IMO
The World's Finest

i3

Intelligent Control Station

XCL-BSSA Setup Tutorial

Think inside the box

Contents

Information in this document is subject to change without notice and does not represent a commitment on the part of IMO Precision Controls.

SAFETY GUIDELINES

Safety Warnings and Guidelines

When found on the product, the following symbols specify:

Warning: Consult user documentation.

Warning: Electrical Shock Hazard.

WARNING – EXPLOSION HAZARD – Do not disconnect equipment unless power has been switched off or the area is known to be non-hazardous

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 – EXPLOSION HAZARD – Substitution of components may impair suitability for Class I, Division 2

WARNING - The USB parts are for operational maintenance only. Do not leave permanently connected unless area is known to be non-hazardous

WARNING – EXPLOSION HAZARD - BATTERIES MUST ONLY BE CHANGED IN AN AREA KNOWN TO BE NON-HAZARDOUS

WARNING - Battery May Explode If Mistreated. Do Not Recharge, Disassemble or Dispose of in Fire

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.

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

a. Connect the green safety (earth) ground first before making any other connections.
b. When connecting to electric circuits or pulse-initiating equipment, open their related breakers. Do not make connections to live power lines.
c. Make connections to the module first; then connect to the circuit to be monitored.
d. Route power wires in a safe manner in accordance with good practice and local codes.
e. Wear proper personal protective equipment including safety glasses and insulated gloves when making connections to power circuits.
f. Ensure hands, shoes, and floor is dry before making any connection to a power line.
g. Make sure the unit is turned OFF before making connection to terminals. Make sure all circuits are de-energized before making connections.
h. Before each use, inspect all cables for breaks or cracks in the insulation. Replace immediately if defective.

Grounding

Grounding is covered in various chapters within this manual.

INTRODUCTION

Smart I/O is a real-time, modular I/O system – expanding the application of the *i³* family of all-in-one controllers. The Smart I/O *i*CAN adapter (XCL-BSSA) utilizes *i*CAN communications for the I/O connection with the *i³*. The highly efficient and highly reliable nature of *i*CAN allows a significant amount of I/O to be added while maintaining fast I/O updates.

Any *i³* Controller with a CAN port can utilize XCL-BSSA adapter. Each adapter can support up to 8 XGB I/O modules – addressed with up to 256 digital I/O and 32 analog I/O per base. The maximum number of bases supported by an *i³* controller is currently 16.

The Smart I/O 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 CANopen network, but individual I/O modules may not be hot-swapped on the base. Smart I/O is not complex to configure – it utilizes *i³ Configurator* (9.50 or later) in an easy, straightforward process.

INSTALLATION

Physical Installation

The XCL-BSSA 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).

XCL-BSSA, with 8 I/O modules installed.

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 adapter are all the way to the front in the "Open" position.
3. Align the first I/O module to the right of the adapter using the alignment features in the plastic case.
4. Upon mounting the module securely, slide the locks on the top and bottom of the base all the way to the back in the "Close" position.
5. Repeat steps 2-4 above until all modules are mounted.
6. Hang the adapter and all the affixed I/O modules on the DIN-rail, and secure them underneath by sliding the DIN-rail latches to the "up" position.

Wiring

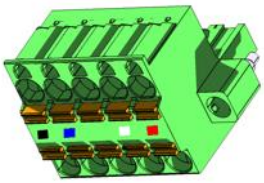
The adapter should be powered independently from the power supplied to the Smart I/O modules themselves. This offers optimum noise immunity, and helps maintain galvanic isolation between the CAN Network and I/O Power. The recommended approach is to power the CAN network from one power supply, and I/O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

The adapter provides two locations to land power wiring – a 5-pin removable network connector, and a 3-pin fixed power connector. While either can be used to power the base, it is recommended to 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. Do not connect shield to any node, but connect it directly 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 one point only.

At each end of the network, a 121 ohm, ¼ watt, 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).

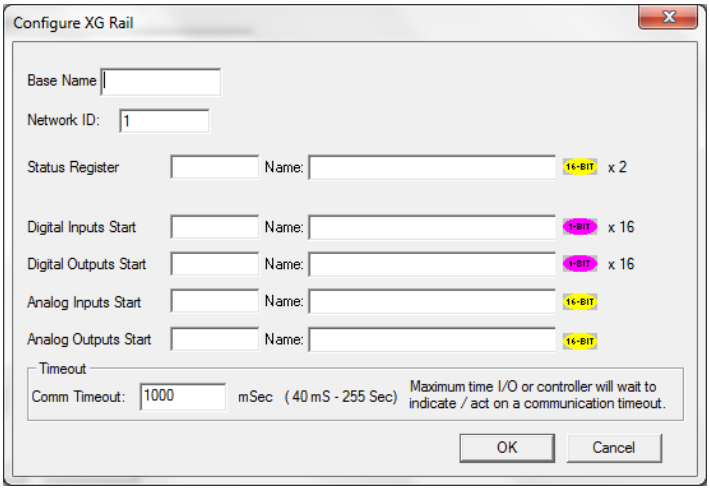


CAN Port Pins			
Pin	**Signal**	**Signal Description**	**Direction**
1	V-	CAN and Device Ground - Black	–
2	CN_L	CAN Data Low - Blue	In/Out
3	SHLD	Shield Ground - None	–
4	CN_H	CAN Data High - White	In/Out
5	V+	Positive DC Voltage Input (10-30VDC) - Red	–

Software Configuration

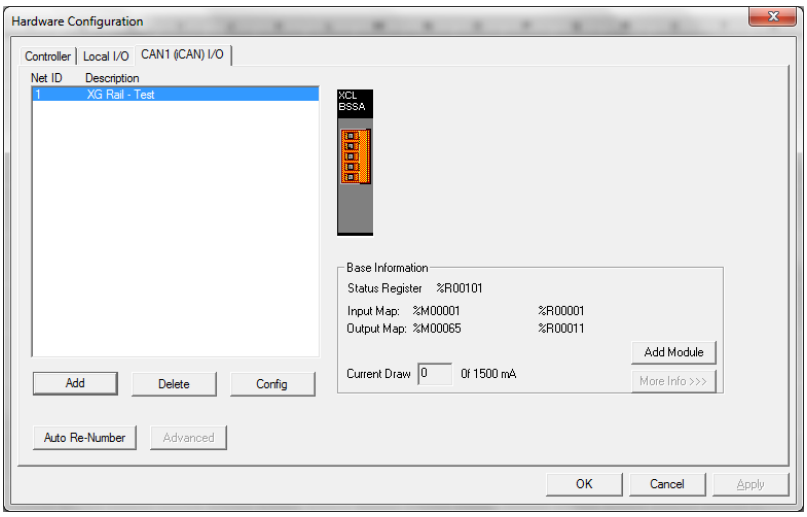
Each Smart I/O adapter is configured from *i³ Configurator*, under "Hardware Configuration". *i³ Configurator* 9.4 or later is required, and *i³* firmware version 12.98 or later is required. The following is the general configuration procedure.

1. In *i³ Configurator*, select "Hardware Configuration".
2. Ensure that the *i³* controller to be used in the application has been selected.
3. Select the "*i*CAN I/O" Tab.
4. Click the "Add" Button
5. Select "*i*CAN I/O base" in the XG Rail I/O tab
6. Click the "OK" button. The following dialog will open:



Base Name – any descriptive text (up to 15 characters)
Network ID – unique CAN 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 adapter.
Comm Timeout – Maximum amount of time the *i³* will wait to act on a communications timeout (40 to 255000 milliseconds)

7. Having entered 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 behaviour adjusted to Hold Last State, or go to Minimum (default), Medium or Maximum value.
10. Press “OK” to complete the process.

Troubleshooting

The two primary tools for troubleshooting the Smart I/O are the LED indicators and the adapter Status Registers – assigned during *i³* Configurator configuration.

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

Status Registers

First 16-bit Status Word								
Bits								
16	11-15	10	9	5-8	4	3	2	1
SEND	0	PUP_ERR	LIFE_ERR	0	BAD_FW	NOT_SR	NO_CFG	Offline

- SEND_NOW – can be asserted by the application to force the *i³* 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 "Set bit", which should be cleared by the *i³* application.
- LIFE_ERR – indicates the controlling *i³* had stopped communicating with the base and has now resumed that communication. This will happen if the *i³* is power-cycled, placed in STOP mode or has its application updated. While the *i³* is down, the base sets all of its outputs to their default states. This is a "set bit", which should be cleared by the *i³* application.
- BAD_FW – always 0 for Smart I/O
- NOT_SR – always 0 for Smart I/O
- 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							
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 Smart I/O slot n.
- If the IOE_n bit is ON, there is an I/O Error in Smart I/O slot n. Only the RD04A (open channel), TC04S (open channel) and AH04A (output value) support the I/O Error Diagnostic.

NOTES

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