CIRCULAR SOLUTIONS

# Generic Remote IO

## User Manual

Document No. CS-RIO101

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Revision 1

# CONTENTS

# Revision History

| Revision | Date | Comment |
|---|---|---|
| 1.0 | 13 October 2020 | First Issue |
| | | |
| | | |
| | | |
| | | |

# 1. PREFACE

## 1.1. FEATURES

The Remote IO enclosure is the perfect solution for easily integrating low density IO clusters into Control Systems via EtherNet/IP or Modbus TCP.

The IO modules are housed in robust polycarbonate housings to ensure maximum resilience in harsh and normally damp conditions. The housings have an ingress protection of IP66 and an IK10 impact rating (Equivalent to impact of 5kg mass dropped from 400 mm above impacted surface).

**Key Features:**

- Dual power supply to reduce required spares holding (110VAC and 24VDC)
- Easy Setup via Circular Configurator
- 4 x Digital Inputs (24VDC)
- 5 x Digital Outputs (up to 60VDC)
- 1 x Analogue Input (4-20mA or 0-10V)
- Supports redundancy
- EtherNet/IP and Modbus-TCP communication protocols standard
- Internal Diagnostics and communication fault management

## 1.2. APPLICATION

The CS-RIO20 is suitable for monitoring and control of small clusters of IO. The pre-packaged IO module and IP66 enclosure allow for implementation in harsh industrial environments.

While the units are generic and can be used for most applications requiring integration of IO, into control systems, they have proven ideal for the following:

- Pump stations
- Loading stations
- Conveyors and conveyor protection
- Remote access control

The units can accommodate both AC and DC power supplies thereby reducing required spares holding.

The Remote IO module is configured for via onboard DIP switches as well as via the ***Circular Configurator*** application. This software utility can be downloaded from www.circularsolutions.co.za free of charge.

## 1.3. ADDITIONAL INFORMATION

The following documents contain additional information that can assist the user with the module installation and operation.

| Resource | Link |
|---|---|
| Circular Configurator Installation | http://www.circularsolutions.co.za/configurator |
| User Manual,<br>Datasheet<br>Example Code & UDTs | http://www.circularsolutions.co.za/remote-io |
| Ethernet wiring standard | www.cisco.com/c/en/us/td/docs/video/cds/cde/cde205_220_420/installation/guide/cde205_220_420_hig/Connectors.html |

Table 1.1 – Additional information

## 1.4. REFERENCES

| Resource | Link |
|---|---|
| Modbus | http://www.modbus.org |

Table 1.2 – References

## 1.5. SUPPORT

Technical support is provided via the Web (in the form of user manuals, datasheets etc.) to assist with installation, operation, and diagnostics.

For additional support the user can use either of the following:

| Resource | Link |
|---|---|
| Contact Us web link | www.circularsolutions.co.za/contact-us |
| Support email | contact@circularsolutions.co.za |

Table 1.3 – Support details

# 2. INSTALLATION

## 2.1. MODULE OVERVIEW

The CS-RIO20 Remote IO module is housed inside a IP66 polycarbonate enclosure. The lid is removed by means of the ¼ stainless steel screws in the corners and midpoint of the cover. These screws are spring-loaded and should be pushed in to turn ¼ anticlockwise to release.

Figure 2.1 – Remote IO Module with Lid Fastened

Mounting of the unit is done through the four mounting holes which are accessed by removing the cover. These mounting holes have been designed to ensure that no holes are required inside the main enclosure which could compromise the enclosure IP rating. The mounting holes accommodate screws/bolts up to 5mm in diameter.

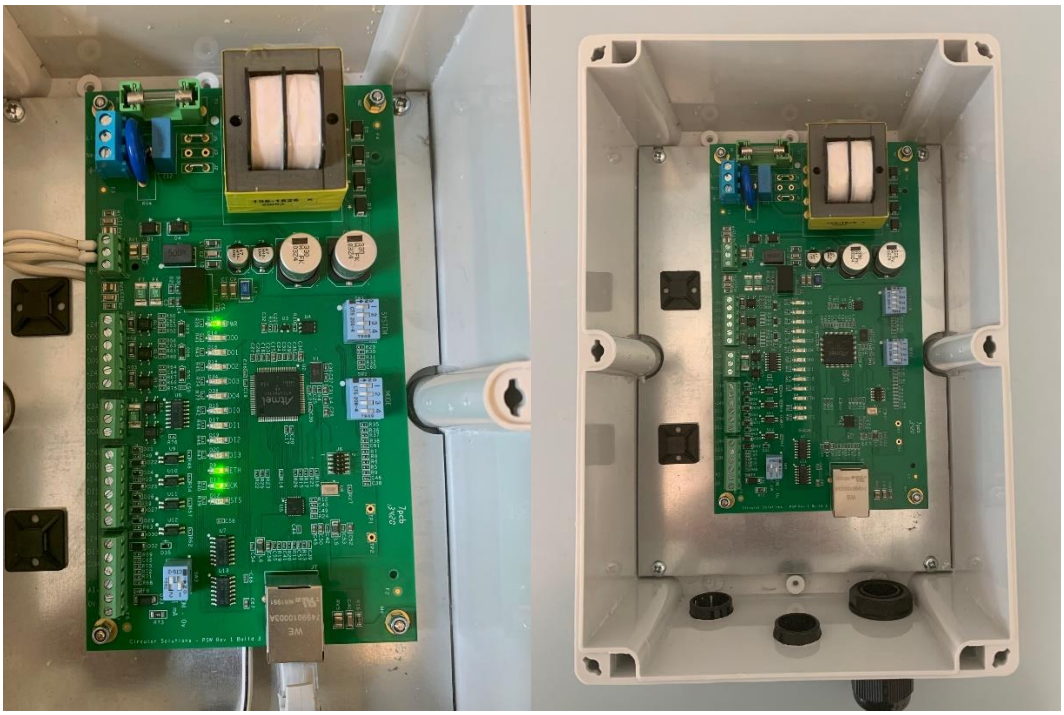

Figure 2.2 – Internal Enclosure Layout

The communications cable is routed through the Ethernet cable gland supplied with the unit. This allows a pre-terminated RJ45 connector to be installed. Two additional gland holes have been predrilled for installation of power and IO cables. Additional gland holes can be drilled as required.

## 2.2. CONNECTION

The Remote IO modules are pre-wired, pre-assembled and ready for use.

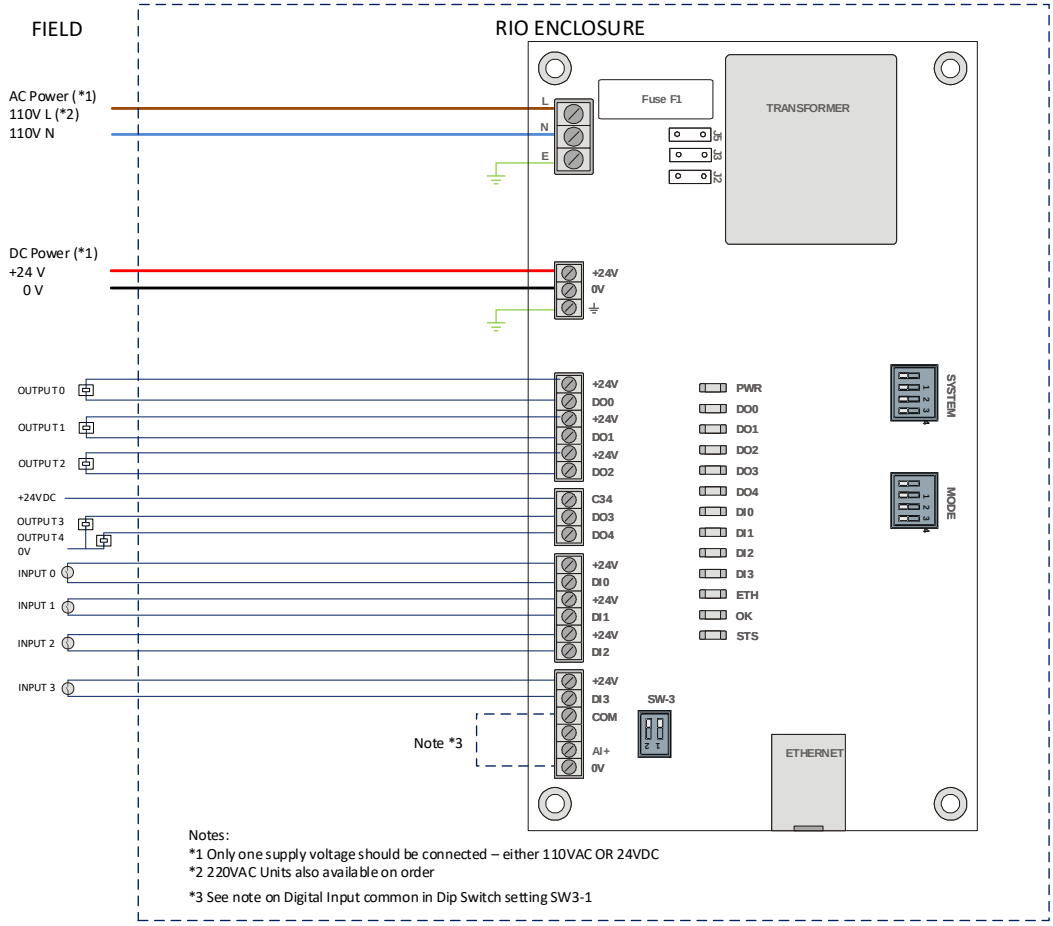


Figure 2.3 – Typical RIO Wiring Diagram

## 2.3. POWER

Each unit is equipped with both a 24VDC input as well as an AC input (either 110VAC or 220VAC). **Only one of the two options is required to be connected.**

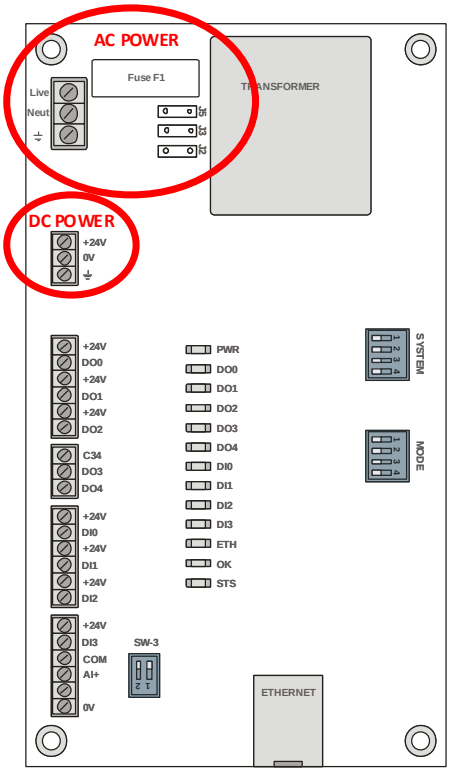


Figure 2.4 – AC & DC Power Circuits

### 2.3.1. DC INPUT

A three-way power connector is used to connect Power+, Power– (ground), and earth. The module requires an input voltage of 24VDC. Refer to the technical specifications section in this document.


Figure 2.5 – DC Power Connector

### 2.3.2. AC INPUT

A three-way power connector is used to connect AC Power Live, Neutral and Earth. The unit is configured for either 220VAC or 110VAC depending on option ordered. The module will be labelled with specified AC supply voltage level. Refer to the technical specifications section in this document.

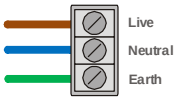


Figure 2.6 – AC Power Connector

The unit is protected from AC supply disturbances by a replaceable 1A fuse as well as a MOV.

The unit's AC rated supply voltage should be confirmed from the label as a well as by confirming the supply jumper configuration.

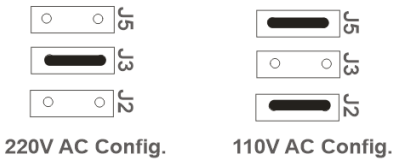


Figure 2.7 – AC Power - Jumper Configuration

**NOTE: Ensure that the correct voltage is applied to the unit. Connecting the incorrect voltage to the unit will cause damage and ould result in personal injury.**

## 2.4. IO CONNECTIONS

The Remote IO module is equipped with four digital inputs, five digital outputs and one analogue input which are connected directly on the labelled terminals on the PCB.

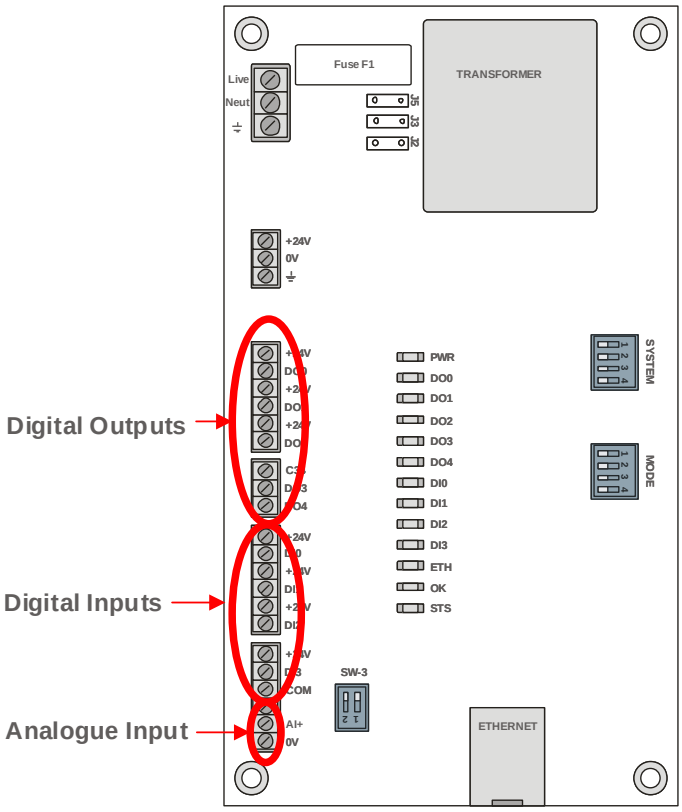


Figure 2.8 – Input and Output Connection

### 2.4.1. DIGITAL INPUTS

The four digital input channels are optically-isolated sharing a common ground. A voltage of between 10-32 VDC applied to an input will result in a logic on state for that input.

| Digital Input | Description |
|---|---|
| DI 0 | Input 0 |
| DI 1 | Input 1 |
| DI 2 | Input 2 |
| DI 3 | Input 3 |

Table 2.1 – Digital Input Description

**NOTE: The Digital Inputs are optically isolated and thus the Digital Input Common point is separate to 0V. These can be commoned by setting DIP Switch SW3-1 on or by adding an external jumper.**

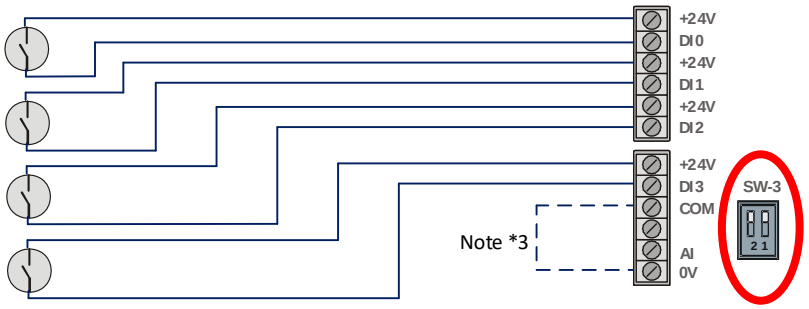


Figure 2.9 – Digital Input Wiring Example

### 2.4.1. DIGITAL OUTPUTS

There are five solid state digital outputs of which three are independent and the remaining two relays (D03 & D04) are connected with a single common as shown in Figure 2.11 – Common Internal Connections of DO3 and DO4**.**

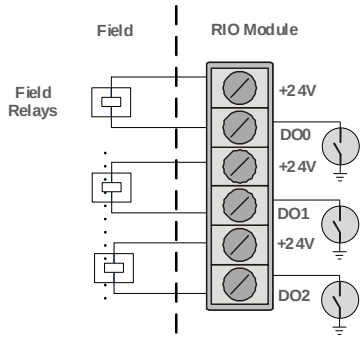


Figure 2.10 – Typical Wiring for DO0-D02

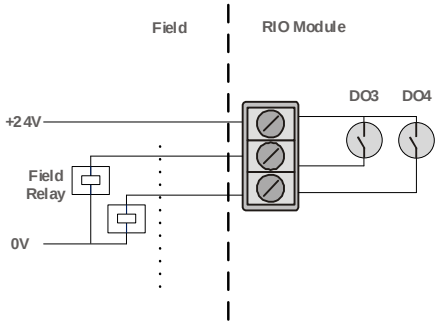


Figure 2.11 – Common Internal Connections of DO3 and DO4

| Digital Input | Description |
|---|---|
| DO 0 | Digital Output 0 |
| DO 1 | Digital Output 1 |
| DO 2 | Digital Output 2 |
| DO 3 | Digital Output 3 – Common connection with D04 |
| DO 4 | Digital Output 4 – Common connection with D03 |

Table 2.2 – Digital Output Description

**NOTE:** The digital outputs are capable of switching a maximum DC current of 400mA.

### 2.4.1. ANALOGUE INPUT

There is one analogue input on the Remote IO unit. This can be set as either a 4-20mA input or alternately as a 0-10V input. This selection is done with DIP switch SW3-2. Refer to section 2.6.3.

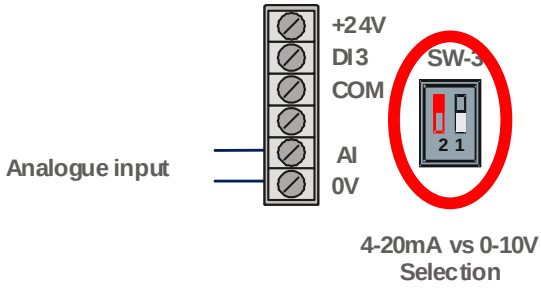


Table 2.3 – Analogue Input Selection

## 2.5. ETHERNET PORT

The Ethernet connector should be wired according to industry standards. Refer to the additional information section in this document for further details.

## 2.6. DIP SWITCHES

The module is pre-programmed with multiple different operating modes. These modes are selected via dip switches on the PCB. Three sets of DIP switches are available for configuration as shown in the figure below.

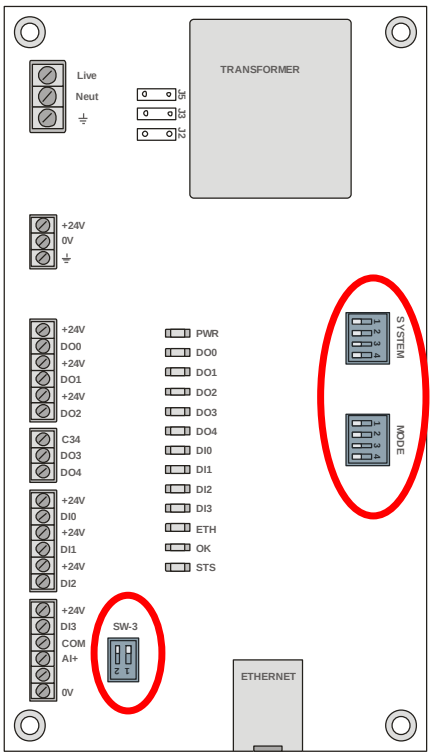


Figure 2.12 – Location of DIP Switches

### 2.6.1. SYSTEM DIP SWITCHES

System DIP Switch Settings

| DIP Switch | Description |
|---|---|
| DIP Switch 1 | Used to force the module into “Safe Mode”. When in “Safe Mode” the module will not load the application firmware and will wait for new firmware to be downloaded. This should only be used in the rare occasion when a firmware update was interrupted at a critical stage.<br>0 = Normal<br>1 = Safe Boot Mode |
| DIP Switch 2 | This will force the module into DHCP mode which is useful when the user has forgotten the IP address of the module.<br>0 = Normal<br>1 = Force DHCP |
| DIP Switch 3 | This will force the module into a fixed IP address – 192.168.1.100<br>0 = Normal<br>1 = Force Fixed IP |

| | |
|---|---|
| DIP Switch 4 | This selects the PLC communications protocol.<br>0 = EtherNet/IP<br>1 = Modbus TCP |

Table 2.4 – System DIP Switch Settings

### 2.6.2. MODE DIP SWITCHES

Mode DIP Switch Settings

| DIP Switch | Description |
|---|---|
| DIP Switch 1 | Comms Fail Mode for DO0, DO1 and DO2<br>0 = Turn output off for Comms Fail<br>1 = Retain last status for Comms Fail |
| DIP Switch 2 | Comms Fail Mode for DO3, DO4<br>0 = Turn output off for Comms Fail<br>1 = Retain last status for Comms Fail |
| DIP Switch 3 | Reserved |
| DIP Switch 4 | Reserved |

Table 2.5 – Mode DIP Switch Settings

### 2.6.3. SW3 DIP SWITCHES

| DIP Switch | Description |
|---|---|
| DIP Switch 1 | Used to common the Digital input common (DI COM) to the internal 0V. When in the off position, the DI COM is isolated from the internal 0V and the inputs are designed to operate from an external power supply. In this mode, if no external power supply is used, a bridge is required between DI COM and 0V.<br>0 = DI COM and 0V isolated<br>1 = DI Com and 0V common |
| DIP Switch 2 | Analogue Input selection<br>0 = 0-10V<br>1 = 4-20mA |

Table 2.6 – SW3 DIP Switch Settings

# 3. SETUP

## 3.1. INSTALL CONFIGURATION SOFTWARE

All the network setup and configuration of the module is achieved by means of the Circular Configurator device configuration environment. This software can be downloaded from *http://www.circularsolutions.co.za/configurator*

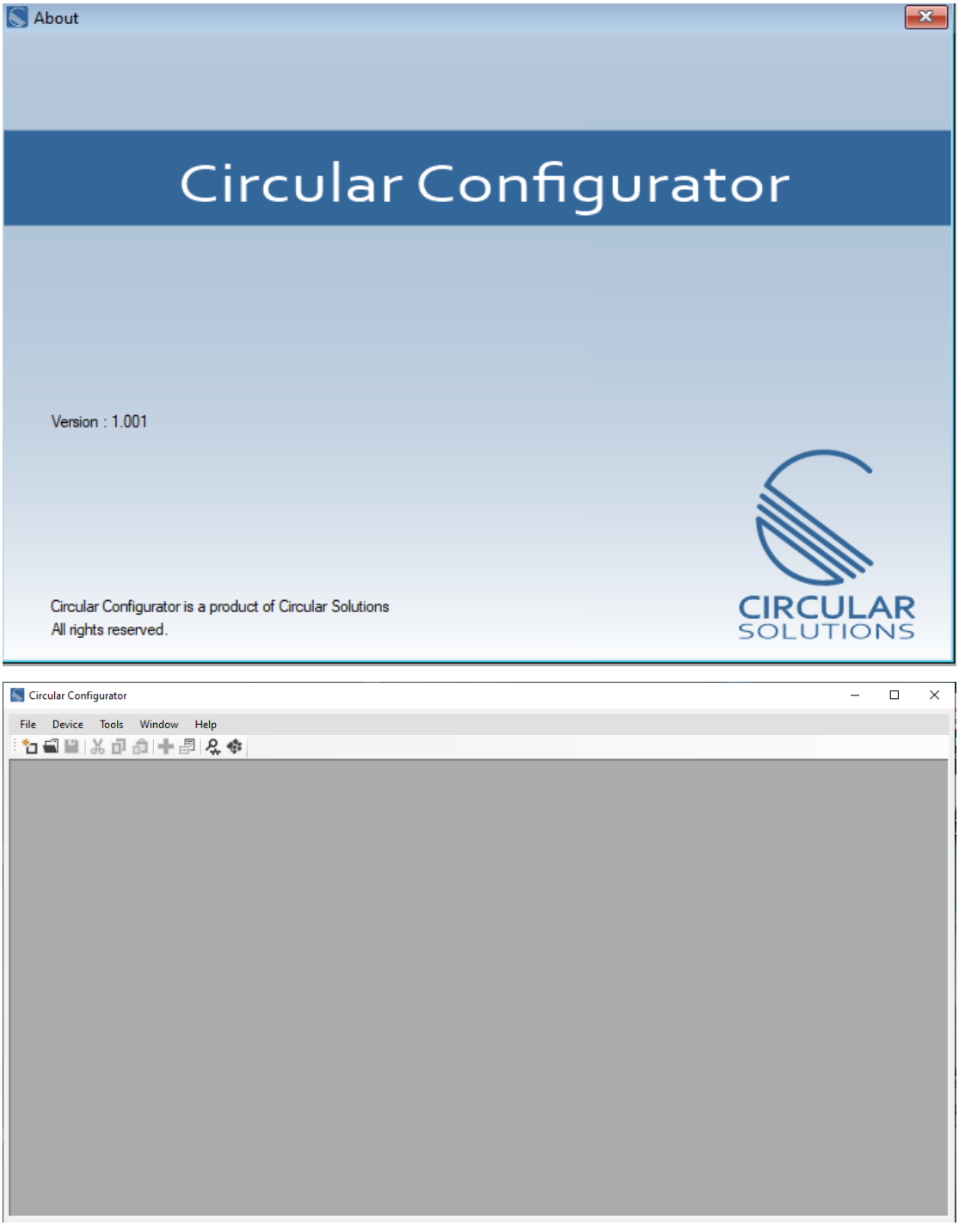


Figure 3.1. Circular Configurator Environment

## 3.2. NETWORK PARAMETERS

The module will have DHCP (Dynamic Host Configuration Protocol) enabled as a factory default. Thus, a DHCP server must be used to provide the module with the required network parameters (IP address, subnet mask, etc.). There are several DHCP utilities available, however it is recommended that the DHCP server in Circular Configurator be used.

Within the Circular Configurator environment, the DHCP Server can be found under the Tools menu.

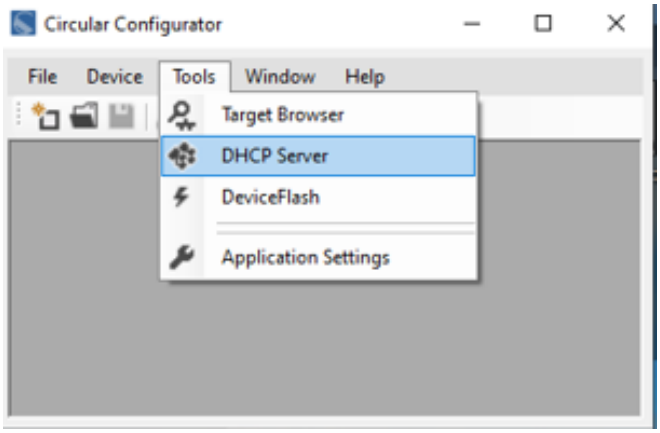


Figure 3.2. - Selecting DHCP Server

Once opened, the DHCP server will listen on all available network adapters for DHCP requests and display their corresponding MAC addresses.

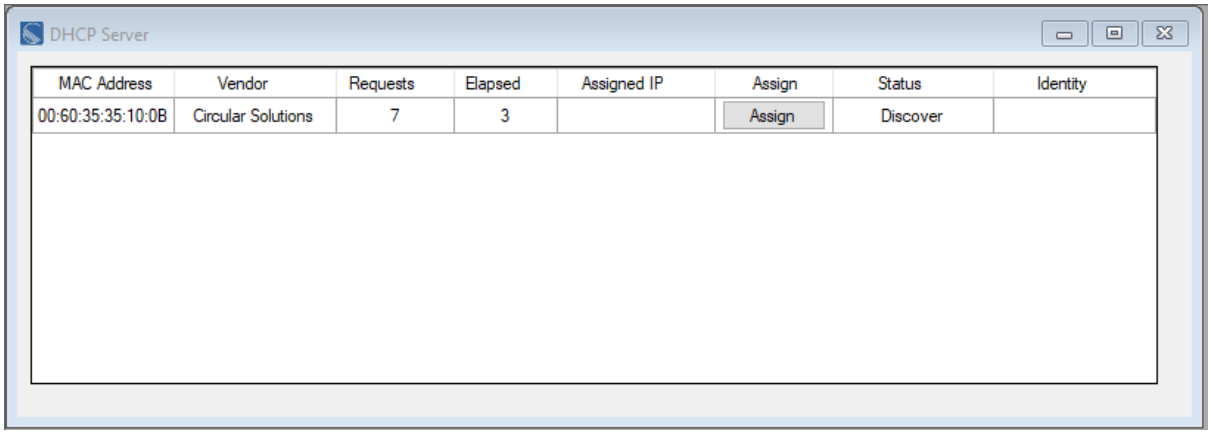


Figure 3.3. - DHCP Server

**NOTE:** If the DHCP requests are not displayed in the DHCP Server it may be due to the local PC's firewall. During installation the necessary firewall rules are automatically created for the Windows firewall. Another possibility is that another DHCP Server is operational on the network and it has assigned the IP address.

To assign an IP address, click on the corresponding Assign button. The IP Address Assignment window will open.

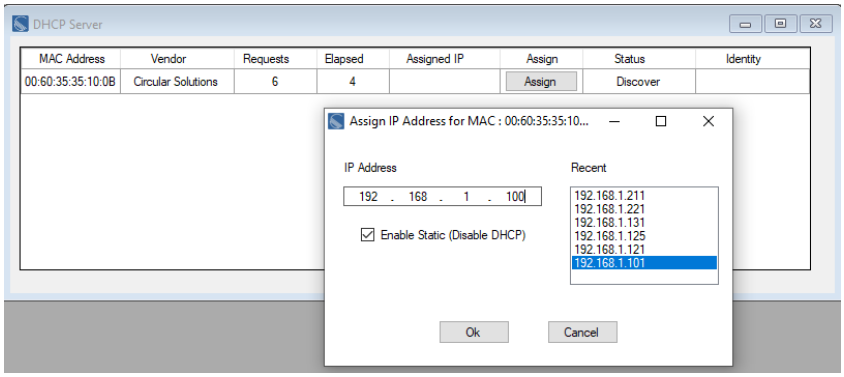


Figure 3.4. - Assigning IP Address

The required IP address can then be either entered, or a recently used IP address can be selected by clicking on an item in the ***Recent*** List. If the ***Enable Static*** checkbox is checked, then the IP address will be set to static after the IP assignment, thereby disabling future DHCP requests.

Once the IP address window has been accepted, the DHCP server will automatically assign the IP address to the module and then read the ***Identity Object Product*** name from the device.

The successful assignment of the IP address by the device is indicated by the green background of the associated row.

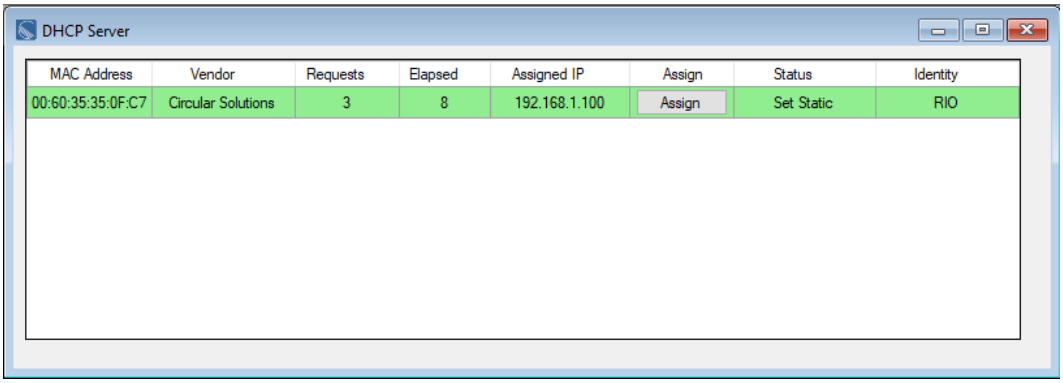


Figure 3.5. - Successful IP address assignment

It is possible to force the module back into DHCP mode by powering up the device with DIP switch 2 set to the “On” position. A new IP address can then be assigned by repeating the previous steps.

**NOTE:** It is important to return DIP switch 2 back to Off position, to avoid the module returning to a DHCP mode after the power is cycled again.

In addition to the setting the IP address, a number of other network parameters can be set during the DHCP process. These settings can be viewed and edited in Circular Configurator’s Application Settings, in the *DHCP Server* tab.

Once the DHCP process has been completed, the network settings can be set using the Ethernet Port Configuration via the ***Target Browser***. The Target Browser can be accessed under the ***Tools*** menu.

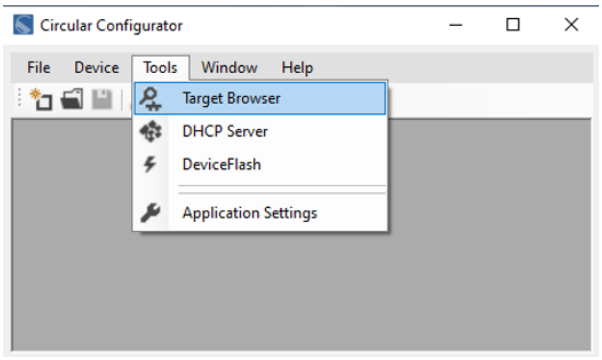


Figure 3.6. - Selecting the Target Browser

The Target Browser automatically scans the Ethernet network for EtherNet/IP devices.

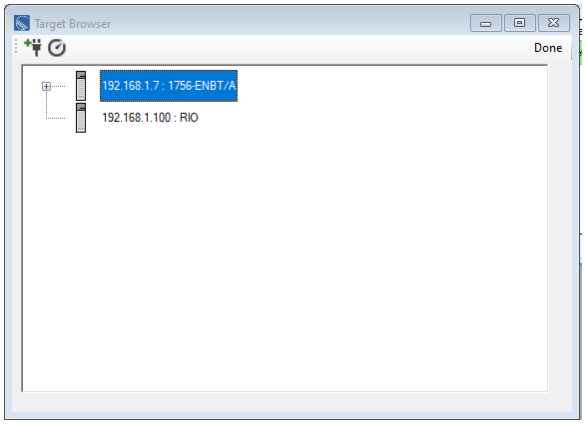


Figure 3.7. - Target Browser

Right-clicking on a device, reveals the context menu, including the ***Port Configuration*** option.

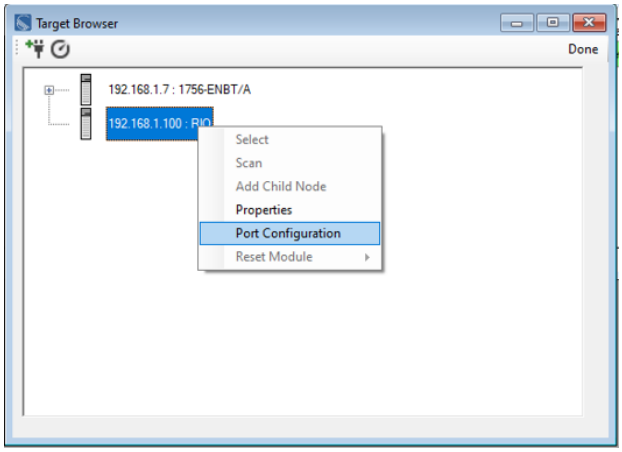


Figure 3.8. - Selecting Port Configuration

All the relevant Ethernet port configuration parameters can be modified using the ***Port Configuration*** window.

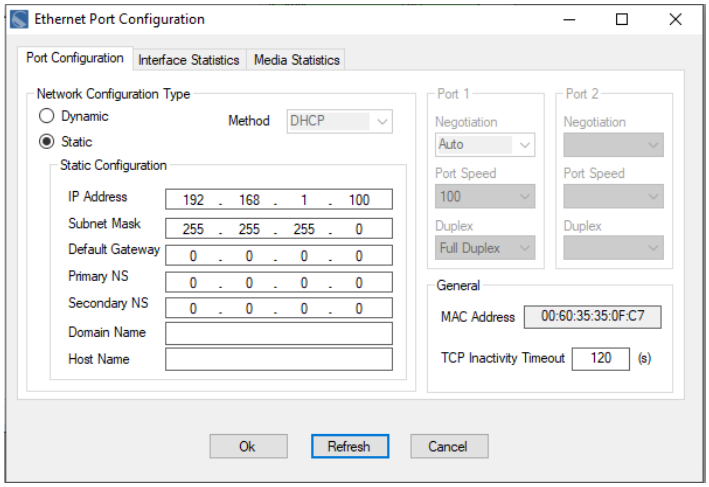


Figure 3.9. - Port Configuration

Alternatively, these parameters can be modified using Rockwell Automation's RSLinx software.

## 3.3. LOGIX INTEGRATION

The CS-RIO20 Remote IO Module is designed to easily integrate with the Allen-Bradley Logix family of controllers.

### 3.3.1. ADD MODULE TO I/O CONFIGURATION

The Remote IO Module must be added to the RSLogix 5000 / Studio 5000 I/O tree as a generic Ethernet module. This is achieved by right clicking on the Ethernet Bridge in the RSLogix 5000 and selecting New Module after which the ETHERNET-MODULE is selected to be added as shown in the figure below.

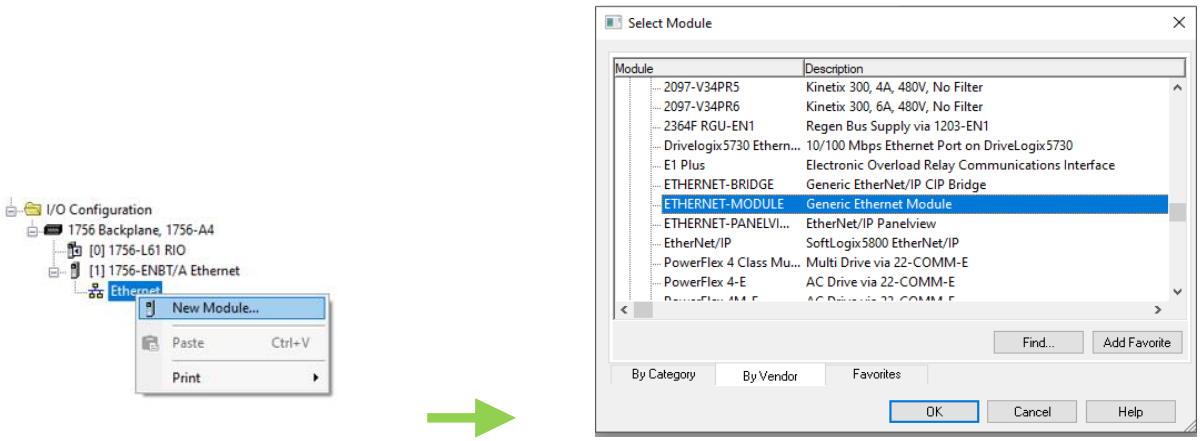


Figure 3.10 - Add a Generic Ethernet Module in RSLogix 5000

The user must enter the IP address of the Remote IO module that has been configured. The assembly instance and size must also be added for the input, output, and configuration in the connection parameters section.

The required connection parameters for the Remote IO module are shown below:

| *Connection Parameter* | *Assembly Instance* | *Size* |
|---|---|---|
| Input | 184 | 100 (8-bit) |
| Output | 185 | 20 (8-bit) |
| Configuration | 102 | 0 (8-bit) |

Table 3.1 - RSLogix class 1 connection parameters

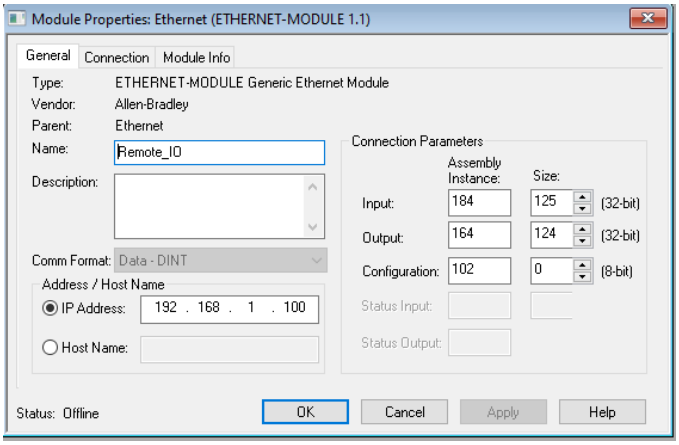


Figure 3.11 - RSLogix 5000 General module properties for Remote IO

Next the user needs to add the connection requested packet interval (RPI). This is the rate at which the input and output assemblies are exchanged. The recommended value is 100ms.

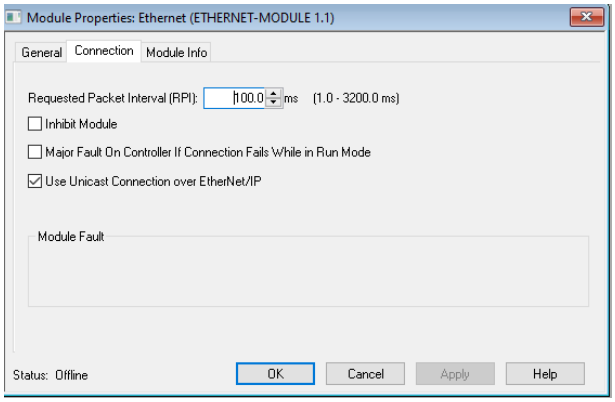


Figure 3.12 - Connection module properties in RSLogix 5000

Once the module has been added to the RSLogix 5000 I/O tree the user must assign the User Defined Types (UDTs) to the input and output assemblies. The user can import the required UDTs by right-clicking on User-Defined sub-folder in the Data Types folder of the I/O tree and selecting Import Data Type. The assemblies are then assigned to the UDTs with a ladder copy instruction (COP) as shown in the figure below.

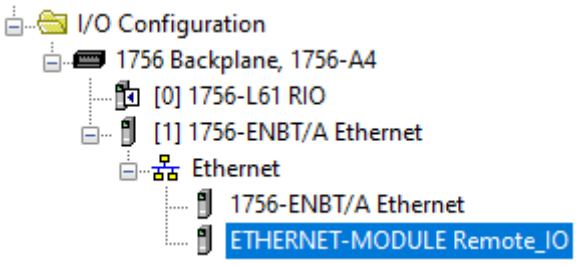


Figure 3.13 – RSLogix 5000 I/O module tree

# 4. LOGIX MAPPING

The Remote IO module can be added in the Logix IO tree to provide diagnostics information to the Logix controller. The Logix controller will establish a class 1 cyclic communication connection with the module. An input and output assembly is exchanged at a fix interval.

As described in chapter 3, by copying the module's input assembly to the supplied UDT, the following structured parameters can be extracted:

### 4.1.1. INPUT ASSEMBLY

The following parameters are used in the input assembly of the Remote IO module.

| Parameter | Datatype | Description |
|---|---|---|
| Instance | STRING | The instance name of the module that was configured under the general Belt Rip and Tear module configuration in Circular Configurator. |
| **Input** | | |
| General Status | BOOL | Bit 0 - Class 1 owned<br>Bit 1 - Modbus comms OK |
| Mode DIP Switch | SINT | Status of Mode DIP-Switches |
| System DIP Switch Boot | SINT | Status of System DIP-Switches at power-up |
| System DIP Switch Current | SINT | Status of System DIP-Switches |
| Firmware Major Rev | SINT | Major Firmware Revision |
| Firmware Minor Rev | SINT | Minor Firmware Revision |
| Firmware Micro Rev | SINT | Micro Firmware Revision |
| DI Status | SINT | Status of input DI0 to DI3 |
| DO Status | SINT | Status of outputs DO0-DO4 |
| CPU Temperature | REAL | CPU temperature (°C) |
| UpTime | DINT | Seconds since power-up |
| HardwareMACaddress | SINT[6] | Ethernet MAC address |
| Analog Input - Voltage (0-10V) | REAL | Analog Input in Volts (when DIP SW3.2 =0) |
| Analog Input - Current (0-20mA) | REAL | Analog Input in mA (when DIP SW3.2 =1) |
| CurrentDO0 | REAL | Current consumption of DO0 load |
| CurrentDO1 | REAL | Current consumption of DO1 load |
| CurrentDO2 | REAL | Current consumption of DO2 load |

| | | |
|---|---|---|
| CurrentDO0On | REAL | Last On Current consumption of DO0 load |
| CurrentDO1On | REAL | Last On Current consumption of DO3 load |
| CurrentDO2On | REAL | Last On Current consumption of DO2 load |
| DI0 Counter | DINT | DI0 Counter |
| DI1 Counter | DINT | DI1 Counter |
| DI2 Counter | DINT | DI2 Counter |
| DI3 Counter | DINT | DI3 Counter |
| ResetStatsCommand Readback | DINT | Echo of Output Assembly |

Table 4.1 –Remote IO Logix 5000 input assembly parameters

### 4.1.1. OUTPUT ASSEMBLY

The following parameters are used in the Output assembly of the Remote IO module.

| Output | | |
|---|---|---|
| ResetStatsCommand | SINT | Transition from 0-1 triggers reset stats |
| DOCmd | SINT | **1=ON, 0=OFF**<br>Bit 0 – DO0<br>Bit 1 – DO1<br>Bit 2 – DO3<br>Bit 3 – DO4<br>Bit 4 – DO5 |

Table 4.2 – Remote IO Logix 5000 Output Assembly Parameters

# 5. MODBUS TCP MAPPING

The Remote IO module can be configured to operate as a Modbus-TCP Slave via the Mode DIP switches (section 2.6.2).

The user will need to enter the IP Address, Slave Node Address and Holding register Start address.

### 5.1.1. HOLDING REGISTERS

The following parameters are used in the input assembly of the Remote IO module.

| Description | Address | Type | Count | Comment |
|---|---|---|---|---|
| General Status | 0 | INT | 1 | - |
| Bit 0 - Class 1 owned | | BOOL | 0 | |
| Bit 1 - Modbus comms OK | | BOOL | 0 | |
| Bit 2 - | | BOOL | 0 | |
| Bit 3 - | | BOOL | 0 | |
| Bit 4 - | | BOOL | 0 | |
| Bit 5 - | | BOOL | 0 | |
| Bit 6 - | | BOOL | 0 | |
| Bit 7 - | | BOOL | 0 | |
| Bit 8 - | | BOOL | 0 | |
| Reserved | 1 | INT | 1 | Reserved for future use. |
| Mode DIP Switch | 2 | INT | 1 | Status of Mode DIP-Switches |
| System DIP Switch Boot | 3 | INT | 1 | Status of System DIP-Switches at power-up |
| System DIP Switch Current | 4 | INT | 1 | Status of System DIP-Switches |
| Firmware Major Rev | 5 | INT | 1 | Major Firmware Revision |
| Firmware Minor Rev | 6 | INT | 1 | Minor Firmware Revision |
| Firmware Micro Rev | 7 | INT | 1 | Micro Firmware Revision |
| DI Status | 8 | INT | 1 | Status of input DI0 to DI3 |
| DO Status | 9 | INT | 1 | Status of input DO0 to DO4 |
| CPU Temperature | 10 | INT | 1 | CPU temperature (°C) |
| UpTime | 11 | DINT | 2 | Seconds since power-up |
| HardwareMACaddress | 13 | SINT[6] | 3 | Ethernet MAC address |
| Analog Input - Voltage (0-10V) | 16 | INT | 1 | Analog Input in Volts (when DIP SW3.2 =0) |

| | | | | |
|---|---|---|---|---|
| Analog Input - Current (0-20mA) | 17 | INT | 1 | Analog Input in mA (when DIP SW3.2 =1) |
| CurrentDO0 (mA) | 18 | INT | 1 | Current consumption of LED 1 |
| CurrentDO1 (mA) | 19 | INT | 1 | Current consumption of LED 2 |
| CurrentDO2 (mA) | 20 | INT | 1 | Current consumption of Siren |
| CurrentDO0On | 21 | INT | 1 | Last On Current consumption of DO0 |
| CurrentDO1On | 22 | INT | 1 | Last On Current consumption of DO1 |
| CurrentDO2On | 23 | INT | 1 | Last On Current consumption of DO2 |
| DI0 Counter | 24 | INT | 1 | DI0 Counter |
| DI1 Counter | 25 | INT | 1 | DI1 Counter |
| DI2 Counter | 26 | INT | 1 | DI2 Counter |
| DI3 Counter | 27 | INT | 1 | DI3 Counter |
| Reserved | 28 | INT | 1 | |
| ResetStatsCommand Readback | 29 | INT | 1 | Echo of reset Command |
| Reserved | 30 | INT | 8 | Reserved for future use. |

Table 5.1 – Modbus TCP Holding Registers

### 5.1.1. MONITOR DISCRETE INPUTS

| Type | Address | Description | Type | Count |
|---|---|---|---|---|
| DI | 0 | General Status - Bit 0 - Class 1 owned | BOOL | 1 |
| DI | 1 | General Status - Bit 1 – Modbus Comms OK | BOOL | 1 |
| DI | 2 | General Status - Bit 2 | BOOL | 1 |
| DI | 3 | General Status - Bit 3 | BOOL | 1 |
| DI | 4 | General Status - Bit 4 | BOOL | 1 |
| DI | 5 | General Status - Bit 5 | BOOL | 1 |
| DI | 6 | General Status - Bit 6 | BOOL | 1 |
| DI | 7 | General Status - Bit 7 | BOOL | 1 |
| DI | 8 | General Status - Bit 7 | BOOL | 1 |
| DI | 16 | DI Status - DI0 | BOOL | 1 |
| DI | 17 | DI Status – DI1 | BOOL | 1 |
| DI | 18 | DI Status – DI2 | BOOL | 1 |
| DI | 19 | DI Status – DI3 | BOOL | 1 |
| DI | 24 | DO Status - DO0 | BOOL | 1 |
| DI | 25 | DO Status – DO1 | BOOL | 1 |
| DI | 26 | DO Status – DO2 | BOOL | 1 |
| DI | 27 | DO Status – DO3 | BOOL | 1 |
| DI | 28 | DO Status – DO4 | BOOL | 1 |

Table 5.2 – Modbus TCP Discrete Inputs

### 5.1.1. CONTROL OUTPUTS

| Type | Address | R/W | Description | Type | Count | Comment |
|---|---|---|---|---|---|---|
| HR | 100 | R/W | ResetStatsCommand | INT | 1 | Transition from 0-1 triggers reset status |
| HR | 101 | R/W | DOCmd | INT | 1 | **1=ON, 0=OFF**<br>Bit 0 – DO0<br>Bit 1 – DO1<br>Bit 2 – DO3<br>Bit 3 – DO4<br>Bit 4 – DO5 |
| HR | 102 | R/W | Reserved | INT | 1 | |
| HR | 103 | R/W | Reserved | INT | 1 | |

Table 5.3 – Modbus TCP Control

# 6. DIAGNOSTICS

## 6.1. LEDS

The module PCB is equipped with multiple diagnostic LEDs as shown in Figure 6.1 - Module Diagnostic LEDs. These LEDs are used to provide information regarding the modules system operation, power supply, the Ethernet interface as well as the status of the inputs and outputs.

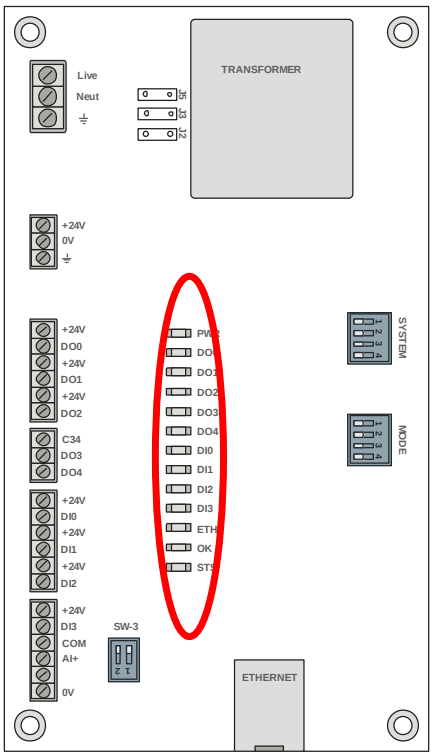


Figure 6.1 - Module Diagnostic LEDs

| LED Description | Colour | Description |
|---|---|---|
| PWR | Green | Indicates that the unit is powered – either from the 24VDC supply or alternately from the 110/220V AC supply. |
| DO0 | Green | Digital Output – LED is Green when output is on. |
| DO1 | Green | Digital Output – LED is Green when output is on. |
| DO2 | Green | Digital Output – LED is Green when output is on. |
| DO3 | Green | Digital Output – LED is Green when output is on. |
| DO4 | Green | Digital Output – LED is Green when output is on. |
| DI0 | Green | Digital Input – LED is Green when input is on. |

| | | |
|---|---|---|
| DI1 | Green | Digital Input – LED is Green when input is on. |
| DI2 | Green | Digital Input – LED is Green when input is on. |
| DI3 | Green | Digital Input – LED is Green when input is on. |
| ETH | Green | The Ethernet LED will light up when an Ethernet link has been detected (by plugging in a connected Ethernet cable). The LED will flash every time traffic was detected. |
| OK | Green/Red | The module LED will provide information regarding the system-level operation of the module.<br>If the LED is red, then the module is not operating correctly. For example, if the module application firmware has been corrupted or there is a hardware fault the module will have a red Module LED.<br>If the LED is green (flashing), then the module has booted and is running correctly without any application configuration loaded.<br>If the LED is green (solid), then the module has booted and is running correctly with application configuration loaded. |
| STS | Green/Red | Status LED<br>When in Modbus-TCP mode, the LED flashes green every time a valid Modbus request is received and flashes red every time an invalid Modbus request is received. |

Table 6.1 – Diagnostic LED's

# 7. TECHNICAL SPECIFICATIONS

## 7.1. ENCLOSURE DETAILS

| Specification | Rating | |
|---|---|---|
| Dimensions | **Receiver Unit**<br>Length 240mm<br>Height 160mm<br>Depth 100mm | **Emitter Unit**<br>Length 160mm<br>Height 120mm<br>Depth 90mm |
| Material | Polycarbonate | |
| Impact Rating | IK10 | |
| Enclosure IP Rating | IP66 | |

Table 7.1 – Enclosure Construction Specification

## 7.2. ELECTRICAL

| Specification | Rating |
|---|---|
| Power requirements | **Input: 24V DC,**<br>130mA @ 24 VDC (Typical)<br>250mA @ 24 VDC (Maximum)<br><br>**Input 110VAC**<br>32mA @ 110VAC (Typical)<br>55mA @ 110VAC (Maximum)<br><br>**Input 220VAC**<br>16mA @ 24 VDC (Typical)<br>28mA @ 24 VDC (Maximum) |
| Power consumption | 3.5 W (Typical)<br>6.0 W (Maximum) |
| Connector (Power) | 24VDC - 3-way terminal (3.81 mm pitch)<br>110/220VAC - 3-way terminal (5.08 mm pitch) |
| Conductors | 24 – 18 AWG |
| Temperature | -20 – 70 °C |
| Earth connection | Yes, terminal based |

Table 7.2 - Electrical specification

## 7.3. ETHERNET

| Specification | Rating |
|---|---|
| Connector | RJ45 |
| Conductors | CAT5 STP/UTP |
| ARP connections | Max 20 |
| TCP connections | Max 20 |
| CIP connections | Max 10 |
| Communication rate | 10/100Mbps |
| Duplex mode | Full/Half |
| Auto-MDIX support | Yes |

Table 7.3 - Ethernet specification

## 7.4. DIGITAL INPUTS

| Specification | Rating |
|---|---|
| Number of channels | 4 |
| Connector | 5-way terminal (3.81 mm pitch) |
| Type | Optical Isolation |
| Input impedance | >10 kΩ |
| Logic 1 Voltage | 10 – 32 V |

Table 7.4 - Digital Input specification

## 7.5. RELAY OUTPUTS

| Specification | Rating |
|---|---|
| Number of channels | 5 |
| Connector | terminal (3.81 mm pitch) |
| Type | Solid State - Normally Open Single Pole |
| Load Current | 400 mA (maximum) |
| Load Voltage | 60 Vdc (maximum) |

Table 7.5 - Relay Output specification