SmartRail I/O – Ethernet Base
HE599ETX200

1   INTRODUCTION

SmartRail I/O is a real-time, modular I/O system – expanding the application of the OCS family of all-in-one controllers.   The SmartRail I/O Ethernet Base (ETX200) utilizes ethernet communications for the I/O connection with the OCS. The high-bandwidth, high-speed nature of Ethernet allows a significant amount of I/O to be added while maintaining fast I/O updates.

Any OCS Controller with a built-in 10/100 Ethernet port can utilize ETX200 Base units. Each Base can support up to 8 SmartRail I/O modules – addressed with up to 256 digital I/O and 32 analog I/O per base. The number of bases can expand literally to the limits of the OCS I/O reference table. These limits are currently set at 2048 digital in, 2048 digital out, 512 analog in, and 512 analog out.

The ETX200 features a built-in unmanaged Ethernet switch for convenience of wiring and system expansion. SmartRail I/O is not complex to configure – it utilizes Cscape (9.1 or later) in an easy, straight forward process.

> Note: The SmartRail I/O Ethernet base is NOT supported by the HE-XEC COM option module for the XLe & XLt series of all-in-one controllers.

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	Modbus/TCP
Inactivity Timeout	10sec
IP configuration	From Cscape, using Boot/p
Cscape version	9.1 or later
OCS Firmware version	12.70 or later
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)	32 (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 ETX200 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 ETX200 base has been installed on the DIN-rail.

| LED Indication	
LED	Meaning
RUN	Power ON, I/O Operating
I/O ERR	I/O Module Fault, or Missing I/O Module
TX	Transmitting Data to OCS
RX	Receiving Data from OCS
Port 1 & Port 2 LEDs	
Yellow	(solid) Normal media
Green	(flash) Normal TX/RX
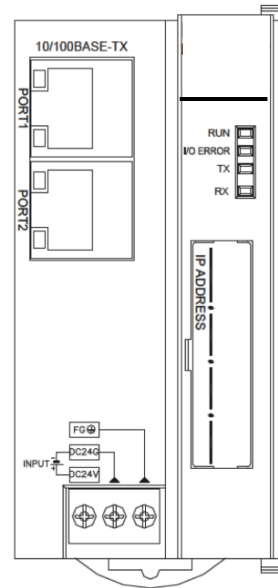
ETX200 Front View
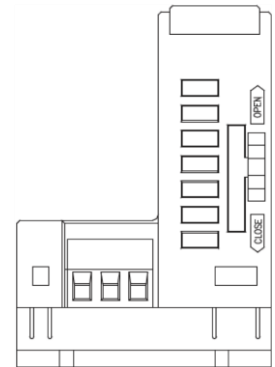
ETX200 Bottom View

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

1. Remove the cover (if present) for the expansion connector from the ETX200 base, and for all but the rightmost I/O module.
2. Make sure that the locks on the top and bottom of the ETX200 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 ETX200 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 ETX200 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 ETX200 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.
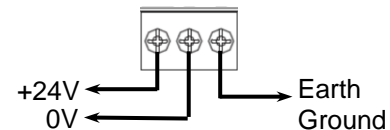
24VDC Power Supply & Earth Ground Terminals

3.3   Software Configuration

Each SmartRail ETX200 Base is configured from Cscape, under "Hardware Configuration". Cscape 9.1 or later is required. What follows is the general configuration procedure:

1. In Cscape, select "Hardware Configuration".
2. Make sure the OCS controller to be used in the application has been properly selected.
3. Select the "Ethernet I/O" Tab. If this tab is not present, it likely means the OCS controller doesn't support Ethernet SmartRail I/O, or that a Cscape version prior to 9.1 is in use.
4. Select "Add Base".
5. Assign the Base a convenient name, configurable in the upper left hand corner of the dialog box. This is just for reference.
6. In the "Device Mac ID" area, enter the Mac ID that is printed on the ETX200 Product Label.
7. If the Mac ID is not configured in Cscape, the OCS will NOT assign the IP address and Net Mask – and a third party Boot/p utility must be used.
8. Assign an IP address in the IPv4 format (eg 192.168.0.100). The Net mask is the same as that configured for the OCS in the OCS Ethernet configuration.
9. Assign a 16-bit Status Register to the Base. This is the OCS reference address where real-time diagnostic status for this ETX200 Base will be reported.
10. Assign starting I/O references for each I/O type. Boolean types must be on a word boundary (1, 17, 33, etc). Typical reference types are %I (digital inputs), %Q (digital outputs), %AI (analog inputs) and %AQ (analog outputs). Make sure the addresses selected do not conflict with I/O used elsewhere in the application. This completes the base configuration.
11. The Base just added is now summarized in the "Base Information" section. To add an I/O module, click "Add Module".
12. Select the desired I/O module to be added from the list, which is segregated by type (Digital In, Digital Out, etc.) through the use of Tabs. Click OK.
13. Click on the I/O module just added, and select "Configure Module". Set the parameters as desired for each module.
14. Sequentially add and configure I/O modules for each slot used (repeat steps 11-13 above).
15. Repeat steps 4-13 as many times as necessary to add all additional Bases as required.
16. Power Cycle the ETX base while connected to the network to finalize boot-p configuration

3.4 Startup Sequence

The OCS that is configured to control the SmartRail I/O will use the I/O configuration data (programmed in 3.3, above) to configure each ETX200 base. The following sequence is followed:

1. Upon power-up, the ETX200 will send periodic requests to the network asking for an IP address. This follows the Boot/P protocol convention.
2. Once in RUN mode, the OCS will check its I/O configuration database, looking for a matching MAC ID entry.
3. If a match is found, the OCS will use the Boot/P protocol to assign the appropriate IP address, Net Mask, and Default Gateway to the ETX200 Base.
4. Once all bases are assigned IP addresses, and the OCS is in RUN mode;
   a. The OCS will place the ETX200 base in RUN mode
   b. Modbus/TCP communications will begin between the ETX200 and the OCS
   c. Input and Output references will be updated.

3.5 Troubleshooting

The two primary tools for troubleshooting the SmartRail I/O are the LED indicators (detailed on page 1 of this document) and the ETX200 Base Status Register (assigned in Step 9 of Section 3.3, above). *The Status Register meaning is shown below and is meaningful only in RUN mode.*

ETX200 Base Status Registers			
Value	Meaning	Value	Meaning
0	Communications OK	-106	OCS Ethernet Error
-103	Connection Timeout	-204	No Response
-104	No I/O Present	-205	Invalid Response
-105	Invalid Configuration	-208	Exception Response

4 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.

> **WARNING:** To avoid the risk of electric shock or burns, 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.

- All applicable codes and standards need to be followed in the installation of this product.
- For I/O wiring (discrete), use the following wire type or equivalent: Belden 9918, 18 AWG or larger.

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.
- Before each use, inspect all cables for breaks or cracks in the insulation. Replace immediately if defective.

5   TECHNICAL SUPPORT

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

North America: **Europe:**
Tel: 317 916-4274   Tel: +353-21-4321266
Fax: 317 639-4279   Fax: +353-21-4321826
Web: http://www.heapg.com   Web: http://www.horner-apg.com
Email: techsppt@heapg.com   Email: tech.support@horner-apg.com