HORNER
AUTOMATION GROUP

SMARTRAIL DATASHEET

HE599CNX100

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 (HE599CNX100) utilizes CsCAN communications for the I/O connection with the OCS. Any modern OCS Controller with a built-in CsCAN port can utilize HE599CNX100 Base units. Each HE599CNX100 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 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.

1   TECHNICAL SPECIFICATIONS

SPECIFICATIONS

GENERAL SPECIFICATIONS		COMMUNICATION SPECIFICATIONS	
Required Power (Steady State)	400mA @ 24 VDC, max **CLASS 2 POWER SUPPLY ONLY**	Data Transmission	CsCAN
Primary Power Range	11 – 28 VDC	Flow Control	CAN Bitwise Arbitration
Output Power	1500mA @ 5 VDC	Connector	5-pin Removable Terminal Block
Terminal Type	M3 Screw Type, Removable	Architecture	Daisy-chain or Trunkline-Dropline
Optional Terminals	HE200ACC500 (spring-clamp double plug) HE200ACC512 (m12 adapter)	Node ID Configuration	Digital Rotary Switches (2)
Terminal Torque Rating	0.6 N-m (5.2 in-lbs)	Legal Node IDs	1 to 79 decimal
Accepted Wire Size	14-26AWG (copper)	Inactivity Timeout	Configurable from Cscape
Wire Stripping Length	7mm	Cscape Version	9.1 (SP3) or later
Relative Humidity	5 to 95% Non-condensing	OCS Firmware Version	12.75 or later
Operating Temperature	0°C to +55°C	I/O SPECIFICATIONS	
Storage Temperature	-25°C to +70°C	Compatible I/O	SmartRail I/O
Dimensions (H x W x D)	90 x 45 x 60mm [3.54 x 1.77 x 2.36 in]	Bases Supported (per system)	16
Weight	114g [4oz]	Modules Supported (per base)	8
Vibration & Shock	Per IEC1131-2	Digital I/O, max (per base)	256 (Inputs + Outputs)
Noise Immunity	Per IEC1131-2, IEC61000-4-2, IEC61000-4-3, IEC61000-4-4	Analog I/O, max (per base)	32 (Inputs + Outputs)
CERTIFICATIONS (CE)		I/O Limitations (per system)	2048 Digital In, 2048 Digital Out, 512 Analog In, 512 Analog Out
USA: https://hornerautomation.com/certifications/ Europe: https://www.hornerautomation.eu/support/certifications-2/		Power Supplied for I/O modules	1500mA @ 5V DC maximum

2   I/O MODULE 5V POWER USAGE (1500mA total available)

8 DC In	16 DC In	32 DC In	8 DC Out
DIM510 30mA	DIM610 40mA	DIM710 50mA	DQM506 40mA
16 DC Out	**32 DC Out**	**8 Relay Out**	**16 Relay Out**
DQM606 60mA	DQM706 120mA	DQM502 230mA	DQM602 420mA
8 DC + 8 Relay	**4 Analog In**	**4 RTD In**	**4 Thermocouple In**
DIQ512 250mA	ADC170 50mA	RTD100 100mA	THM100 100mA
4 Analog Out (mA)	**4 Analog Out (V)**	**2 Analog In + 2 Analog Out**	
DAC106 120mA	DAC101 70mA	MIX116 100mA	

3   INSTALLATION

The HE599CNX100 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). NOTE: The distance between wiring duct and surrounding modules should be at least 50mm apart.

Modules can be added either before or after the HE599CNX100 base has been installed on the DIN-rail.

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

1. Remove the cover (if present) for the expansion connector from the base, and for all but the rightmost I/O module.
2. Make sure that the locks on the top and bottom of the 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 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 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.

4   WIRING

The SmartRail HE599CNX100 Base should be powered independently from the power supplied to the SmartRail I/O modules themselves. This offers optimum noise immunity and helps maintain galvanic isolation between the CsCAN Network and I/O Power. The recommended approach is to power the CsCAN network from one power supply, and I/O devices from at least one separate power supply. The SmartRail bases are powered from the CsCAN Network.

To power the HE599CNX100, use only the 5-pin removable connector. Leave the 3- pin fixed connector disconnected.

For network wiring, the recommended approach is to daisy-chain each node, with a continuous connection for shield. The center pin of the CAN port does not provide a connection to earth ground. The cable shield should be connected to earth ground at one location only – usually at the DC supply powering the network. The network DC supply should have its V- terminal connected directly to earth ground.

If multiple DC supplies are used to power the network, the V+ from any one supply should be connected only to nodes it is powering – disconnected from other sections powered by other supplies. The V- connection should be continuous across the entire network, although V- should connect to earth at exactly one point only.

At each end of the network, a 121Ω, 1/4W, 1% resistor should be used for termination – installed between the CAN_H and CAN_L terminals. Only appropriate Thin (for <100m) or Thick (<500m) cabling should be used (assuming 125 KBaud). This cable is available from a variety of sources, including Horner APG which offers both Thin (HE200CBL100) and Thick (HE200CBL500) varieties.

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5 DIP SWITCH SETTINGS

NOTE: Dip Switches 1 and 2 should remain OFF.

Dip Switch 3	Dip Switch 4	CsCAN Baud Rate
Down (OFF)	Down (OFF)	125kBd
Down (OFF)	Up (ON)	250kBd
Up (ON)	Down (OFF)	500kBd
Up (ON)	Up (ON)	1Mbd

6 LED INDICATORS

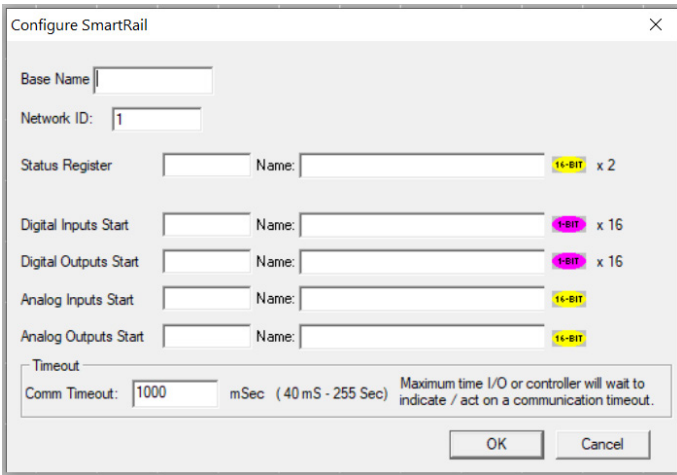| LED	State	Meaning
RUN (Power)	Off	Base Unit is powered down
	Solid Green	Base Unit is powered up
I/O (I/O System)	Solid Red	I/O interface power-on-self-test failed
	Blinking Red	I/O Module error detected (IOE_n status bit On)
	Off	I/O Modules are running normally
MS (Main System)	Solid Red	Power-on-self-test 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

7 NETWORK ID

Set a unique Network ID by inserting a small Phillips screwdriver into the two identical switches. Select the Network ID from 01 to 79. The 00 setting is illegal, and the 80-89 setting are interpreted by the hardware as 00-19.

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Each SmartRail HE599CNX100 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 following dialog:
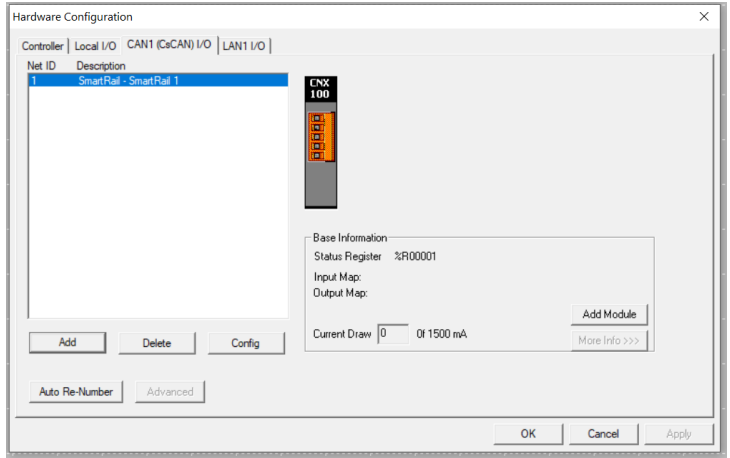
Base Name – any descriptive text (up to 15 characters)
Network ID – unique CsCAN ID (1-79 decimal)
Status Register – Location where two consecutive words are reported
Digital Inputs / Digital Outputs / Analog Inputs / Analog Outputs Start – starting locations for each type of I/O for that base.
Comm Timeout – Maximum amount of time the HE599CNX100 or OCS will wait to act on a communications timeout (40 to 255000 ms).

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.

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9 STATUS REGISTERS

First 16-Bit Status Word								
16	11-15	10	9	5-8	4	3	2	1
SEND_NOW	0	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 had powered down and is now powered up again. This is a "sticky bit", which should be cleared by the OCS application.

LIFE_ERR – Indicates the controlling OCS had stopped communicating with the base and has now resumed that communication. This will happen if the OCS is power-cycled, placed in STOP mode or has its application updated. While the OCS is down, the base sets all of its outputs to their default states. This is a "sticky bit", which should be cleared by the OCS application.

BAD_FW – Always 0 for SmartRail

NOT_SR – Always 0 for SmartRail (indicates a SmartStix or SmartBlock device)

NO_CFG – Indicates the base is waiting to be configured

Offline – Indicates no device was found with the configured Network ID.

Second 16-Bit Status Word							
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. Only the RTD100 (open channel), THM100 (open channel) and MIX116 (illegal analog output value) support the I/O Error Diagnostic.

10 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

AVERTISSEMENT - RISQUE D'EXPLOSION -Ne débranchez pas l'équipement tant que l'alimentation n'a pas été coupée ou que la zone n'est pas dangereuse.

WARNING - EXPLOSION HAZARD - Substitution of any component may impair suitability for Class I, Division 2

AVERTISSEMENT - RISQUE D'EXPLOSION -Le remplacement de tout composant peut nuire à la compatibilité avec la classe 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.

AVERTISSEMENT - DOMMAGES POSSIBLES À L'ÉQUIPEMENT - Coupez l'alimentation de la base d'E / S et de tout équipement périphérique connecté à ce système local avant d'ajouter ou de remplacer ce module ou tout autre module.

a. All applicable codes and standards should be followed in the installation of this product.
b. Shielded, twisted-pair wiring should be used for best performance.
c. Shields should be grounded at one end only, preferably at the end providing the best noise shunting.
d. Use the following wire type or equivalent: Belden 8441.

11 PART NUMBER

The global part number is **HE599CNX100.**

12 TECHNICAL SUPPORT

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

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