IMO

*i*3A Lite User Manual

Solutions with you in mind

User Manual for i³A Lite

PREFACE

This manual explains how to use the *i*³A Lite.

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LIMITED WARRANTY AND LIMITATION OF LIABILITY

IMO Precision Controls Ltd ("IMO") warrants to the original purchaser that the *i*³A Lite module manufactured by IMO is free from defects in material and workmanship under normal use and service. The obligation of IMO under this warranty shall be limited to the repair or exchange of any part or parts which may prove defective under normal use and service within three (3) years from the date of manufacture, such defect to be disclosed to the satisfaction of IMO after examination by IMO of the allegedly defective part or parts. THIS WARRANTY IS EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES EXPRESSED OR IMPLIED INCLUDING THE WARRANTIES OF MERCHANTABILITY AND FITNESS FOR USE AND OF ALL OTHER OBLIGATIONS OR LIABILITIES AND IMO NEITHER ASSUMES, NOR AUTHORIZES ANY OTHER PERSON TO ASSUME FOR HE-APG, ANY OTHER LIABILITY IN CONNECTION WITH THE SALE OF THIS *i*³A Lite module. THIS WARRANTY SHALL NOT APPLY TO THIS *i*³A Lite module OR ANY PART THEREOF WHICH HAS BEEN SUBJECT TO ACCIDENT, NEGLIGENCE, ALTERATION, ABUSE, OR MISUSE. IMO MAKES NO WARRANTY WHATSOEVER IN RESPECT TO ACCESSORIES OR PARTS NOT SUPPLIED BY HE-APG. THE TERM "ORIGINAL PURCHASER", AS USED IN THIS WARRANTY, SHALL BE DEEMED TO MEAN THAT PERSON FOR WHOM THE *i*³A Lite module IS ORIGINALLY INSTALLED. THIS WARRANTY SHALL APPLY ONLY WITHIN THE BOUNDARIES OF THE CONTINENTAL UNITED STATES.

In no event, whether as a result of breach of contract, warranty, tort (including negligence) or otherwise, shall IMO or its suppliers be liable of any special, consequential, incidental or penal damages including, but not limited to, loss of profit or revenues, loss of use of the products or any associated equipment, damage to associated equipment, cost of capital, cost of substitute products, facilities, services or replacement power, down time costs, or claims of original purchaser's customers for such damages.

To obtain warranty service, return the product to your distributor with a description of the problem, proof of purchase, postpaid, insured, and in a suitable package.

ABOUT PROGRAMMING EXAMPLE

Any example programs and program segments in this manual or provided on accompanying diskettes are included solely for illustrative purposes. Due to the many variables and requirements associated with any installation, IMO cannot assume responsibility or liability for actual use based on the examples and diagrams. It is the sole responsibility of the system designer utilizing the *i³A Lite* module to appropriately design the end system, to appropriately integrate the *i*³A Lite module and to make safety provisions for the end equipment as is usual and customary in industrial applications as defined in any codes or standards which apply.

NOTE: The programming examples shown in this manual are for illustrative purposes only.
Proper machine operation is the sole responsibility of the system integrator.

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CHAPTER 1: SAFETY / COMPLIANCE

1.1 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 RECHARD, 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 manual 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.

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 floors are 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.

1.2 Grounding

Grounding is covered in various chapters within this manual.

1.3 Compliance

To check for compliance and updates, visit the IMO website.
IMO Precision Controls Ltd: https://www.imopc.com

CHAPTER 2: INTRODUCTION

2.1 Visual Overview of the *i*³A Lite

Figure 2.1 – Visual Overview of the *i*³A Lite

2.2 Where to Find Information about the *i*³A Lite

a) **Datasheet – The datasheet is the first document to refer to for key information related to specific *i*³A Lite models.**

1. The datasheets for all *i*³A Lite models are available on the IMO website.
2. Datasheets contain pin-outs, jumper settings, and other model specific information.

b) **User Manual – This manual provides general information that is common to *i*³A Lite models and can be downloaded from our website.** Visit the IMO website to obtain user documentation and updates.
IMO Precision Controls Ltd: http://www.imopc.com

2.3 Four Main Types of Information are covered in this Manual

a) Safety and Installation guidelines / instructions (Mechanical and Electrical)
b) Descriptions of hardware features – Serial ports, Removable Media, Communications, etc.
c) Configuration and Use of the *i*³A Lite
d) Maintenance and Support

2.6 Connectivity to the i³A Lite

The *i*³A Lite has excellent capability for connecting to a variety of devices. The diagram below shows some examples of devices that can be used with the *i*³A Lite.

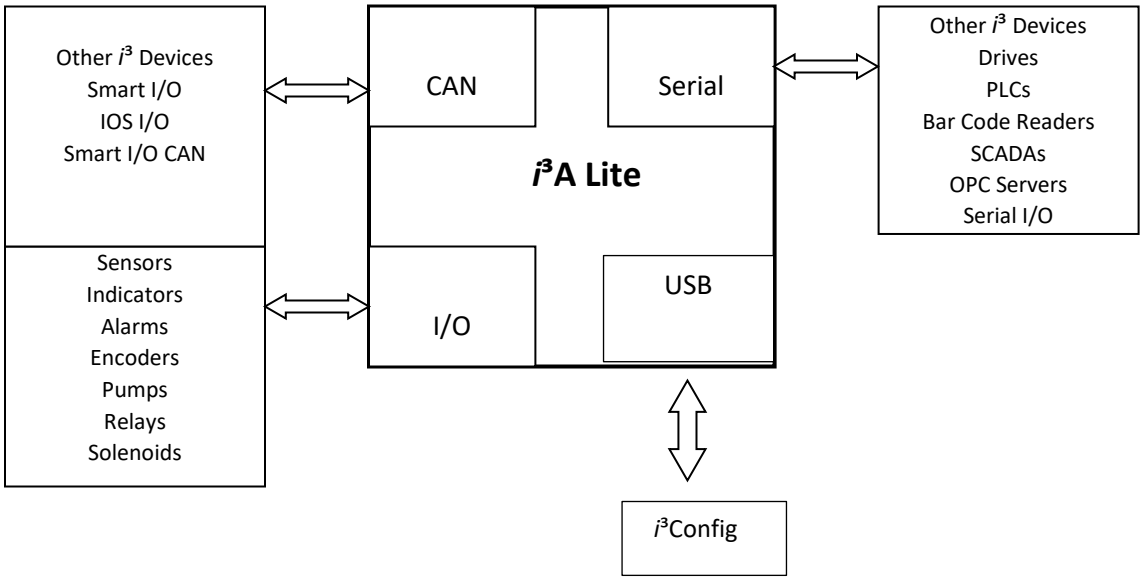


Figure 2.2 – Visual Overview of *i*³A Lite Connectivity

2.7 Features of the *i*³A Lite

The *i*³A Lite are all-in-one industrial control devices. They combine control, user interface, I/O and networking into a single, integrated package. Unique features of the *i*³A Lite include the following.

- Small, sleek profile saves space and resources.
- Physical Specifications
    - mm: 89.76 tall x 119.18 wide x 35.8 deep
    - inches: 3.53 tall x 4.69 wide x 1.41 deep
    - weight: 270 g / 9.5 oz.
- Bright monochrome display
- Display of complex graphical objects including trends, gauges, meters and animations
- Advanced control capabilities including floating point, multiple auto-tuning PID loops and string handling capabilities
- Intuitive interface
- Removable media for storage of programs, data logging, or screen captures
- *i*CAN networking port (optional) for communication with remote I/O, other controllers or PCs
- *i*³ configurator programming software that allows all aspects of the *i*³A Lite to be programmed and configured from one integrated application
- Fail – Safe System which allows an application to continue running in the event of "Soft" failures such as (Battery power loss or Battery Backed register RAM / Application Flash corruption)
- Clone Unit allows the user to "clone" the *i*³. This feature "clones" application program and unit settings stored in Battery backed RAM of an *i*³. It can then be used to clone a different *i*³ (but must be the exact same model).
- Suited for most applications across a diverse range of industries

2.8 Accessories

Please visit the IMO Control Accessories website for communication, programming, and I/O accessories.

IMO Precision Controls Ltd: https://www.imopc.com/products/97660000

CHAPTER 3: MECHANICAL INSTALLATION

NOTE: The datasheet is the first document to refer to for model-specific information related to *i*³A Lite models such as pin-outs, jumper settings, and other key installation information.
Visit the IMO websites to obtain datasheets, user documentation, and updates.

3.1 Mounting Overview

The mechanical installation greatly affects the operation, safety, and appearance of the system. Information is provided to mechanically install the unit such as cut-out sizes, mounting procedures, and other recommendations for the proper mechanical installation of the unit.

3.2 Mounting Procedures (Installed in a Panel Door)

Once the panel design has been completed using the criteria and suggestions in the following sections, use the following steps to panel mount the *i*³*A* Lite.

NOTE: Unit comes with composite clips, which are tested for typical wash down, shock, and vibration. If metal mounting clips are needed, they can be ordered at the IMO Automation website.

1. Carefully locate an appropriate place to mount the *i*³A Lite. Be sure to leave enough room at the top of the unit for insertaion. Remove the microSD card to prevent damage to the panel edge.
2. Carefully cut the host panel per the measurements found in the datasheet .
3. Dimensions can also be found below in Section 3.5. If the opening is too large, water may leak into the enclosure, potentially damaging the unit. If the opening is too small, the *i*³ may not fit through the hole without damage.
4. Remove any burrs and/or shape edges and ensure the panel is not warped in the cutting process.
5. Make sure the gasket is installed on the *i*³A Lite and is free from dust and debris. Check that the corners of the gasket are secure.
6. Pass the unit through the panel.
7. Insert each of the four (**4**) mounting clips into the slots in the i³A Lite case. One composite plastic clip should be installed on each corner. Lightly tignten each screw so the clip is held in place.
8. Tighten the screws on the clips such that the gasket is compressed against the panel. Recommended torque is 2-3 in-lbs (0.23 – 0.34 Nm). If metal mounting clips are used in place of the plastic composite mounting clips, the recommended torque is 4-8 in-lbs (0.45-0.90 Nm).
9. Connect communications cables to the serial port, USB ports, and CAN port as required.

3.3 Mounting Clip Locations

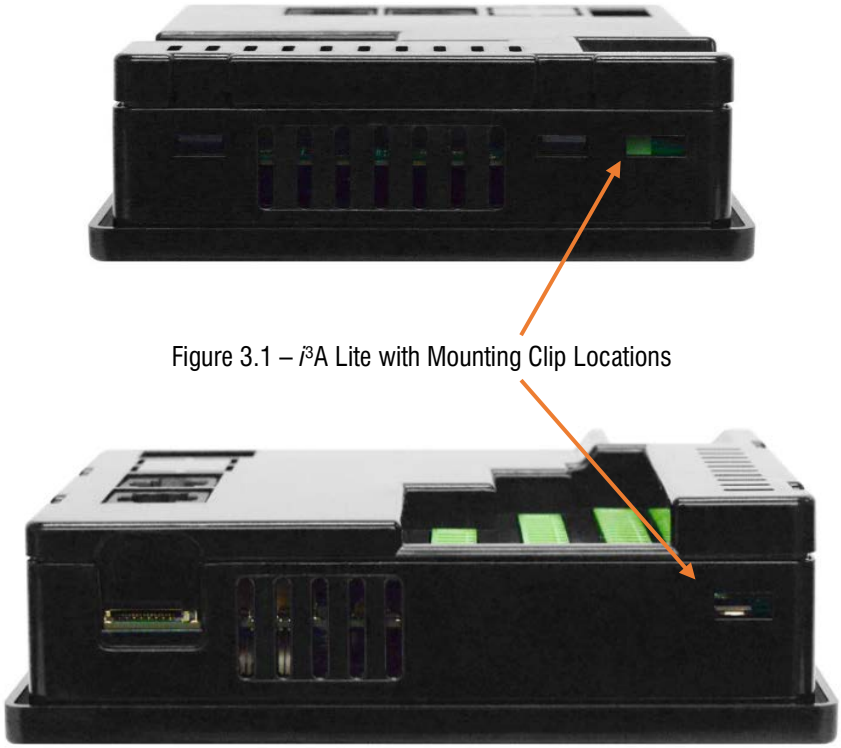


Figure 3.1 – *i*³A Lite with Mounting Clip Locations

3.4 Mounting Orientation

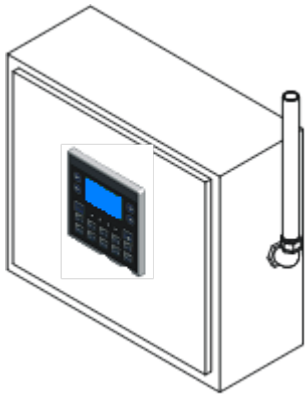


Figure 3.2 – Orientation of *i*³A Lite

NOTE: For panel mounting—The orientation shown provides for optimum readability screen and ease of use of the keypad.

3.5 Panel Cutout

For installations requiring NEMA4X liquid and dust protection, the panel cutout should be cut with a tolerance of +/- 0.005" (0.1 mm).

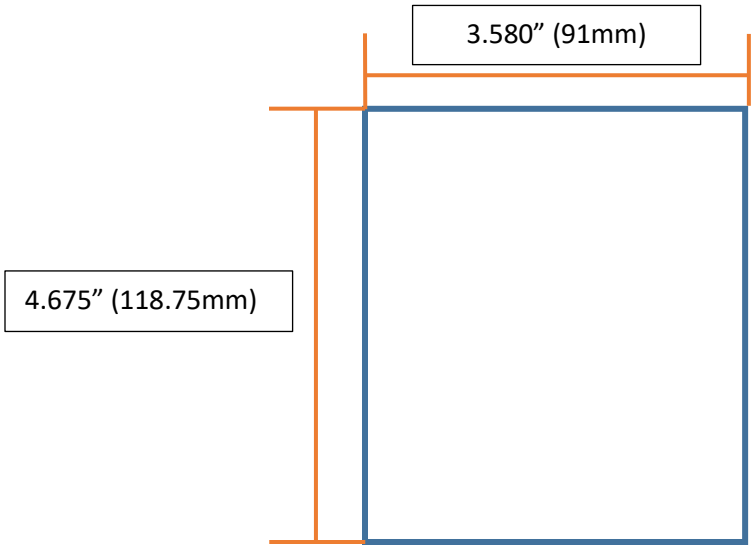


Figure 3.3 – Panel Cutout Tolerances

3.6 *i*³A Lite Dimensions

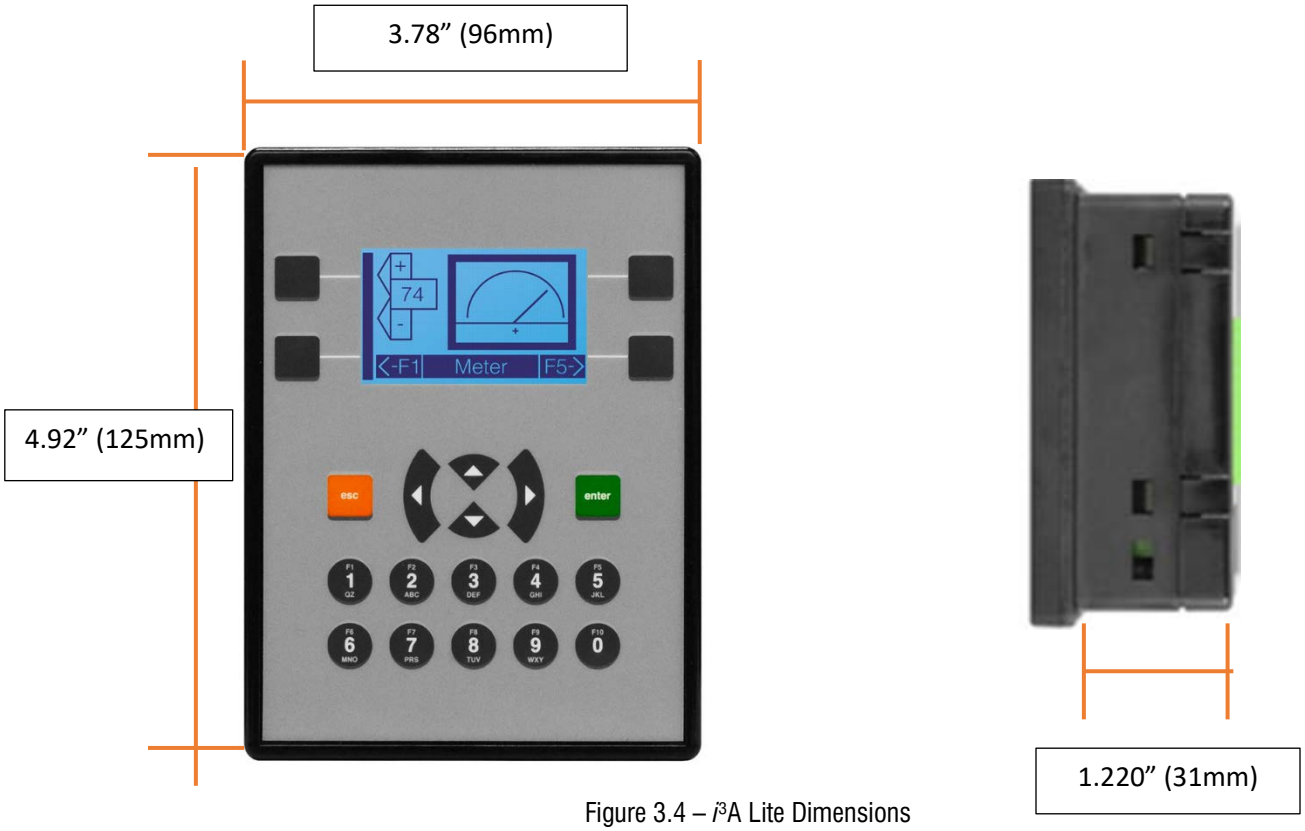


Figure 3.4 – *i*³A Lite Dimensions

3.7 Factors Affecting Panel Layout Design and Clearances

WARNING: It is important to follow the requirements of the panel manufacturer and to follow all applicable electrical codes and standards.

The designer of a panel layout needs to assess the requirements of a system and to consider the following design factors.

3.8 Clearance / Adequate Space

Install devices to allow sufficient clearance to open and close the panel door.

Table 3.1 – Minimum Clearance Requirements for Panel Box and Door	
Minimum Distance – between base of device and sides of cabinet.	2” (50.80mm)
Minimum Distance – between base of device and wiring ducts.	1.5” (38.10mm)
Minimum Distance - between bases of each device if more than one device is installed in panel box or on door.	4” between bases of each device (101.60mm)
Minimum Distance – between device and closed door when door is closed. (Be sure to allow enough depth for the *i*³.)	2” (50.80mm)

3.9 Grounding

WARNING: Be sure to meet the ground requirements of the panel manufacturer and also meet applicable electrical codes and standards.

Panel Box: The panel box needs to be properly connected to earth ground to provide a good common ground reference.

Panel Door: Tie a low impedance ground strap between the panel box and the panel door to ensure that they have the same ground reference.

3.10 Temperature / Ventilation

Ensure that the panel layout design allows for adequate ventilation and maintains the specified ambient temperature range. Consider the impact on the design of the panel layout if operating at the extreme ends of the ambient temperature range. For example, if it is determined that a cooling device is required, allow adequate space and clearances for the device in the panel box or on the panel door.

3.11 Noise

Consider the impact on the panel layout design and clearance requirements if noise suppression devices are needed. Be sure to maintain an adequate distance between the *i*³A Lite and noisy device such as relays, motor starters, etc.

3.12 Shock and Vibration

The *i*³A Lite has been designed to operate in typical industrial environments that may inflict some shock and vibration on the unit. For applications that may inflict excessive shock and vibration, please use proper dampening techniques or relocate the *i*³A Lite to a location that minimizes shock and/or vibration.

CHAPTER 4: ELECTRICAL INSTALLATION

NOTE: The datasheet is the first document you need to refer to for model-specific information related to *i*³A Lite model such as pin-outs and other key installation information.

4.1 Grounding Definition

Ground: The term **Ground** is defined as a conductive connection between a circuit or piece of equipment and the earth. Grounds are fundamentally used to protect an application from harmful interference causing either physical damage such as by lightning or voltage transients or from circuit disruption often caused by radio frequency interference (RFI).

4.2 Ground Specifications

Ideally, a ground resistance measurement from equipment to earth ground is 0 Ω. It typically is higher. The U.S. National Electrical Code (NEC) states the resistance to ground shall not exceed 25 Ω. IMO Automation recommends *less than* 15 Ω resistance from our equipment to ground. Resistance *greater than* 25 Ω can cause undesirable or harmful interference to the device.

4.3 How to Test for Good Ground

To test ground resistance, a Ground Resistance Tester must be used. A typical Ground Resistance Meter Kit contains a meter, two or three wire leads, and two ground rods. Instructions are supplied for either a two-point or a three-point ground test.

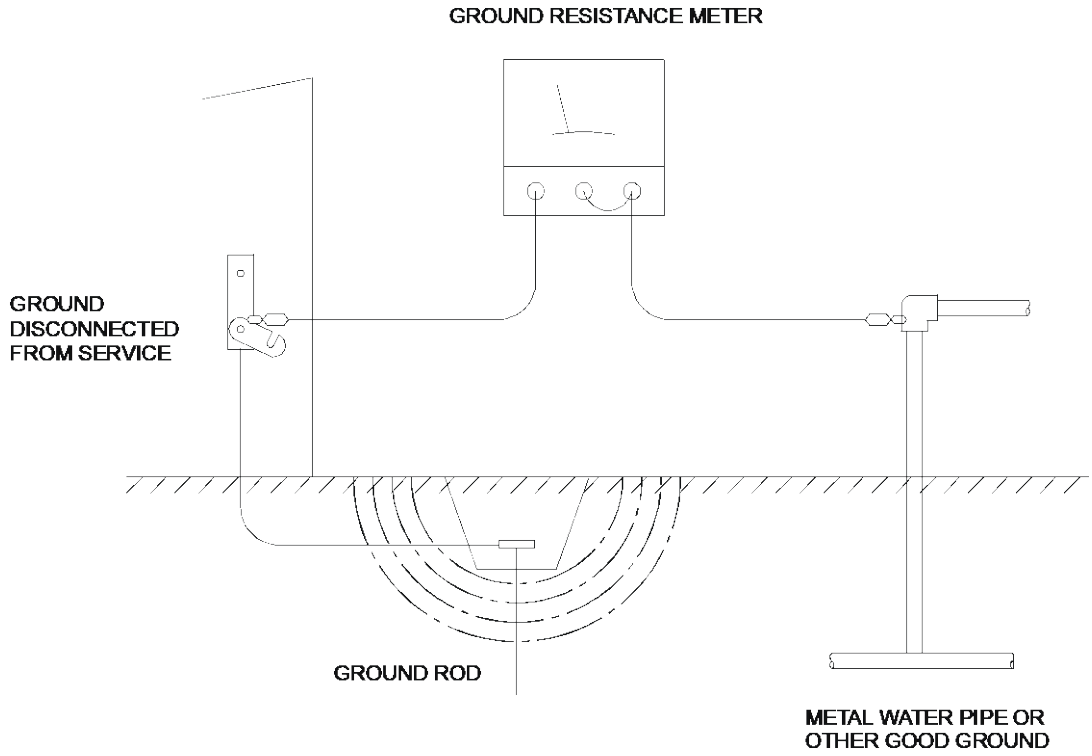


Figure 4.1 – Two-Point Ground Connection Test

4.4 Primary Power Port

Table 4.1 – Primary Power Port Pins		
Pin	**Signal**	**Description**
+	24VDC + / - 20%	Input Power Supply Voltage
–	0V	Input Power Supply Ground
⏚	⏚	Frame Ground

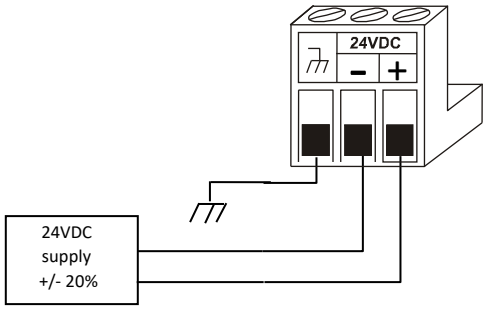
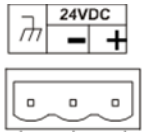


Figure 4.2 – Power Connector (Primary Power Port)



DC INPUT / FRAME

Solid/Standard wire: 12-24 awg (2.05-0.511mm or 3.31-.205mm²).
Strip length—0.28" (7mm).
Torque rating: 4.5 – 7 in-lbs (0.50 – 0.78 Nm).
DC- is internally connected to I/O 0 V.
A Class 2 power supply must be used.

Figure 4.3 – Primary Power Port as Viewed Looking at the *i*³A Lite

CHAPTER 5: SERIAL COMMUNICATIONS

5.1 Overview

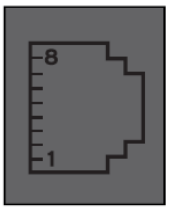
All *i*³A Lite models provide two serial ports, which are implemented with a single 8-position modular jack that is labeled **MJ1/2**. The MJ1 serial port is RS-232 while the MJ2 port is RS-485. By defaults, MJ1 can be connected to the COM port of a PC running *i*³ Configurator, for controller programming. In addition, both MJ1 and MJ2 can be used for application-specific communication, using a variety of standard data exchange protocols.

5.2 Port Descriptions

The MJ1 serial port contains a RS-232 interface with RTS/CTS handshaking.

The MJ2 serial port contains half-duplex RS-485 interface with no handshaking. The MJ2 RS-485 interface provides switchable termination and bias resistors internally.

5.3 Wiring—MJ1/MJ2 Serial Ports



MJ1: RS-232 w/Full Handshaking
MJ2: RS-485 Half-Duplex

Table 5.1 – MJ1/ MJ2 Serial Ports

Pin	**MJ1 Pins**		**MJ2 Pins**	
	Signal	**Direction**	**Signal**	**Direction**
8	TXD	OUT	--	--
7	RXD	IN	--	--
6	0V	Common	0V	Common
5	+5VDC @ 60 mA	OUT	+5VDC @ +/-60mA	OUT
4	RTS	OUT	--	--
3	CTS	IN	--	--
2	--	--	RX- / TX-	IN / OUT
1	--	--	RX+ / TX+	IN / OUT

5.4 RS-485 Termination and Biasing

Termination—Proper RS-485 termination minimizes signal reflections and improves reliability.

The MJ2 serial port allows an internal termination resistor to be placed across pins 1 and 2 by software control. Only the two devices physically located at the endpoints of the RS485 network should be terminated.

This termination is only in place when the *i*³A Lite is powered on. This would typically only be an issue if the*i*³A Lite is being used as a slave on the RS485 network. In that case, the electronic should not be used, but a physical external termination resistor should be used instead.

Biasing—RS485 biasing passively asserts a line-idle state when no device is actively transmitting, which is useful for multi-drop RS485 networking. The MJ2 serial port allows internal bias resistor to be activated by software control, pulling pin 1 up to 3.3 V and pulling pin 2 down to ground.

NOTE: If biasing is used, it should be enabled in only one of the devices attached to the RS485 network.

The "Set Serial Ports" option in the *i*³ System Menu can be used for termination and biasing. Also, an application graphics screen that writes to %SR can do the same thing.

Biasing Details:
- %SR152.3 enables RS485 Port Termination
- %SR164.1 enables RS485 Port Biasing

5.5 i³ *Configurator* Programming via Serial Port

MJ1 is the default programming port. The connection is RS232 serial and is compatible with the IMO programming cable kits, I3PC45. MJ2 can be configured as the programming port; however, it is only RS485 and is not compatible with the programming cable kits.

Selecting the default programming port between the MJ1 and MJ2 ports is done in the System Menu.

NOTE: Only one *i³ Configurator* software connection is allowed at a time.

5.6 Ladder-Controlled Serial Communication

Using Serial Communication function blocks, both MJ1 and MJ2 serial ports support Generic, Modbus Master and Modbus Slave Protocols. In addition, external modems can be connected and accessed using Init, Dial and Answer Modem function blocks.

5.7 Configuration via Mini-B USB

NOTE: The unit must be connected via the mini-USB port to the PC or laptop.

It is possible to load the program and monitor data via the Mini-B USB. To load via Mini-B USB, configure the communications port in *i³ Configurator* as follows:
Select **Tools** from the toolbar → **Application Settings** → **Communications** → **USB** button.

It is possible to download or upload and use the data monitoring functions once connected.

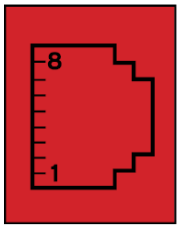
NOTE: It is advisable to use an isolated USB cable between the PC or laptop and the *i*³A Lite when third party devices are connected to the *i*³A Lite to avoid damage to the PC or laptop and/or the *i*³A Lite.

CHAPTER 6: CAN COMMUNICATIONS

NOTE: For additional CAN information, refer to the CAN Networks manual on the website.

6.1 Overview

The *i*³A Lite provides a CAN networking port, which is implemented with an 8-position RJ-45 modular jack. The connector is labeled CAN and is red.



CAN

Modular jack (8posn RJ45)

CAN Pin Assignments	
PIN	SIGNAL
8	No Connection
7	Ground
6	Shield
5	No Connection
4	No Connection
3	Ground
2	CAN Data Low
1	CAN Data High

Figure 6.1 – CAN Connector

6.2 *i³ Configurator* Programming via CAN

The CAN port supports iCAN Programming Protocol. If a PC has a CAN interface installed (via PCI card or USB), and the PC CAN port is connected to the *i*³A Lite CAN port, then *i³ Configurator* can access the *i*³A Lite controller for programming and monitoring.

In addition, the *i*³A Lite controller supports single-point-programming of all *i*³A Lite and other *i³* controllers that are connected to a CAN network. If the PC COM port is connected to the *i*³A Lite programming port, then the *i*³A Lite can act as a pass-through gateway allowing *i³ Configurator* to access all *i*³A Lite and *i³* devices that are attached to the CAN port network.

6.3 Ladder-Controlled CAN Communication

Using Put and Get Network Words function blocks, the CAN port can exchange digital and analogue global data with other *i*³A Lite or *i*³ devices attached to the CAN port network.

In addition, Put and Get Network Heartbeat function blocks allow nodes on the CAN network to regularly announce their presence and to detect the presence (or absence) of other nodes on the network.

6.4 Using CAN for I/O Expansion (Network I/O)

Connecting remote I/O devices (Smart I/O) to the *i*³A Lite controller CAN port, allows the *i*³A Lite I/O to be economically expanded and distributed. A variety of remote I/O modules are available for this purpose.

6.5 CAN and Termination and Bias

If there is controller to controller communication on a network, and an *i*³A Lite will be at either end, then it is recommended that onboard electronic termination NOT be used. Physical external resistors should be used instead. In this case utilizing an RJ-45 to open-style connector cable will make termination easier.

NOTE: %SR152.4 enables CAN port termination.

NOTE: When powered down, the biasing and termination is no longer in effect.

CHAPTER 7: DOWNLOADABLE COMMUNICATION PROTOCOLS

7.1 Overview

Through loadable protocol device drivers, certain models of the *i*³ family can provide the ability to exchange data with remote devices such as variable-frequency drives, PLCs, and remote I/O devices. This feature greatly expands the *i*³ 's control capability with negligible effect on the *i*³ 's ladder scan time.

Remote devices that communicate serially must do so under certain rules of data transfer known as a protocol. Many device manufactures have created their own protocol for communications with their device. For an *i*³ to communicate with a specific device, it must be loaded with the corresponding serial communications protocol device driver that supports that protocol.

A limited number of protocol device drivers are packaged with the *i*³ *Configurator* distribution; however, as more are developed, they will be made available as add-on packages. A device driver is typically distributed as a Windows module, which contains the Configuration Menus, Help Files and the Target Executable Driver Code. When updating device drivers, an install routine loads the device driver to the *i*³ *Configurator* directory structure and makes that driver available to *i*³ *Configurator* applications.

Once installed, the protocol device driver can be included as part of a *i*³ *Configurator* application by selecting it from a list of installed protocol device drivers and attaching it to the desired serial port (Program > Protocol Config menu). Only one protocol device driver can be associated with a serial port, though some *i*³ models support multiple protocols on a single Ethernet port.

Once the protocol is selected for a specific port, that port must be configured to match the bit transfer size and rate of the target device(s). This is configured under the **Network Config** menu, which contains port specific information such as the basic serial port parameters (i.e. baud rate, stop bits parity, retries, etc.). In addition to the serial port parameters, this menu also contains the transaction scan update control configuration and any network level protocol specific configuration.

Once the network is configured, each device on the serial communications network must be configured. For some communications (i.e. RS232), the network can be limited to one device. The devices are configured under the **Device Config** menu, which contains an arbitrary device name, the device ID and optionally an *i*³status register that contains any device fault information.

Once each device(s) is configured, a **Scan List** of entries must be created which defines the transfer of data between a local (*i*³) register(s) and a remote device register(s). These entries are created under the **Data Mapping** menu, which contains an *i*³ register, a target device ID, a target device register address, the number of registers to transfer, and update type.

Each entry can be configured for one of two types of initiating a transaction: **Polled and Triggered.** Polled type entries initiate a transaction with the remote device on every transaction scan. Triggered type entries only initiate a transaction when a corresponding local (*i*³) binary trigger register is *set*. Once a triggered type transaction completes, the protocol device driver *resets* the local (*i*³) binary register to indicate completion. See Section 8.5 for more details on Polled and Triggered entries.

These basic types are also subdivided into Read or Write operations. For polled operations, a Read operation only reads from a remote device. Likewise, a Read/Write operation continuously reads from the remote device unless the target *i*³ register value changes from one ladder scan to another. In this case, the new *i*³ value is written to the target device. For triggered operations, only a Read or Write action is available.

When downloaded to the *i*³ , the Scan List is scanned sequentially to generate data transactions with the remote device. This transaction scanning can be on a continual basis (**automatic**) or controlled from ladder logic (**manual**) once a complex connection is programmatically created (i.e., dialup modem). The specific transaction-scanning mode is selected from the **Network Config** menu.

Please refer to the *i*³ *Configurator* Help file for more information on Downloadable Protocols Configuration. After opening the *i*³ *Configurator* Help file, select **Contents → Serial Communications → Protocol Configuration.**

7.2 Protocol Config

After opening *i³ Configurator*, choose **Program → Protocol Config**, and select the port drop-down box to select a protocol device driver. All protocol device drivers currently loaded in *i³ Configurator* are displayed in the dropdown selection. Some *i³* models can be limited in the number of ports or number of protocol device drivers that can be selected. Once a protocol is selected, the Network, Devices, and Data (Scan List) must be configured through corresponding dialogs accessible through the respective buttons (Network, Device, and Scan List.)

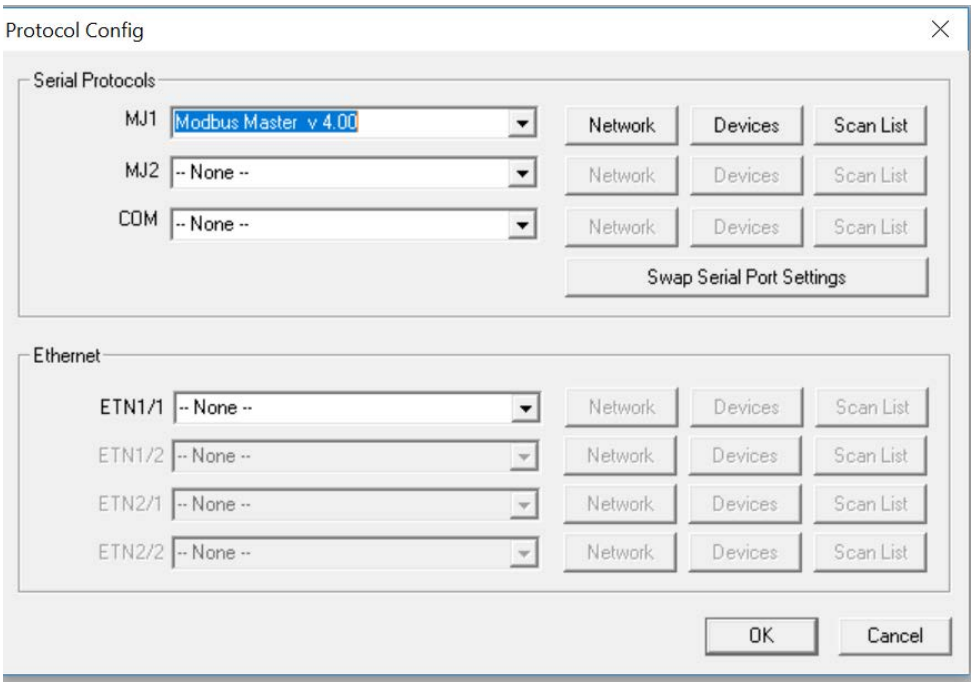
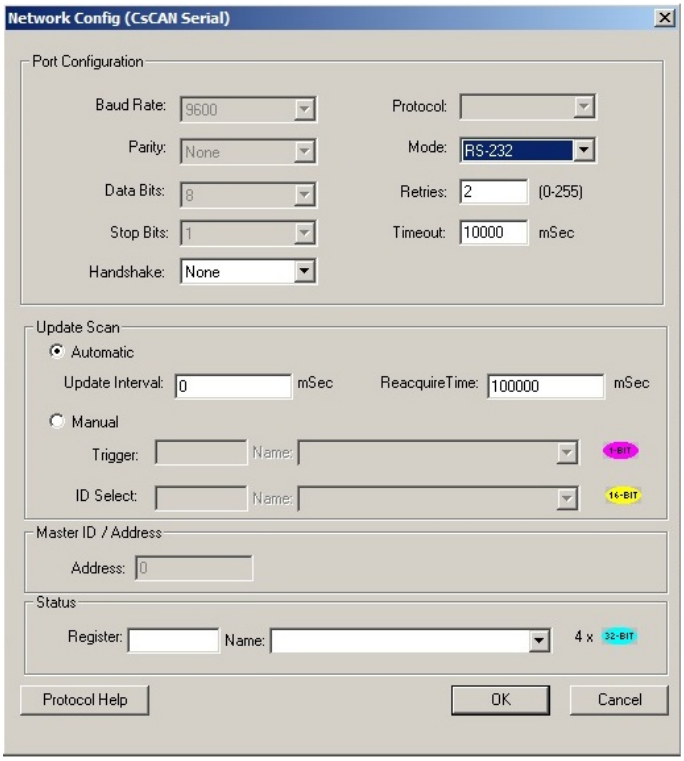


Figure 7.1 – Protocol Config Dialog

Three fields must be configured after a protocol is selected:

1. Network
2. Devices
3. Scan List

7.3 Network Configuration

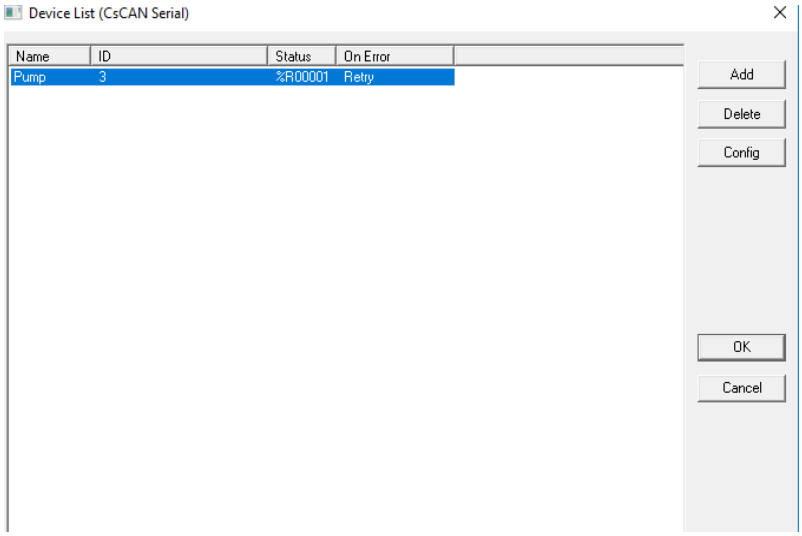


Network Configuration provides the required parameters to configure the network. Each protocol is different and may not require all the Network Config field. Please refer to the table below for the options in the Network Config field.

Table 7.1 – Network Protocols		
Baud Rate, Data Bits, Stop Bits, Parity	These field define the bit level transfer over the serial port.	
Handshake	**None** – No handshake lines are used **Multidrop Full** – Rx remains active while Tx is occurring. **Multidrop Half** – Rx is shut off while Tx is occurring. **Radio Modem** – Wait for CTS acknowledgement before transmitting (legacy radio modem support).	
Protocol	If a driver supports multiple protocols, it is selected here, (i.e. Modbus supports RTU or ANSI).	
Mode	Specifies if port operates in RS232 or RS485 mode.	
Retries	Specifies number of times a transaction is retried on a failed response.	
Timeout	Specifies the amount of time for a device to wait for a valid response.	
Update Scan	**Automatic**	**Update Interval** – Specifies the update interval at which all the mapped entries are executed.
		Reacquire Time – Specifies the amount of time to wait before attempting communications with an offline device.
	Manual	**Trigger** – Specifies the binary register that a single transaction scan of the Scan List.
		ID Select – If an analogue is specified in the field, the ID Select filter is enabled.
Status Register	Specifies the starting *i*³ register of eight (8) consecutive registers (4-32bit counters), which provide an indication of the network health.	
Scanner Address	Specifies the *i*³'s device (network) ID if a master ID is required by the protocol.	
Protocol Help	Provides protocol specific help.	

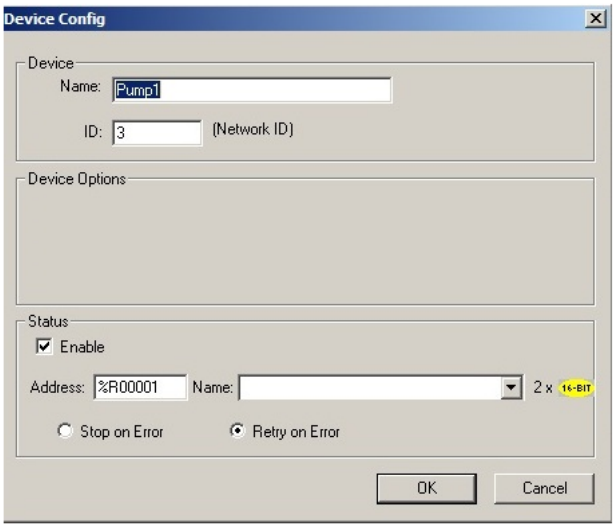
7.4 Device List and Device Configuration

Device List



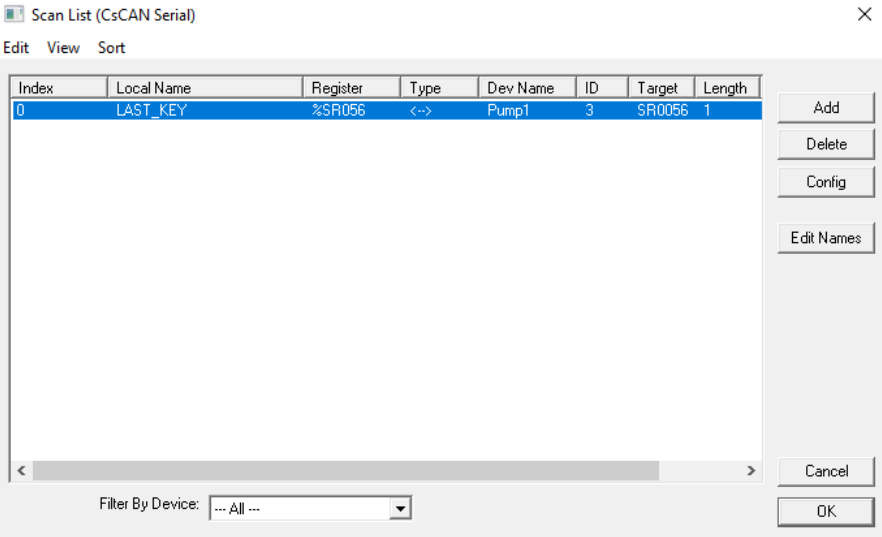
The Device List is reached from the Device button on the Protocol Config screen and provides a list of the configured devices on the Network. Devices must be created and exist in this list before corresponding Scan List entries can be created for this device. Typically, the number of entries is limited to **64 devices**.

Device Configuration



This configuration is reached from the Device List when adding or modifying an existing device.

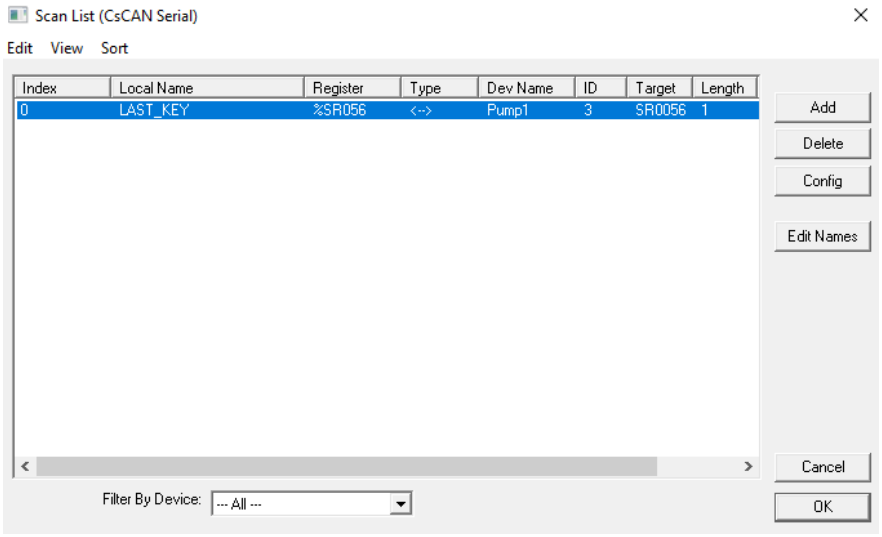
7.5 Scan List



This can be accessed from the Scan List button on the Protocol Config screen or the Mapping button on the Device List screen and provides a Scan List of the Data Mapping entries. To transfer data between the *I*³ and remote target, a Scan List must be created that defines each transaction. Each mapping entry (transaction) contains the source and destination registers, the number of consecutive registers transferred, the direction of the transfer and what triggers the transfer. Typically, the number of entries is **limited to 512**.

NOTE: The order of the Scan List is the order in which the transactions occur. Sort functions are provided to change the order of the list. Each entry also has an identifying index. If the device status register is enabled and a transaction failure occurs, the status register indicates the index number of the transaction that has failed.

7.6 Data Mapping Configuration (Scan List Entry)



Update Type

This field specifies the direction and what triggers the transfer of data between the *i*³ and target device for a mapping entry.

Polled Read

On every transaction scan, a read-only target device register(s) transaction occurs.

Polled Read/Write

On every transaction scan, a read target device register transaction occurs unless a local register value has changed. The write transaction only updates those local registers that have changed in value. If several non-consecutive local registers (contained in a single mapping entry) change value between transaction scans, it takes several consecutive transaction scans to write each changed register.

When the *i*³ is placed in RUN mode, **the initial action for this mapping type is a read target register transaction.** This transaction initializes the local (*i*³) register(s) to match that of the remote device register(s). Thereafter, any change to the corresponding *i*³ register(s) triggers a write operation to the remote device.

Polled Read/Write/Init

On every transaction scan, a read target device register transaction occurs unless a local register value has changed. The write transaction only updates those local registers that have changed in value. If several non-consecutive local registers (contained in a single mapping entry) change value between transaction scans, it takes several consecutive scans to write each changed register.

When the *i*³ is placed in RUN mode, **the initial action for this mapping type is a write target register transaction.** This transaction initializes the target device register(s) to match that of the local (*i*³) register(s). Thereafter, any change to the corresponding *i*³ register(s) triggers a write operation to the remote device.

The initial write transaction does not occur until after the first logic scan of the *i*³. This allows registers to be initialized locally before Writing to the target device register(s).

Triggered Read

A read transaction is triggered by a high level on a separately designated *i*³ (binary) trigger register. Once the read transaction is complete (or the device is offline), the *i*³ trigger register is cleared by the *i*³. This update type can be used for occasion data accesses such as retrieving trend data.

NOTE: This operation increases the associated transaction scan time and can cause the **Update Interval Exceeded Counter** to increment on a tightly adjusted update interval.

Triggered Write

A write transaction is triggered by a high level on a separately designated i³ (binary) trigger register. Once the write transaction is complete (or the device is offline), the *i*³ trigger register is cleared by i³. This function can be used for occasion data accesses such as sending recipe data.

NOTE: This operation increases the associated transaction scan time and can cause the **Update Interval Time Exceeded Counter** to increment on a tightly adjusted update interval.

CHAPTER 8: SYSTEM SETTING AND ADJUSTMENTS

8.1 System Menu – Overview

The *i*³A Lite controller has a built-in System Menu, which lets the user view System Settings and make adjustments. To start the System Menu, press the ↓ and ↑ keys at the same time (or set %SR3 to 1), which will display the Main Menu, as shown Figure 7.1. Then use the ↓ and ↑ keys to select a **Main Menu** item and press **Enter** to display the item's Sub-Menu.

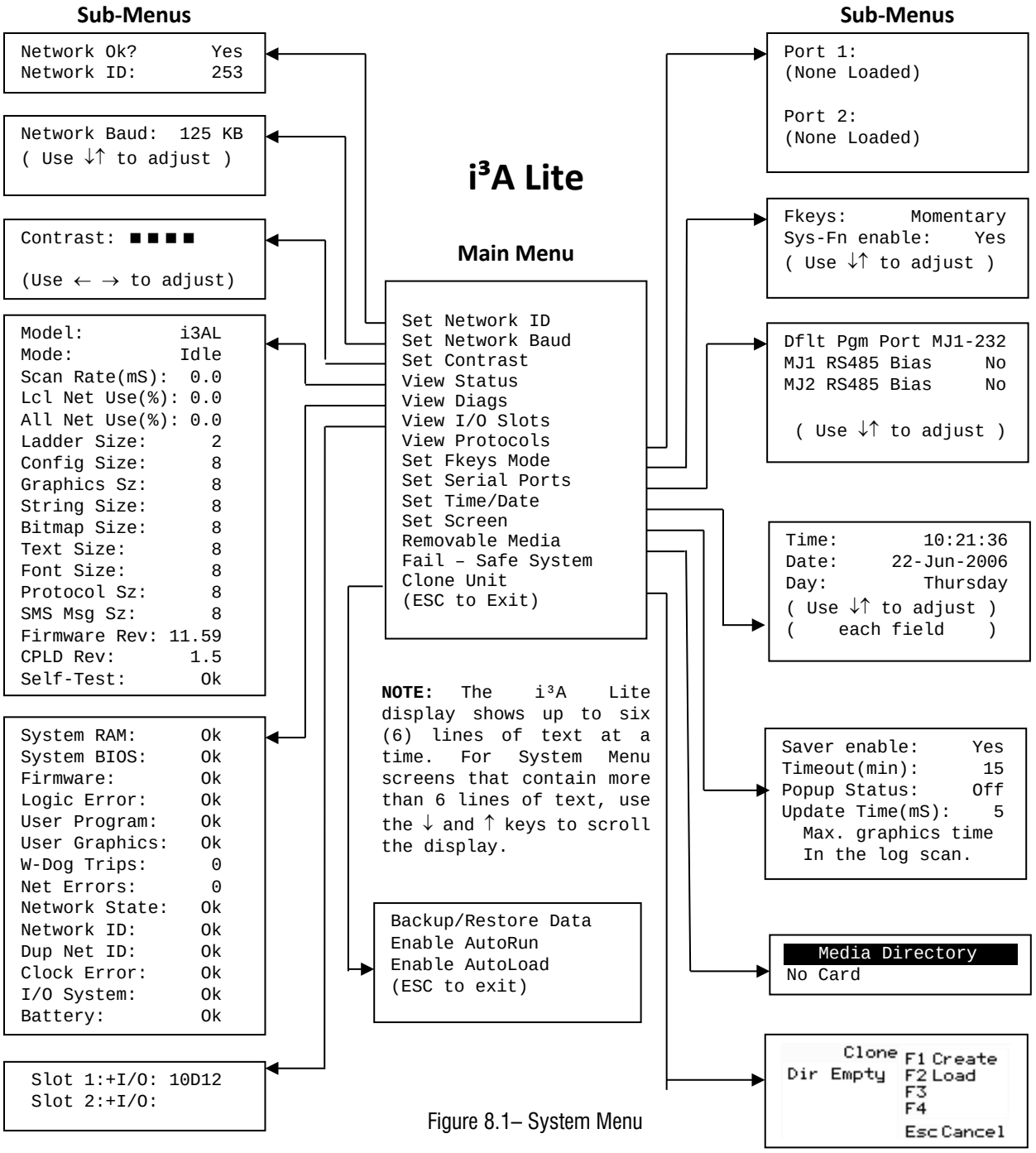


Figure 8.1– System Menu

8.2 System Menu – Navigation and Editing

As mentioned above, the System Menu is started by pressing the ↓ and ↑ keys at the same time for the *i*³A Lite. Then, either press ESC to exit the System Menu, or use the ↓ and ↑ keys to select an item and press **Enter** to display the item's Sub-Menu.

A Sub-Menu generally shows a list of System Settings and their values. After opening a Sub-Menu, if any of its System Settings are editable, the first System Setting that can be edited is highlighted. If desired, the ↓ and ↑ keys can be used to select a different System Setting to be edited.

At this point, either press **ESC** to exit the Sub-Menu (returning to the Main Menu) or press **Enter** to edit the highlighted System Setting. If **Enter** is pressed, the System Setting's value will be highlighted, indicating that it is ready to be modified.

When modifying a System Setting's value, use either the arrow keys (← → ↓ ↑) or the numeric keys to select a new value.

The arrow keys are used to edit System Settings that have just a few possible values. Each time the arrow key is pressed, a new possible value is displayed. When the desired value appears, press the **Enter** key to save it; otherwise press the **ESC** key to cancel the edit.

The numeric keys are normally used to enter numeric System Settings. In addition, to edit a single numeric digit, use the ← or → key to select the digit and then either press a numeric key or use ↓ or ↑ to modify the digit. In any case, after entering the new desired value, press the **Enter** key to save it; otherwise press the **ESC** key to cancel the edit.

8.3 System Settings Details

Set Network ID

The Network ID Sub-Menu appears for both *i*³A Lite models. This Sub-Menu displays two System Settings of which only **Network ID** is editable.

Network Ok?	Yes = NET1 connected to a CAN network and functioning properly No= Not ready to communicate on CAN network
Network ID:	1 to 253= This node's ICAN Network ID; must be unique on network

Set Network Baud

The Network Baud Sub-Menu for both *i*³A Lite models. This Sub-Menu displays just one System Setting and it is editable.

Network Baud?	125kB = 125kBd CAN network 250kB = 250kBd CAN network 500kB = 500kBd CAN network 1MB = 1MBd CAN network

Set Contrast

The Set Contrast Sub-Menu displays just one System Setting and it is editable.

Contrast: ■ ■ ■ ■	= Current display contrast setting

View Status

The View Status Sub-Menu displays up to 17 System Settings. Only the **Mode** System Setting is editable.

Model:	**Xxyyz** = 5 or 6 character model number of this *i*³A Lite unit **x** is 1 for models that have a CAN port; **0** = no CAN port **yy** indicates the installed I/O module; **00** = no I/O module **z** indicates the installed COM module; **N** = no COM module
Mode:	**Idle** = *i*³A Lite is in Idle mode **DoIO** = *i*³A Lite is in Do I/O mode **Run** = *i*³A Lite is in Run mode
Scan Rate(mS):	**0.0** = *i*³A Lite is not in Run mode **0.1 to 999.9** = Average number of mS for each ladder scan
Lcl Net Use %:	**0.0 to 100.0** = CAN network bandwidth % used by this *i*³A Lite node
All Net Use %:	**0.0 to 100.0** = CAN network bandwidth % used by all nodes
Ladder Size:	**x** = Number of bytes in application ladder program
Config Size:	**x** = Number of bytes in application I/O configuration
Graphics Sz:	**x** = Number of bytes in application graphic screens
String Size:	**x** = Number of bytes in application string table
Bitmap Size:	**x** = Number of bytes in application bitmaps
Text Size:	**x** = Number of bytes in application text tables
Font Size:	**x** = Number of bytes in application font tables
Protocol Sz:	**x** = Number of bytes in application downloaded protocols
SMS Msg Sz:	**x** = Number of bytes in application SMS protocol configuration
Firmware Rev:	**xx.yy** = Current firmware version
CPLD Rev:	**x.y** = Current CPLD (Complex Programmable Logic Device) version
Self-Test:	**Ok** = All power-on self-tests passed **Fault** = One or more power-on self-tests failed

View Diags

The View Diags Sub-Menu displays up to 11 System Diagnostics, none of which are editable.
The first two System Diagnostics are critical. If either of these indicate a Fault condition, then the *i*³A Lite will not enter or remain in Run mode, and the problem must be investigated and corrected.

Logic Error:	**Ok** = All executed ladder instructions are legal for loaded firmware **Fault** = A ladder instruction not supported by firmware was found
User Program:	**Ok** = Ladder program and I/O configuration loaded successfully **Fault** = Ladder program or I/O configuration not loaded, or load failed

The first five System Diagnostics are critical. If any of them indicate a Fault condition, then the *i*³A Lite will not enter or remain in Run mode, and the problem must be investigated and corrected.

System RAM:	**Ok** = System RAM power-up self-test passed **Fault** = System RAM power-up self-test failed
System BIOS:	**Ok** = System BIOS power-up self-test passed **Fault** = System BIOS power-up self-test failed
Firmware:	**Ok** = Firmware power-up self-test passed **Fault** = Firmware power-up self-test failed
Logic Error:	**Ok** = All executed ladder instructions are legal for loaded firmware **Fault** = A ladder instruction not supported by firmware was found
User Program:	**Ok** = Ladder program and I/O configuration loaded successfully **Fault** = Ladder program or I/O configuration not loaded or load failed

The last nine System Diagnostics are informational. If any of them indicate a Warning condition, then the *i*³A Lite can still enter and remain in Run mode, but the problem should be investigated and corrected.

User Graphics	**Ok** = Application graphics objects loaded successfully **Fault** = Application graphics objects not loaded or load failed
W-Dog Trips	**0** = Watchdog timer has not tripped since the last power-up **x** = Number of times watchdog timer has tripped
Net Errors	**0** = No CAN network bus-off errors have occurred **x** = Number of CAN network bus-off errors that have occurred
Network State	**Ok** = At least one other node was found on the CAN network **Warning** = No other nodes were found on the CAN network
Network ID	**Ok** = This node's CAN Network ID is in the range 1 to 253 **Warning** = This node's CAN Network ID was out of range at power-up
Dup Net ID	**Ok** = This node's Network ID is unique on the CAN network **Warning** = This node's Network ID is duplicated in another node
Clock Error	**Ok** = Time and date have been set **Warning** = Time and date need to be set
I/O System	**Ok** = I/O configuration matches the installed I/O and COM modules **Warning** = I/O configuration needs updating to match installed modules
Battery	**Ok** = Backup battery operating properly **Warning** = Backup battery needs to be replaced

View Protocols

The View Protocols Sub-Menu displays two System Settings, both of which are not editable.

As mentioned in, both the MJ1 (Port 1) and MJ2 (Port 2) serial ports support downloadable protocols. To assign a downloadable protocol to an *i*³A Lite serial port, select the **Protocol Config** item in i³ Configurator's Program menu and then setup a protocol for Port 1 or Port 2 (or both).

In the View Protocols Sub-Menu, the currently downloaded protocol, if any, and its version number are displayed for both Port 1 and Port 2.

Port 1	
Protocol Name	**(None Loaded)** or name of the protocol assigned to MJ1
Protocol Version	Blank or version of the protocol assigned to MJ1
Port 2	
Protocol Name	**(None Loaded)** or name of the protocol assigned to MJ2
Protocol Version	Blank or version of the protocol assigned to MJ2

Set Fkeys

The Set Fkeys Sub-Menu displays two System Settings, both of which are editable.

Fkeys:	**Momentary** = %K1-10 bits go On & Off as F1-F10 are pressed & released **Toggle**= %K1-10 bits toggle each time F1-F10 are pressed
SYS_Fn enable:	**Yes** = Reset and all clear system functions enabled **No** = Reset and all clear system functions disabled

Set Serial Ports

The Set Serial Ports Sub-Menu displays three System Settings, all of which are editable, and one optional item. For the **Dflt Pgm Port** System Setting, only MJ1-232 can be selected.

Dflt Pgm Port	**MJ1-232** = MJ1 RS232 port is the default programming port
MJ2 RS485 Bias	**No** = MJ2 RS485 bias resistors are not switched in **Yes** = MJ2 RS485 bias resistors are switched in

Set Time/Date

The Set Time/Date Sub-Menu displays three System Settings. **Time** and **Date** are editable, and **Day** is automatically calculated from the **Date** setting.

NOTE: Time and **Date** are split into three editable fields each. Use ← or → to select a field and then use ↓ or ↑ to edit the field.

Time:	10:21:36	= Current time (hours:minutes:seconds in 24-hour format)
Date:	22-Jun-2006	= Current date (day-month-year)
Day:	Thursday	= Current day of week calculated from the Date setting

NOTE: The *i*³A Lite must be power-cycled (or reset) before the changes take effect.

Removable Media

The Removable Media Sub-Menu displays the Removable Media Manager. After selecting Removable Media from the Main Menu, one of four Sub-Menu screens will appear:

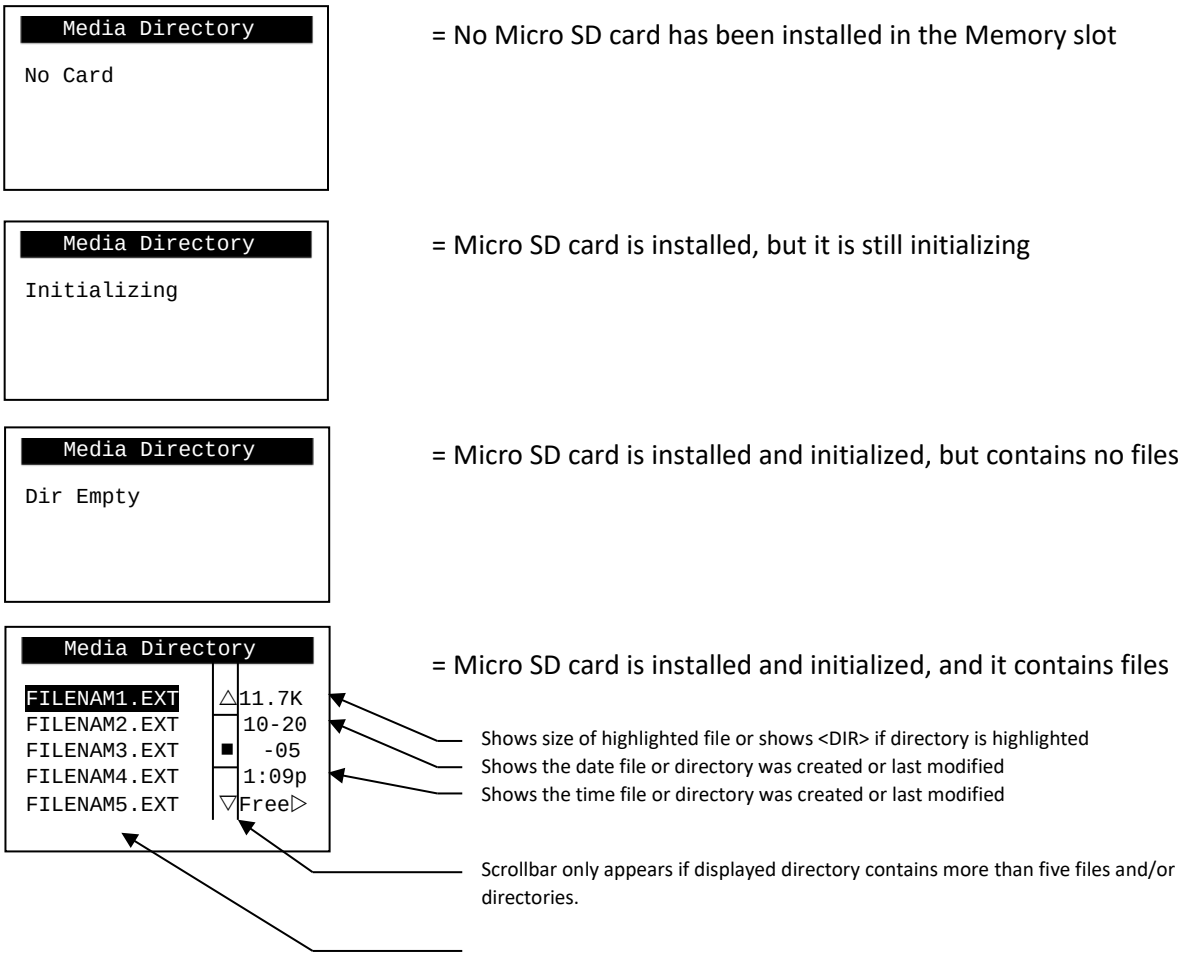


Figure 8.2 - Removable Media Submenu

If the Removable Media Manager displays files or directories, as in the last example above, there are several options available:

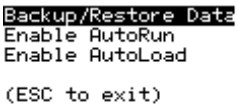
If → is pressed, the number of total and free bytes is displayed. Then, pressing ← returns to the normal file and directory display.

Fail – Safe System

The Fail-Safe System is a set of features that allows an application to continue running in the event of certain types of "soft" failures. These "soft" failures include:

- Battery power loss
- Battery-Backed Register RAM or Application Flash corruption due to, for example, an excessive EMI event.

The fail-safe system can be accessed through the system menu of the controller. A new menu “Fail-Safe System” has been added at the end of the main system menu for this. Selecting “Fail-Safe System” menu will open the following menu screen:



Selecting this option brings up a screen having four operations:

Backup *i*³ Data—Copies Battery Backed RAM contents on to the onboard flash memory of the *i*³.
Restore *i*³ Data— Copies the backed-up data from onboard flash to the battery backed RAM.
Clear Backup Data— The backup data will be erased from the onboard flash.
Exit— Goes back to previous menu.

Enable AutoRun

"Enable AutoRun" displays the following options which can be selected:

Enable AutoRun	**No** = *i*³ will be in IDLE mode after AutoLoad or Automatic Restore. **Yes** = *i*³ will automatically be placed into RUN mode after AutoLoad or Automatic Restore.

Enable AutoLoad

"Enable AutoLoad" displays the following options:

Enable AutoLoad	**No** = Does not load AUTOLOAD.PGM automatically when application program is absent or corrupted. **Yes** = Loads AUTOLOAD.PGM file automatically from RM when application program is absent or corrupted.

Clone Unit

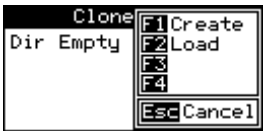
The 'Clone Unit' feature allows the user to "clone" the *i*³ of the exact same model. This feature "clones" application program and unit settings stored in Battery backed RAM of an *i*³ into the RM (refer Removable Media (Chapter 8) for details on using RM). It can then be used to clone a different *i*³ (exact same model).

This feature can be used for:

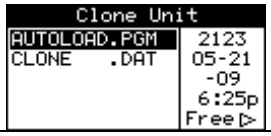
- Replacing an *i*³ by another unit of the same model.
- Duplicating or "clone" units without a PC.

Make Clone

Selecting "Clone Unit" menu will open the following menu screen:



Selecting "Create" will open the following screen:



AUTOLOAD.PGM	Application file
CLONE.DAT	File having all unit settings and register values from Battery Backed RAM

Load Clone

Selecting "Clone Unit" menu will open the following menu screen. Select "Load".

CHAPTER 9: REMOVABLE MEDIA

9.1 Overview

All *i*³ A Lite models provide a Removable Media slot, labeled **Memory**, which supports standard microSD Flash memory cards. MicroSD cards can be used to save and load applications, to capture graphics screens, and to log data for later retrieval.

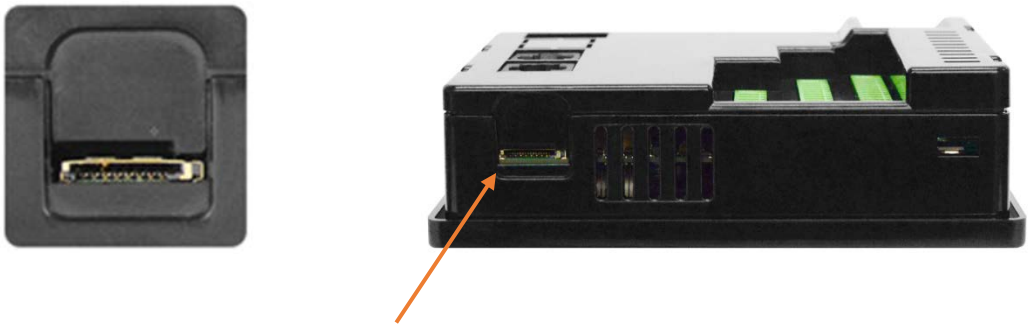


Figure 9.1 – Removable microSD Memory Card Slot

9.2 MicroSD Cards

The *i*³A Lite Memory slot is equipped with a "push-in, push-out" connector and a microSD card can be safely inserted into the Memory slot when the *i*³A Lite is powered On or Off.

To install a microSD card: Align its 8-pin gold edge connector down, facing the front of the *i*³A Lite; then carefully push it all the way into the Memory slot. Ensure that it clicks into place.

To remove the microSD card: Push down on the top of the card gently to release the spring. The card pops up for removal.

9.3 MicroSD File System

The *i*³A Lite supports the 8.3 filename format. This means that all file and directory names must consist of up to eight (8) characters left of the dot, and three (3) characters right of the dot, i.e. filename.pgm.

Directories and sub-directories may be nested up to 16 levels deep as long as each pathname string does not exceed 147 characters.

9.4 Using the Removable Media Manager

The Removable Media Manager can be accessed via the System Menu or by using *I3 Configurator* to place a Removable Media Manager object on an application graphics screen.

The Removable Media Manager is an interactive *i*³A Lite screen that performs the following functions:

- Display number of total and free bytes
- Browse file and directory lists
- Delete files and directories
- Format a MicroSD card
- Load and save application programs
- View screen capture bitmaps

To access via System Menu, press the Up and Down keys simultaneously. In the System Menu, you can press the Down arrow key until Removable Menu is selected and then press Enter.

For additional options, press one of the soft keys to the right of the display. Options are as follows:

F1 Delete	= Delete the highlighted file or directory
F2 DelAll	= Delete all files and directories
F3 Format	= Format the microSD card
F4 SavPgm	= Save *i*³A Lite application to DEFAULT.PGM
Esc Cancel	= Cancel current operation (back up one screen)

Pressing the soft key again or pressing ESC returns to the normal file and directory display.
If a directory name is highlighted, pressing **Enter** will switch to that directory showing its files and sub-directories.
In a sub-directory, highlighting **..** (dot dot) and pressing **Enter** will move up one directory.

9.5 Using Removable Media to Log Data

Using Read and Write Removable Media function blocks, an application ladder program can read and write *i*³A Lite controller register data in the form of comma-delimited files, with a .CSV extension. These files are compatible with standard database and spreadsheet PC programs. In addition, an application ladder program can use Rename and Delete Removable Media function blocks to rename and delete files.

9.6 Using Removable Media to Load and Save Applications

A special file type, with a .PGM extension, is used to store *i*³A Lite application programs on microSD. To load an application from microSD to the I3A LITE, use the Removable Media Manager to find and highlight the desired .PGM file, and then press **Enter**.

To save an application from the *i*³A Lite to MicroSD, open the Removable Media Manager in the System Menu and press the F4 function key. The application will be saved in a file called **DEFAULT.PGM** in the MicroSD root directory. Press either of the two soft-keys to the right of the display to see options.

NOTE: Saving an application to microSD can only be done from the System Menu and is not available on a Removable Media Manager object that is placed on an application graphics screen by *i*³ Configurator.

NOTE: Saving an application to microSD does not also save register data.

*i*³ Configurator can also save an application directly to a microSD card, which is plugged into the PC's microSD compatible card reader by selecting the Export to Removable Media item on the **File** menu.

9.7 Configuration of a Removable Media

The configuration of the Removable Media Object that invokes the Removable Media Viewer defines what buttons are enabled and available to the user.

The ↵ (Enter) button performs certain operations based on the selected file's type:

..	- change display to parent directory
<DIR>	- change display to child directory
pgm	- load application (if compatible model and version)

Alternately, by checking the 'Write Selected Filename' option, the RM Manager object will load the currently displayed path and filename into a block of registers for use with other Removable Media functions. The register block is assigned in the 'File Select' config found in the Config menu of the graphic/screen editor.

Once view operations are complete, simply touch the *Esc* button to remove the pop-up removable media viewer.

9.8 Removable Media (RM) Features—Program Logic

NOTE: For detailed information regarding RM function blocks and parameters, refer to the Help file in *I3 Configurator* software. Refer to "USB Flash Media support for RM Functions" for USB Flash drive access details.

The following RM function blocks are available in *i³ Configurator* Software. These function blocks will reference:

- MicroSD when filename is prefixed with 'A:' or nothing OR
- USB A Flash Drive when filename is prefixed with 'B:'.

Read RM csv	Allows reading of a comma-separated value file from the MicroSD interface into the controller register space.
Write RM csv	Allows writing of a comma-separated value file to the MicroSD interface from the controller register space.
Rename RM csv	Allows renaming a file on the RM card. The data in the file is not changed.
Delete RM csv	Allows deleting a file on the RM card
Copy RM csv	Allows copying a file on the RM card. The data in the file is not changed.

Additional features that utilize the Removable Media port are the data log and report features, as well as graphic editor options: alarm and trend objects, screen capture, filename counters, and file select.

9.9 Removable Media (RM) Features— Program Features

a. Data log Configuration—This feature allows the controller to periodically log register values to Removable Media. The register data is stored in .**csv** (comma separated value) format, which is compatible with 3rd party PC applications, such as Microsoft Excel.

b. Report Editor—This feature allows the *i*³ to be configured to generate text printouts which incorporate data from the registers embedded in the text. The reports can be printed using a serial interface printer through any of the serial ports of the *i*³ or can be saved on the removable media of the device.

c. Recipes Editor—Recipes allow the user to send or update multiple registers simultaneously.

9.10 Removable Media (RM) Features—Graphic/Screen Editor

a. Trends—The historic support feature in the trend object utilizes Removable Media.

b. Removable Media—This is a graphic object used to access files and functions pertaining to Removable Media.

c. Recipes—This is a graphic object that is used in conjunction with the recipe editor which is mentioned above.

9.11 Removable Media Features—Additional Configuration

a. Alarms—Alarm data can be logged to a .csv file stored on Removable Media.

b. Screen Capture—The screen capture function allows a bitmap or jpeg image of the displayed *i*³ screen to be written to the Removable Media card.

c. Filename Counters— The filename counters can be accessed wherever Removable Media functions require a path name. A typical application is the auto-incrementing of a file name when doing screen captures.

d. File Select— File Select is used to specify the register block that is used with the Removable Media Manager object 'Write Selected Filename' option.

9.12 Filenames used with the Removable Media (RM) Function Blocks

The RM function blocks support the flash with a DOS/Windows standard FAT32 file system. All names must be limited to the "8.3" format where the filename contains eight characters a period then a three-character extension.

The entire filename including any path must be less than or equal to 147 characters.

When creating filenames and directories it is sometimes desirable to include parts of the current date or time, or even the screen number in the case of screen capturing. There are special symbols that can be entered into a filename that are replaced by the *i*³ as follows.

Table 9.1 – Filename Special Symbols

Symbol	Description	Example
$Y	Substitutes the current 2-digit year	2004 = 04
$M	Substitutes the current month with a 2-digit code	March = 03
$D	Substitutes the current day	22nd = 22
$h	Substitutes the current hour in 24-hour format	4 PM = 16
$m	Substitutes the current minute	45 = 45
$s	Substitutes the current second	34 = 34
$p	Substitutes 4-digit current screen displayed	Screen 76 = 0076

NOTE: All the symbols start with the dollar sign ($) character. Date symbols are in upper case, time symbols are in lower case. The following are examples of the substituted time/date filenames:

Current date and time: March 1, 2004 3:45:34 PM; Screen 4 is currently displayed.

Filename: Data$M$D.csv = Data0301.csv

Filename: Year$Y\Month$M\aa$D_$h.csv = Year04\Month03\aa01_15.csv

Filename: Month_$M\Day_$D\$h_$m_$s.csv = Month_03\Day_01\15_45_34.csv

Filename: captures\SCR$p.bmp = captures\SCR0004.bmp

9.13 System Registers used with RM

%SR174 Status	Removable Media Protect**.** Write a one (1) to %SR174 to prohibit read/write access to the removable media card. Write a zero (0) to allow access.
%SR175 Status	This shows the current status of the RM interface
%SR176 Free Space	This 32-bit DINT register shows the free space on the RM card in bytes
%SR178 Card Capacity	This 32-bit DINT register shows the total card capacity in kilobytes

Possible status values are shown in the table:

Table 9.2– RM Status Values	
0	RM interface OK
1	Card present but unknown format
2	No card in slot
3	Card present, but not supported
4	Card swapped before operation was complete
5	Unknown error
6	Access protected

For additional status information, consult the i3 Configurator help file.

9.14 Safe Removal of Removable Media Card

If the Removable Media card should need to be removed during operation, it can be safely removed by moving a one (1) into %SR174. This prevents corruption to the file system if the card is removed during a file-write sequence. The graphic objects should set *i*³ register %SR174.1 (when requesting the card be removed) and provide an indicator based on *i*³ register %SR174.2 (which indicates that it is safe to remove the removable media). %SR174 must be set back to zero after the card is reinserted.

Figure 9.3 – Safe Removal of Removable Media

CHAPTER 10: GENERAL I/O

NOTE: Each *i*³A Lite controller unit is sent with a datasheet in the box. The datasheet is the first document to refer to for **model-specific information related to *i*³A Lite model such as pin-outs, jumper settings, and other key installation information.** The web version of this manual has all of the *i*³A Lite datasheet attached to it.

10.1 Overview

The *i*³A Lite controller is a compact unit that contains high density and very versatile I/O. Using the I/O properly requires wiring to the proper terminals and configuring *i*³ controller properly. This section will offer some tips and suggestions to configure the I/O properly. For the register mapping of the I/O, refer to Chapter 12 on Registers.

NOTE: To remove remote I/O connectors, gently pry up the connectors with a small flathead screwdriver.

10.2 Model and I/O Overview

Table 10.1– I/O and Model Overview

***i*³A Lite Models**	**Solid State Digital Outputs**	**Relay Outputs**	**Digital Inputs**	**Analogue Inputs**	**Analogue Outputs**
*i*³A Lite 10D12	✓		✓	✓	✓
*i*³A Lite 10D14	✓	✓	✓	✓	✓

Table 10.1 shows the different types of I/O included with the *i*³A Lite model. Specific specifications and wiring diagrams can be found on the data sheets.

10.3 Solid-State Digital Outputs

***i*³A Lite:** Solid-state digital outputs are generally used to activate lamps, low voltage solenoids, relays, and other low voltage and low current devices.

NOTE*:* The digital outputs used on the *i*³A Lite are "sourcing" outputs. This means the output applies a positive voltage to the output pin when turned ON. When turned off, the output applies approximately zero (0) volts with respect to the I/O ground.

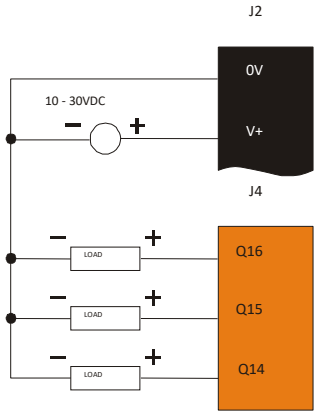


Figure 10.1 – Typical Output Wiring

The digital outputs used in the *i*³A Lite have electronic short circuit protection and current limiting. While these electronic protections work in most applications, some applications may require external fusing on these outputs.

The digital outputs in the *i*³A Lite controller typically controlled via %Q bits in the register mapping. Some of the outputs are designed for high-speed applications and can be used for PWM or frequency output applications. Please see the data sheet and Chapter 10 on High Speed I/O for additional information.

When the controller is stopped, the operation of each output is configurable. The outputs can hold the state they were in before the controller stopped or they can go to a predetermined state. By default, digital outputs turn off. The digital outputs feature an output fault bit. %I32 will turn on if any of the outputs experience a short circuit, over-current or the output driver overheats.

Below are the Wiring Connectors for Digital Output

Model -10D14 Digital Out

Position / Pin		Digital Model
1	Q1	Output 1 (PWM)
2	Q2	Output 2 (PWM)
3	Q3	Output 3
4	Q4	Output 4
5	V+	External V+
6	C	Common
7	Q5	Output 5
8	Q6	Output 6
9	Q7	Output 7
10	Q8	Output 8
11	Q9	Output 9
12	Q10	Output 10
13	Q11	Output 11
14	Q12	Output 12
15	V+	External V 2+
16	C	Common

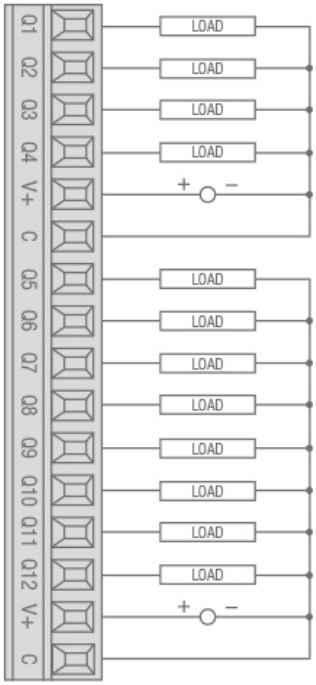
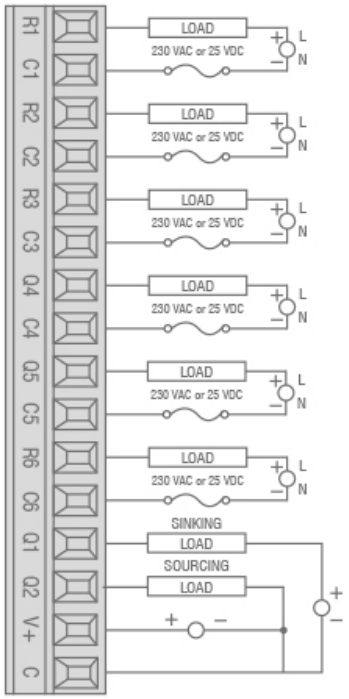


Figure 10.2 –Digital Output

Model -10D12 Relay & Digital Out

Position / Pin		Digital Model
1	R1	Relay 1 NO
2	C1	Relay 1 C
3	R2	Relay 2 NO
4	C2	Relay 2 C
5	R3	Relay 3 NO
6	C3	Relay 3 C
7	R4	Relay 4 NO
8	C4	Relay 4 C
9	R5	Relay 5 NO
10	C5	Relay 5 C
11	R6	Relay 6 NO
12	C6	Relay 6 C
13	Q1	Output 1
14	Q2	Output 2
15	V+	External V+
16	C	Common



NOTE: Internal 10kΩ resistors between: V+ and Q1; V+ and Q2

Figure 10.3 – Relay and Digital Output

10.4 Relay Outputs

Relay outputs are designed to switch loads that typically have high voltage or current requirements or require isolation that relays provide.

NOTE: The design of the *i*³A Lite does not require external coil power for the relays to function. The relays will activate anytime the*i*³A Lite is powered.

There are several factors that should be considered when using relays.

- **Relay Life** – Relays are mechanical devices that have a long but limited life. Typically switching more current limits the life of relays. Please check the datasheet for expected relay life.
- **Current / Temperature De-Rating** – Products containing relays often have total current limits based on the ambient temperature of the application. Please see the product datasheet for current / temperature de-rating information for relays.
- **Fusing** – External fusing is generally required to protect the relays, devices and wiring from shorts or overloads.

WARNING: To protect the module and associated wiring from load faults, use external (**5A)** fuse(s) as shown. Fuses of lower current or fusing for the entire system must be in place to ensure that the maximum current rating of the unit is not exceeded.

WARNING: Connecting high voltage to any I/O pin can cause high voltage to appear at other I/O pins.

Protection for Inductive Loads – Inductive loads can cause reverse currents when they turn off that can shorten the life of relay contacts. Some protective measures must be determined by an engineer. Below are some recommendations that will work for many applications. If there are additional questions on protection from inductive load, consult IMO Technical Support.

Output State on Controller Stop – When the controller is stopped, the operation of each output is configurable. The outputs can hold the state they were in before the controller stopped or they can go to a predetermined state. By default, relay outputs turn off.

10.4.1 Sinking and Sourcing Outputs

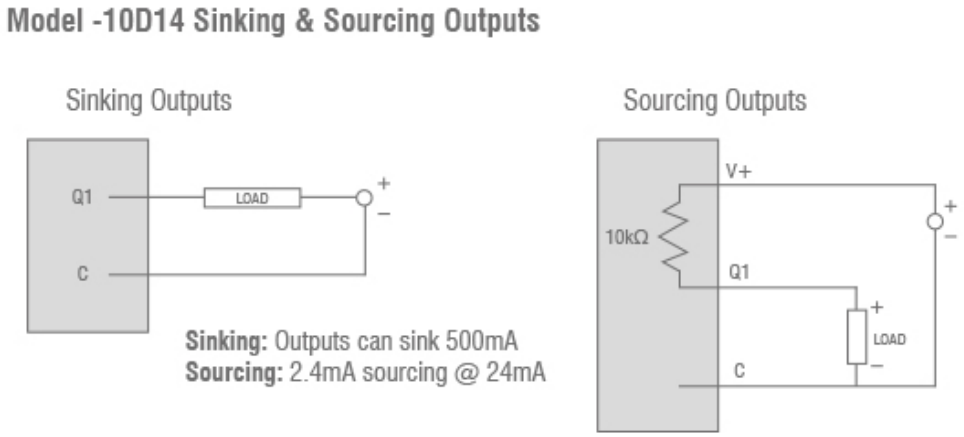


Figure 10.4 – Model -10D14: Sinking and Sourcing Outputs

10.5 Digital Inputs

NOTE: See Chapter 11 for High-Speed I/O information and refer to the datasheet for *i*³A Lite model being used for details on jumper settings.

NOTE*:* **The digital inputs on the *i*³A Lite are designed for low voltage DC inputs.**

The inputs are designed to support both positive and negative input modes. The mode is set by jumper setting and a configuration parameter in *i³ Configurator*. All the inputs on the unit must be configured to the same mode.

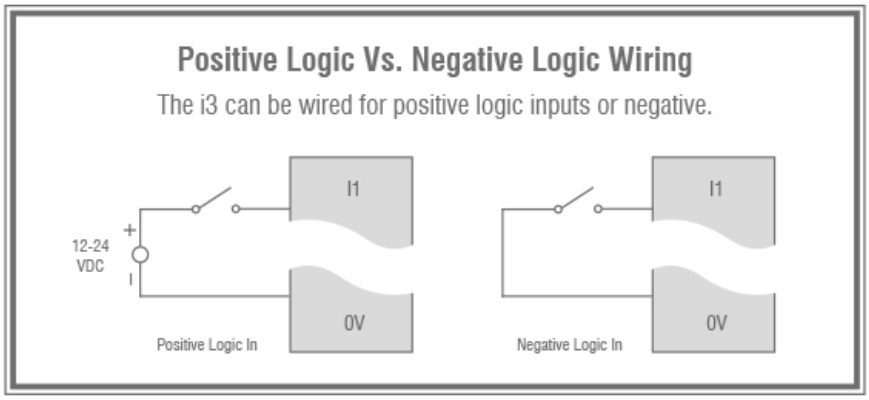


Figure 10.5 – Positive and Negative Inputs

In positive logic mode, a positive voltage applied to the input will turn the input 'On'. The internal design of this mode is basically a resistor from the input to I/O ground. This mode is sometimes called sourcing.

In negative logic mode, connecting the input to the I/O ground or zero volts will turn the input 'On'. The internal design of this mode is basically a resistor from the input to the positive I/O voltage (usually 12 or 24 V). This mode is sometimes called sinking.

Some of the digital inputs may support high-speed input functions such as counting or frequency measurement.

Digital Input

Position / Pin		Digital Model
1	I1	Input 1 (HSC)
2	I2	Input 2 (HSC)
3	I3	Input 3 (HSC)
4	I4	Input 4 (HSC)
5	I5	Input 5
6	I6	Input 6
7	I7	Input 7
8	I8	Input 8
9	I9	Input 9
10	I10	Input 10
11	I11	Input 11
12	I12	Input 12
13	C	Common
14	C	Common

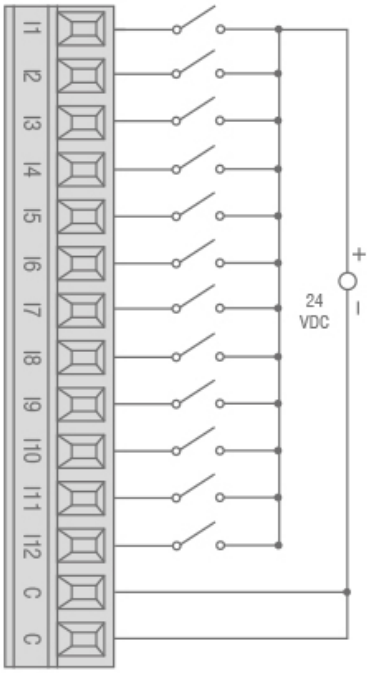


Figure 10.6 –Digital Input

10.6 Analogue Inputs

The analogue inputs on the *i*³A Lite controller allow current or voltage measurement from a variety of devices. The voltage or current mode is set though jumpers on the unit and settings in *i³ Configurator*. Each channel can be separately configured for voltage or current mode.

The analogue inputs have a digital filter that can be used to filter electrical noise that may be unavoidable in some installations. The downside to digital filtering is the inputs will respond more slowly to sudden changes in the actual input.

Analogue Input & Output

Position / Pin		Digital Model
1	AI1	Analogue Input 1
2	AI2	Analogue Input 2
3	AI3	Analogue Input 3
4	AI4	Analogue Input 4
5	C	Common
6	C	Common
7	AQ1	Analogue Output 1
8	AQ2	Analogue Output 2
9	C	Common

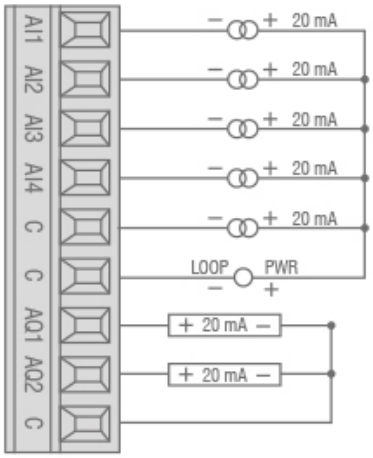


Figure 10.7 –Analogue In and Out

10.7 Analogue Outputs

Note: Refer to the datasheet for *i*³A Lite controller model being used for details on jumper settings.

The analogue outputs on *i*³A Lite device provide high resolution current outputs. The current selection is controlled with jumpers and configuration settings in *i³ Configurator*.

NOTE: Each channel can be separately configured for voltage or current mode.

When the controller is stopped, the operation of each output is configurable. The outputs can hold the state they were in before the controller stopped or they can go to a predetermined value. By default, analogue outputs are set to a value of zero (0). For more information on Stop State, see Chapter 14 on *I3 Configurator* Configuration.

CHAPTER 11: HIGH SPEED I/O (HSC/PWM)

11.1 Overview

In addition to the compliment of simple analogue and digital I/O, several of the *i*³A Lite I/O module support High Speed Counting (HSC) I/O functions and may support Pulse Width Modulation (PWM) Output functions. The HSC functions include frequency, totalizing, pulse width, and quadrature measurement. The PWM functions include traditional PWM (with variable rate and duty) with variable acceleration and deceleration rates. To determine function availability, refer to the associated model's Specification/Installation sheet (Digital DC Input / Output sections).

This chapter describes the operation of these high-level I/O functions. For configuration details of these functions, see Chapter 14, *i*³ Configurator Configuration.

11.2 Glossary of High Speed I/O Terms

Table 11.1 – Glossary of High Speed I/O Terms

Accumulator	Register used to accumulate or store up a sum or count of many items or events.
Clear	A special function to zero out the value in a specific register. (Not used with Frequency or Period Measurement.)
Disable	A special function to prevent the counter from running.
Encoder	A sensor or transducer for converting rotary motion or position to a series of electronic pulses
Frequency Input	The number of times an electromagnetic signal repeats an identical cycle in a unit of time, usually one second.
Latch (strobe)	A special function that uses a digital logic circuit to store one or more bits. A latch has a data input, a clock input and an output. When the clock input is active, data on the input is "latched" or stored and transferred to the output register, either immediately or when the clock input goes inactive. The output retains its value until the clock goes active again.
Marker	Input into the controller indicates a particular position. Typically, an encoder has a marker output that represents a specific point in the rotation.
Polarity	A polarity pull-down box is associated with each function and indicates the manner in which the trigger happens (e.g., High Level, Low Level, Falling Edge, Rising Edge).
Preload (load)	A special function used to trigger loading of a value into a register upon an event. (Not used with Frequency or Period Measurement.)
Quadrature	A high-speed device that expresses the phase relationship between two periodic quantities of the same period when the phase difference between them is one fourth of a period. A coupler in which the two output signals are 90° out of phase.
Totalizer	A counter that sums the total number of cycles applied to its input.

11.3 High Speed Counter (HSC) Functions

On units that support the HSC, four dedicated inputs are available that can be configured for one of four modes of operation. Those modes are Frequency, Count (totalize), Pulse width or period (pulse) and Quadrature measurement. For some modes, more than one HSC input may be consumed. The measurement value is provided to ladder in a %AI register.

NOTE: While the high-speed input circuitry has a resolution of 1μs, measured edge transitions must not occur faster than 100μs for accurate measurements. Keep in mind that pulse width measurements utilize both the rising and falling edges of the waveform, thus the pulse width must exist longer than 100μs.

NOTE: The **edge** polarity selection in the mode parameter for the totalize and pulse width functions (Digital/HSC Input Configuration) assume Positive Logic regardless of the associated I/O board's jumper setting for the **Digital DC inputs polarity.** If Negative logic is configured when using these functions, the opposite edge polarity must be selected in the mode parameter**.**

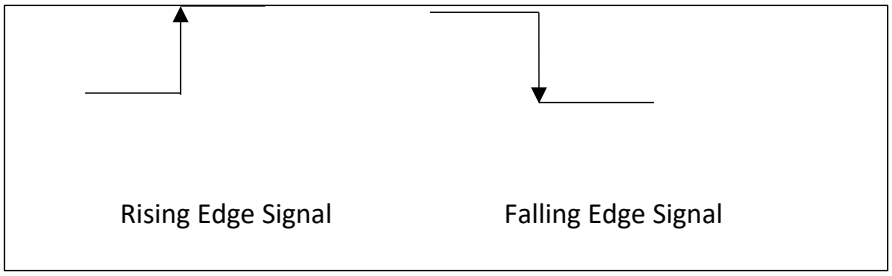
11.3.1 Frequency

In frequency mode, the frequency of the input signal is written to the accumulator in terms of Hertz (cycles/second). When using frequency mode, four update selections are provided which specify the width of the sample window.

NOTE: Selecting a shorter sample window provides a quicker measurement (faster response) but lowers the frequency accuracy (resolution) and increases the minimum frequency measurement limit.

11.3.2 Totalize

In totalize mode, the accumulator is simply incremented each time the input transitions in a specific direction. Totalize mode is configurable to specify the edge (rising or falling) on which the accumulator is incremented.



Three different options are available to reset the current count.

- **Configured reset value**
  When configuring the Totalize function, a value may be specified under the *Counts per Rev* column. When the totalizer accumulator reaches the value - 1, the accumulator will reset to zero on the next count. Specifying zero for this value allows the totalizer to count through the full 32-bit range before resetting.
- **Ladder control**
  Setting registers %Q17-20 reset HSC1-4 (respectively) with no additional configuration. When these registers are asserted, the associated totalizer accumulator is reset and held at zero (level sensitive).
- **Direct digital input control** (HSC1 and HSC2 only)
  HSC3 (%I11) and HSC4 (%I12) may be configured as hardware digital reset signals for HSC1 and HSC2 (respectively). To enable these inputs as reset signals, specify the type as *Totalize Reset* (note that the corresponding Totalize HSC must be previously configured before this option is available). The direct digital reset controls are edge sensitive with the edge polarity configurable.

NOTE: Maximum direct digital reset latency is 100μs.

The totalize function also supports an option which compares the current accumulator value with a supplied Preset Value (PV), which is provided through a %AQ, and drives a physical digital output based on the that comparison.

- This option (available for HSC1 and HSC2 only) drives Q1 or Q2 output point (respectively) once the associated totalizer accumulator reaches (or exceeds) the PV value. To enable this function, the corresponding PWM function output (Q1 or Q2) must be configured for *HSCx Output*.

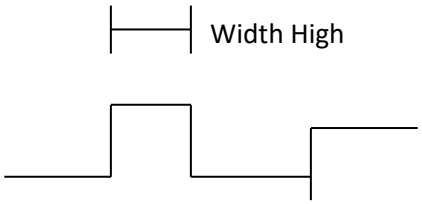
NOTE: Q1 and Q2 are PWM function outputs that may be configured independently as one of the following: standard digital output, PWM, or HSCx output.

Preset values may be modified during run-time. A preset value of zero disables (resets) the totalizer compare function output causing the output to remain low.

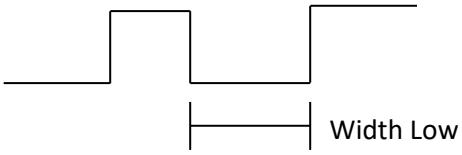
11.3.3 Pulse

In pulse mode, the high-speed input can measure the width or period of a pulse stream in one of four modes and provides a continuous indication of the last sampled value.

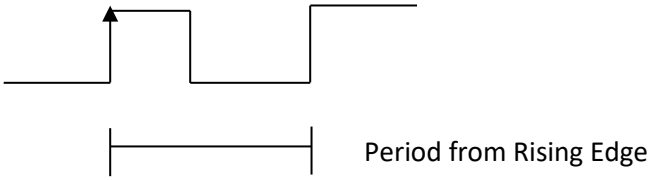
Width High 1µs Counts – In this sub-mode the accumulator value will contain the number of 1µs counts for which the pulse is high.



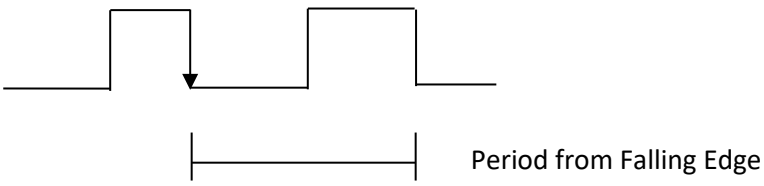
Width Low 1µs Counts - In this sub-mode the accumulator value will contain the number of 1µs counts for which the pulse is low.



Period Rising Edges 1µs Counts – In this sub-mode the period of the input signal is reported in one (1) µs units. The period measurement will start on the rising edge of the input.



Period Falling Edges 1µs Counts – In this sub-mode the period of the input signal is reported in one (1) µs units. The period measurement will start on the falling edge of the input.

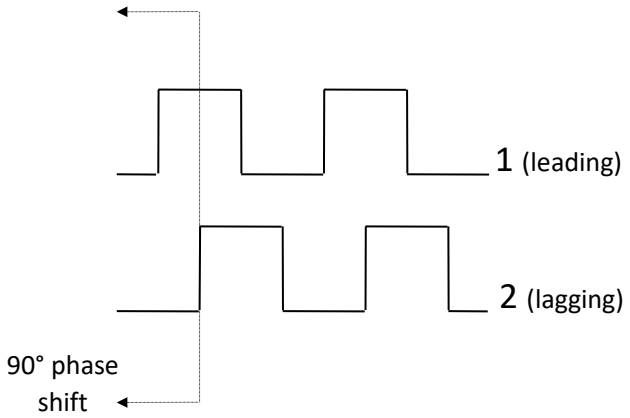


11.3.4 Quadrature

Two HSC inputs are consumed for each of the two possible Quadrature counters. For example, selecting quadrature mode for HSC 1 will use HSC inputs 1 and 2, which correspond to A and B quadrature signals. Therefore, HSC 1 and 3 may be configured for quadrature input. Alternately, HSC 3 may be configured to reset HSC1 (quadrature) count on a marker input

Quadrature mode works much like the totalizer except the accumulator will automatically increment or decrement based on the rotation phase of the two inputs. See the following example for more details. Quadrature inputs are typically used for reporting the value of an encoder.

Two modes are available for quadrature that select whether the accumulator counts up or down when the phase of input 1 leads input 2. Check your encoder's documentation to determine the output form it uses or try both modes to determine if the encoder counts up when expected.



Using the above waveforms and a HSC input configuration of "Quadrature" - "1 leads 2, count up," the accumulator will count up when 1 is rising and 2 is low, 1 is high and 2 is rising, 1 is falling and 2 is high, and when 1 is low and 2 is falling. This results in 4 counts per revolution. So, in order to determine the number of cycles, the accumulator would have to be divided by 4.

Three different options are available to reset (or set) the current count.

- **Configured *Counts per Rev* value**
  When configuring the quadrature function, a value may be specified under the *Counts per Rev* column. When rotation produces an increasing count, the quadrature accumulator resets to zero on reaching the *Counts per Rev* count. Alternately, when rotation produces a decreasing count, the quadrature accumulator is set to *Counts per Rev* – 1 on the count following zero. Specifying zero for this value allows the totalizer to count through the full 32-bit range before resetting.

  For example, if your encoder outputs 1024 counts per revolution, the value of 1024 can be entered into the configuration for *Counts per rev*. This will result in a counter that produces counts in the range of 0 to 1023.

- **Ladder control**
  Setting registers %Q17 or Q19 resets quadrature (HSC) 1 or quadrature (HSC) 3 (respectively) with no additional configuration. Setting registers %Q18 or Q20 sets quadrature (HSC) 1 or quadrature (HSC) 3 (respectively) to *Counts per Rev* – 1.

- **Direct digital input control (HSC3) [Marker]**
  When HSC input 1 and 2 are used for quadrature inputs, an additional choice of marker input becomes available for HSC input 3. The marker input is typically part of an encoder or motion system that signals when a cycle of motion is complete. When the marker input is triggered, the accumulator is reset to zero or to *Counts per rev - 1* based on rotation direction.

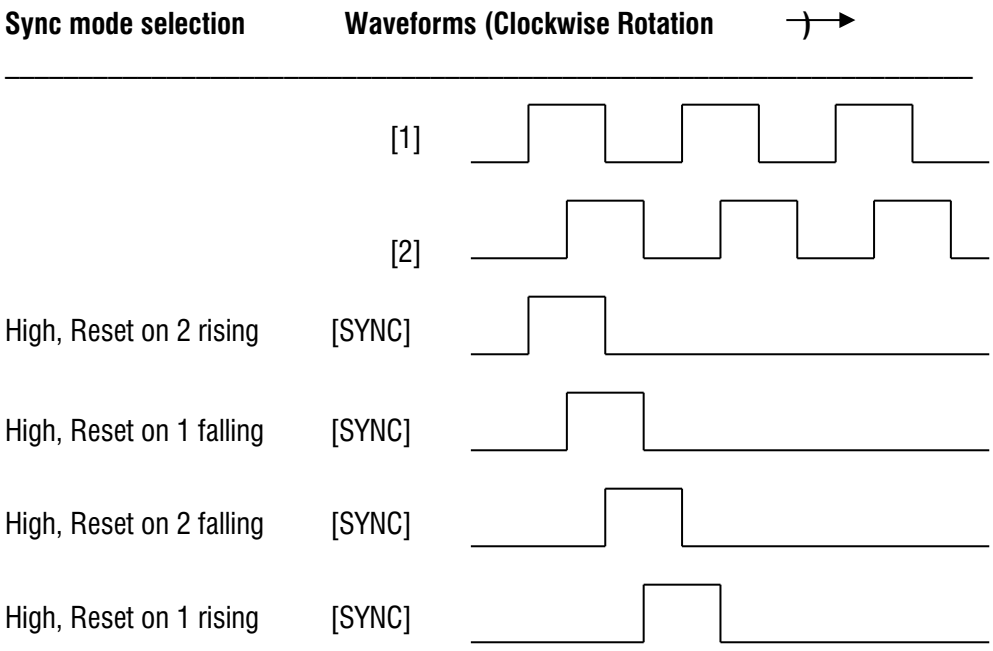
  Marker reset operation is enabled when HSC3 is configured for *Marker* type. Once selected, one of several modes is available for marker operation. These modes can be sub-divided into two groups of marker operation.

Asynchronous modes ignore the quadrature inputs and reset the quadrature accumulator to zero on the configured edge (rising, falling or both). These are the most common settings used. When configuring, asynchronous mode selections are prefixed with the word *Async.*

Synchronous modes synchronize the reset (or set) to the selected quadrature input and the selected marker polarity. Figure 11.1 below indicates which mode to select based on the markers timing diagram. Consult the documentation provided with your encoder to determine the marker pulse timing.

NOTE: The Marker input is sampled within 50 μs of the associated quadrature edge. It is left to the user to determine if this meets the time constraints of the measured drive.

NOTE: If the Marker input pulse consecutively spans more than one of the specified edges, quadrature-decoding operation is unpredictable.



*While not displayed in this figure, modes for low level (inverse logic) are also supported for each state.

Figure 11.1 – Sync pulse mode illustration

The accumulator is reset to zero on the specified edge if rotation is clockwise (as shown in Figure 11.1 above). However, if rotation is reversed, the accumulator is alternately set to *Counts per rev* – 1 on that same physical edge. When direction is reversed, that same physical edge is seen (by the internal decoder) as having the opposite edge polarity as shown below.

Table 11.2 – Marker Function Table

Mode	Direction	A (HSC1)	B (HSC2)	Marker (HSC3)	Reset Value
Async, Reset on rising edge				Rising	0
Async, Reset on falling edge				Falling	0
Async, Reset on both edge				Both	0
High, Reset on 1 rising	Clockwise	Rising		High	0
"	Counter	Falling		High	CPR - 1
Low, Reset on 1 rising	Clockwise	Rising		Low	0
"	Counter	Falling		Low	CPR - 1
High, Reset on 1 falling	Clockwise	Rising		High	CPR - 1
"	Counter	Falling		High	0
Low, Reset on 1 falling	Clockwise	Rising		Low	CPR - 1
"	Counter	Falling		Low	0
High, Reset on 2 rising	Clockwise		Rising	High	0
"	Counter		Falling	High	CPR - 1
Low, Reset on 2 rising	Clockwise		Rising	Low	0
"	Counter		Falling	Low	CPR - 1
High, Reset on 2 falling	Clockwise		Rising	High	CPR - 1
"	Counter		Falling	High	0
Low, Reset on 2 falling	Clockwise		Rising	Low	CPR - 1
"	Counter		Falling	Low	0

11.4 HSC (High Speed Counter)

When either Q1 or Q2 is configured for HSC operation, HSC1 or HSC2 totalize functions are extended to allow respective direct output control based on a comparison of the current count and a preset value (PV). See totalize in the HSC section above for more information.

11.4.1 HSC Functions Register Map

Table 11.3 – HSC Functions Register Map

Register	Frequency	Totalize	Pulse	Quad
%AI5-6	HSC1 (function) Accumulator			Quad 1 Acc
%AI7-8	HSC2 (function) Accumulator			
%AI9-10	HSC3 (function) Accumulator			Quad 2 Acc
%AI11-12	HSC4 (function) Accumulator			
%AQ9-10		HSC1 Preset		
%AQ13-14		HSC2 Preset		
%Q17		Clear HSC1		Clear Quad 1
%Q18		Clear HSC2		Set Quad 1
%Q19		Clear HSC3		Clear Quad 2
%Q20		Clear HSC4		Set Quad 2

11.5 Pulse Width Modulation (PWM) Functions

On units that support the PWM, two dedicated outputs are available that can be configured for one of four modes of operation. Those modes are Normal, PWM, and HSC (count = PV).

NOTE: In *i³ Configurator*, the *i*³A Lite automatically defaults to Extended PWM Mode.

11.5.1 Normal

When either Q1 or Q2 is configured for Normal operation, the digital output registers %Q1 and %Q2 drives that respective output.

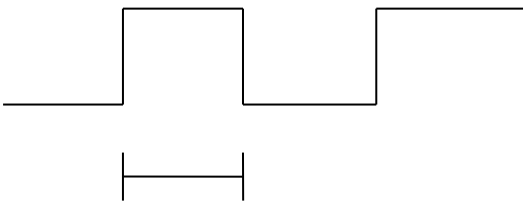
11.5.2 PWM

When either Q1 or Q2 is configured for PWM, the PWM function drives that respective output. Both PWM channels may be individually enabled; however, when both PWM outputs are enabled, both share the same output frequency (with the low going pulses synchronized). Otherwise, each PWM's pulse width can be independently adjusted.

Duty Cycle Count

This value (PWM1: %AQ1-2, PWM2: %AQ3-4) sets the width of the output signal by specifying the number of internal PWM counter *counts* that the output is maintained high. The duration of each *count* is determined by the pre-scaler value. Each PWM channel has its own duty cycle count parameter.

Setting the period count to 1000 and the duty cycle count to 500 results in a duty cycle of 50 percent. Changing just the duty cycle count to a value of 250 results in a duty cycle of 25 percent.



At controller power-up or during a download, the PWM output is maintained at zero until both the Period (count) and the Duty cycle (count) are loaded with non-zero values. When the controller is placed in stop mode, the state of the PWM outputs is dependent on the *PWM State on Controller Stop* configuration.

This configuration allows for either hold-last-state or specific prescale, period and duty cycle counts. Specifying zero for either the period or duty causes the PWM output to remain low during stop mode.

NOTE: The nominal output driver turn-on-time delay (to reach 50% output) is 25 μs on Models 3-5. Therefore, this limitation should be considered when determining both the minimum pulse width and the duty cycle accuracy of the application.

11.5.3 PWM Output Waveform

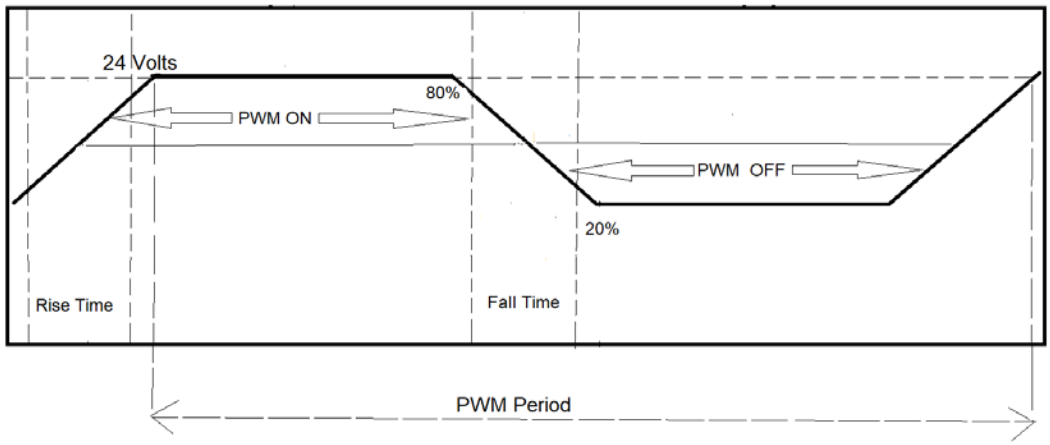


Figure 11.2 – PWM Output Waveform

Table 11.4 – PWM Output Waveform Table	
Rise Time	150ns Max
Fall Time	150ns Max
PWM Period	Frequency $= \frac{1}{Period}$

11.6 PWM Functions Register Map

Table 11.5 – PWM Functions Register Map		
Register	**PWM**	**HSC**
%AQ7	PWM1 Duty Cycle (32-bit)	HSC1 Preset Value(AQ3-4)
%AQ8		
%AQ9	PWM1 Frequency (32-bit)	
%AQ10		
%AQ11	PWM2 Duty Cycle (32-bit)	HSC2 Preset Value (AQ5-6)
%AQ12		
%AQ13	PWM2 Frequency (32-bit)	
%AQ14		

11.6.1 PWM Examples

Example 1	**Duty Cycle**	**Frequency**
To get a 50% Duty Cycle @ 10kHz waveform on **PWM1**:	Set %AQ7 – 8 = 16,000	Set %AQ9 – 10 = 10,000

Example 2	**Duty Cycle**	**Frequency**
To get a 25% Duty Cycle @ 5kHz waveform on **PWM2**:	Set %AQ11 – 12 = 8,000	Set %AQ13 – 14 = 5,000

Example 3	**Duty Cycle**	**Frequency**
To turn PWM 1 output ON all the time:	Set %AQ7 – 8 = 32,000	Set %AQ9 – 10 = Any Value

Example 4	**Duty Cycle**	**Frequency**
To turn PWM 1 output OFF all the time:	Set %AQ7 – 8 = 0	Set %AQ9 – 10 = Any Value

Table 11.6 – PWM Examples

Chapter 12: User Interface

12.1 Overview

This chapter presents the user interface (or operator view) of the *i*³A Lite and some of the model specific characteristics of the *i*³A Lite as compared to the rest of the *i*³ line. This chapter does NOT cover building screens or using the *i*³ *Configurator* graphics editor. For instructions on creating screens and using the graphics editor, refer to the **Graphics Editor Help file** in *I3 Configurator*.

NOTE: The*i*³A Lite screen is a 2.2-inch diagonal LCD screen with an LED backlight.

12.2 Displaying and Entering Data

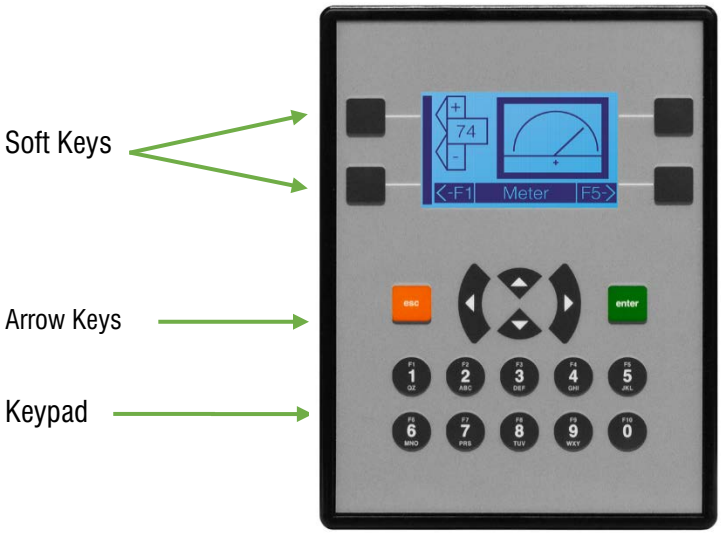


Figure 12.1 – Types of Keys and Buttons

The *i*³A Lite uses multiple objects to display data. The user can use either the soft keys, which are the black buttons on either side of the screen to select items. The user can also use the arrows or the alpha-numeric keys that can also be used as function keys.

Based on the editable field as programmed in *i*³ *Configurator*, the numeric entry will automatically switch between numbers or letters. To type in some letters, a button may have to be pressed numerous times until the desired letter is displayed.

12.3 Types of Objects

The *i*³A Lite has two types of objects which must be defined using the *i*³ *Configurator* program. Please refer to the *i*³ *Configurator* Help file for further instructions.

Display Objects—Display objects just display data and cannot be edited.

Editable Screen Objects— Editable Field Objects contain fields that can be edited by using the arrow keys and the Function Keys.

12.4 Using Editable Screen Objects

When a screen contains editable objects, one of the objects will be selected by default. Selected objects will be **outlined with a dotted line**. The arrow keys can be used to navigate the editable objects and allow selection of an object to edit. When the object to be edited is selected, press the **Enter** button. This enters the objects editing mode. The most common editable object is the numeric object.

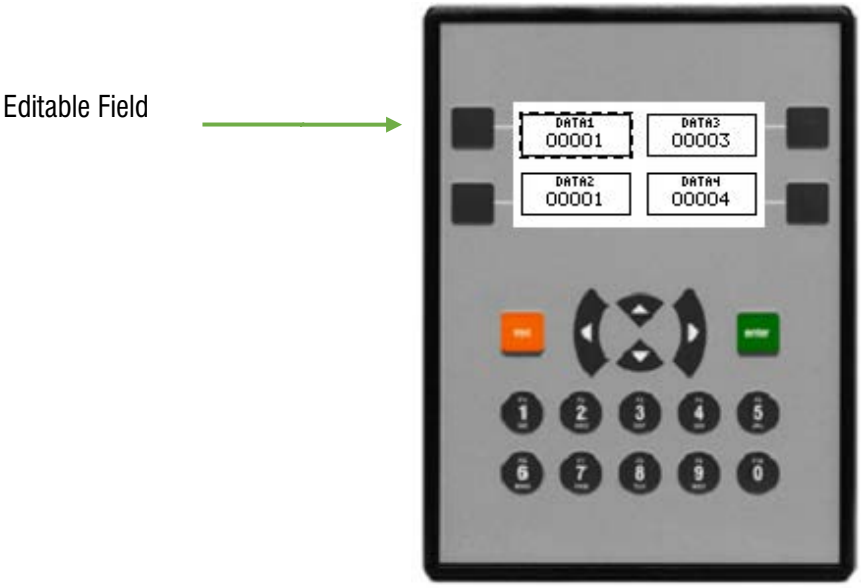


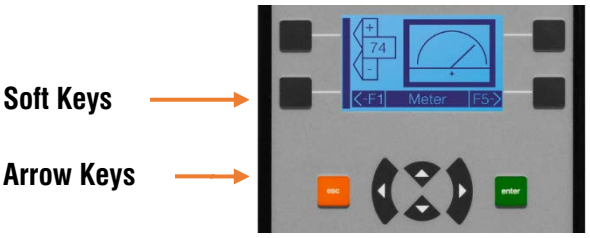
Figure 12.2—*i*³A Lite and Editable Field

If the *i*³A Lite display **>>>>>>** in a numeric field, the value is too big to display in the field or is above the maximum for an editable field. If the *i*³A Lite display **<<<<<<** in a numeric field, the value is too small to display or is below the minimum for an editable field.

NOTE: **Display Objects**—Some objects just display data and cannot be edited.

12.5 Navigation Keys

The *i*³A Lite has two types of navigation keys:



Soft Keys—The black squares on the sides of the screen are called "soft keys" and can be used to select objects that have an arrow icon pointing to the soft key. Soft keys can be assigned to certain objects, such as switch objects or jump objects.

Arrow Keys—The arrows keys are used for editable fields. Select an editable field by using one of the arrow keys to highlight a field to be edited. Then press Enter to change the value using the numeric key pad. Then press Enter again to store the value.

12.6 Screen Navigation

To allow the operator to change screens, a **screen jump object** is generally used. This object is typically tied to a soft key (One of the four keys to the sides of the display for the *i*³A Lite). Pressing the soft key will switch to the screen that is programmed in *i³ Configurator*.

NOTE: A triangle or arrow on the side of an image on the *i*³A Lite screen indicates that this button can be selected by using one of the soft keys on the side of the screen.

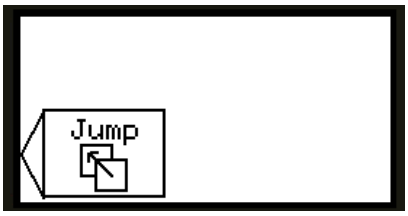


Figure 12.3 – Typical Screen Jump Object

12.7 Ladder Based Screen Navigation

Ladder logic can use several techniques to control screen navigation. Coils can be tied to %D registers to make them screen coils. These coils have two modes: switch and alarm. If the ladder program energizes an alarm display coil, the screen associated with this coil is displayed and overrides the normal user screens. This is designed to show alarm conditions or to display other ladder-detected events. When the text coil is de-energized, the previous screen that was being viewed before the alarm is returned.

The switch display coil switches to the associated screen when it is energized. Once it is de-energized the screen remains until it is switched by the user or ladder.

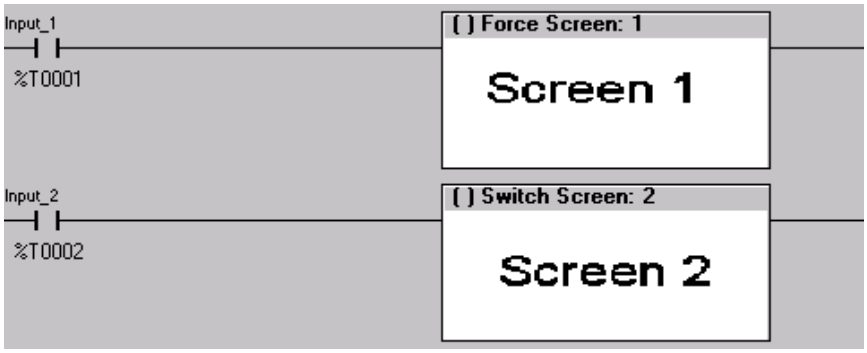


Figure 12.4 – Force and Switch Coils in Ladder Programming

There is also a system register that can be used to for control-based screen navigation. %SR1 can be read to determine the current screen or written to change the current screen.

Refer to the to the *i³ Configurator* Help file for more information on control-based screen navigation.

12.8 Alarms

Alarm presentation to the operator is highly configurable and beyond the scope of this document to describe fully. The alarm object is generally used to enunciate alarms to the operator.

For more information, refer to the **Graphics Editor Help** file in *i³ Configurator*. This section presents a typical configuration thereby providing an introductory description on what the operator should expect.

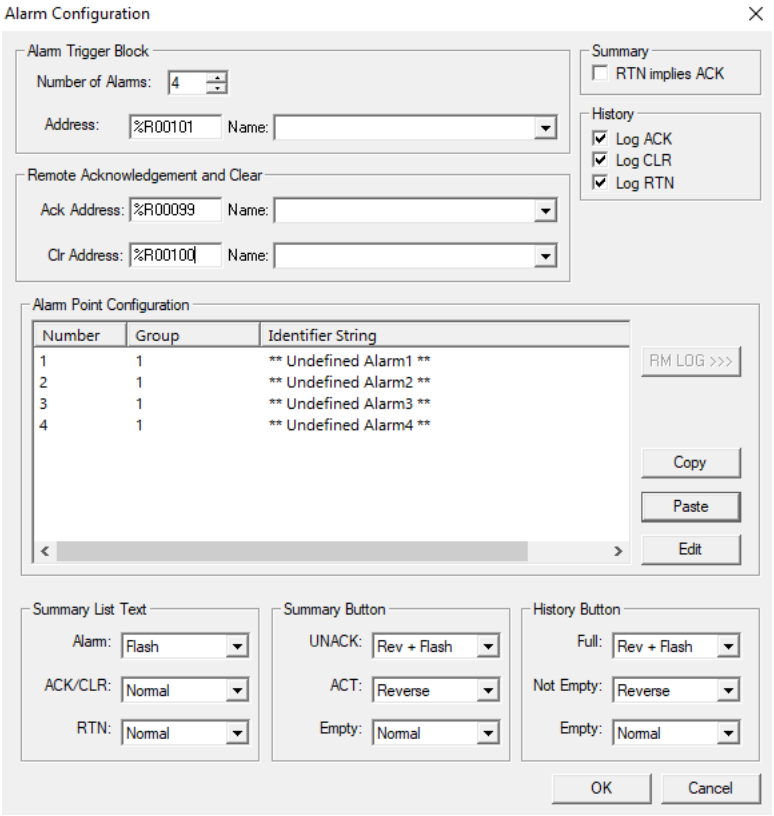


Figure 12.5—Alarm Configuration in *i³ Configurator*

To view, acknowledge, and/or clear alarms, the operator must access the alarm viewer. This is accomplished by selecting an alarm object. When accessed, the alarm object is displayed as pop-up alarm viewer dialog.

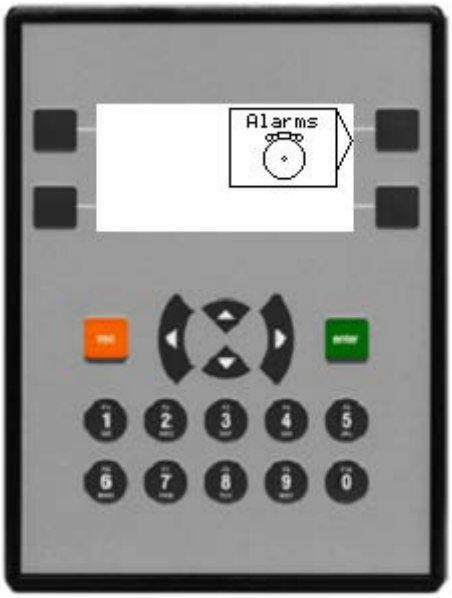


Figure 12.6 – Alarm Object

Once view operations are complete, simply touch the *Esc* button to remove the pop-up alarm viewer.

NOTE: *i*³ registers %SR181 and %SR182 are available for ladder use, which indicate presence of unacknowledged or acknowledged alarm (respectively). The screen designer may implement these registers to switch screens or activate the beeper to attract the operator's attention.

12.9 Screen Saver

The *i*³A Lite screen backlight life remains sufficiently bright for five (5) years. It will dim to 70% brightness if it is left on continuously for five (5) years. If the application does not require interaction with the*i*³A Lite for long periods of time, the backlight life can be extended by using the screen saver function. When enabled through the System Menu, the backlight is shut off (screen goes black) after a specified time of no activity on the screen. When the screen saver shuts off the backlight, any key or button reactivates the backlight.

It is possible for the application to temporarily disable the screen saver by generating a positive transition to %SR57.16 (coil only) at a rate faster than the screen saver timeout value. This may be desired while waiting for alarm acknowledgement.

NOTE: The backlight life can be extended by powering off the backlight.

CHAPTER 13: REGISTERS

13.1 Register Definitions

When programming the *i*³A Lite controller, data is stored in memory that is segmented into different types. This memory in the controller is referred to as registers. Different groups of registers are defined as either bits or words (16 bits). Multiple registers can usually be used to handle larger storage requirements. For example, 16 single-bit registers can be used to store a word, or two 16-bit registers can be used to store a 32-bit value.

Table 13.1 - Types of Registers in the i3A LITE	
%AI Analogue Input	16-bit input registers used to gather analogue input data such as voltages, temperatures, and speed settings coming from an attached device.
%AQ Analogue Output	16-bit output registers used to send analogue information such a voltages, levels or speed settings to an attached device.
%D Display Bit	These are digital flags used to control the displaying of screens on a unit which has the ability to display a screen. If the bit is SET, the screen is displayed.
%I Digital Input	Single-bit input registers. Typically, an external switch is connected to the registers.
%K Key Bit	Single-bit flags used to give the programmer direct access to any front panel keys appearing on a unit.
%M Retentive Bit	Retentive single-bit registers.
%Q Digital Output	Single-bit output registers. Typically, these bits are connected to an actuator, indicator light or other physical outputs.
%R General Purpose Register	Retentive 16-bit registers.
%S System Bit	Single-bit bit coils predefined for system use.
%SR System Register	16-bit registers predefined for system use.
%T Temporary Bit	Non-retentive single-bit registers.

13.2 Useful %S and %SR registers

Table 13.2 – Common %S Register Definitions	
Register	**Description**
%S1	Indicate First Scan
%S2	Network is OK
%S3	10ms time base
%S4	100ms time base
%S5	1 second time base
%S6	I/O is OK
%S7	Always ON
%S8	Always OFF
%S9	Pause 'n Load soon
%S10	Pause 'n load done
%S11	I/O being forced
%S12	Forcing is enabled
%S13	Network I/O is OK

Table 13.3 – %SR Registers				
Register	**Name**	**Description**	**Min Val**	**Max Val**
%SR1	USER_SCR	Current User Screen Number	1	1023
%SR2	ALRM_SCR	Current Alarm Screen Number (0=none)	0	1023
%SR3	SYS_SCR	Current System Screen Number (0=none)	0	14
%SR4	SELF_TEST	Bit-Mapped Self-Test Result	0	65535
%SR5	CS_MODE	Control Station Mode (0=Idle, 1=Do I/O, 2=Run)	0	2
%SR6	SCAN_RATE	Average Scan Rate (/ 10)	-	1000
%SR7	MIN_RATE	Minimum Scan Rate (/ 10)	-	1000
%SR8	MAX_RATE	Maximum Scan Rate (/ 10)	-	1000
%SR9-10	EDIT_BUF	Data Field Edit Buffer	0	2^{32}-1
%SR11-12	LADDER_SIZE	Ladder Code Size	2	256K
%SR 13-16	Reserved	-	-	-
%SR17-18	IO_SIZE	I/O Configuration Table Size	16	127K
%SR19-20	NET_SIZE	Network Configuration Table Size	34	1K
%SR21-22	SD_SIZE	Security Data Table Size	-	-
%SR23	LADDER_CRC	Ladder Code CRC	0	65535
%SR 24-25	Reserved	-	-	-
%SR26	IO_CRC	I/O Configuration Table CRC	0	65535
%SR27	NET_CRC	Network Configuration Table CRC	0	65535
%SR28	SD_CRC	Security Data Table CRC	0	65535
%SR29	NET_ID	This Station's Primary Network ID (ICAN)	1	253
%SR30	NET_BAUD	Network Baud Rate (ICAN) (0=125KB; 1=250KB; 2=500KB; 3=1MB)	0	3
%SR31	NET_MODE	Network Mode (0=network not required; 1=network required; 2=network optimized; 3=network required and optimized)	0	3
%SR32	LCD_CONT	LCD Display Contrast setting	0	255
%SR33	FKEY_MODE	Function Key Mode (0=Momentary; 1=Toggle)	0	1
%SR34	SERIAL_PROT	RS232 Serial Protocol Mode (0=Firmware Update (RISM); 1=ICAN; 2=Generic (Ladder- Controlled); 3=Modbus RTU; 4=Modbus ASCII)	0	4
%SR35-36	SERIAL_NUM	This Station's 32-bit Serial Number	0	2^{32}-1
%SR37	MODEL_NUM	This Station's Binary Model Number	0	65535
%SR38	ENG_REV	Firmware Rev Number (/ 100)	0000	9999
%SR39	CPLD_REV	BIOS Rev Number (/ 100)	000	255
%SR40	FPGA_REV	FPGA Image Rev Number (/ 10)	000	255
%SR41	LCD_COLS	Vertical Pixel Count		
%SR42	LCD_ROWS	Horizontal Pixel Count		
%SR43	KEY_TYPE	Keypad Type		
%SR44	RTC_SEC	Real-Time-Clock Second	0	59
%SR45	RTC_MIN	Real-Time-Clock Minute	0	59
%SR46	RTC_HOUR	Real-Time-Clock Hour	0	23
%SR47	RTC_DATE	Real-Time-Clock Date	1	31
%SR48	RTC_MON	Real-Time-Clock Month	1	12
%SR49	RTC_YEAR	Real-Time-Clock Year	1996	2095
%SR50	RTC_DAY	Real-Time-Clock Day (1=Sunday)	1	7
%SR51	NET_CNT	Network Error Count	0	65535
%SR52	WDOG_CNT	Watchdog-Tripped Error Count	0	65535
%SR53-54	BAD_LADDER	Bad Ladder Code Error Index	0	65534
%SR55	F_SELF_TEST	Filtered Bit-Mapped Self-Test Result	0	65535

Table 13.3 – %SR Registers				
Register	**Name**	**Description**	**Min Val**	**Max Val**
%SR56	LAST_KEY	Key Code of Last Key Press or Release	0	255
%SR57	BAK_LITE	LCD Backlight Dimmer Register 0 = 0% On; 100-255 = 100% On	0	255
%SR59-60	Reserved	-	-	-
%SR61	NUM_IDS	This Station's Number of Network IDs	1	253
%SR62	NUM_IDS	This Station's Number of Network IDs	1	253
%SR113-114	GOBJ_SIZE	Graphics Object Table Size	8	256K
%SR115-116	GSTR_SIZE	Graphics String Table Size	8	128K
%SR117-118	GBMP_SIZE	Graphics Bitmap Table Size	4	256K
%SR119-120	GTXT_SIZE	Graphics Text Table Size	8	128K
%SR121-122	GFNT_SIZE	Graphics Font Table Size	8	256K
%SR123-124	PROT_SIZE	Protocol Table Size	16	64K
%SR125	GOBJ_CRC	Graphics Object Table CRC	0	65535
%SR126	GSTR_CRC	Graphics String Table CRC	0	65535
%SR127	GBMP_CRC	Graphics Bitmap Table CRC	0	65535
%SR128	GTXT_CRC	Graphics Text Table CRC	0	65535
%SR129	GFNT_CRC	Graphics Font Table CRC	0	65535
%SR130	PROT_CRC	Protocol Table CRC	0	65535
%SR131-163	Reserved	-	-	-
%SR152.3		Enables RS485 Port Termination		
%SR152.4		Enables CAN Port Termination		
%SR164.1		Enables RS485 Port Biasing		
%SR164.3		Read bit indicating Auto Restore of Register Data has been performed (Fail Safe)		
%SR164.4		Read bit indicating Backup of Register Data has been performed (Fail Safe)		
%SR164.5		Enable AUTORUN (Fail Safe)		
%SR164.6		Enable AUTOLOAD (Fail Safe)		
%SR164.7		Backup trigger bit		
%SR164.8		Clear Backup trigger bit		
%SR164.9		MAKE_CLONE trigger bit		
%SR164.10		LOAD_CLONE trigger bit		
%SR164.11		Status indicating Make Clone Fail (This bit goes high when Make / Create clone fails)		
%SR164.12		Status indicating Load Clone Fail (This bit goes high when Load clone fails)		
%SR165-174	Reserved			
%SR175	Removable Media	Current Removable Media interface status	0	6
%SR176-177	Removable Media	Indicates free space on the Removable Media card in K bytes.	0	2^{31}
%SR178-179	Removable Media	Indicates the total card capacity in K bytes.	0	2^{31}
%SR180	Reserved	-	-	-
%SR181	ALM_UNACK	Unacknowledged Alarm (high bit indicates what group #)		
%SR182	ALM_ACT	Active Alarm (high bit indicates what group #)		
%SR183	SYS_BEEP	System Beep Enable (0=disabled; 1=enabled)		
%SR184	USER_BEEP	Software configurable (0=OFF; 1=ON)		
%SR185	SCR_SAVER	Screen Saver Enabled (0=disabled; 1=enabled)		
%SR186	SCR_SA_TM	Screen Saver Time in minutes (delay)		
%SR187	NET_USE	Average Net Usage of all units on the CAN network		

Table 13.3 – %SR Registers				
Register	**Name**	**Description**	**Min Val**	**Max Val**
%SR188	NET_MIN	Minimum Net Usage of all units on the CAN network		
%SR189	NET_MAX	Maximum Net Usage of all units on the CAN network		
%SR190	NT_TX_AVG	Average Net Usage of this unit		
%SR191	NT_TX_MIN	Minimum Net Usage of this unit		
%SR192	NT_TX_MAX	Maximum Net Usage of this unit		

For additional information on system bits and registers, refer to the *i³ Configurator* Help file.

13.3 Register Map for *i*³A Lite I/O

Table 13.4 – Register Map for i³A Lite I/O			
Fixed Address	**Digital/Analogue I/O Function**	***i*³A Lite Models**	
		R	**A**
%I	Digital Inputs	1-12	1-12
	Reserved	13-32	13-32
%Q	Digital Outputs	1-6	1-12
	Reserved	7-16	13-16
%AI	Analogue Inputs	1-4	1-4
	Reserved	5-12	5-12
%AQ	Analogue Outputs	1-2	1-2
	Reserved	3-6	3-6

13.4 Resource Limits

Table 13.5– Resource Limits for *i*³A Lite

Resource	Value
%S	16
%SR	255
%T	1024
%M	1024
%R	5,000
%K	20
%D	250
%I	1024
%Q	1024
%AI	256
%AQ	256

Resource	Value
ICAN	125kBd, 250kBd, 500kBd, or 1MBd
Serial Ports	1 RS232, 1 RS485 Ports (Single Connector)
IDs Per ICAN Network	64 w/o repeat (253 w/ 3 repeaters)
Keypad	20 Metal Dome Keys
Display	128 x 64 Monochrome LCD
Screen Memory	256kB
User Screens	250
Data Fields Per User Screen	15
Ladder Code	256 kB

CHAPTER 14: I3 CONFIGURATOR CONFIGURATION

14.1 Overview

*i*³A Lite controller hardware is programmed with a Windows based PC application called *i³ Configurator*. This application can be used to program, configure, monitor, and debug all aspects of the *i*³A Lite unit. Please refer to the *i³ Configurator* Help file for additional details.

14.2 *i³ Configurator* Status Bar

When the *i*³A Lite is connected to a PC using *i³ Configurator* software a Status Bar appears at the bottom of the screen. The *I3 Configurator* Status Bar can be used to determine if communications have been established between the *i*³A Lite and the *i³ Configurator* program. Components of the *i³ Configurator* Status Bar are explained below.

Message Line -

The contents of these messages are context sensitive. The Message line can be empty.

Equal Indicator – indicates whether the current program in *i³ Configurator* is equal to the program stored in the Target Controller.

- If ***Equal***, the program in *i³ Configurator* is the same as the program stored in the Target Controller.
- If ***Not Equal***, the program in *i³ Configurator* is <u>not</u> the same as the program stored in the Target Controller.
- If **Unknown**, there may have been a change since the last time the program in *i³ Configurator* was compared to the Target Controller.

Current User -
indicates who is logged (for security purposes).

File Modified Indicator - indicates that the file in the selected window has been modified but has not been saved.

Controller Model - Network (Model Confirmation)

- **Controller Model** indicates the controller model for which the program in *i³ Configurator* is configured.
- **Network** indicates the type of network that the program in *i³ Configurator* expects to use (e.g., iCAN).
- **(Model Confirmation)** Provides the following indications:
- **(Model=)** – The actual Target Controller matches the configured Controller Model and Network.
- **(Model Not=)** – The actual Target Controller does <u>not</u> match the configured Controller Model and Network.
- **(Model?)** –There may have been a change since the last time the Target Controller was compared to the configured Controller Model and Network.

Communications Status - indicates the current status of the "pass through" connector.

- **Local: xx** – indicates the Network ID of the i³ to which the *i³ Configurator* program is physically connected through its serial port. It can serve as a pass-through device to other nodes on the network.
- **Target: yy(R)** – indicates the Network ID of the device with which the *i³ Configurator* program is exchanging data.
  Note: The **Local** unit and **Target** unit can be the same unit, or they can be separate units.

The following are status indicators:
(R) – Running
(D) - Do I/O
(I) – Idle
(?) – *i³ Configurator* is not communicating with the remote unit.
[no forces] – Indicates no I/O has been forced.

Figure 14.1 – *I3 Configurator* Status Bar

14.3 Establishing Communications

The *i*³A Lite can communicate with *i³ Configurator* using USB to USB, USB to serial adapters, serial port communications via MJ1 Port, CAN (ICAN), or modems. For *i*³A Lite, use *i³ Configurator* Version 9.80 or newer.

To communicate with the *i*³A Lite via USB you will need the Automated Driver Installer located on the Microsoft web site. For any difficulties in installing the driver, please contact IMO Automation support team.

Next, connect a PC's (Personal Computer running a Windows Microsoft operating system) USB port via USB cable to the USB mini B port on the *i*³A Lite controller.

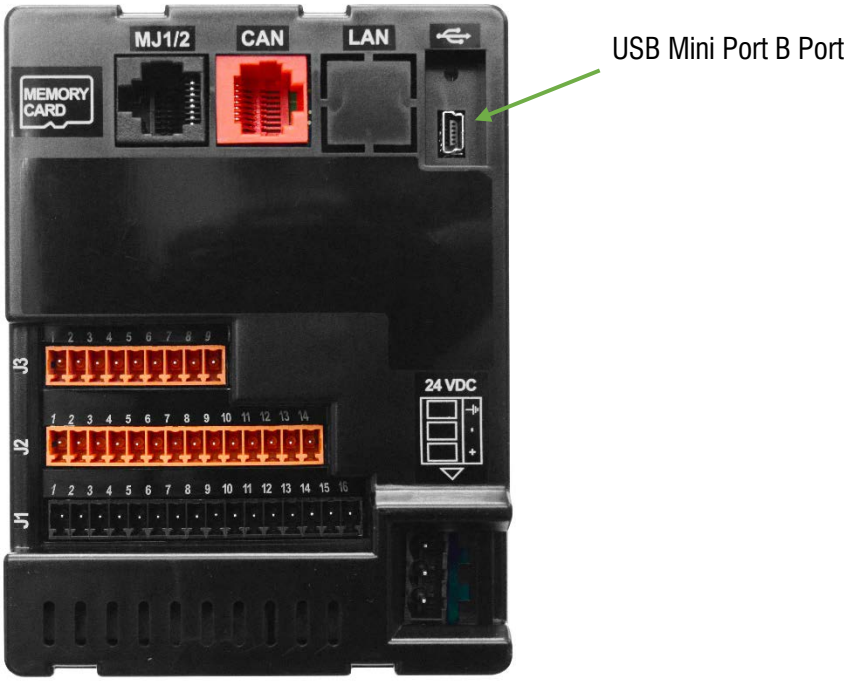
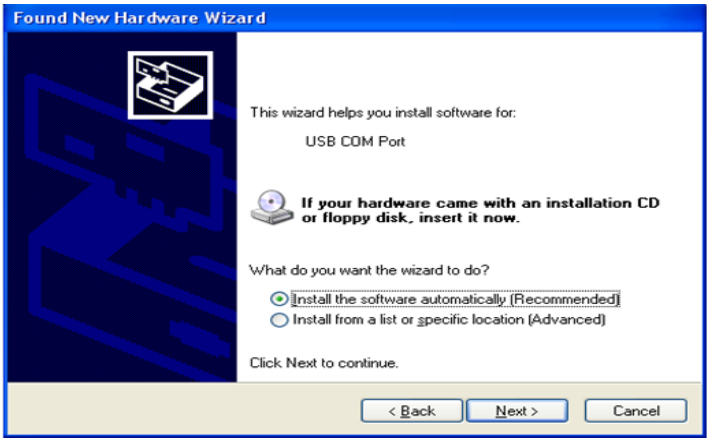


Figure 14.2 – USB Programming Connector

The PC will detect a new device has been plugged into the USB port.



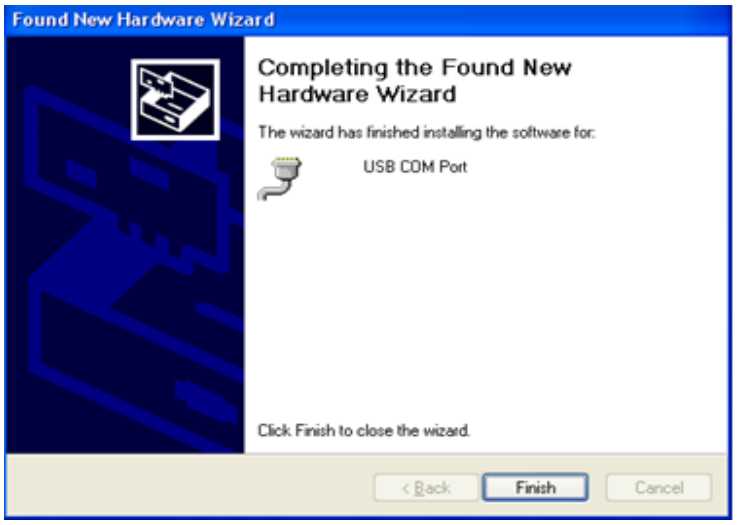


Figure 14.3 – Hardware Wizard Screenshots

Now that the *i*³A Lite is plugged in, go to the *i*³ Configurator menu Controller à Connection Wizard, choose your connection method. If you are connecting for the first time, we suggest connecting via USB.

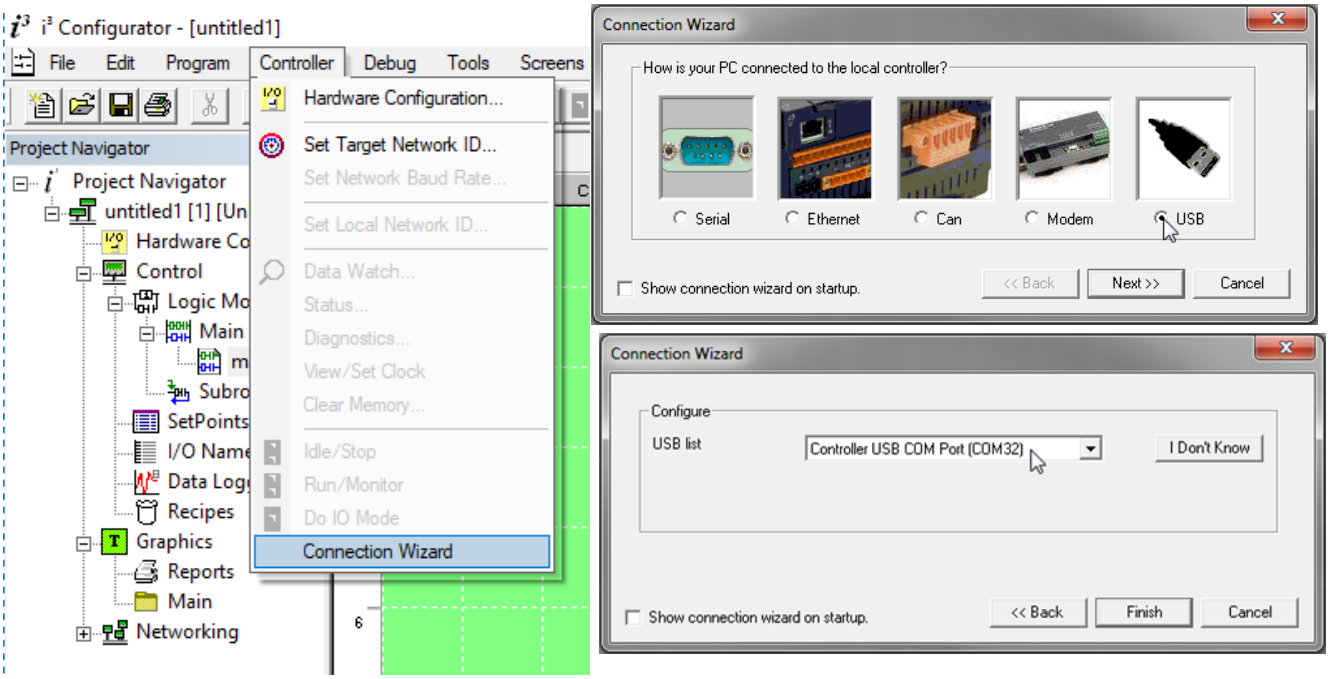


Figure 14.4 – *i*³ *Configurator* Connection Wizard Screenshots

If **Controller USB COM Port** is not present in the dropdown list, the Windows operating system has not yet recognized the *i*³ as an installed device. Be sure the installation process is complete and that the correct drivers are installed.

An alternate way to select the COM setting is to go to ***I3 Configurator*** → **Tools** → **Application Settings** → **Communication** → **Configure** and choose connection method in **Add Target**.

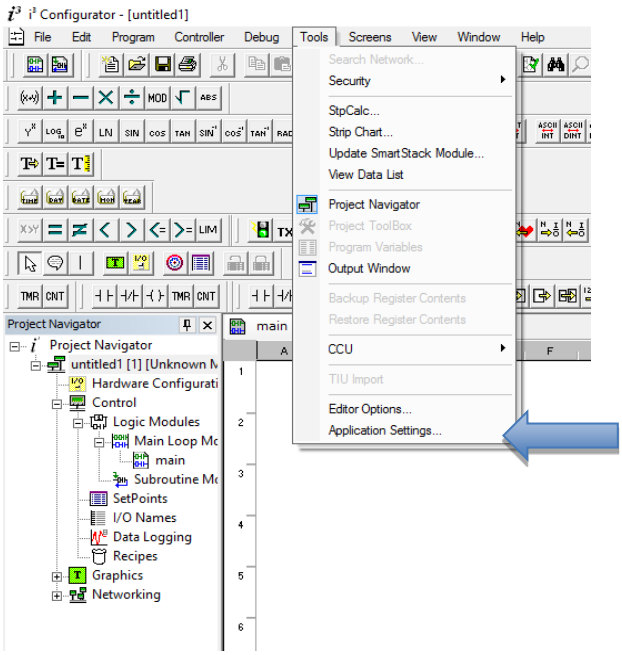


Figure 14.5 – *I3 Configurator*: Alternative Connection Method Screenshot

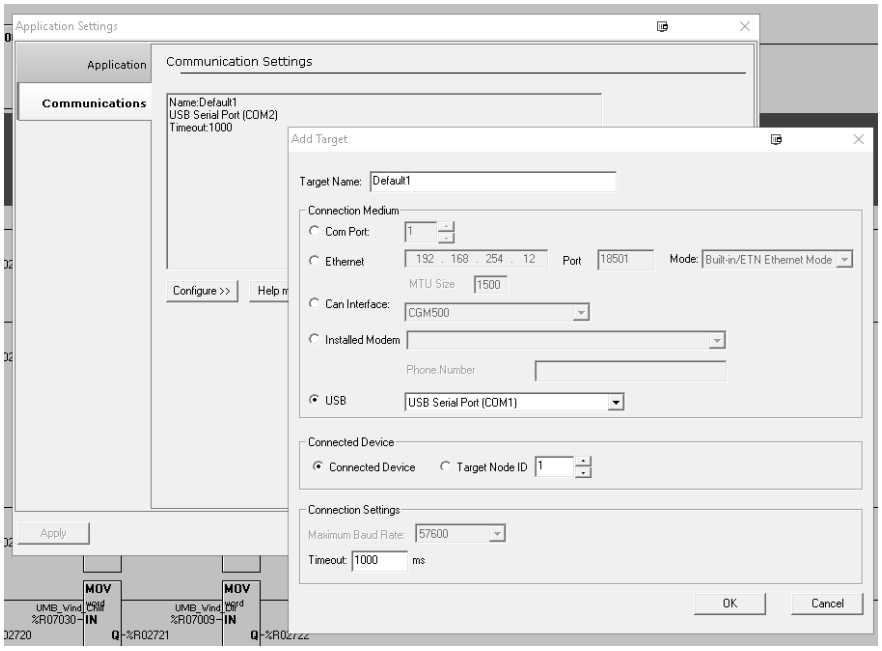


Figure 14.6 – Add Target Screenshot in *i*3 *Configurator*

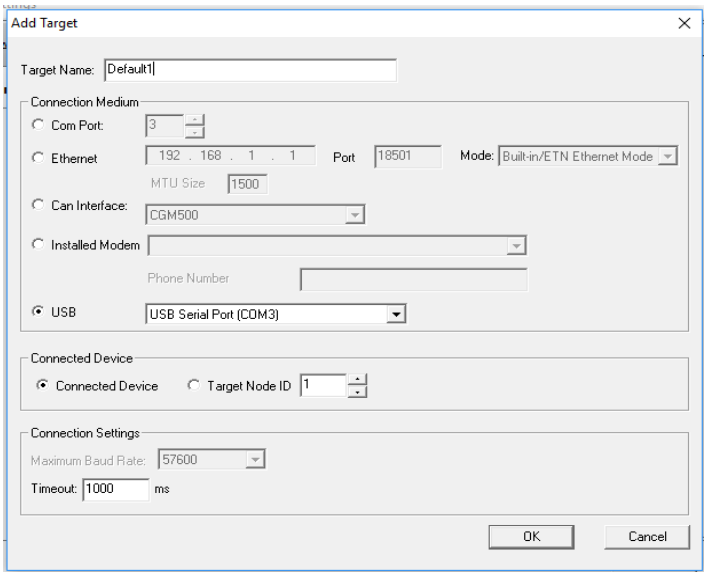


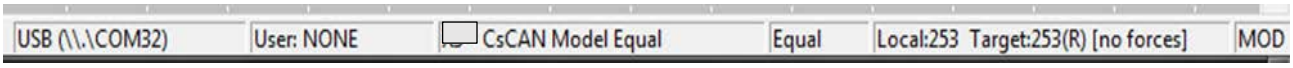
Figure 14.7 – *i*3 *Configurator*: Add Target

NOTE: The following fields need to be filled for communication configuration if *i*³ *Configurator* Connection Wizard was not used. Table 14.1 explains the information needed in each field.

1. Target Name
2. Connection Medium
3. Connected Device
4. Connection Settings

Table 14.1 – Communication Configuration Dialog	
Target Name	Name for connection. This is not a mandatory column to be filled, by default *i³ Configurator* will populate 'Default1' in edit box.
Connection Medium	
Com Port	Select this option to communicate over serial communication with the device. The port number can be configured here.
Ethernet	Connection through Ethernet is **not** an option with the *i³*A Lite.
CAN Interface	Select this option to communicate over CAN. This option requires additional hardware to be installed with the PC to be able to do so. Select the type of hardware installed from the dropdown.
Installed Modem	Select this option to communicate to the device through the internal modem of the computer. *i³ Configurator* will automatically detect the internal modem attached with PC and list in the attached drop down. User can select modem and telephone number for target controller. **NOTE**: *i³ Configurator* will do necessary initialization for the selected internal modem.
USB	Select this option to communicate over USB. Now IMO devices and IMO USB to serial converters are recognized and can be specifically selected.
Connected Device	
NOTE: This configuration is required if the controller to which *i³ Configurator* is communicating is connected to a ICAN network.	
Connected Device	By default, this option is selected and networking feature of *i³ Configurator* is disabled.
Target Node ID	On selecting this option, Networking feature of *i³ Configurator* is enabled. iCAN ID for the target controller to be provide here.
Connection Settings (General Communication Settings)	
Maximum Baud Rate	Select the baud rate for serial communication.
Timeout	Select the communication timeout. **NOTE**: Select a larger timeout for GPRS and installed modem communication configuration

If communication is established, the target indicator will show the mode of the controller **Target: yy(R)** as shown in the status section above in this chapter, section *i³ Configurator* Status Bar.



When connected directly to the controller to which *i*³Configurator communications are required, the **Local ID and the Target ID should match.**

Local ID and Target ID Match

If the controller is not communicating, you may need to set the Target ID of the controller in *i³ Configurator* or change the controllers ID on the unit itself. The **Target ID** allows directing communications to a unit when multiple units are connected via an iCAN network. Units without iCAN network ports respond to any network ID and do not require the ID to be configured.

The main method for communicating between *i³ Configurator* and an *i³* A Lite is RS-232 serial. The *i*³A Lite can communicate with *i³ Configurator* using USB to serial adapters, CAN (iCAN) or modems. For communications other than RS-232 serial please refer to the manual that ships with the adapter hardware being used for programming.

14.4 Communicating via MJ1 Serial Port

Start by configuring *i³ Configurator* to use the correct communications port. This can be done using the **Tools → Application Settings → Communication Port** dialog in *i³ Configurator*.

Next connect the PC serial port to the port labeled MJ1 on the *i³* A Lite.

NOTE: If communications are successful, the target indicator should show the mode of the controller **Target: yy(R)** as shown in the status section above.

If the controller is not communicating you may need to set the target ID of the controller in *i³ Configurator* or on the unit. The **Target ID** allows directing communications to a particular unit when multiple units are connected via a iCAN network. Units without iCAN network ports respond to any network ID and do not require the ID to be configured.

To check or change the ID on the *i*3A Lite, press the UP and DOWN keys on the *i*³A Lite simultaneously to enter the System Menu. The first item in the menu is **Set Network ID**. Pressing **Enter** allows you to view or modify the ID of the unit.

To point *i³ Configurator* at the correct controller, change the Target ID using the **Controller → Set Target Network ID** dialog. Also, to change the Target ID of *i³ Configurator* use the **Controller → Set Target Network ID** dialog.

14.5 Configuration

An overview of configuration:

1. Start the configuration by selecting the **Controller → Hardware Configure** menu item.
2. If the *i*³A Lite is connected to the PC press the **Auto Config System** button to automatically detect the Base model, I/O and any communication options.
3. If the *i*³A Lite is not connected press the **Config** button to the right of the top of the unit. This allows the base CPU to be selected.
4. Select either ***i*³A Lite iCAN** or ***i*³A Lite No Net** from the type drop down box.
5. Once the type of *i*³A Lite is selected, the model number drop down box will provide the *I*³A Lite model numbers from which to choose from.
6. Once the *i*³A Lite CPU is selected, press **OK** to exit the dialog and configure the I/O that is present in the first slot.
7. The I/O configure dialog (Specifically the **Module Setup** tab) provides four (4) buttons to configure all of the I/O. Go through each area of I/O and configure it.
8. Once done configuring the I/O OK out of configuration dialogs.

Configuring the *i*³A Lite I/O has four main portions that are covered in this chapter. For additional information on I/O, refer the chapters covering General I/O (Chapter 10) or High Speed I/O (Chapter 11).

The four areas of I/O configuration are Digital In/HSC, Digital Out/PWM, Analogue In, and Analogue Out.

14.6 Digital / HSC Input Configuration

The following figure illustrates the **Digital / HSC Input Configuration** dialog.

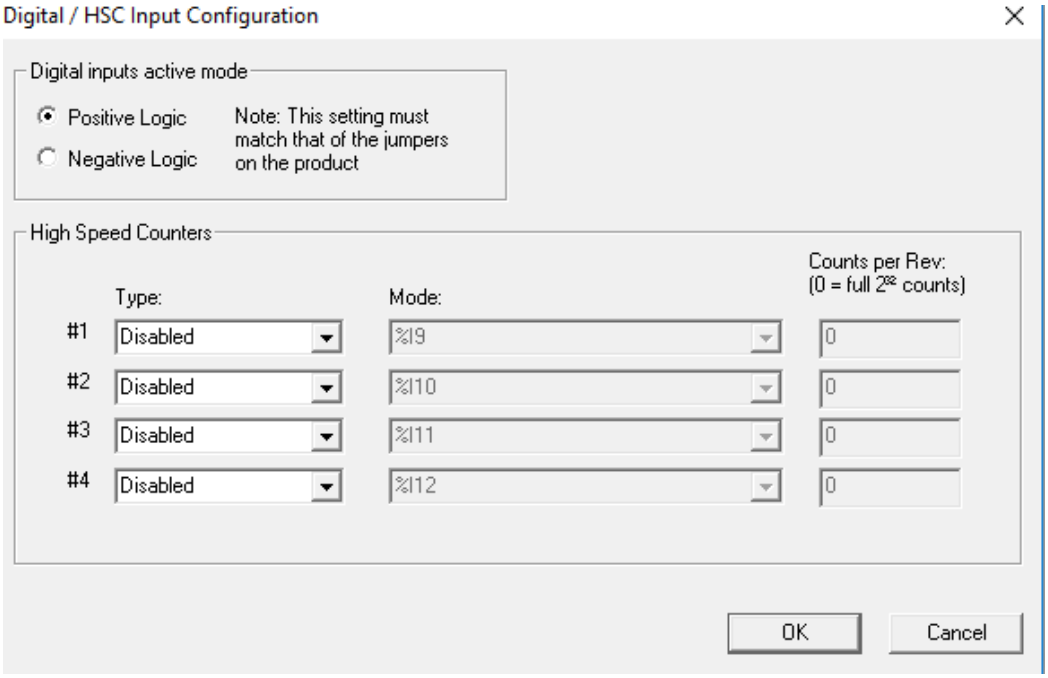


Figure 14.8– Digital / HSC Input Configuration Dialog

The Active mode group box allows the user to select if inputs are active high (Positive logic) or active low (Negative logic). It is important that this setting matches the jumper settings on the hardware.

The High-Speed Counters group box contains all of the windows that are used to configure the four available high-speed counters on the *i*3A Lite. To configure a counter, the user needs to set the type, mode, and counts per rev.

The type drop down includes the following options:

- Disabled
- Frequency
- Totalize
- Pulse
- Quadrature
- Marker (Only available in counter #3 if counter #1 is set to quadrature.)

The mode drop-down items are set according to the type selection. The **Counts Per Rev** window is enabled/disabled according to the type selection as well.

14.7 Digital / PWM Output Configuration

The following figure illustrates the **Digital / PWM Output Configuration** dialog.

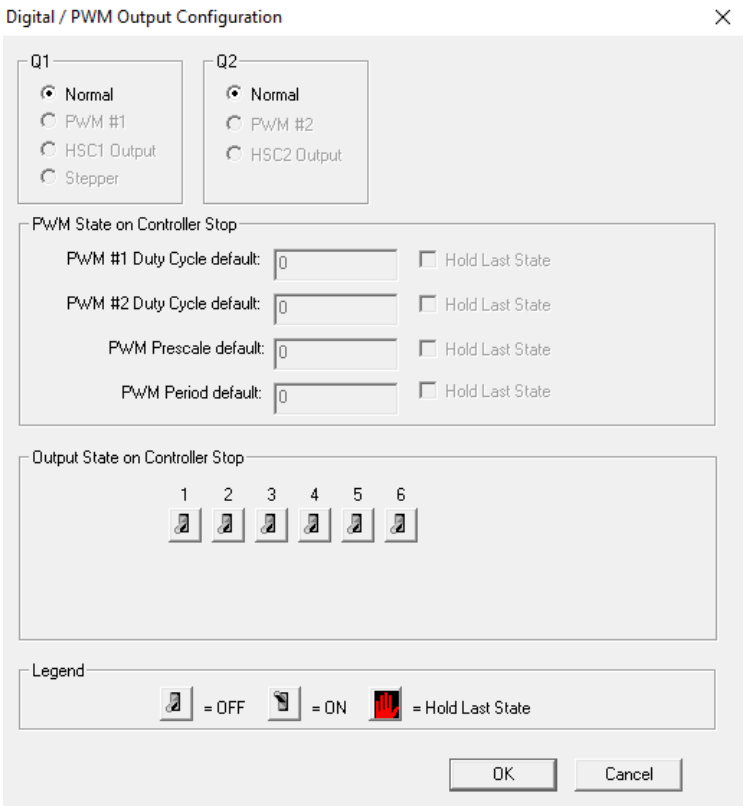


Figure 14.9 – Digital / PWM Output Configuration Dialog

The **Q1** and **Q2** group boxes allow the user to specify the operation of the multi-function outputs.

The **PWM State ON Controller Stop** group box contains items that allow the user to specify how the PWM outputs behave when the controller is stopped. These items can either hold their value or default to some value when the controller is stopped.

NOTE: The PWM outputs are set to the OFF state at power-up and during program download and remain in that state until the unit is placed in RUN.

The **Output State ON Controller Stop** group box contains items to allow the user to specify how the remaining digital outputs behave when the controller is stopped. These items can either hold their value or default to some value when the controller is stopped.

14.8 Analogue Input Configuration

The following figure illustrates the **Analogue Input Configuration** dialog.

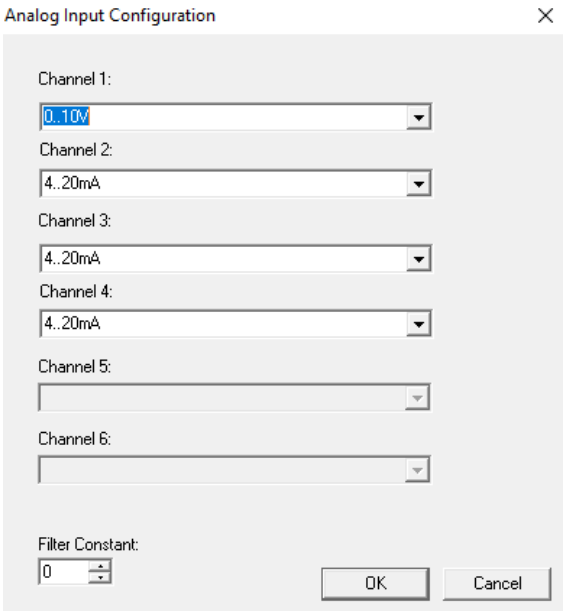


Figure 14.10– Analogue Input Configuration Dialog

The **Channel x** drop down windows allows the user to specify the mode for each analogue input to operate. The **Channel x** drop down windows are enabled/disabled according to which model is being configured. All of the models have the following modes available: 0.10V, 0..20mA, and 4..20mA.

14.9 Analogue Output Configuration

The following figure illustrates the **Analogue Output Configuration** dialog.

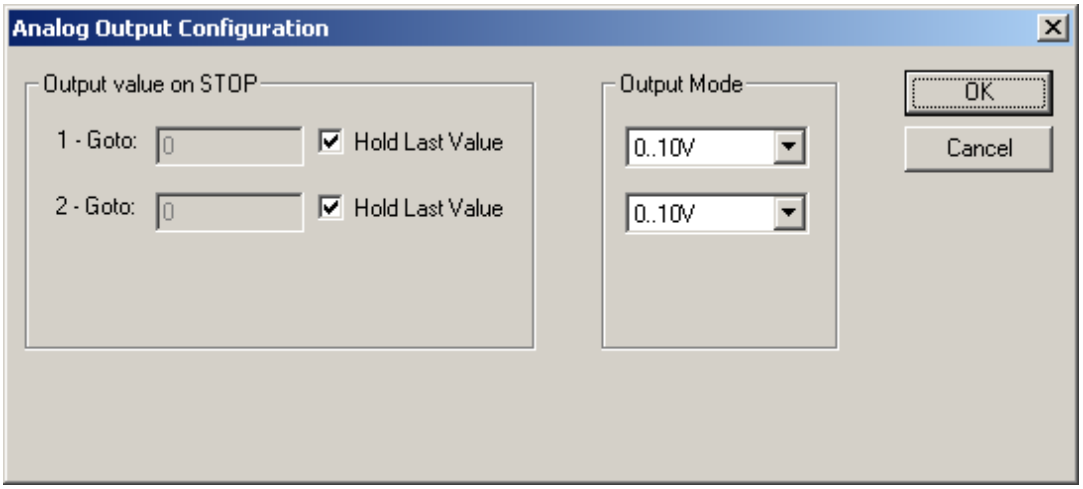


Figure 14.11 – Analogue Output Configuration Dialog

The **Output value on Stop** group box contains items that allow the user to specify how the analogue output channels behave when the controller is stopped. The outputs can either hold their value or default to a value when the controller is stopped.

The **Output Mode** group box allows the user to select the operating modes for each of the analogue outputs. The modes include 0..10V, 0..20mA, and 4..20mA.

CHAPTER 15: FAIL – SAFE SYSTEM

15.1 Overview

The Fail-Safe System has the following capabilities:

- Manually backup the current Battery-Backed RAM Register Settings into Flash memory.
- Manually restore Register Settings from the values previously backed up in Flash to Battery-Backed RAM.
- Detect corrupted Register Settings at power-up and then automatically restore them from Flash.
- Detect corrupted or empty application in Flash memory at power-up and then automatically load the AUTOLOAD.PGM application file from Removable Media (Compact Flash or microSD).
- If an automatic Register Restore or Application Load occurs, the *i*³ can automatically be placed in RUN mode

15.2 Settings

To use the fail – safe feature, the user must do the following:

1. Backup the current Battery-Backed RAM Register contents in On-Board Flash memory using System Menu options.
2. From *i*³ *Configurator*, create AUTOLOAD.PGM for the application program using 'Export to Removable Media'.
3. Place the Removable Media with AUTOLOAD.PGM in the device.
4. Set the 'Enable Autoload' option `in the device to YES.
5. Set the 'Enable Autorun' option to YES if the controller needs to be placed in RUN mode automatically after automatic restore of data or Autoload operation.

15.3 Backup / Restore Data

Selecting this option brings up a screen having four operations:
Backup *i*³ Data—Copies Battery Backed RAM contents on to the onboard flash memory of the *i*³.
Restore *i*³ Data— Copies the backed up data from onboard flash memory to the battery backed RAM.
Clear Backup Data— The backup data will be erased from the onboard flash.
Exit— Goes back to previous menu.

Figure 15.1 – Backup / Restore Data

Backup I3 Data:

When initiated, this will allow the user to manually copy Battery-Backed RAM contents on to the onboard FLASH memory of the *i*³. This will have the effect of backing up all the registers and controller settings (Network ID, etc.) that would otherwise be lost due to a battery failure.

%SR164.4 is set to 1 when backup operation is performed.

Figure 15.2 – Backup Registers

Restore *i*³ Data:

When initiated, this will allow the user to manually copy the backed-up data from the onboard FLASH to the Battery-Backed RAM.

A restore operation will be automatically initiated if a backup has been previously created and on power-up the Battery-Backed RAM registers fail their check.

The following process is implemented to restore data:

- The controller will be placed in IDLE mode.
- Data will be copied from onboard FLASH to *i*³ Battery-Backed RAM
- The controller will reset.
- The controller will be put in RUN mode if the Autorun setting is 'Yes' else it will remain in IDLE mode.

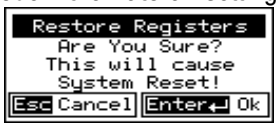


Figure 15.3 – Restore *i*³ Data

%SR164.3 is set to 1 only when an automatic restore operation is performed - not on a manual one. This bit is reset to 0 when a new backup is created.

Restoring of data can be manually performed by selecting RESTORE option from the Backup / Restore Data menu.

This will cause the controller to reset.

Clear Backup Data:

When initiated, the backup data will be erased from the onboard Flash and no backup will exist. %SR164.4 and %SR164.3 is reset to 0 when backed up data is erased.

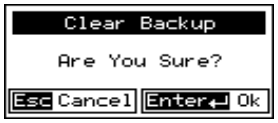


Figure 15.4 – Clear Backup Data

Exit: Goes back to the previous screen.

The *i*³ follows the following sequence in execution of Automatic Restore:

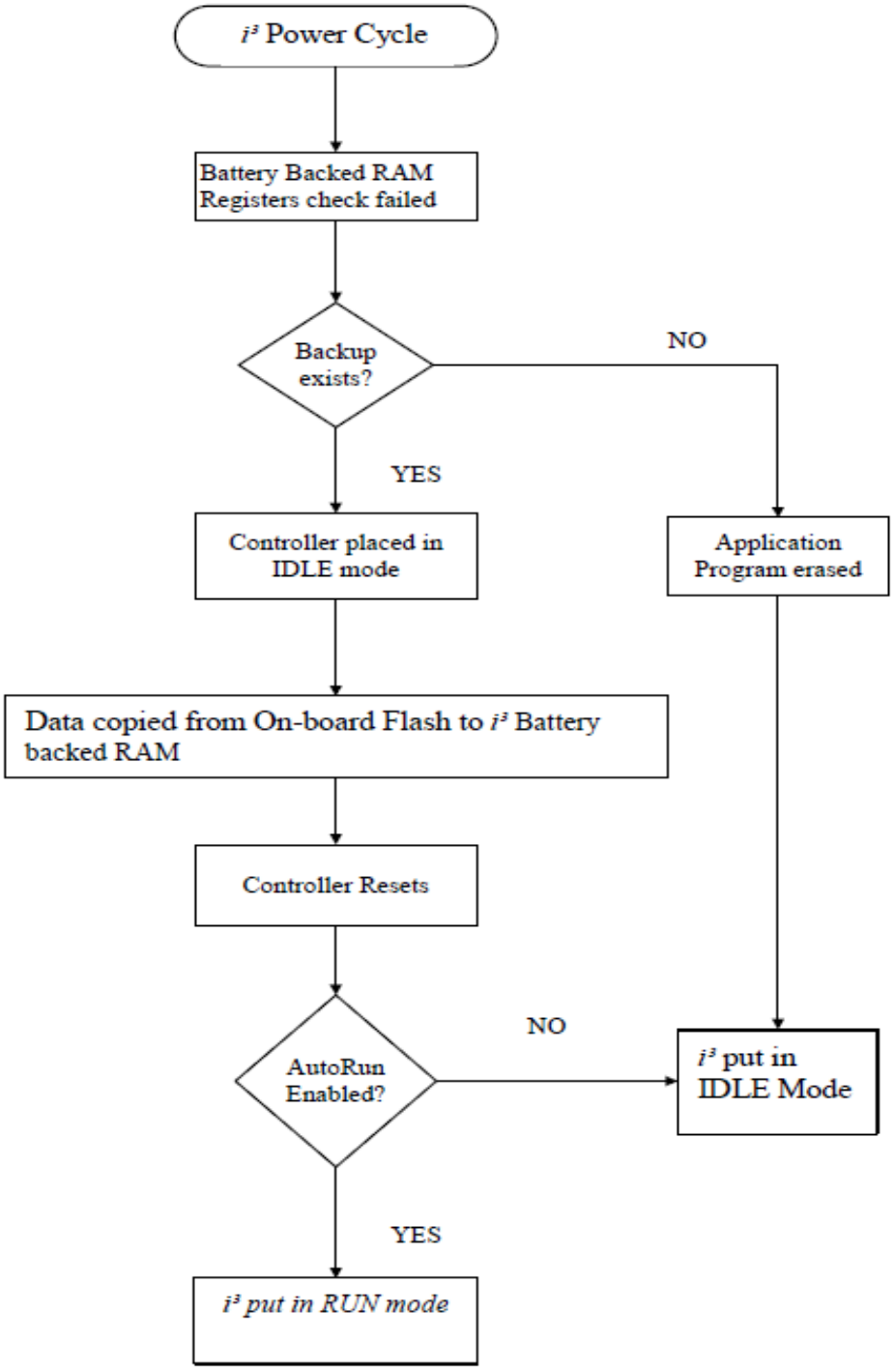


Figure 15.5 – Flow Chart for Automatic Restore

15.4 AutoLoad

This system menu option allows the user to specify whether the i³ automatically loads the application AUTOLOAD.PGM located in Removable Media.

When the AutoLoad setting is enabled (set to YES), it can be manually or automatically initiated at power-up.

The automatic initiation will happen only in the following two cases:

- When there is no application program in the *i*³ and a valid AUTOLOAD.PGM is available in the removable media of the device.
- When the program residing in onboard memory is corrupted and a valid AUTOLOAD.PGM is available in the removable media of the device.

AutoLoad can be manually initiated when the SYS-F3 key is pressed (*i*³*r* can be in any of the following mode – Idle / Run / DoIO). This also requires a valid AUTOLOAD.PGM to be present in the removable media of the device.

When the AutoLoad setting is not enabled (set to NO), *i*³ will be in IDLE mode and the application is not loaded.

If the AUTOLOAD.PGM is security enabled, the user will be prompted to enter the password before loading the application. The application will be loaded from the Removable media only after getting the correct password.

%SR164.6 can be set to enable AutoLoad feature.

Figure 15.6 – AutoLoad Menu

The *i*³ implements the following sequence to execute the AutoLoad function:

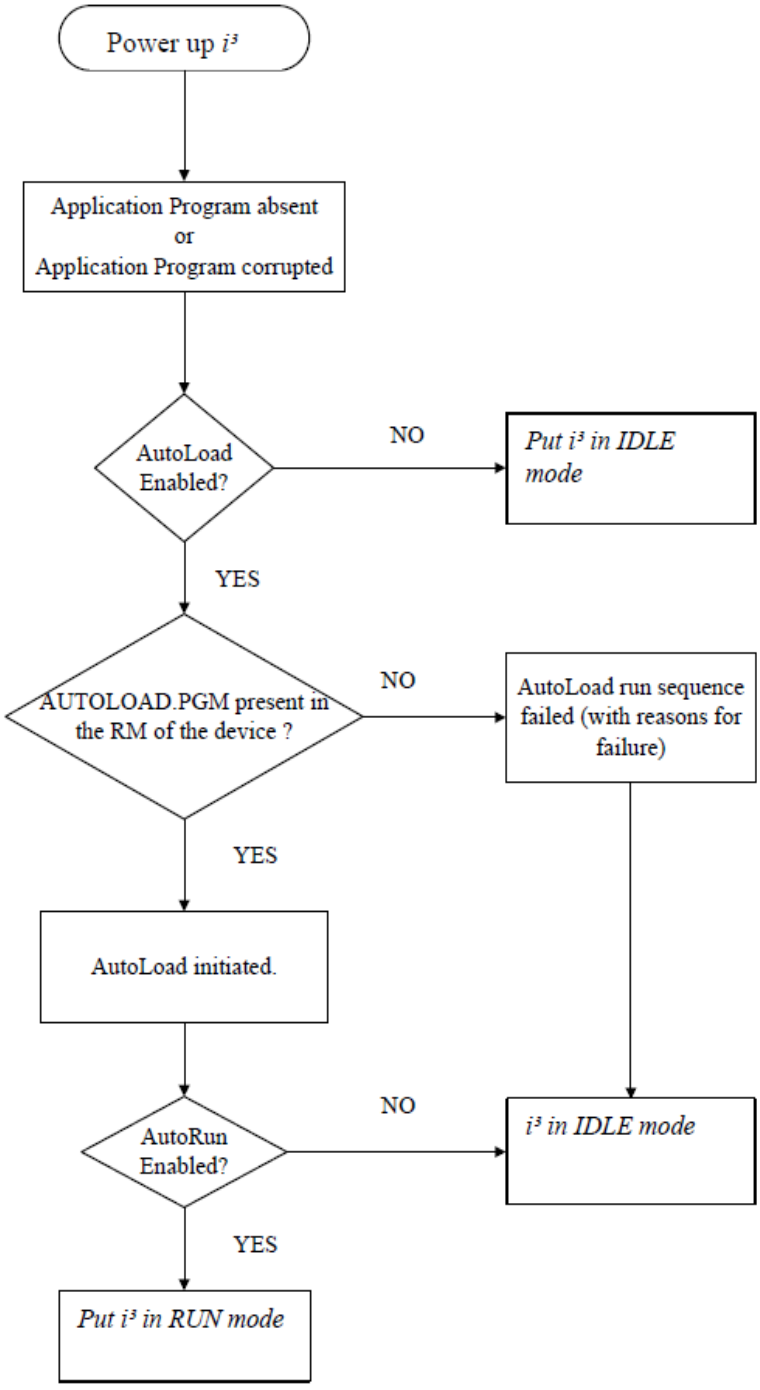


Figure 15.7 – Flow Chart for AutoLoad

15.5 AutoRun

This system menu option, when enabled (YES), allows the user to automatically place the *i*³ into RUN mode after the AutoLoad operation or automatic Restore Data operation.

When the AutoRun setting is disabled (NO), the *i*³ remains in the IDLE mode after a Restore Data or AutoLoad operation.

%SR164.5 can be set by putting the system into RUN mode automatically, once an AutoLoad has been performed or an Automatic Restore has occurred.

If for any reason the AutoLoad-Run (Loading the AUTOLOAD.PGM automatically and I3 put in RUN mode) sequence does not succeed, a pop-up message box saying "AUTO-LOAD-RUN SEQUENCE FAILED" will be displayed. It will also show the reason for its failure. On acknowledging this message box the AutoLoad-Run sequence will be terminated, controller will return to the first user-screen and will be placed in IDLE mode.

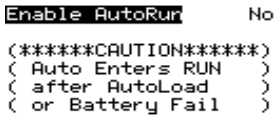


Figure 15.8 – AutoRun Menu

Enable AutoRun	**No** = *i*³ will be in IDLE mode after AutoLoad or Automatic Restore. **Yes** = *i*³ will automatically be placed into RUN mode after AutoLoad or Automatic Restore.

"Enable AutoLoad" displays the following options:

Enable AutoLoad	**No** = Does not load AUTOLOAD.PGM automatically when application program is absent or corrupted. **Yes** = Loads AUTOLOAD.PGM file automatically from Removable Media when application program is absent or corrupted.

CHAPTER 16: CLONE UNIT

16.1 Overview

The 'Clone Unit' feature allows the user to "clone" the *i*³ of the exact same model. This feature "clones" application program and unit settings stored in Battery backed RAM of an *i*³ into the RM (refer Removable Media, Chapter 8, for details on using RM). It can then be used to clone a different *i*³ (exact same model).

This feature can be used for:

- Replacing an *i*³ by another unit of the same model.
- Duplicating or "clone" units without a PC.

16.2 Clone

User must perform the following sequence of action to Clone a unit:

1. The 'Clone Unit' can be accessed by going to the 'System Menu' of the *i*³. A new menu "Clone Unit" has been added at the end of the main system menu as shown below:

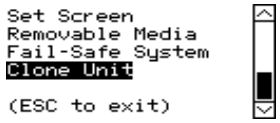


Figure 16.1 – System Menu

2. Selecting "Clone Unit" menu will open the following screen:

Figure 16.2 – Clone Unit Menu before Cloning

NOTE: In the above Figure 16.2, F3 and F4 are inactive in the clone Unit.

Make/Create Clone option enables the user to duplicate / Clone an application file, all unit settings and all register values from Battery Backed RAM.

Selecting Make Clone brings up the screen below:

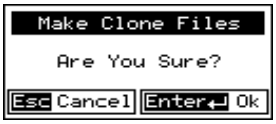


Figure 16.3 – Clone Unit Confirm Screen

After confirmation, the *i*³ will create two new files in the root directory of the Removable Media Drive as shown below:

AUTOLOAD.PGM	Application file
CLONE.DAT	File having all unit settings and register values from Battery Backed RAM

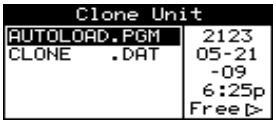


Figure 16.4 – Clone Unit Files

NOTE: Make/Create clone operation automatically includes the security in AUTOLOAD.PGM file for security enabled files.

3. Once the cloning is successful, the *i*³ gives a message as below:

Figure 16.5 – Cloning Status

Make/Create clone can also be triggered by setting %SR164.9 bit to "1" from Ladder program or graphics. Once the operation is completed, this bit is made zero (0) by the firmware. When Make Clone operation is triggered by this SR bit, it does not ask the user for confirmation to make the clone. The success / failure of the operation is also not notified on screen to the user.

In case of failure of "Make Clone" operation, %SR164.11 bit is set to "1" by the firmware and never reset.

NOTE: Backup of registers in Flash memory is not performed by the Clone Feature. If user desires, backup should be done as explained in Chapter 15 (Fail – Safe System).

16.3 Load Clone

This option loads the application, all unit settings, and register values from Removable Media to the battery-backed RAM (regardless of AutoLoad settings), and then resets the *i*³ for the settings to take effect.

User must perform the following to Load the Clone:

1. Select "Clone Unit" from main system menu of *i*³ as shown below:

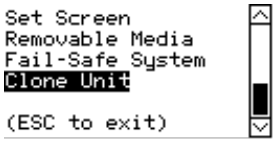


Figure 16.6 – System Menu

2. Selecting "Clone Unit" menu will open the following menu screen. Select "Load Clone".

Figure 16.7 – Clone Unit Menu after Cloning

3. User must confirm Load Clone as shown below:

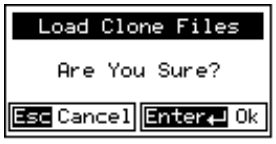


Figure 16.8 – Load Clone Confirm Screen

4. After confirmation, all unit settings and register values will be loaded from the Removable media to the Battery backed RAM (Regardless of AutoLoad settings) and then the *i*³ resets at which stage the settings take effect.

NOTE: For security enabled files, Load Clone asks for password validation before loading the application.

Load Clone can also be triggered by setting %SR164.10 bit to "1" from Ladder program or graphics. Once the operation is completed, this bit is made zero (0) by the firmware. When the Load Clone operation is triggered by this SR bit, it does not ask the user for confirmation to load the clone. The success / failure of the operation is not notified on the screen to the user.
In case of failure of the Load Clone operation, %SR164.12 bit is set to "1" by the firmware and never reset.

CHAPTER 17: MAINTENANCE

17.1 Firmware Updates

The *i*³A Lite product contain field updatable firmware to allow new features to be added to the product at a later time. Firmware updates should only be performed when a new feature or correction is required.

> **WARNING:** Firmware updates should only be performed when the equipment being controlled by the *i³A Lite* is in a safe, non-operational state. Communication or hardware failures during the firmware update process can cause the controller to behave erratically resulting in injury or equipment damage. Make sure the functions of the equipment work properly after a firmware update before returning the device to an operational mode.

Steps for updating the firmware:

1. Establish communication between *i³ Configurator* and the controller using a direct serial connection to MJ1 or USB.
2. Make sure your application is available on your PC or upload the application.
3. Make sure the machinery connected to the *i*³A Lite is in a safe state for firmware update (see warning above).
4. Start the firmware update by selecting **File → Firmware Update Wizard**.
5. The correct product type should be selected, if it is not select the type of controller from the drop-down list.
6. Press the Start button.
7. Wait for the firmware update to complete.
8. If there is a communication failure check the cable, connections and comm. port setting and try again.
9. Firmware updates typically delete the user applications to ensure compatibility. You will need to reload your application.
10. Test the operation of the equipment with the new firmware before returning the *i*³A Lite system to an operation mode.

17.2 Backup Battery

The *i*³A Lite contains a run-time battery monitor that checks the voltage of the internal lithium battery. This battery is used to run the real-time clock and maintains retentive registers when power is disconnected.

Under normal conditions the battery in the *i*³A Lite should last 7 to 10 years. Higher operating temperatures or variations in batteries may reduce this time.

17.3 Battery Replacement

If the battery is 7 to 10 years old, it is recommended that it be replaced as preventative maintenance.

WARNING: Lithium Batteries may explode or catch fire if mistreated.
Do not recharge, disassemble, heat above 100°C (212°F) incinerate, or puncture.

WARNING: Disposal of lithium batteries must be done in accordance with federal, state, and local regulations. Be sure to consult with the appropriate regulatory agencies *before* disposing batteries. In addition, do not re-charge, disassemble, heat or incinerate lithium batteries.

WARNING: Do not make substitutions for the battery. Be sure to only use the authorized part number to replace the battery.

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

The *i*³A Lite uses a CR2450 (Part No. HE-BAT14) coin lithium battery produced by a variety of manufacturers.

Below are the steps to replace the battery.

1. Make sure the user program and any data stored in retentive memory is backed up.
2. Disconnect all power from the*i*³A Lite unit including I/O power.
3. Remove all connectors, and then use a flat head screwdriver to press and release the four (4) clips. Remove the back cover.
4. Remove the old battery. It may require a small flat blade screwdriver to lift it from the holder.
5. Dispose of the battery properly; see the above warning on disposal regulations.
6. Slide the new battery into the holder. Make sure the battery is inserted with the proper polarity. The top tab of the battery holder should contact the positive (+) terminal of the battery.
7. Place the back cover over the unit and gently press each corner evenly in order to snap the clips back into place.
8. Apply power to the unit. Check that the battery error is no longer reported. If the unit still reports the error, remove the battery immediately and contact Technical Support .

CHAPTER 18: MODBUS COMMUNICATIONS

18.1 Modbus Overview

For complete Modbus instructions, please refer to the Help file in *I3 Configurator*.

Modbus (serial) is a popular, de-facto standard protocol that allows industrial devices from multiple manufacturers to easily share data in real-time. For Modbus serial communications, the *i*³A Lite can act as either a Master or a Slave.

Modbus protocol (serial) allows for one master and multiple slaves. The master always initiates the conversation by sending a request to a slave. Only the addressed slave will send a response when the request is completed. Should the slave be unable to complete the request, it returns the appropriate error response. Should the slave be unable to respond, the master's timeout timer expires to provide an indication of **No Response**.

18.2 Modbus Slave Overview

For complete Modbus Slave instructions, **please refer to the Help file in *i³ Configurator***.

The Modbus slave function block, when used with the appropriate Modem and/or Open function blocks, allows the primary serial port on the controller to act as a Modbus slave. The Modbus function supports both ASCII and RTU modes of operation across a range of baud rates and protocol frames. Also supported is port activity status, an inactivity timer, support for call-on exception, and support for store and forward (repeater) operation for radio modems.

Section 17.5 describes the supported Modbus Commands as well as the Modbus Map for *i*³A Lite References (%R, %M, etc.).

18.3 Modbus Master Overview

For complete Modbus Master instructions, please refer to the Help file in *i³ Configurator*.

When acting as a Modbus master, there are two primary mechanisms used by the *i*³A Lite to allow the user to specify the data to be read/written from/to the slaves.

Modbus Master Function Block—This is for serial only. This is an advanced feature that should only be used in rare occasions.

Protocol Config—The Protocol Config is configured in the Hardware Configuration dialog box in *i³ Configurator* (serial) – See Section 17.5. This is the preferred method in most applications.

After the protocol has been selected from the dropdown menu, the **Network**, **Devices**, and **Scan List** become available. The Protocol Config is configured on three different levels:

- **Network**—Parameters, such as the polling rate of the data scan, are specified along with timeout values, retry, and re-acquisition settings. Serial configuration, baud rate, parity, etc. are also set here.
- **Devices**—For every slave to be polled, configuration details are added in the Devices dialog box. This includes Slave ID (serial). Under Device Type, the Modbus addressing style matching that specified in the slave's user documentation may be selected. For instance, some slaves specify Modbus addresses (i.e. 40,001), and others specify offsets (i.e. 0000).
    - **Hex or Decimal**—Some specify addresses in hex, and others in decimal. By allowing the user to select the Modbus addressing style for each slave on the network, minimal address conversion is required. Also, if the slave is another IMO product (i.e. another *i*³), the "Native Addressing" option can be selected (i.e. %R1, %M17, etc.), and this skips the conversion to Modbus style altogether.
- **Scan List**—This is where the specific Modbus addresses to be read/written from/to each slave are specified. Up to 32 words of data can be read at the same time.

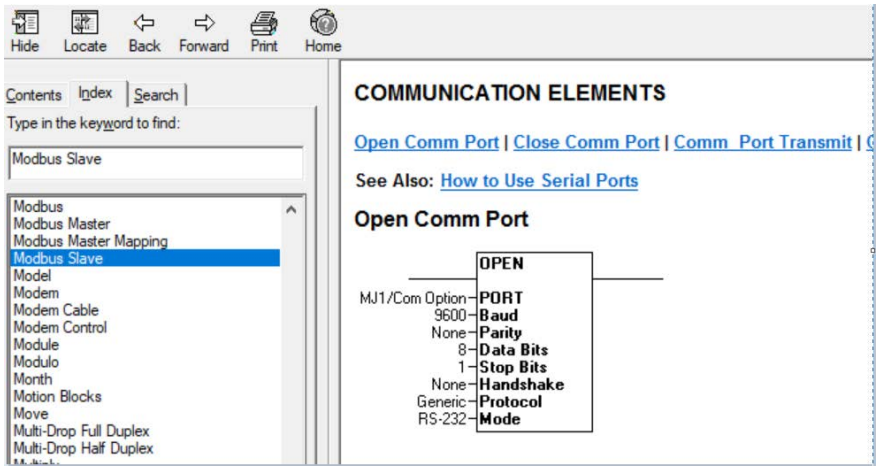
  NOTE: Once configuration has been completed on the Network and Devices level, Modbus data can be directly read/written from graphics objects in the *i³Configurator* screen editor. This is available even if the Modbus register is not listed on the scan list.

The above information is just an introduction to the topic. For more detailed information, please consult the *i³ Configurator* Help file.

18.4 Opening i³Configurator Help File

After opening the *i³ Configurator* Help file, select the Index table and search for “Modbus Slave” or “Modbus Master”, as shown below.

Select “Index” tab.



18.5 Modbus Addressing Table for *i*³A Lite Units

To access *i*³A Lite register, a Modbus Master must be configured with the appropriate register type and offset. This is usually accomplished with one of two methods:

Method 1: The first method uses **Traditional Modbus References**, in which the high digit represents the register type and the lower digits represent the register offset (starting with Register 1 for each type). Since only four register types can be represented in this manner, *i*³A Lite Modbus Function Blocks pack several *i*³A Lite register types into each Modbus register type. Starting addresses of each *i*³A Lite register type are shown in the **Traditional Modbus Reference** column of the Table 17.1.

Method 2: The second method requires the Modbus Master to be configured with a specific **Modbus Command** and **Modbus Offset.** The supported Modbus commands and the associated offsets are also illustrated in Table 17.1.

Table 18.1 – Modbus Master Mapping

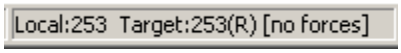
I3A LITE Reference	Maximum Range	Traditional Modbus Reference	Modbus Commands	Modbus Offset
%I1	1024	10001	Read Input Status (2)	0
%IG1	256	13001		3000
%S1	266	14001		4000
%K1	10	15001		5000
%Q1	1024	1	Read Coil Status (1) Force Coil (5) Force Multiple Coils (15)	0
%M1	1024	3001		3000
%T1	1024	6001		6000
%QG1	256	9001		9000
%AI1	256	30001	Read Input Register (4)	0
%AIG1	32	33001		3000
%SR1	200	34001		4000
%AQ1	256	40001	Read Holding Register (3) Load Register (6) Load Multiple Registers (16)	0
%R1	2488	40513		0
%R1	2048	43001		3000
%AQG1	32	46001		6000
%R1	5000	410001		10000

CHAPTER 19: TROUBLESHOOTING / TECHNICAL SUPPORT

Chapter 18 provides commonly requested **troubleshooting information and checklists** for the following topics.

19.1 Connecting to the *i*³A LITE

i³ Configurator connects to the local controller automatically when the serial connection is made. The status bar below shows an example of a successful connection. This status bar is located in the bottom right hand corner of the *i³ Configurator* window.



NOTE: In general, the **Target** number should match the **Local** number. The exception to this is when the controller is being used as a "pass through" unit where other controllers on a iCAN network could be accessed through the local controller.

Determine connection status by examining feedback next to **Local** & **Target** in the status bar of *i³ Configurator*.

Local: ###	If a number shows next to **Local,** then communication is established to the local controller.
Local: No Port	*I3 Configurator* is unable to access the COM port of the PC. This could mean that *i³ Configurator* is configured for a COM port that is not present or that another program has control of the COM port. Only one *i³ Configurator* window can access a port at a time. Subsequent instances of *i³ Configurator* opened will indicate No Port.
Local: No Com	*i³ Configurator* has accessed a PC COM port but is not communicating with the controller. This typically occurs when the controller is not physically connected.
Local: ???	Unknown communication error. Close *i³ Configurator*, power cycle the controller and reopen *i³ Configurator* with a blank project. Check Local.
Target: #(I,R,D)	If I (idle), R (run), or D (do I/O) shows next to **Target number** then communication is established to the target controller.
Target: #(?)	Communication is not established to the target controller. Check node ID of controller and set Target to match. Make sure **local** connection is established.

19.2 Connecting Troubleshooting Checklist (serial port – MJ1 Programming)

1. Controller must be powered up.
2. Ensure that the correct COM port is selected in *i³ Configurator*. **Tools → Applications Settings → Communications** .
3. Ensure that a cable with proper pinout is being used between PC and controller port MJ1.
4. Check that a Loaded Protocol or ladder is not actively using MJ1. Taking the controller out of Run Mode from the System Menu on the controller will make MJ1 available to *i³ Configurator*.
5. Successful communications with USB-to-serial adapters vary. If in doubt, IMO offers a USB to serial adapter. Part numbers PC501

19.3 Connecting Troubleshooting Checklist (USB Port - Mini B Programming)

1. Controller must be powered up.
2. Ensure that the correct COM port is selected in *i³ Configurator*. **Tools → Applications Settings → Communications**.
3. Be sure that the USB cable is connected between the PC and the controller. Check Windows Device Manager to ensure that the USB driver is properly installed and to verity the port number.

19.4 Local Controller and Local I/O

The system menu provides the following status indications that are useful for troubleshooting and system maintenance.

- Self-test results, diagnostics.
- RUN and OK status
- Network status and usage
- Average logic scan rate
- Application memory usage
- Loaded firmware versions
- Loaded protocols
- Removable media access

To view the system menu, press the UP and DOWN arrow keys simultaneously. See Chapter 8 for full details on the System Menu diagnostic capabilities.

19.5 Local I/O Troubleshooting Checklist

1. Verify the controller is in RUN mode.
2. Check diagnostics to insure controller passed self-tests.
   View Diags in System Menu or in i³ *Configurator*, click; **Controller → Diagnostics**
3. Check data sheets to insure proper wiring.
4. Insure that hardware jumpers and software configuration for I/O match.
5. Check data sheets for voltage and current limits.
6. Take ladder out of the picture. From *i³ Configurator* set controller to "Do I/O" mode. In this mode, inputs can be monitored and outputs set from a data watch window in *i³ Configurator* without interference from the ladder program. Some I/O problems are only a result of a mistake in the ladder program.

WARNING: Setting outputs ON in "Do I/O" mode can result in injury or cause machinery to engage in an unsafe manner depending on the application and the environment.

19.6 iCAN Network

For complete information on setting up an iCAN network, refer to CAN Networks manual by visiting our website for the address to obtain documentation and updates.

Network status, node ID, errors, and baud rate in the controller System Menu are all about the ICAN network. These indications can provide performance feedback on the ICAN network and can also be used to aid in troubleshooting. Refer to Chapter 8 for full details on the System Menu.

19.7 iCAN Network Troubleshooting Checklist

1. Use the proper Belden wire type or equivalent for the network as specified
2. The *i*³A Lite does not provide 24VDC to the network. An external voltage source must be used for other devices.
3. Check voltage at both ends of the network to ensure that voltage meets specifications of attached devices.
4. Proper termination is required. Use 121 Ω (or 120 Ω) resistors at each end of the network. The resistors should be placed across the CAN_HI and CAN_LO terminals. The *i*³A Lite contains a software selectable internal CAN termination resistor. Please see the CAN details for additional information.
5. Measure the resistance between CAN_HI and CAN_LO. If the network is properly wired and terminated there should be around 60 Ω.
6. Check for duplicate node ID's.
7. Keep proper wires together. One twisted pair is for V+ and V- and the other twisted pair is used for CAN_HI and CAN_LO.
8. Make sure the baud rate is the same for all controllers on the network.
9. Assure shields are connected at one end of each segment -- they are not continuous through the network.
10. Do not exceed the maximum length determined by the baud rate and cable type.
11. Total drop length for each drop should not exceed 6 m (20'). A drop may include more than one node. The drop length adds to the overall network length.
12. Network should be wired in "straight line" fashion, not in a "star" pattern.
13. In applications requiring multiple power supplies, make sure the V- of all supplies is connected together and to earth ground at one place only.
14. In some electrically noisy environments it may be necessary to add repeaters to the network. Repeaters can be used to add additional nodes and/or distance to the network and protect the signal against noisy environments

19.8 Basic Troubleshooting

Description	Action
*i*³A Lite does not read media card.	The media card should be formatted with the 2.
*i*³A Lite will not download project file.	Make sure the project file is saved as a .pgm file and not a .csp file.

19.9 Technical Support

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

IMO Precision Controls Ltd:
Tel: +44 (0) 1707 414 444

Website: https://www.imopc.com
Email: automation@imopc.com

IMO Worldwide Offices

IMO Precision Controls Limited
The Interchange
Frobisher Way
Hatfield, Herts AL10 9TG
United Kingdom

Tel: 01707 414 444
Fax: 01707 414 445
Email: imo@imopc.com
Web: www.imopc.com

IMO Jeambrun Automation SAS
5, Rue Alfred De Musset
94100
Saint-Maur-Des-Fosses
France

Tel: 0800 912 712 (nº gratuit)
Fax: 0145 134 737
Email: imo-fr@imopc.com
Web: www.imojeambrun.fr

IMO Automazione
Via Belfiore 10,
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Fax: 8000 452 6445
Email: imo-it@imopc.com
Web: www.imopc.it

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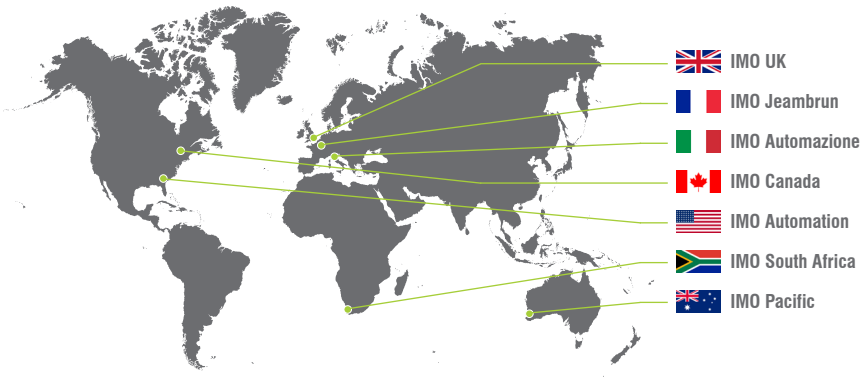
Unit 32 - B - North
18 Strathearn Avenue, Brampton
Ontario L6T 4Y2
Canada

Tel: 905 799 9237
Fax: 905 799 0450
Email: imo-ca@imopc.com
Web: www.imopc.com



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