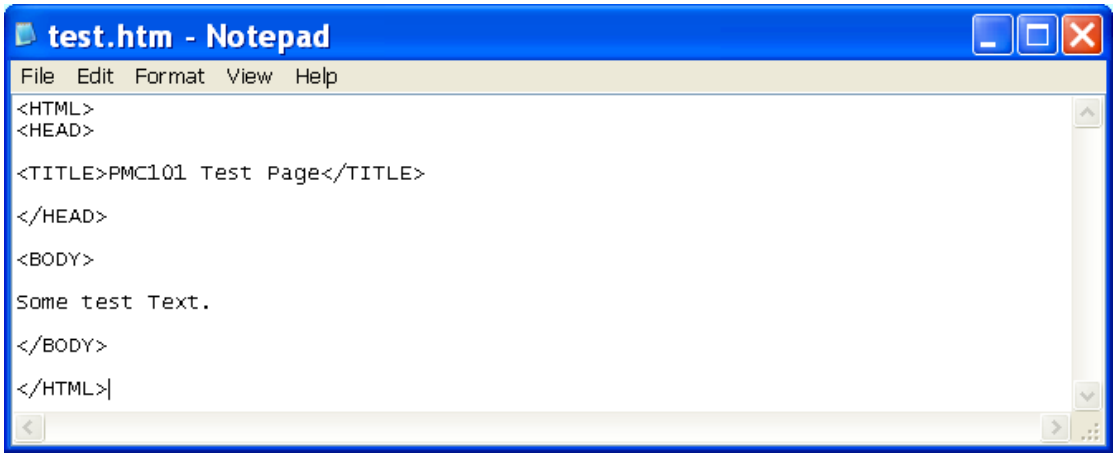



The first thing required on a web page is the HTML tag. It identifies the contents of your text document as HTML code.

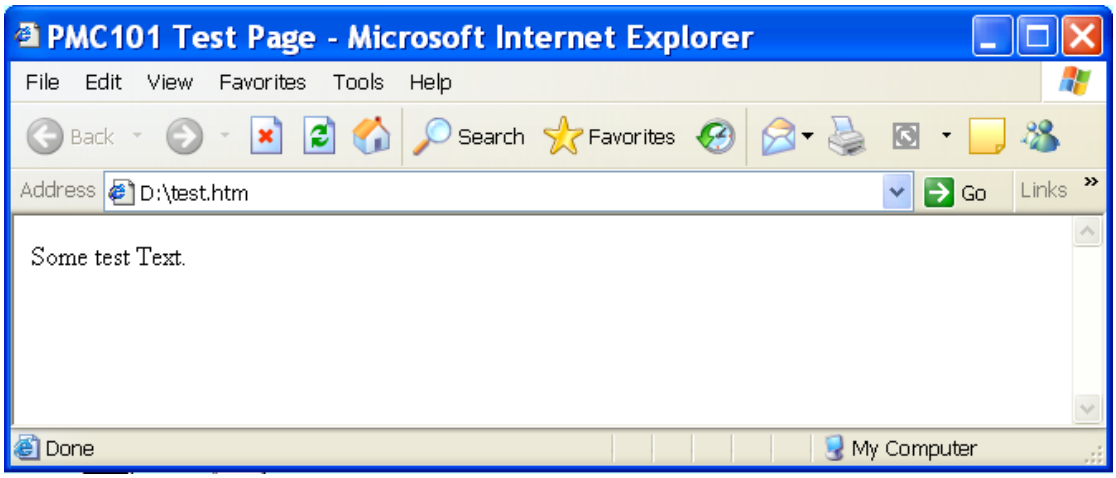
Secondly divide the HTML page into two sections. The HEAD section and the BODY.

The HEAD section is where you define the title of the page and add advanced formatting information such as scripts.

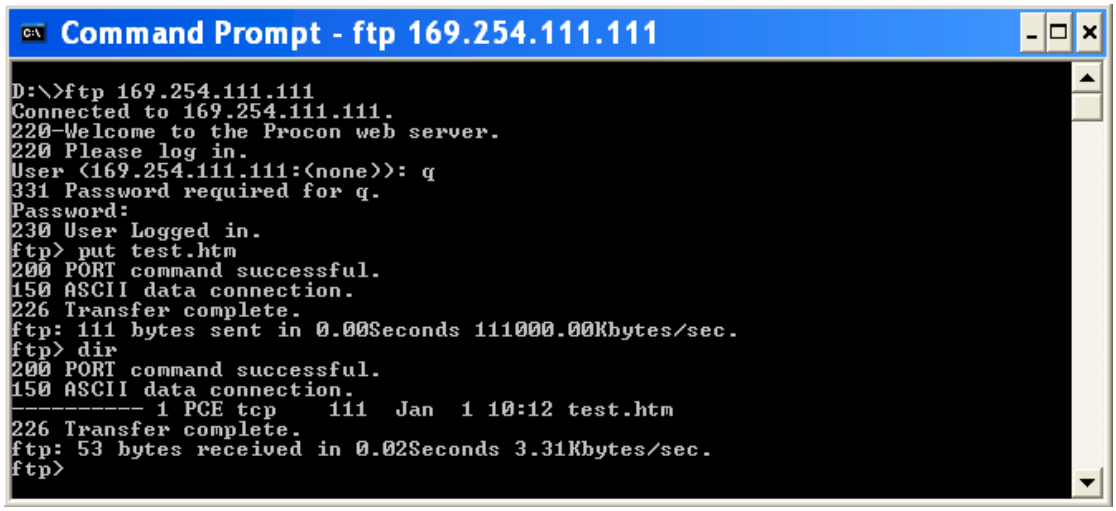
The BODY encloses the content of the web page. The part you see on the screen in the browser.



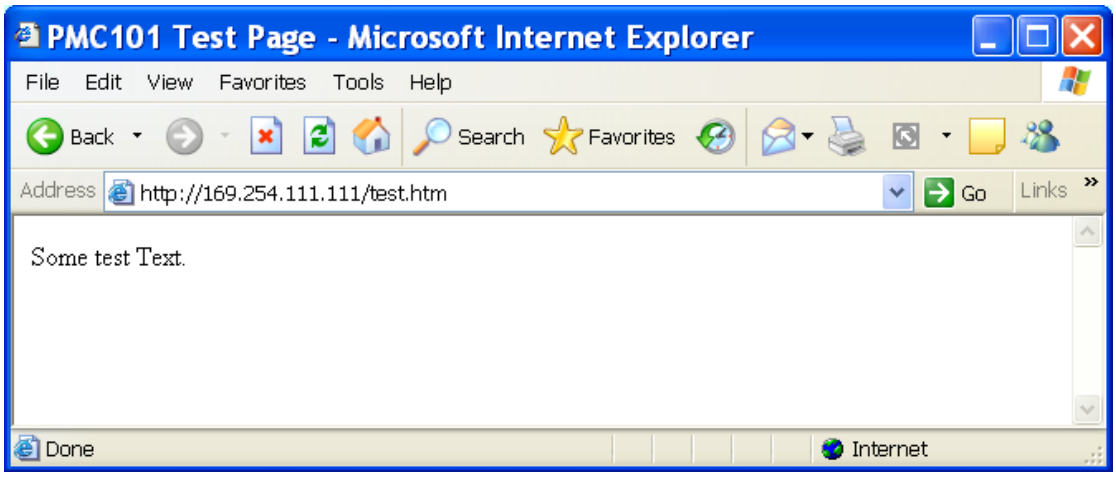

Save the file. Now open the file in your browser. You should see the following. Note the title at the top of the page and the content in the window.




Now save the .htm file on the flash disk on the PL101 using the ftp commands.




Go to your browser and open the file on the PL101.




The are many tags you can use to format the text on the screen, such as changing the font, colour, new paragraph etc. You will see some in the following examples.

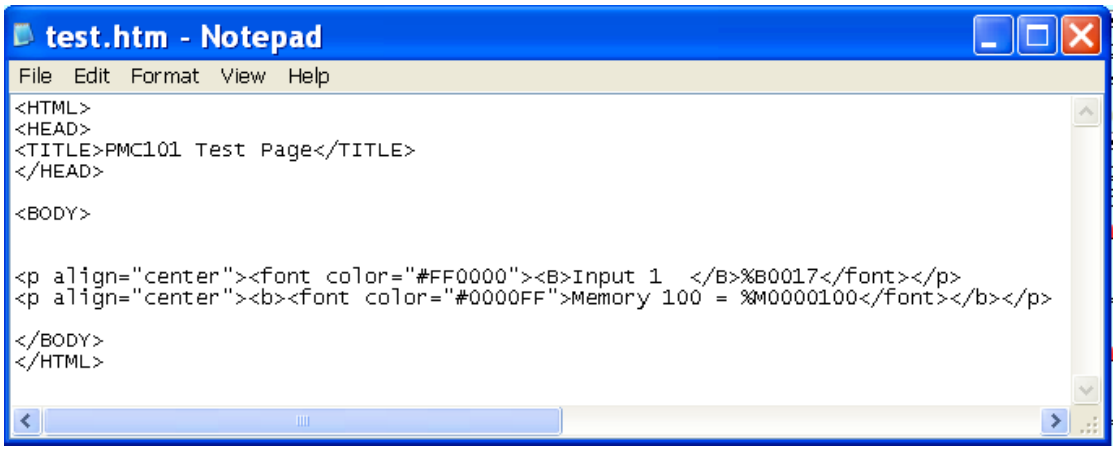
## 4.4 Adding a data tag.

When you open a web page with your browser the PL101 reads the file from the flash drive and sends it to the browser. It is possible for the PL101 to insert data from the ladder logic program or other memory locations so that you can view more useful information.

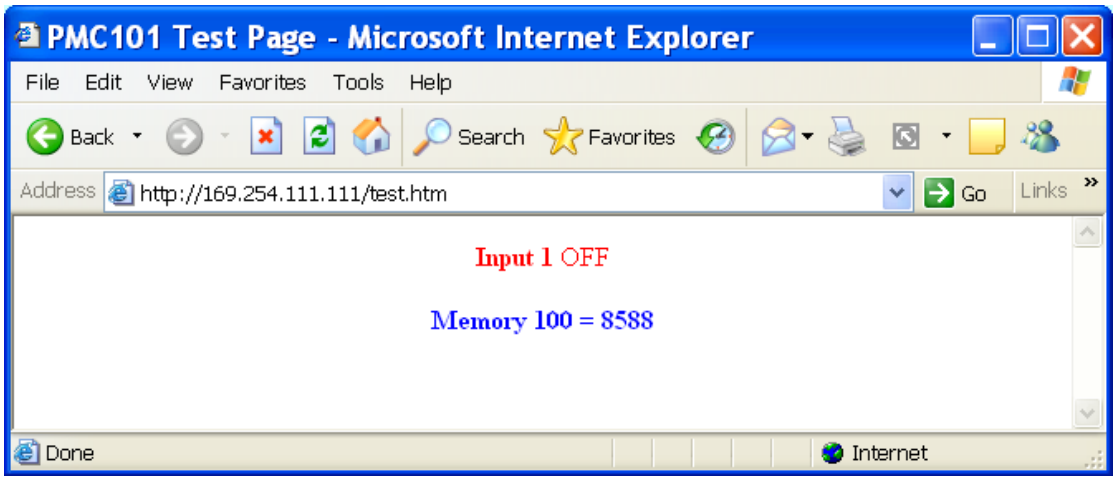
To display some data, you need to specify the data tag identifier, the memory type, and memory address. For example %B0017 will display digital input 1 and %M0000100 will display the contents of memory M100.

If you need to display a “%” in your text then you must use %%.

Edit the test file to include the following:



Put the test file into the PL101 and then open it with the browser. The values with the % sign are replaced with the actual data.




The different tags that can be used are shown:

- **%Bxxxx** This tag is used to access digital data or data bits. Bit 1 is the very first bit in memory M0 in the PL101. The digital inputs start at M1 and as each memory location has 16 bits you can work out that the address for input 1 is %B0017. The response will be “OFF” if the bit is zero and “ON” if the bit is one.

- **%Cxxxx and %Dxxxx** These are also digital bits and are used with check boxes to turn digital I/O on and off from the web page. This will be explained later. The response is "checked" or “ “.

- **%Exxxx** This tag is used to access analog data or memory variables related to the HTTP and TCP/IP configuration. The table later in this manual shows the memory addresses for the %E registers. As an example, the IP address, subnet mask and default gateway addresses are saved here. If you edit the ip.htm page that comes with the PL101 you will see how these tags are used.

- **%Mfwdxxxx** This tag allows you to display the Memory M data from the ladder logic program. The %M tag includes three extra characters which are used to format the data being sent to the web browser.

  **f – Format Field** This field is used to choose the format of the value being displayed.

| %M Format | |
|---|---|
| **Value** | **Format** |
| 0 | Unsigned Single |
| 1 | Signed Single |
| 2 | Unsigned Double |
| 3 | Signed Double |
| 4 | Float |

  **w – Width Field** This field is used to specify the minimum number of characters to generate for the conversion. A value of zero (0) will let it the function generate an unrestricted number of characters.

  **d – Decimal Places Field** This field is used to specify the number of fraction characters to generate for the conversion after the decimal point.

| %M Decimal Places | |
|---|---|
| **Value** | **Format** |
| 0 | xxxxx |
| 1 | xxxx.x |
| 2 | xxx.xx |
| 3 | xx.xxx |
| 4 | x.xxxx |

Using the %TAG method is the easiest way of inserting data onto your web page. The only problem with this technique is that if you want to get updated values then you need to do a refresh and load the whole web page again from the PL101.

## 4.5 Automatically updating web page data.

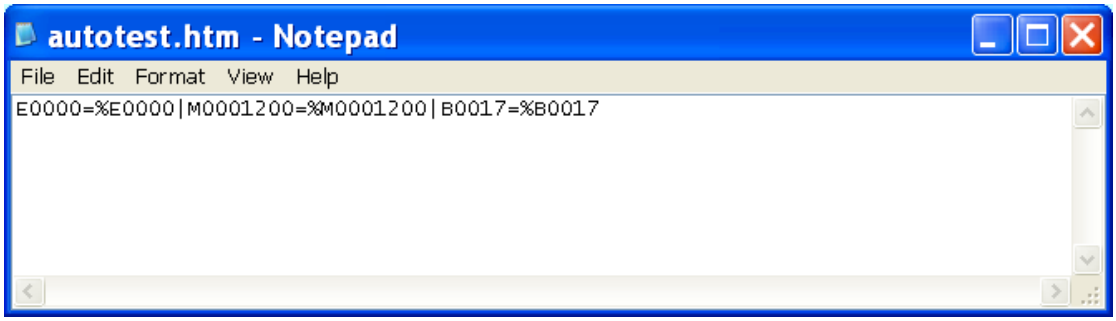
It is possible to update the data on the web page without actually reloading the complete page. This is a more complicated technique and may not be necessary if you just want to check some data values once in a while.

There are a number of ways of implementing this method, and the technique we will use makes use of a programming language called JavaScript.

JavaScript is not the same as JAVA in that it does not have to be compiled. You can insert JavaScript commands into the HTML code and they will be interpreted and executed as the web page is loaded into the browser.

When you want to automatically load data to a web page, a small program is required to request the data from the PL101. This program is written in JavaScript and is named "`autoUpdate` ". The program is kept separate from the .htm web page as a library function so that it can be called by many different web pages. The file where the function is kept is called `"AHAHlib.js"` where the extension .js means JavaScript. This file must be put into the PL101 if you are going to use it from your web page.

The autoUpdate function is used to retrieve a file from the PL101 which includes a list of data tags that you want to update on the web page. The file is stored as a .htm file to inform the PL101 that the %tags must be replaced with the required data before it is sent to the browser. A typical file is shown:

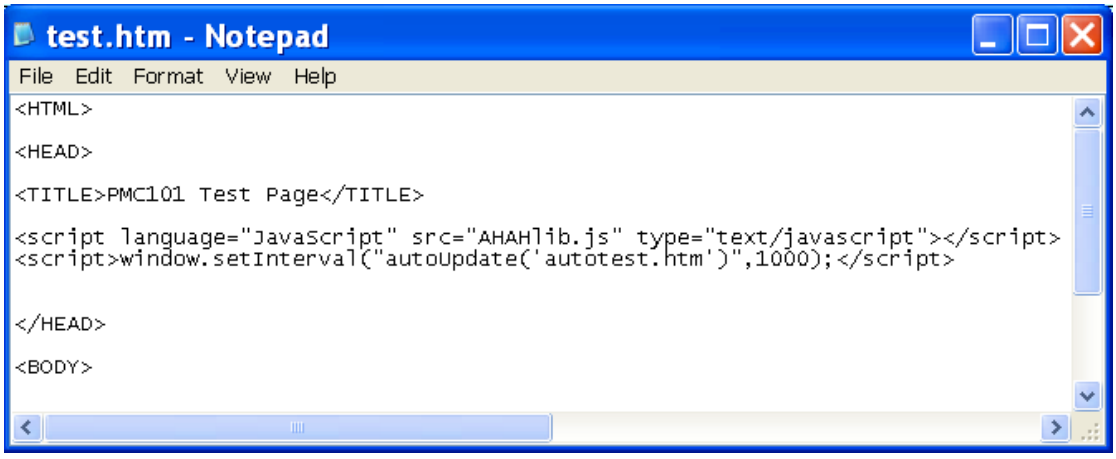



The first tag E0000 is a dummy tag at the beginning of the file for synchronization. The second tag is M0001200=%M0001200. We have chosen this memory as it is the seconds for the real time clock in the PL101 and will show changing data for our test. The PL101 will replace the %tag with a value, so the actual file that gets sent to the browser will be like this, M0001200=xxxx. You must also include the pipe character (|) between the fields as a separator.
We have made the file which determines what data will be sent to the web page. We now have to add the correct HTML and JavaScript code to our web page to make use of the file.

The <script> tag is used to tell the browser that the following information is to be used by the JavaScript interpreter.

The first line sets the language, JavaScript, and tells the interpreter where to find the library file “AHAHlib.js” which has the autoUpdate function.

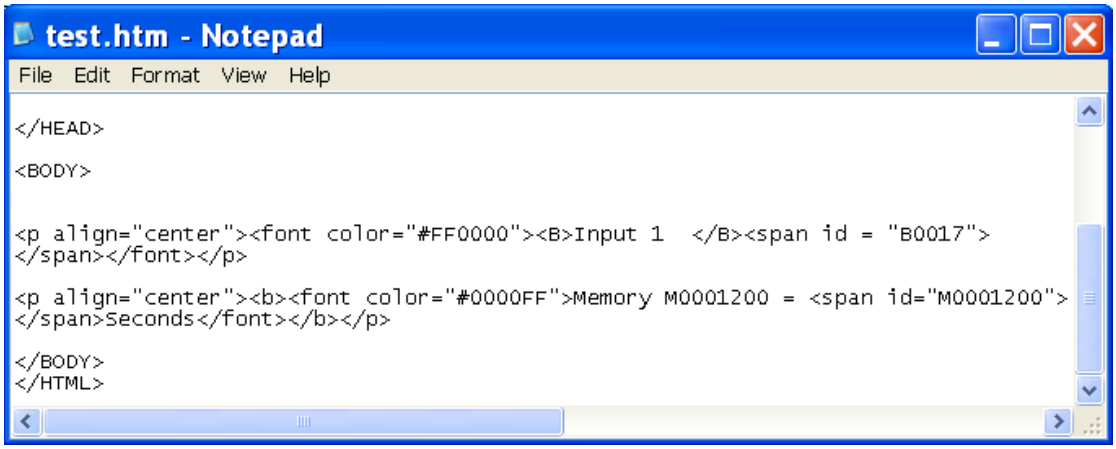
The second line tells the interpreter to run the autoUpdate function every 1000 milliseconds and to use the autotest.htm file to send back the tags data.



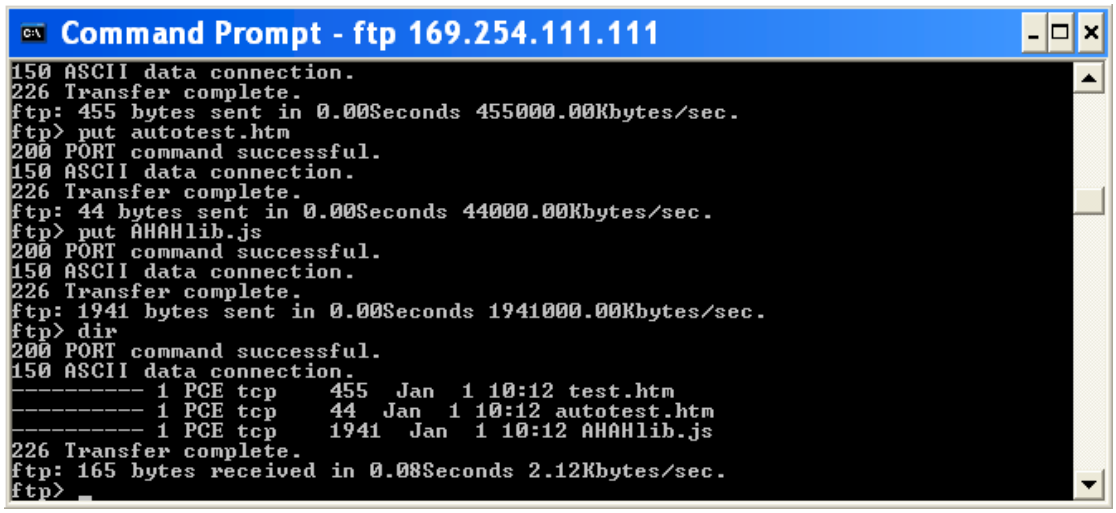

We now have to get the autoUpdate function to insert the data into the web page. The autoUpdate function looks through the web page for tags with ID’s (Identification numbers).

When the browser gets the autotest.htm file from the PL101 it will read out M0001200=xxxx. The M0001200 is the tag ID, so the browser will look for a tag on the web page ( id = “M0001200” ) and insert the data xxxx. The same applies to the tag %B0017.

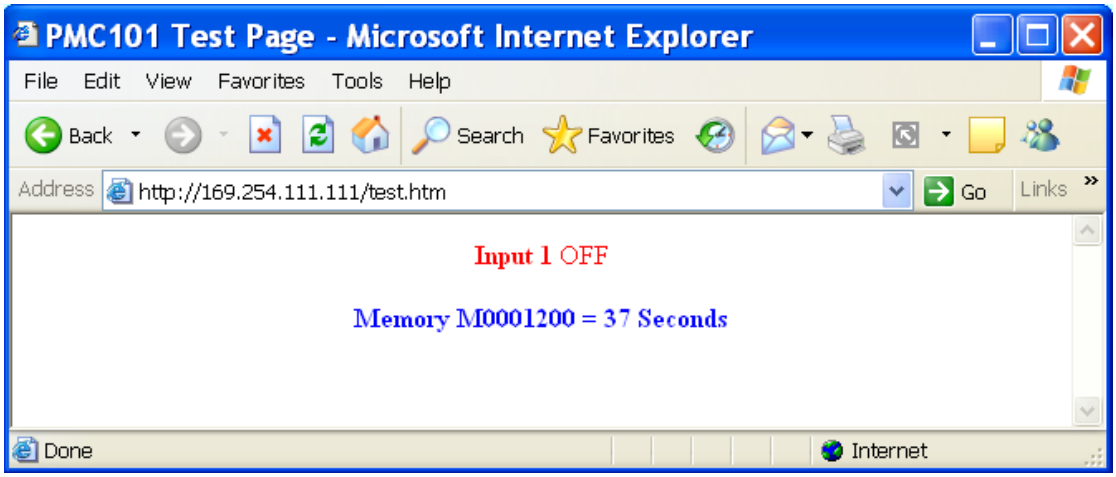
In order to use the ID property, we need a tag that includes an ID property. For this we can use the built in  tag. Add the span tags to the test.htm file as shown.



Now put the three files into the PL101 as follows:




Next open the browser and load the file test.htm from the PL101. You will see the seconds changing on the screen.



## 4.6 Using Radio Buttons to switch a Digital On and OFF.

Sometimes you may want to do more than just open a web page and view the contents. You may want to interact with the PL101 so that you can switch digitals on and off from the web page. One way of doing this is by using Radio Buttons.

**Radio Buttons** work in sets, where you can never push two buttons at once, and only one button can be **checked** at a time. Once you have checked the On or Off button, you need to send the information to the PL101 by clicking on a **Submit button**.

To use Radio Buttons you initially need to create a **Form** tag. The Radio Buttons and Submit button are placed within the Form tags.

The first line of the Form code is as follows:

<FORM METHOD=POST>
This line tells the browser that a form is being initiated and the POST command must be used to submit the information on the form.

Next we use the hidden input field:

<INPUT TYPE="hidden" NAME="form" VALUE="test">

This line informs the PL101 that name of the web page (**form**) that is sent back after the submit button is pressed is **test**. You could send back some other web page but you would normally want to just get an update of the current web page test.htm.

Now we do the Radio Button code:

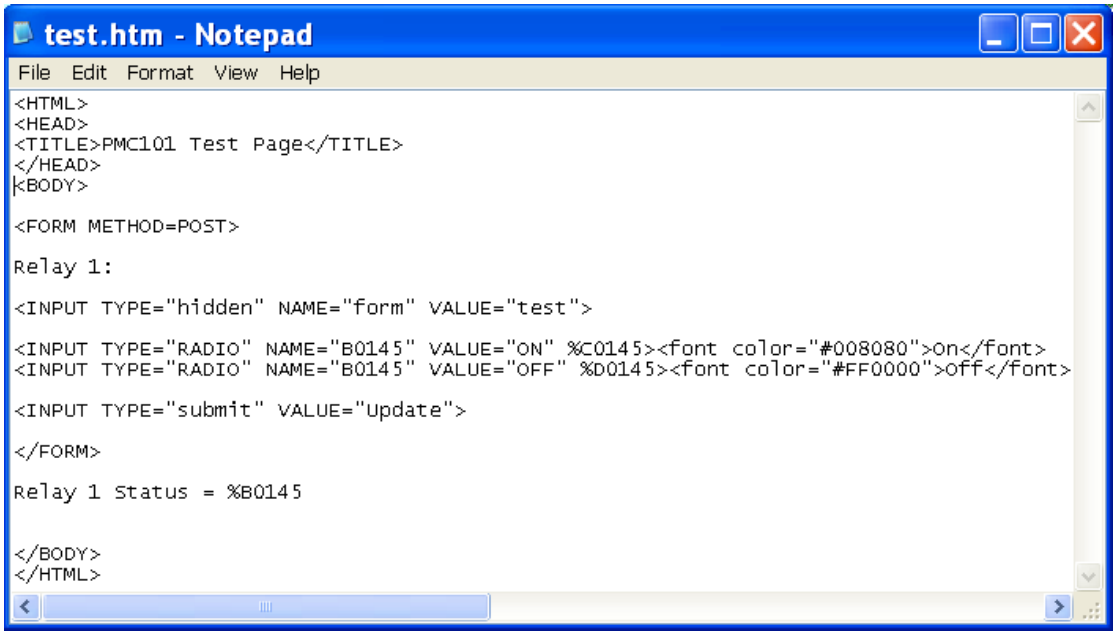
<INPUT TYPE="RADIO" NAME="B0145" VALUE="ON" %C0145><font color="#008080">On</font>
<INPUT TYPE="RADIO" NAME="B0145" VALUE="OFF" %D0145><font color="#FF0000">Off</font>

- INPUT TYPE="RADIO" tells the browser to put a Radio button on the web page. We use this twice to add two radio buttons.
- The Name is used to inform the PL101 which digital must be updated. Both radio buttons must have the same name so that they work together.
- The VALUE="ON" is sent to the PL101 when the first radio button is checked. The VALUE="OFF" is sent to the PL101 when the second radio button is checked.
- The %C0145 tag is used with the ON button and the %D0145 tag is used with the OFF button. If the digital is ON then the %C0145 tag will return *checked* to the browser and the %D0145 tag will return nothing to the browser. If the digital is OFF then the %C0145 tag will return nothing to the browser and the %D0145 tag will return *checked* to the browser.
- Finally we label the Radio Buttons with the text On and Off.

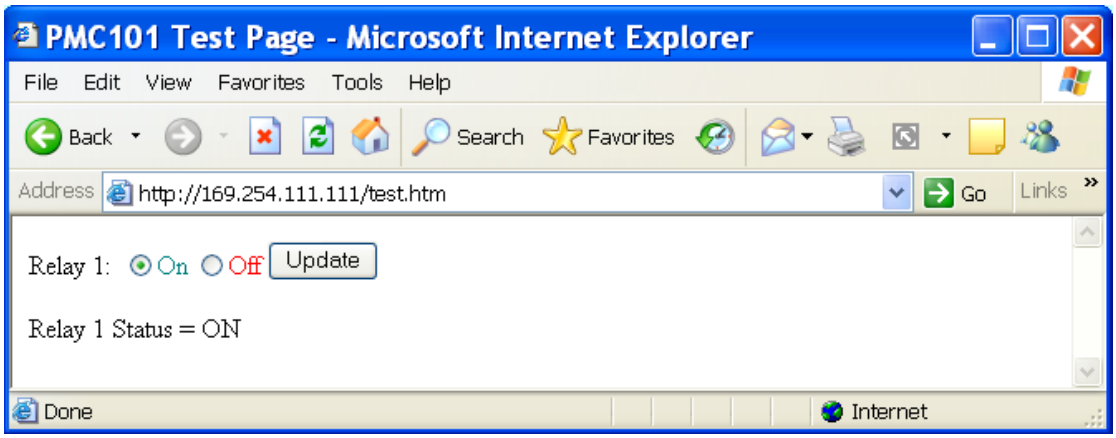
To send the information on the form to the PL101 we use the following code:

<INPUT TYPE="submit" VALUE="Update">

This code puts a Submit button on the web page with the label "Update".




Now ftp the file test.htm to the PL101 and open it with your browser.




To test the web page, click on the On radio button and then Update. The Relay 1 Status should change to ON.

## 4.7 Using a Text Box to enter a new Analog Value.

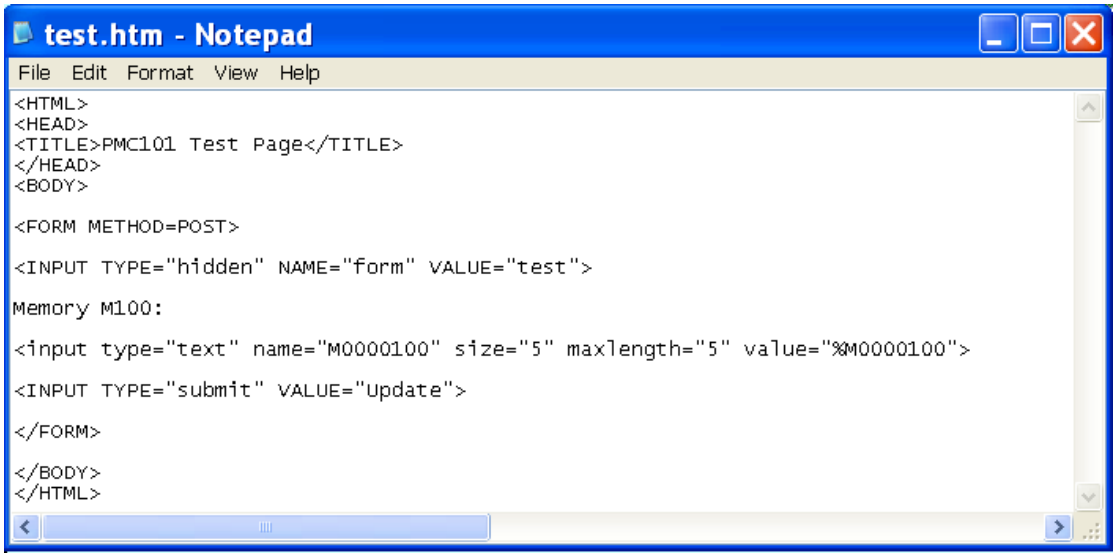
This example shows how to write a new analog value to a memory location in the PL101.

A form is also required as with the Radio Button example.

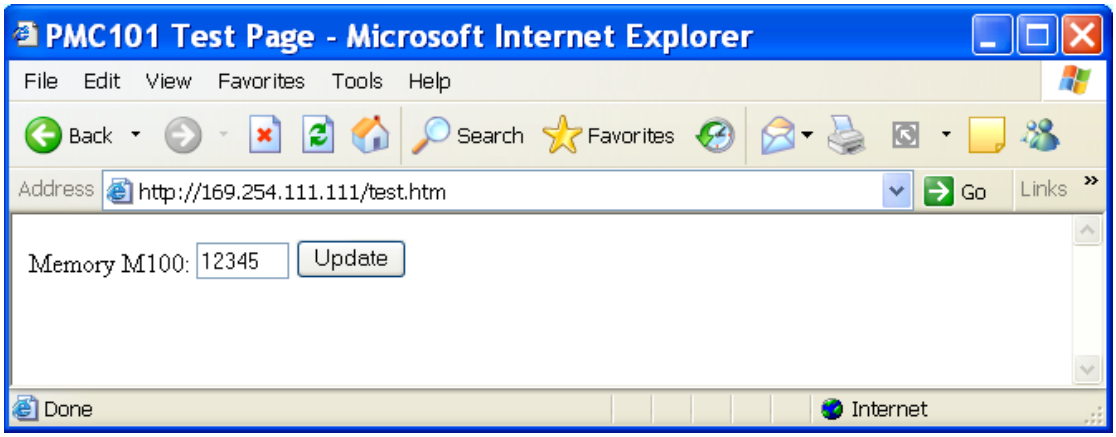
The new value is entered into the text box as follows:

<input type="text" name="M0000100" size="5" maxlength="5" value="%M0000100">

- First a text box is added to the web page.
- The name="M0000100" tag informs the PL101 which memory is to be updated.
- The size determines the size of the text box on the web page.
- The maxlength determines how many numbers you can type into the text box.
- The " value="%M0000100" is used fill in the analog contents of the memory M100 when the web page is being sent to the browser so that you see it in the text box when the web page is displayed.




Now ftp the file test.htm to the PL101 and open it with your browser.




Type a new value into the text box and click on Update. The new value will now be in the PL101.

# 5. SPECIFICATIONS

## 5.1 Environmental

| | |
|---|---|
| Operating Temperature | -30°C to +80°C |
| Storage Temperature | -40°C to +85°C |
| Humidity | Up to 95% non condensing. |

## 5.2 EMC Installation Instructions

1. Screened twisted pair RS485 cable must be used with the screen grounded at one point only.
2. The RS485 cable must be terminated at both ends using a 120 ohm resistor.
3. Use should be made of screened I/O, T/C, RTD cable with the screens grounded at one point as close to the PROLOGIC module as possible.
4. The PROLOGIC modules must be installed in an appropriate enclosure inaccessible to the operator during normal use.

## 5.3 Conformity Certificate

**DECLARATION OF CONFORMITY**
according to EN 45014

| | |
|---|---|
| Manufacturer's Name: | Procon Electronics CC |
| Manufacturer's Address: | 26 Wareing Park<br>2 Wareing Road<br>Pinetown 3610<br>South Africa |

declares that the product

| | |
|---|---|
| Product Name: | PROLOGIC |
| Model Number(s): | PL16DI, PL16DI110, PL16DI220, PL16DIB, PL16DO, PL8DIO, PL4RO, PL8AI/I, PL8AI/V, PL8AI/IISO, PL8AI/VISO, PL8AO, PL8VO, PL8TC, PL8TCISO, PL6RTD, PLDAIO, PLDAIO2, PL100, PL101. |

complies with EMC Directive 89/336/EEC and Low Voltage Equipment Directive 73/23/EEC and conforms to the following Product specifications:

| | |
|---|---|
| Safety: | IEC 950 |
| EMC: | EN 61326-1 Electrical Equipment for measurement, control and laboratory use. |

| | | |
|---|---|---|
| Pinetown, SA | August 2006 | |
| Location | Date | D.Ruddock |

## 5.4 EMC Test Results

| PROLOGIC EMC Test Results | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Test | Standard | Test Value | PROLOGIC Product Compliance (PL) | | | | | | |
| Immunity Test Results EN 61326-1 | | | 16DI | 16DO | 4RO | 8DIO | 8AII | 8AII ISO | 8AIV |
| Electrostatic Discharge | IEC 61000-4-2 | 8KV Air | A | A | A | A | A | B | A |
| | | 4KV Contact | A | A | A | A | A | A | A |
| Radiated Field | IEC 61000-4-3 | 10V/m | A | A | A | A | A | A | A |
| Fast Transients | IEC 61000-4-4 | Power 2KV | A | A | A | A | A | B | A |
| | | I/O 1KV | A | A | A | A | A | B | A |
| Surge | IEC 61000-4-5 | Power 1KV/2KV | A | A | A | A | A | A | A |
| RF Conducted | IEC 61000-4-6 | Power 3 Vrms | A | A | A | A | A | A | A |
| Voltage Interrupt | IEC 61000-4-11 | 0.5cycle 100% | A | A | A | A | A | A | A |
| Emissions Test Results EN 61326-1 Class A | | | | | | | | | |
| Radiated Emissions | CISPR 22 | Class A | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Conducted Emissions | CISPR 22 | Class B | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |

| Test | Standard | Test Value | PROLOGIC Product Compliance (PL) | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Immunity Test Results EN 61326-1 | | | 8AIV ISO | 8TC | 8TC ISO | 6RTD | DAIO | 8AO | 8VO |
| Electrostatic Discharge | IEC 61000-4-2 | 8KV Air | B | A | B | A | A | A | B |
| | | 4KV Contact | A | A | A | A | A | A | A |
| Radiated Field | IEC 61000-4-3 | 10V/m | A | A | A | A | A | A | A |
| Fast Transients | IEC 61000-4-4 | Power 2KV | B | A | B | A | A | A | A |
| | | I/O 1KV | B | A | B | A | A | A | A |
| Surge | IEC 61000-4-5 | Power 1KV/2KV | A | A | A | A | A | A | A |
| RF Conducted | IEC 61000-4-6 | Power 3 Vrms | A | A | A | A | A | A | A |
| Voltage Interrupt | IEC 61000-4-11 | 0.5cycle 100% | A | A | A | A | A | A | A |
| Emissions Test Results EN 61326-1 Class A | | | | | | | | | |
| Radiated Emissions | CISPR 22 | Class A | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Conducted Emissions | CISPR 22 | Class B | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |