



SmartRail I/O – Ethernet Base HE599ETX300

1 INTRODUCTION

SmartRail I/O is a real-time, modular I/O system that supports a variety of Ethernet and Fieldbus Communication architectures. The SmartRail I/O Ethernet/IP Base (ETX300) utilizes Ethernet/IP communications, the popular Industrial Ethernet protocol based on Common Industrial Protocol (CIP) distributed by the Open DeviceNet Vendor Association (ODVA). Unlike other SmartRail I/O Bases (such as the HE599CNX100) which utilize Horner Controllers, the ETX300 supports third party PLCs and Ethernet IP Scanners, such as those from Rockwell Automation.

Each SmartRail I/O base can support up to 8 SmartRail I/O Modules, addressed with up to 256 digital and 64 analog I/O per base. The number of ETX300 bases allowed on a single network is defined by Controller memory limitations.

The ETX300 features a built-in unmanaged Ethernet switch for the convenience of wiring and system expansion. SmartRail I/O is not complex to configure – the ETX300 Ethernet/IP can be configured with a variety of manufacturer’s software suites that Support Ethernet/IP communications.

2 SPECIFICATIONS

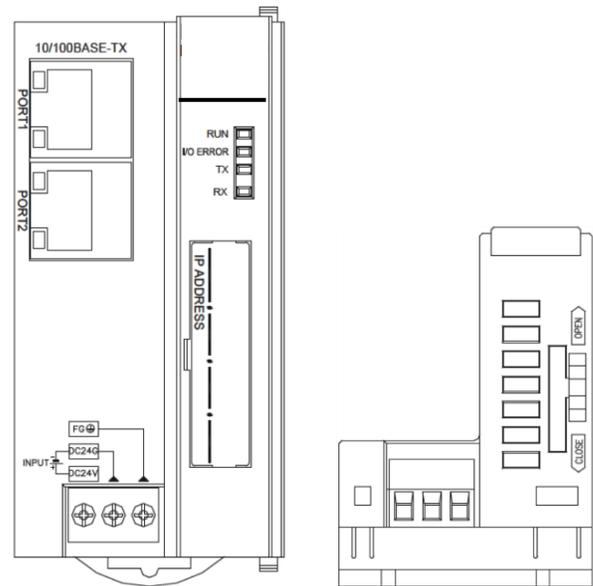
General Specifications			
Required Power (Steady State)	550mA @ 24 VDC CLASS 2 POWER SUPPLY ONLY		
Primary Power Range	19.2 – 28.8 VDC		
Output Power	1500mA @ 5 VDC		
Terminal Type	M3 Screw Type, Fixed		
Terminal Torque Rating	0.6 N-m (5.2 in-lb)		
Recommended Wire Size	14-18AWG (copper)		
Wire Stripping Length	7mm		
Relative Humidity	5 to 95% Non-condensing		
Operating Temp.	-5°C to +50°C		
Storage Temp.	-40°C to +75°C		
Dimensions (H x W x D)	90 x 45 x 60 mm [3.54 x 1.77 x 2.36 in]		
Weight	4oz. (114g)		
Vibration & Shock	Per IEC1131-2		
Noise Immunity	Per IEC1131-2, IEC61000-4-2, IEC61000-4-3, IEC61000-4-4		
CE	Yes		
UL & C-UL	Class I, Div 2 Groups A, B, C & D		
Communications Specifications			
Data Transmission	10/100 Mbps		
Flow Control	Full/Half-duplex		
Connectors	RJ-45 (8P8C), 2 ports (AutoMDIX)		
Built-in Switch	Unmanaged type		
I/O Protocol	Ethernet/IP		
Inactivity Timeout	10sec		
IP configuration	Boot/p		
I/O Specifications			
Compatible I/O	SmartRail I/O		
Modules Supported (per base)	8		
Digital I/O, max (per base)	256 (Inputs + Outputs)		
Analog I/O, max (per base)	64 (Inputs + Outputs)		
I/O Limitations (per system)	2048 Digital In, 2048 Digital Out, 512 Analog In, 512 Analog Out		
Power Supplied for I/O modules	1500mA @ 5V DC maximum		
I/O Module 5V Power Usage (1500mA total available)			
8 DC In DIM510 30mA	16 DC In DIM610 40mA	32 DC In DIM710 50mA	8 DC Out DQM506 40mA
16 DC Out DQM606 60mA	32 DC Out DQM706 120mA	8 Relay Out DQM502 230mA	16 Relay Out DQM602 420mA
8DC + 8 Relay DIQ512 250mA	4 Analog In ADC170 50mA	4 RTD In RTD100 100mA	4 T-couple In THM100 100mA
4 Anlg. Out (mA) DAC106 120mA	4 Analog Out (V) DAC101 70mA	2 Analog In + 2 Analog Out MIX116 100mA	

3 INSTALLATION

3.1 Physical Installation

The ETX300 is compact (45mm W x 90mm H x 60mm D), and mounts on DIN-rail. Each I/O module installed adds width in increments of 20mm (for DC & analog I/O) or 27mm (for relay I/O).

Modules can be added either before or after the ETX300 base has been installed on the DIN-rail.



ETX300 Front View

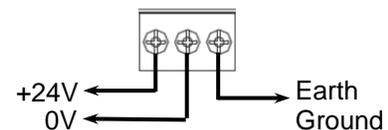
ETX300 Bottom View

I/O modules are physically added with the following procedure:

1. Remove the cover (if present) for the expansion connector from the ETX300 base, and for all but the rightmost I/O module.
2. Make sure that the locks on the top and bottom of the ETX300 base are slid all the way to the front in the “Open” position.
3. Align the first I/O module to the right of the ETX300 base using the alignment features in the plastic case.
4. After affixing the module securely, slide the locks on the top and bottom of the base all the way to back in the “Close” position.
5. Repeat steps 2-4 above until all modules are affixed.
6. Hang the ETX300 base and all the affixed I/O modules to the top of the DIN-rail, and secure them by sliding the DIN-rail latches to the “up” position.

3.2 Wiring

Each SmartRail ETX300 Base requires 24VDC power, and an appropriate Earth Ground connection for normal operation. Port 1 & Port 2 are AutoMDIX RJ45 ports (8P8C), compatible with both straight through and crossover cables. Horner APG offers high-quality cables in a variety of convenient lengths.



24VDC Power Supply & Earth Ground Terminals

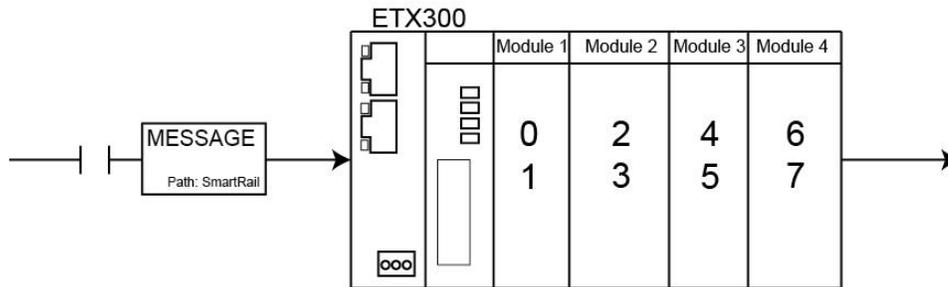
4 Software Configuration

Each SmartRail ETX300 can be configured using a variety of Ethernet/IP ready devices. Setup has two top-level steps: use Boot/P service to assign I/P address to the ETX300 module, then use UCMM (unconnected message manager) through the desired software package to configure parameters of the I/O modules attached to the ETX300 SmartRail Base.

4.1 Startup Sequence Overview

The software that is configured to control the SmartRail I/O will use the I/O configuration data (programmed via UCMM in the following section) to configure each ETX300 base. The following sequence is followed:

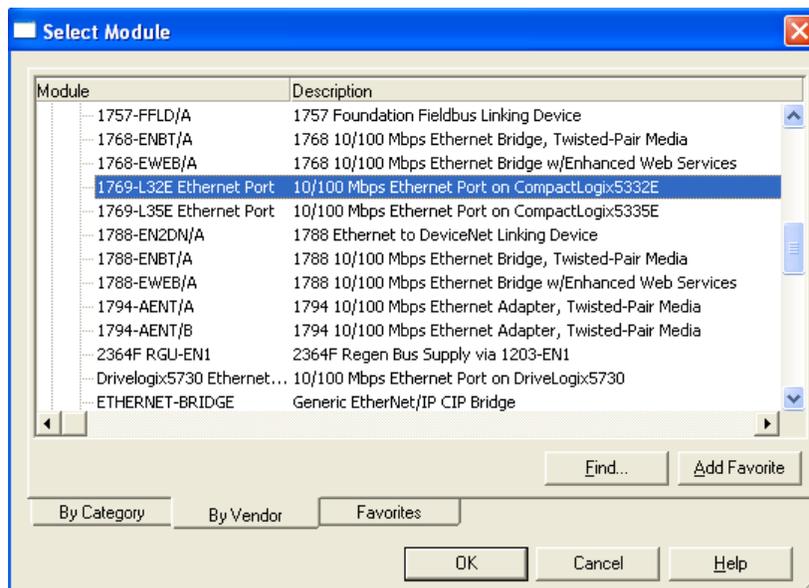
1. Upon power-up, the ETX300 will broadcast the MAC address to be assigned I/P data. This follows the Boot/P protocol convention.
2. Once in RUN mode, the Boot/P protocol will check its I/O configuration database, looking for a matching MAC ID entry.
3. If a match is found, the Boot/P protocol will assign the appropriate IP address, Net Mask, and Default Gateway to the ETX300 Base.
4. Once all bases are assigned IP addresses, setup I/O configuration in Logic software by entering IP address of the base module.
 - a. The PLC will place the ETX300 base in RUN mode
 - b. Then, send a UCMM message to the base unit to configure the I/O modules attached to it.
 - c. UCMM message will contain configuration parameters for the I/O attached to the base module for Ethernet I/P communication, assigning the arrays in the following order:



4.2 Configuration in RSLogix 5000

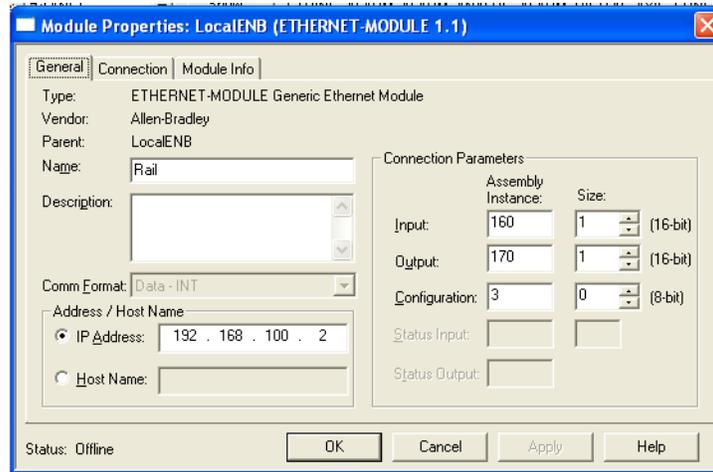
4.2.1 Setting up communication with the ETX300 Module in RSLogix:

- 1) In project, right-click I/O Configuration folder and select **New Module**.
- 2) Select the scanner being used, in this case: **1769-L32E Ethernet port on Compact Logix 5332E** (see image below), and press **OK**:



- 3) Enter revision number of the scanner and press **OK**.

- 4) Enter name and IP address for the scanner. Click **Finish**.
- 5) This will place the scanner module below the **I/O Configuration** folder in the folder explorer tab.
- 6) Right-click on the added scanner and select **New Module**
- 7) The same dialogue box from adding the scanner will appear. This time, select **Generic Ethernet Module** and press **OK**. Configure the Module Properties:
 - Enter a name that will be tagged later on (here "Rail")
 - Enter **IP address** on the ETX300 Module
 - Choose Assembly Instance Input, Output, and sizes
 - **Configuration** should always be set to Instance 3 and Size 0



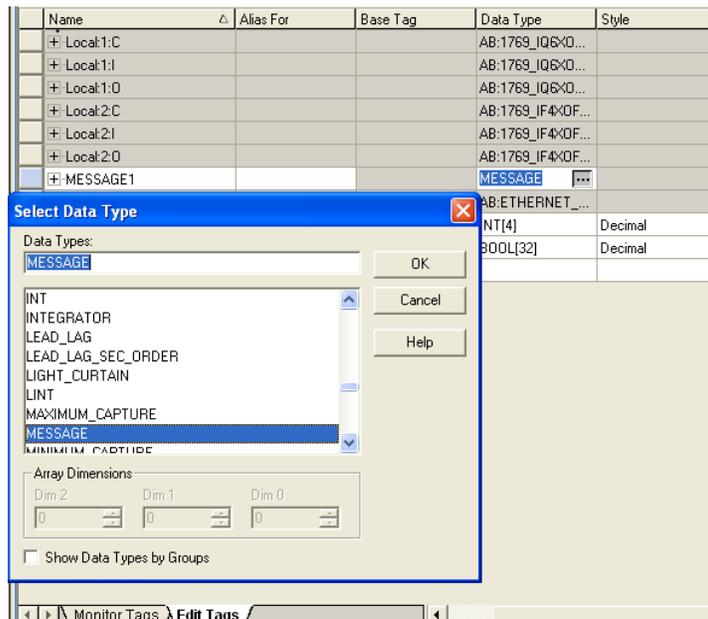
Note: Choose an assembly instance for the input and output not in use. The size refers to words (1 16-bit word above) and is determined by the number of modules attached to the ETX300

- 8) The next window will ask for **RPI Settings**. Start with **10ms** and adjust if needed.
- 9) Click **Next>** then **Finish>>**
- 10) Check the tags under **Controller Tags** in the folder navigation menu to make sure they are desired for the installed ethernet module. You can also add or edit tags from this pane, as you will do in the next section.

4.2.2 Explicit Messaging Tags

The first step of creating the Explicit message for parameter settings of the ETX300 modules is generating Tags that will be used to move information:

- Create a tag with MESSAGE type – The explicit message block will use this tag.
 - Create a tag with INT type – This tag holds the parameter data that the explicit message uses.
 - Assign the generated MESSAGE tag to the Message block
 - Add required parameters (shown in section 4.3) to the explicit message
 - Create a path to the module; here "Rail"
- 1) Create MESSAGE Tag. Open **Controller Tags** and click **Edit Tags**.
 - 2) Click in the space next to blank line to add tag. Use desired name, here: "MESSAGE1"

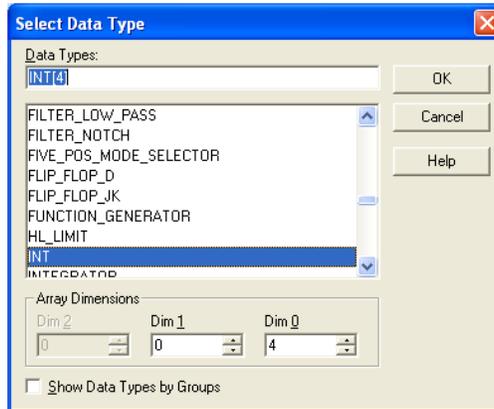


- 3) Click the [. . .] button under **Data Type** and change to **MESSAGE**. Press **OK**. (see above).
- 4) Create INT tag. Create another tag with desired name. Here: "Test1"
- 5) Click the [. . .] under **Data Type** and change to **INT**. Change **DIM_0** to **4** array dimensions (byte address 0-3 will be accessed in parameter data). Press **OK**.

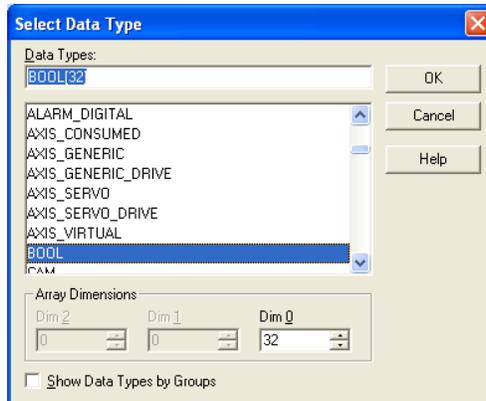
Note: Each module requires 2 words of configuration data (which are configured via the Array Dimensions)

Ex) 2 modules = 4 words of data. Use "0" Dim_1 through "3" Dim_0.

See section 4.3 for module configuration mapping.

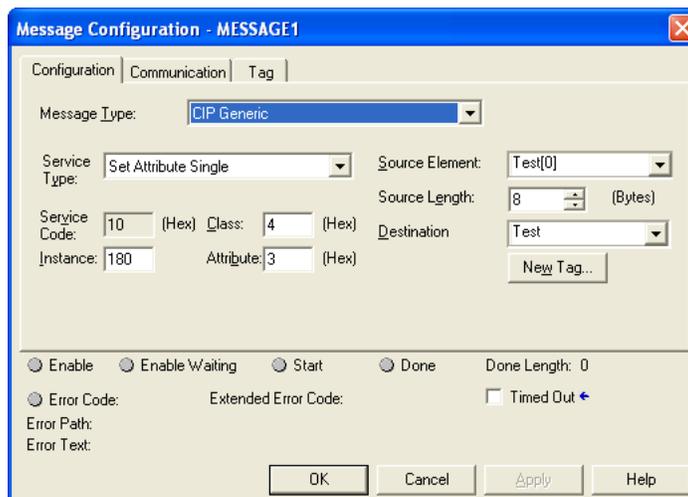


- 6) Create BOOL tag. Create the last tag with the desired name. Here: "Test"
- 7) Click the [. . .] **Data Type** and change to **INT**. Change **DIM_0** to **32**. (Each module uses 32 bits of configuration data. 4 bytes from the INT tag above)

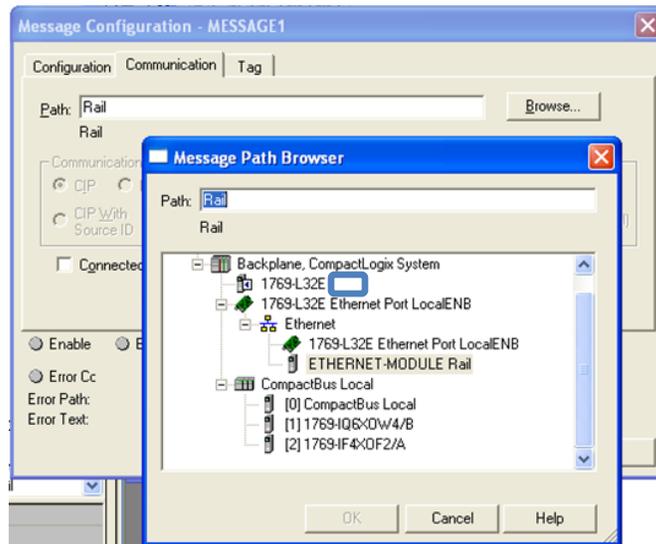


The second step is to create and configure the MESSAGE block in the Main Program :

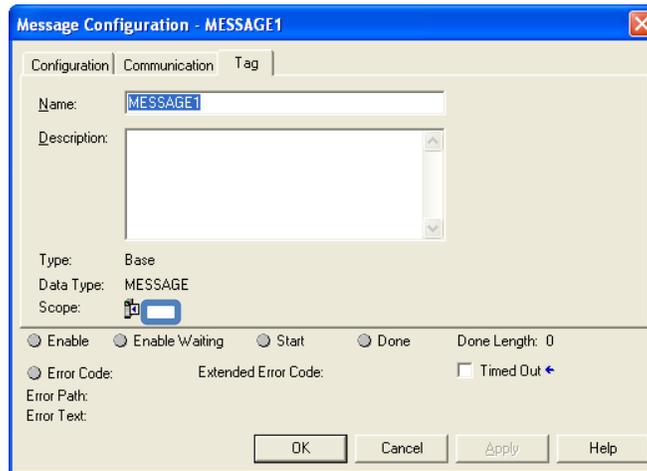
- 1) Add a rung with a normally open contact and a Message block.
- 2) Double-click on the contact and assign the **BOOL** tag from step 6 above.
- 3) Assign the message block the **MESSAGE** tag.
- 4) Double-Click the [. . .] button on the message block to get to the following **Message Configuration** screen:



- 5) Enter the values above. **Source Element** is the first array of the Test INT [4] previously made. **Source Length** depends on how many modules attached. 2 bytes per array, 2 arrays per module = 32 bits per module. **Destination** is the **INT[4]** tag from before. Here: **Test** and open the **Communication** Tab:



- 6) From the **Path** section, click **Browse** and set the path to the **Generic Ethernet Module** set up in 4.2.1. Above: **"Rail."** Press **OK**
- 7) Click **Tag** tab and ensure **Message1** is tagged:



- 8) To Change Parameters, Move parameter data into the added/established memory in the processor (INT[4] tagged above).

Example UCMM message

```

Service Code   : 16 (0x10: Set)
Instance      : 04 (0x04: Assembly Class)
Class         : 180 (0xB4 : parameter setting Assembly Object)
Attribute     : 03 (0x03: Data)
Data          : :XX XX (Parameter Setting Value)
    
```

4.3 Parameter Settings for SmartRail devices.

Note: Byte addresses are formatted as such: 01 23. The first 8 bits, byte address "0", use bits 0-7. The second 8 bits, byte address "1" use bits 8-15. The Second word is addressed in the same fashion.

ADC170 – Analog Input

Byte Address	Description	Bit								Configuration
		15 7	14 6	13 5	12 4	11 3	10 2	9 1	8 0	
0	Channel Used	-	-	-	-	Ch3	Ch2	Ch1	Ch0	Bit off (0): Disabled Bit on (1): Enabled
1	Input Voltage / Current Range	Ch3		Ch2		Ch1		Ch0		00: 0~10V 01: 0~20mA 10: 4~20mA
2	Output Data Range	Ch3		Ch2		Ch1		Ch0		00: 0~4000 01: -2000~2000 10:0~1000(400~2000/0~2000) 11: 0~1000
3		-	-	-	-	-	-	-	-	

DAC101 – Analog Output

Byte Address	Description	Bit								Configuration
		15 7	14 6	13 5	12 4	11 3	10 2	9 1	8 0	
0	Channel Used	-	-	-	-	Ch3	Ch2	Ch1	Ch0	Bit off (0): Disabled Bit on (1): Enabled
1	Output type configuration	Ch3		Ch2		Ch1		Ch0		00: 4~20mA 01: 0~20mA
2	Input data range designation	Ch3		Ch2		Ch1		Ch0		00: 0~4000 01: -2000~2000 10:0~1000(400~2000/0~2000) 11: 0~1000
3	Output status configuration	Ch3		Ch2		Ch1		Ch0		00: former value 01: minimum value 10: medium value 11: maximum value

DAC106 – Analog Output

Byte Address	Description	Bit								Configuration
		15 7	14 6	13 5	12 4	11 3	10 2	9 1	8 0	
0	Channel Used	-	-	-	-	Ch3	Ch2	Ch1	Ch0	Bit off (0): Disabled Bit on (1): Enabled
1	Output type configuration	Ch3		Ch2		Ch1		Ch0		00: 4~20mA 01: 0~20mA
2	Input data range designation	Ch3		Ch2		Ch1		Ch0		00: 0~4000 01: -2000~2000 10:0~1000(400~2000/0~2000) 11: 0~1000
3	Output status configuration	Ch3		Ch2		Ch1		Ch0		00: former value 01: minimum value 10: medium value 11: maximum value

All Digital I/O SmartRail Modules

Byte Address	Description	Bit								Configuration
		15 7	14 6	13 5	12 4	11 3	10 2	9 1	8 0	
0	Input Filter	-	-	-	-	Input Filter				0000:3ms 0100:20ms 0001:1ms 0101:70ms 0010:5ms 0110:100ms 0011:10ms
1	Maintaining Output Allowed	Configuration of Maintaining Output								01: Allow Other: Prohibit
2	Maintaining Output By Channels	56 to 63	48 to 55	40 to 47	32 to 39	24 to 31	16 to 23	8 to 15	0 to 7	01: Allow Other: Prohibit
3	Output status configuration	-	-	-	-	-	-	-	-	

MIX116 – Mixed Analog I/O Module

Byte Address	Description	Bit								Configuration
		15 7	14 6	13 5	12 4	11 3	10 2	9 1	8 0	
0	Channels Used	-	-	-	-	Out Ch1	Out Ch0	In Ch1	In Ch0	Bit off (0): Disabled Bit on (1): Enabled
1	Output type configuration	Output Ch1		Output Ch0		Input Ch1		Input Ch0		00: 4~20mA 01: 0~20mA 10: 0~5V 11: 0~10V
2	Output data range designation	Output Ch1		Output Ch0		Input Ch1		Input Ch0		00: 0~4000 01: -2000~2000 10: 0~1000(400~2000/0~2000) 11: 0~1000
3	Output status configuration	Ch1				Ch0				00: former value 01: minimum value 10: medium value 11: maximum value

RTD100 – Resistance Temperature Detector Input

Byte Address	Description	Bit								Configuration
		15 7	14 6	13 5	12 4	11 3	10 2	9 1	8 0	
0	Channel Used	-	-	-	-	Ch3	Ch2	Ch1	Ch0	Bit off (0): Disabled Bit on (1): Enabled
1	Output type configuration	Ch3		Ch2		Ch1		Ch0		00: PT100 01: JPT100
2	Input data range designation	Ch3		Ch2		Ch1		Ch0		Bit Off(0): Centigrade Bit On (1): Fahrenheit
3	-	-	-	-	-	-	-	-	-	-

THM100 – Thermocouple Input

Byte Address	Description	Bit								Configuration
		15 7	14 6	13 5	12 4	11 3	10 2	9 1	8 0	
0	Channel Used	-	-	-	-	Ch3	Ch2	Ch1	Ch0	Bit off (0): Disabled Bit on (1): Enabled
1	Output type configuration	Ch3		Ch2		Ch1		Ch0		00: K 01: J 10: T 11: R
2	Input data range designation	Ch3		Ch2		Ch1		Ch0		Bit Off(0): Centigrade Bit On (1): Fahrenheit
3	-	-	-	-	-	-	-	-	-	-

ADC270 – Analog Mixed Module

Memory Address	Description	Setting
0	Operating Channel	Bit off (0): stop Bit on (1): run
1	I/O Range (Ch0-Ch3)	0000: 4~20mA 0001: 0~20mA
2	I/O Range (Ch4-Ch7)	0010: 1~5V 0011: 0~5V 0100: 0~10V
3	Output Data Type	00: 0 ~ 4000 01: -2000 ~ 2000 10: precise value 11: 0 ~ 1000

5 SAFETY

This equipment is suitable for use in Class I, Division 2, Groups A, B, C and D or Non-hazardous locations only

WARNING - EXPLOSION HAZARD -

Do not disconnect equipment unless power has been removed or the area is known to be non-hazardous

WARNING - EXPLOSION HAZARD -

Substitution of any component may impair suitability for Class I, Division 2

WARNING – POSSIBLE EQUIPMENT DAMAGE

Remove power from the I/O Base and any peripheral equipment connected to this local system before adding or replacing this or any module.

When found on the product, the following symbols specify:



Warning: Consult user documentation.



Warning: Electrical Shock Hazard.

- All applicable codes and standards need to be followed in the installation of this product.

Adhere to the following safety precautions whenever any type of connection is made to the module.

- Connect the green safety (earth) ground first before making any other connections.
- When connecting to electric circuits or pulse-initiating equipment, open their related breakers. Do not make connections to live power lines.
- Make connections to the module first; then connect to the circuit to be monitored.
- Route power wires in a safe manner in accordance with good practice and local codes.

- Wear proper personal protective equipment including safety glasses and insulated gloves when making connections to power circuits.

- Ensure hands, shoes, and floor are dry before making any connection to a power line.
- Make sure the unit is turned OFF before making connection to terminals. Make sure all circuits are de-energized before making connections.

WARNING: To reduce the risk of fire, electrical shock, or physical injury, always connect the safety (or earth) ground before making any other connections.

WARNING: To reduce the risk of fire, electrical shock, or physical injury it is strongly recommended to fuse the voltage measurement inputs. Be sure to locate fuses as close to the source as possible.

WARNING: Replace fuse with the same type and rating to provide protection against risk of fire and shock hazards.

WARNING: In the event of repeated failure, do not replace the fuse again as a repeated failure indicates a defective condition that will not clear by replacing the fuse.

WARNING: Only qualified electrical personnel familiar with the construction and operation of this equipment and the hazards involved should install, adjust, operate, or service this equipment. Read and understand this manual and other applicable manuals in their entirety before proceeding. Failure to observe this precaution could result in severe bodily injury or loss of life.

6 TECHNICAL SUPPORT

For assistance and manual updates, contact Technical Support at the following locations:

North America:
Tel: 1-877-665-5666
Fax: 317 639-4279

Europe:
Tel: +353-21-4321266
Fax: +353-21-4321826

Web: <http://www.heapg.com> Web: <http://www.horner-apg.com>
Email: techspt@heapg.com Email: tech.support@horner-apg.com

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