SmartRail I/O – CsCAN Base
HE599CNX100

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 CsCAN Base (CNX100) utilizes CsCAN communications for the I/O connection with the OCS. The highly efficient, and highly reliable nature of CsCAN allows a significant amount of I/O to be added while maintaining fast I/O updates.

Any modern OCS Controller with a built-in CsCAN port can utilize CNX100 Base units. Each CNX100 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 supported by each OCS controller is currently 16.

The CNX100 network wiring is typically a daisy-chain architecture, although trunkline-dropline architectures are also supported. Entire bases of I/O may be hot-swapped to/from the CsCAN network, but individual I/O modules are not hot-swappable. SmartRail I/O is not complex to configure – it utilizes Cscape (9.1 SP3 or later) in an easy, straightforward process.

> **Note: The SmartRail CsCAN base is NOT supported by Classic OCS Controllers such as miniOCS, OCS100 and OCS200.**

2   SPECIFICATIONS

General Specifications	
Required Power (Steady State)	400mA @ 24 VDC
Primary Power Range	19.2 – 28.8 VDC
Output Power	1500mA @ 5 VDC
Relative Humidity	5 to 95% Non-condensing
Operating Temp.	-5°C to +50°C
Storage Temp.	-40°C to +75°C
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	Ordinary location
Communications Specifications	
Data Transmission	CsCAN
Flow Control	CAN bitwise arbitration
Standard Plug	Screw-type 5pin Removable Terminal Block
Optional Plug	**Double CsCAN Plug HE200ACC500**
Architecture	Daisy-chain or Trunkline-Dropline
Node ID config	Digital Rotary Switches (2)
Legal Node Ids	1 to 79 decimal
Inactivity Timeout	Configurable from Cscape
Cscape version	9.1 (SP3) or later
OCS Firmware	Version 12.75 or later
I/O Specifications	
Compatible I/O	SmartRail I/O
Bases Supported (per system)	16
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 CNX100 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 CNX100 base has been installed on the DIN-rail.

CsCAN Double Plug HE200ACC500 (optional)

CNX100 Front View   CNX100 Bottom View
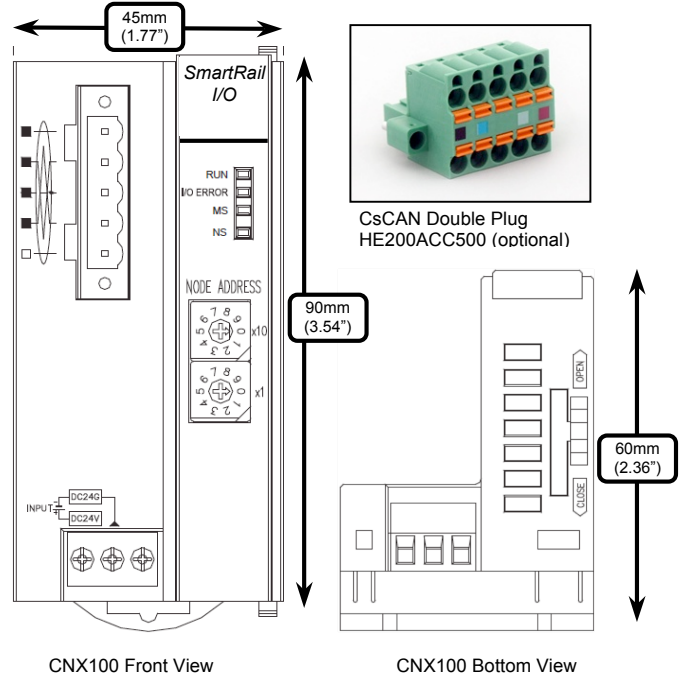
I/O modules are physically added with the following procedure:

1. Remove the cover (if present) for the expansion connector from the CNX100 base, and for all but the rightmost I/O module.
2. Make sure that the locks on the top and bottom of the CNX100 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 CNX100 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 CNX100 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 CNX100 Base requires 24VDC power, and an appropriate Earth Ground connection for normal operation. The CsCAN connector is a 5pin, removable terminal strip. The network connection is self-powered, in that no power is drawn by the CNX100 base from the CsCAN (V+) terminal. All power required to operate the bas is drawn from the 3pin 24Vdc Power connector (see below).
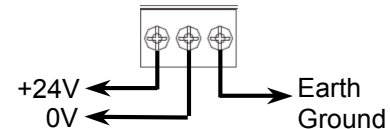

24VDC Power Supply & Earth Ground Terminals

3.3   Software Configuration

Each SmartRail CNX100 Base is configured from Cscape, under "Hardware Configuration". Cscape 9.1 (SP3 or later) is required, and OCS firmware version 12.75 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 "CsCAN I/O" Tab.
4.   Click the "Add" Button
5.   Select "HE599CNX100" in the SmartRail tab
6.   Click the "OK" button. This opens the dialog below:
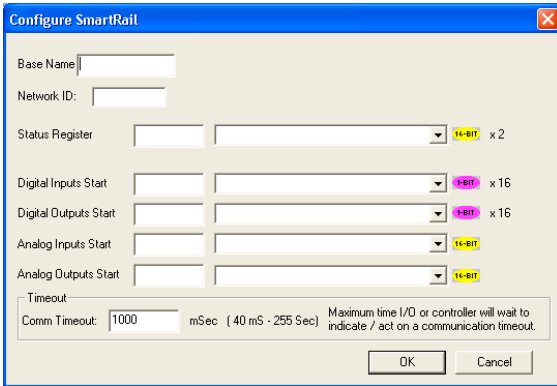
> *Base Name* – any descriptive text (up to 15 characters)
> *Network ID* – unique CsCAN ID (1-79 decimal)
> *Status Register* – Location where two consecutive words are reported
> *Digital Inputs / Digital Outputs / Analog Inputs / Analog Outputs Start* – starting locations for each type of I/O for that base.
> *Comm Timeout* – Maximum amount of time the CNX100 or OCS will wait to act on a communications timeout (40 to 255000 milliseconds)

7.   After entering all the required information (above), click "OK". At this point, the following Hardware Configuration dialog will appear:
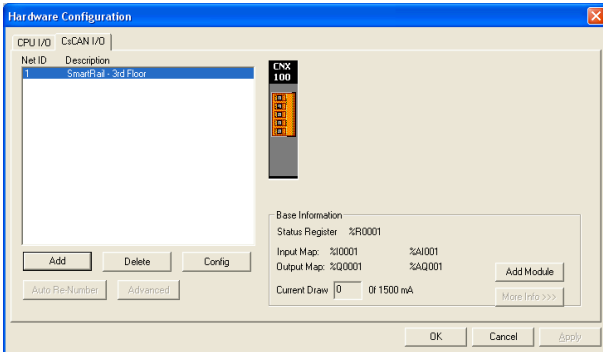
8.   Now up to 8 modules can be added via the "Add Module" button. As I/O modules are added the Input Map, Output Map, and Current Draw are updated, showing the accumulated I/O Module Information. More details regarding each module can be viewed via the "More Info" button.
9.   Right clicking on an I/O module will allow detailed configuration to be performed, as follows:
     a.   Digital Input modules can be configured to update on a change of state (typical) or periodically (rare). Input filtering can also be adjusted from the default of 1mS.
     b.   Digital Output modules can optionally be configured to hold last state (in groups of 8) in Stop/Idle mode.
     c.   Analog Input modules can be configured with an update rate of 10mS to 255 seconds. Analog Inputs also have configurable data type and range which varies by module type.
     d.   Analog Output modules have configurable type and range, and also can have Stop/Idle behavior adjusted to Hold Last State, or go to Minimum (default), Medium or Maximum value.
10. Press "OK" to complete the process.

3.4   Troubleshooting

The two primary tools for troubleshooting the SmartRail I/O are the LED indicators and the CNX100 Base Status Registers – assigned during Cscape configuration.

3.4.1   LED Indicators

During normal operation, the RUN, MS & NS LEDs will be solid green, and the I/O LED will not be illuminated.

LED	State	Meaning
RUN (Power)	Off	Base Unit is powered down
	Solid Green	Base Unit is powered up
I/O (I/O System)	Solid Red	I/O interface power-on-self-test failed
	Blinking Red	I/O Module error detected (IOE_n status bit On)
	Off	I/O Modules are running normally
MS (Main System)	Solid Red	Power-on-self-test failed
	Blinking Red	Configuration mismatch error (CME_n status bit On)
	Blinking Green	Waiting to be configured (NO_CFG status bit On)
	Solid Green	Base Unit is running normally
NS (Network System)	Solid Red	Network Ack or Duplicate ID test failed
	Blinking Red	Network ID test failed
	Blinking Green	Network Life Timeout expired (LIFE_ERR status bit On)
	Solid Green	Network is running normally

3.4.2   Status Registers

First 16-bit Status Word							
Bits							
16	15	14	13-5	4	3	2	1
SEND_NOW	PUP_ERR	LIFE_ERR	0	BAD_FW	NOT_SR	NO_CFG	Offline

• SEND_NOW can be asserted by the application to force the OCS to immediately update all digital and analog outputs. This is an advanced feature not normally used.
• PUP_ERR – indicates the base is waiting for configuration after a power up
• LIFE_ERR – indicates the base unit has lost comms with the controlling OCS
• BAD_FW – always 0 for SmartRail
• NOT_SR – always 0 for SmartRail (indicates a SmartStix or SmartBlock device)
• NO_CFG – indicates the base unit is waiting to be configured
• Offline – indicates no device was found with the configured Network ID.

Second 16-bit Status Word							
Bits							
8	7	6	5	4	3	2	1
CME_8	CME_7	CME_6	CME_5	CME_4	CME_3	CME_2	CME_1
16	15	14	13	12	11	10	9
IOE_8	IOE_7	IOE_6	IOE_5	IOE_4	IOE_3	IOE_2	IOE_1

• If the CME_n bit is ON, there is a Configuration Mismatch Error in SmartRail slot n.
• If the IOE_n bit is ON, there is an I/O Error in SmartRail slot n. Typical I/O errors would include an open input channel, or an illegal analog output value.

4   SAFETY

When found on the product, the following symbols specify:

<table>
<tr><td></td><td>**Warning:** Consult user documentation.</td><td></td><td>**Warning:** Electrical Shock Hazard.</td></tr>
</table>

> **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:
Tel: 317 916-4274
Fax: 317 639-4279
Web: http://www.heapg.com
Email: techsppt@heapg.com

Europe:
Tel: +353-21-4321266
Fax: +353-21-4321826
Web: http://www.horner-apg.com
Email: tech.support@horner-apg.com