

# i<sup>3</sup>C Mini Intelligent Control Station

- 3.5" TFT Colour Touchscreen
- 65,535 Colours, QVGA (320 x 240)
- MicroSD™ Data storage upto 32GB
- Real Time Clock
- 1 CAN Port, 1 RS-232, 1 RS-485
- 1 Integral Ethernet Port
- USB Port for Programming
- USB Port for Flash Drives upto 2TB
- Addressable function keys
- 1MB RAM (Program), 27MB (Graphical)
- IP65 (NEMA4)
- 10 - 30 VDC Power Supply
- Online Programming
- Free Configuration Software
- Remote I/O Communication
- Optional - Modem (SMS, GSM, GPRS)



## Options & Ordering Codes

Standard Options	DI	DO	AI	AO
i3CM12Y/10D03-SEHF	12	6 Relay	4	-
i3CM12Y/13C14-SEHF	12	12	2*	2
i3CM12Y/20B05-SEHF	24	16	2	-
i3CM12Y/10B04-SEHF	12	12	2	-
i3CM12Y/10E24-SEHF	12	12	6*	4
i3CM12Y/00000-SEHF	-	-	-	-

\* Universal Analogue Inputs

i3	CM	12	Y	/	10	D	0	3	-	S	E	H	F
<b>Colour Display</b>													
320 x 240		<b>CM</b>											
<b>Comms Ports</b>													
RS-232, RS-485		<b>12</b>											
<b>Programmable Keys</b>													
4 Programmable Keys		<b>Y</b>											
<b>Digital Inputs</b>													
No Digital Input						<b>00</b>							
12 Digital Inputs						<b>10</b>							
24 Digital Inputs						<b>20</b>							
12 Digital Inputs + Temperature PT100/TC						<b>13</b>							
								<b>Digital Outputs</b>					
								<b>0</b>		No Digital Output			
								<b>3</b>		6 (Relay)			
								<b>4</b>		12 (DC)			
								<b>5</b>		16 (DC)			
								<b>Analogue Outputs</b>					
								<b>0</b>		No Analogue Output			
								<b>1</b>		2 (12 Bit)			
								<b>2</b>		4 (12 Bit)			
								<b>Analogue Inputs</b>					
								<b>0</b>		No Analogue Input			
								<b>B</b>		2 (12 Bit)			
								<b>C</b>		2 (14 Bit)			
								<b>D</b>		4 (12 Bit)			
								<b>E</b>		6 (14/17 Bit)			
										Serial		In-built Ethernet and CAN port	
												MicroSD™ Flash Card	
										iCAN		<b>H</b>	
										CANopen		<b>A</b>	
										Devicenet		<b>D</b>	
										J1939		<b>J</b>	

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## Technical Specifications

General Specifications	
Required Power (Steady State)	190mA @ 12VDC / 95mA @ 24VDC
Required Power (Inrush)	2A for <1ms @ 24VDC DC Switched
Primary Voltage Range	10-30VDC
Relative Humidity	5 to 95% Non-Condensing
Clock Accuracy	+/-20ppm Maximum at 25°C (+/-1 Minute per month)
Operating Air Temperature	-10°C to +60°C
Storage Temperature	-30°C to +70°C
Weight	0.34kg (without I/O)
Approvals	cUL, UL, CE

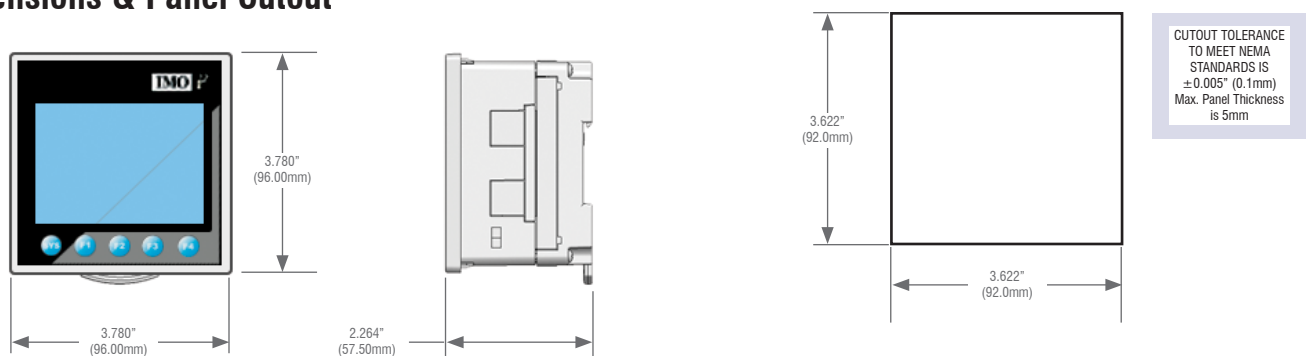
Control & Logic Specifications	
Control Language Support	Advanced Ladder Logic Full IEC 61131-3
Logic Program Size & Logic Scan Rate	1MB Maximum 0.013ms/k
Online Programming Changes	Supported in Advanced Ladder
I/O Support	Digital Inputs - 2048
	Digital Outputs - 2048
	Analogue Inputs - 512
	Analogue Outputs - 512
General Purpose Registers	50,000 (words) Retentive 16,384 (bits) Retentive 16,384 (bits) Non-retentive

Display Specifications	
Display Type	3.5" QVGA TFT
Resolution	320 x 240
Colour	16-bit (65,536)
Screen Memory	27MB
User-Programmable Screens	1023
Backlight	LED - 50,000 hour life
Screen Update Rate	User configurable within the scan time (perceived as instantaneous in many cases)

Connectivity	
Serial Ports	1 RS-232 & 1 RS-485 on first modular jack (MJ1/2)
USB mini-B	USB 2.0 (480MHz) Programming & Data Access
USB A	USB 2.0 (480MHz) for USB FLASH Drives (up to 2TB)
CAN	Remote I/O, Peer-to-Peer Comms, i3 Configurator
Ethernet	10/100MB (Auto-MDX), Modbus TCP, HTTP, FTP, SMTP, i3 Configurator, Ethernet IP
Remote I/O	IOS, Smart I/O, iSmart
Removable Memory	MicroSD™ (support for 32GB max) Application updates, Datalogging, more

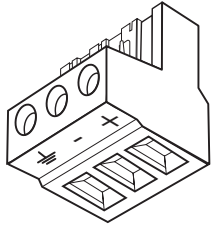
Input / Output Specifications											
Model	DC In	DC Out	Relays	HS In	HS Out	mA/V In	mA/V RTD/TC	mA/V Out	High Speed Counters		
10D03	12		6	4		4			Number of Counters	2	
10B04	12	12		4	2	2			Maximum Frequency	500kHz each	
20B05	24	16		4	2	2			Accumulator Size	32-bits each	
13C14	12	12		4	2		2	2	Modes Supported		
10E24	12	12		4	2		6*	4*	Totalizer	Quadrature	
There are 4 high-speed inputs of the total DC inputs. There are 2 high-speed outputs of the total DC outputs. Model 10D03, 10B04, 20B05 feature 12-bit Analogue I/O. Model 13C14 features 14/16-bit Analogue I/O. High-speed outputs can be used for PWM and Pulse Train Outputs, currently limited to <65kHz. Model 10E14 features a 14/17 bit Analogue I/O.										Pulse Measurement	Frequency Measurement
*Up to six mA/V In, RTD/TC, and mA/V Out										2 Position Controlled Outputs 1 ON/OFF Setpoint per Output	

## Dimensions & Panel Cutout



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## Ports & Connectors



### DC Input / Frame

Torque rating: 4.5-7 Lb-in  
(0.50-0.78Nm)  
DC- is internally connected to I/O V-,  
but is isolated from CAN V-  
A Class 2 power supply must be used

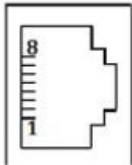


### CAN

Locking Spring-Clamp  
2-Terminators Per Conductor  
Mounting screw torque rating: 4.5 Lb-in  
(0.50Nm)  
SHLD and V+ pins are not  
internally connected to i<sup>3</sup>C Mini

Primary Power Port Pins		
Pin	Signal	Signal Description
1	Ground	Frame Ground
2	DC-	Input Power Supply Ground
3	DC+	Input Power Supply Voltage

Primary Power Port Pins			
Pin	Signal	Description	Direction
1	V-	CAN Ground - Black	-
2	CN L	CAN Data Low - Blue	IN / OUT
3	SHLD	Shield Ground - None	-
4	CN H	CAN Data High - White	IN / OUT
5	V+ (NC)	No Connect - Red	-

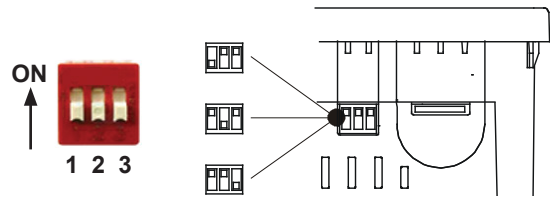


### MJ1/2 Independent Serial Ports

MJ1: RS-232 with Full Handshaking  
MJ2: RS-485 Half-Duplex

PIN	MJ1 PINS		MJ2 PINS	
	Signal	Direction	Signal	Direction
8	TXD	OUT	-	-
7	RXD	IN	-	-
6	0 V	Ground	0 V	Ground
5	+5V@60mA	OUT	+5V@60mA	OUT
4	RTS	OUT	-	-
3	CTS	IN	-	-
2	-	-	RX- / TX-	IN / OUT
1	-	-	RX+ / TX+	IN / OUT

### DIP Switches



Switch	Name	Function	Default
1	RS-485 Termination	ON = Terminated	OFF
2	Spare	Always Off	OFF
3	Factory Use	Always Off	OFF

### Built-in I/O

I/O is mapped into i<sup>3</sup>C Register space, in three separate areas – Digital/Analogue I/O, High-Speed Counter I/O, and High-Speed Output I/O. Digital/Analogue I/O location is fixed starting at 1, but the High-Speed Counter and High-Speed Output references may be mapped to any open register location. For more details on using the High-Speed Counter and High-Speed Outputs, see the i<sup>3</sup>C Mini User's Manual.

Fixed Address	Digital/Analogue I/O Function	i <sup>3</sup> C Mini Model				
		10D03	10B04	20B05	13C14	10E24
%I1	Digital Inputs	1-12	1-12	1-24	1-12	1-12
	Reserved	13-32	13-31	25-31	13-31	13-31
	ESCP Alarm	n/a	32	32	32	32
%Q1	Digital Outputs	1-6	1-12	1-16	1-12	1-12
	Reserved	7-24	13-24	17-24	13-24	13-24
%AI1	Analogue Inputs	1-4	1-2	1-2	1-2	1-4:33-38
	Reserved	5-12	3-12	3-12	3-12	n/a
%AQ1	Reserved	n/a	1-8	1-8	1-8	1-12
	Analogue Outputs	n/a	n/a	n/a	9-10	n/a

Reserved areas maintain backward compatibility with other i<sup>3</sup>C Controller models

Default Address*	High Speed Counter Function	i <sup>3</sup> C Mini Models
%I1601	Status Bits	1-8
&Q1601	Command Bits	1-32
%AI0401	Accumulator 1&2	1-8
%AQ0401	Preload & Match Values	1-12

\*Starting Address locations for %I, %Q, %AI & %AQ may be re-mapped by user

Default Address*	High Speed Output Function	i <sup>3</sup> C Mini Models
%I1617	Status Bits	1-8
&Q**	Command Bits	1-32
n/a	n/a	n/a
%AQ0421	PWM or Pulse Train Parameters	1-20

\*Starting Address locations for %I & %AQ may be re-mapped by user

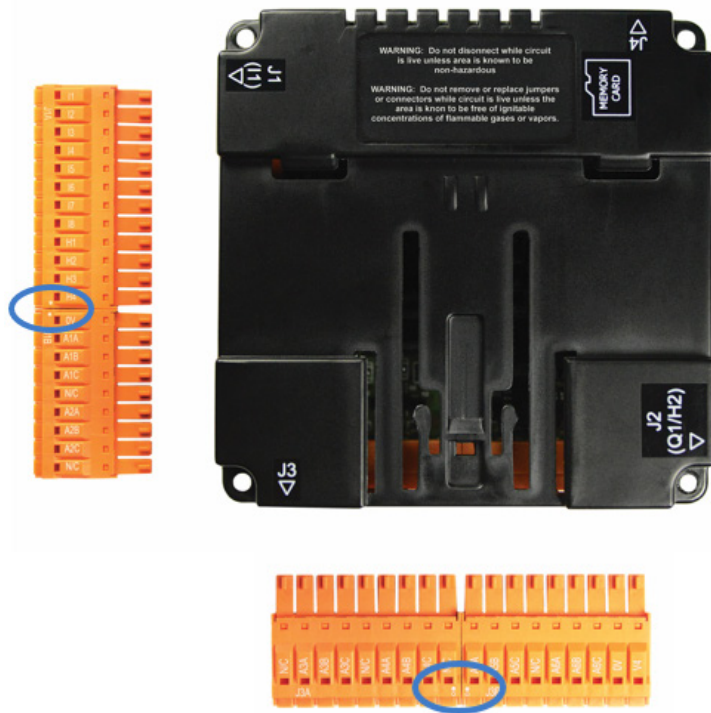
\*\*Q1-Q2 are part of the Fixed I/O Map. In High Speed Output mode they can be used to initiate a Stepper/PTO Move

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## 10E24 I/O Board Specifications

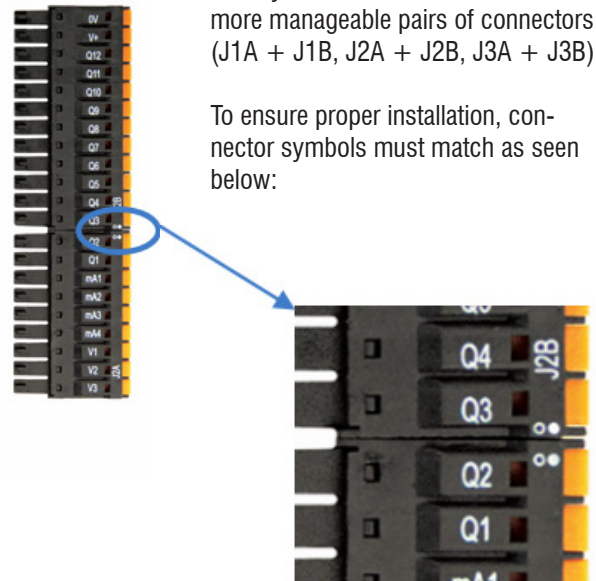
Digital DC Inputs		Digital DC Outputs		
Inputs per Module	12	Outputs per Module	12	
Commons per Module	1	Commons per Module	1	
Input Voltage Range	10-30 VDC	Output Type	Sourcing / 10 K Pull-Down	
Absolute Max. Voltage	35 VDC Max	Absolute Max. Voltage	30 VDC Max	
Input Impedance	10 kΩ	Output Protection	Short Circuit & Overvoltage	
Input Current	Positive Logic Negative Logic	Max. Output Current per Point	0.5A	
Upper Threshold	0.8mA	-1.6mA	Max. Total Current per driver	2 A Continuous
Lower Threshold	0.3mA	-2.1mA	Max. Output Supply Voltage	30 VDC
Min. "On" Input	8 VDC	Min. Output Supply Voltage	10 VDC	
Max. "Off" Input	3 VDC	Max. Voltage Drop at Related Current	0.25 VDC	
Galvanic Isolation	None	I/O Indication	None	
OFF to ON Response	1 ms	Galvanic Isolation	None	
ON to OFF Response	1 ms	Min. Load	None	
Logic Polarity	Positive and Negative based on Common pin level.	OFF to ON Response	150 ns	
I/O Indication	None	ON to OFF Response	150 ns	
High Speed Counter Inputs	4 - DIN 8-12	PWM Out	500kHz	
High Speed Counter Max. Frequency	500kHz	Output Characteristics	Current Sourcing (Positive Logic)	
Connector Type	3.5mm Pluggable cage clamp connector			
Analogue Inputs, High Resolution				
Number of Channels	6	Absolute Max. Input Voltage	-0.5 to 12V DC	
Input Range	0-20mA, 4-20 mA dc. 0-60mV, 0-10V dc. TC - J, K, N, T, E, R, S, B RTD - PT100, PT1000	Input Impedance (Clamped @ -0.5 to 10.23VDC).	TC / RTD / mV > 2 MΩ mA: 15 Ω + 1.5 V V: 1.1 MΩ	
Nominal Resolution	14 - 17 Bits (variable depending on input type)	Galvanic Isolation	None	
Sensor Range and Accuracy	Input Type	Range	Accuracy	
	TC J	-120 to 1000°C / -184 to 1832°F	± 0.2% FS ± 1°C	
	TC K	-130 to 1372°C / -202 to 2501.6°F	± 0.2% FS ± 1°C	
	TC T	-130 to 400°C / -202 to 752°F	± 0.2% FS ± 1°C	
	TC E	-130 to 780°C / -202 to 1436°F	± 0.2% FS ± 1°C	
	TC N	-130 to 1300°C / -202 to 2372°F	± 0.2% FS ± 1°C	
	TC R, S	20 to 1768°C / 68 to 3214.4°F	± 0.2% FS ± 3°C	
	TC B	100 to 1820°C / 212 to 3308°F	± 0.2% FS ± 3°C	
	PT100/1000	-200 to 850°C / -328 to 1562°F	± 0.15% FS	
	0-20mA	0-20mA	± 0.15% FS	
0-60mV	0-60mV	± 0.15% FS		
0-10V	0-10V	± 0.15% FS		
Conversion Speed	Minimum all channels converted in approx. 150mS			
Analogue Outputs				
Number of Channels	4	Minimum Current Load	500Ω	
Output Ranges	0-10VDC, 0-20mA, 4-20mA	Galvanic Isolation	None	
Nominal Resolution	12 Bits	Conversion Speed	Min. all channels once per scan	
Response Time	One update per ladder scan			
Max. Error at 25°C (excluding zero)	0-20mA 0.1% of FS 0-10V 0.1% of FS	Additional Error for temperatures other than 25°C	20mA 0.0126%/°C	

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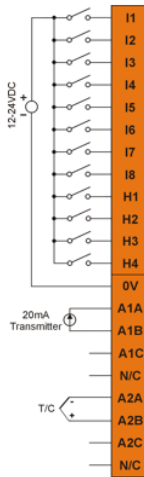


For ease of operability, the high density terminals are divided into more manageable pairs of connectors (J1A + J1B, J2A + J2B, J3A + J3B)

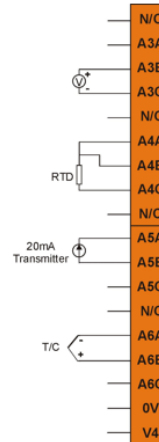
To ensure proper installation, connector symbols must match as seen below:



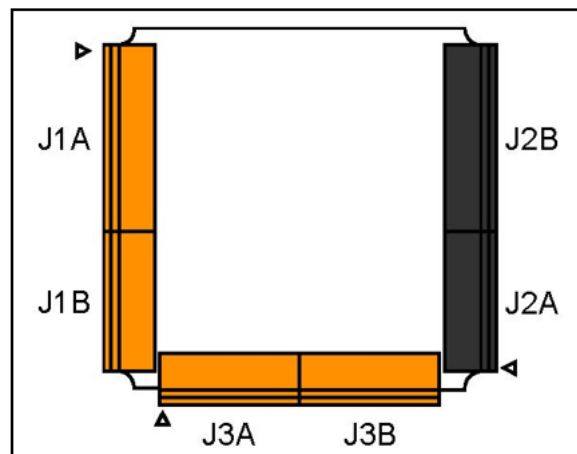
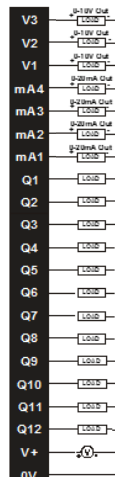
J1 (Orange/Green)		Signal Name
J1A	I1	V IN1
	I2	V IN2
	I3	V IN3
	I4	V IN4
	I5	V IN5
	I6	V IN6
	I7	V IN7
	I8	V IN8
J1B	H1	HSC1 / V IN9
	H2	HSC2 / V IN10
	H3	HSC3 / V IN11
	H4	HSC4 / V IN12
	0V	Common
	A1A	Univ. AI 1 pin 1
	A1B	Univ. AI 1 pin 2
	A1C	Univ. AI 1 pin 3
	NC	No Connect
	A2A	Univ. AI 2 pin 1
	A2B	Univ. AI 2 pin 2
	A2C	Univ. AI 2 pin 3
NC	No Connect	



J3 (Orange/Green)		Signal Name
Univ. AI	NC	No Connect
	A3A	Univ. AI 3 pin 1
	A3B	Univ. AI 3 pin 2
	A3C	Univ. AI 3 pin 3
	NC	No Connect
	A4A	Univ. AI 4 pin 1
	A4B	Univ. AI 4 pin 2
	A4C	Univ. AI 4 pin 3
	NC	No Connect
	A5A	Univ. AI 5 pin 1
	A5B	Univ. AI 5 pin 2
	A5C	Univ. AI 5 pin 3
Univ. AI	NC	No Connect
	A6A	Univ. AI 6 pin 1
	A6B	Univ. AI 6 pin 2
	A6C	Univ. AI 6 pin 3
	NC	No Connect
	V4	V OUT4*



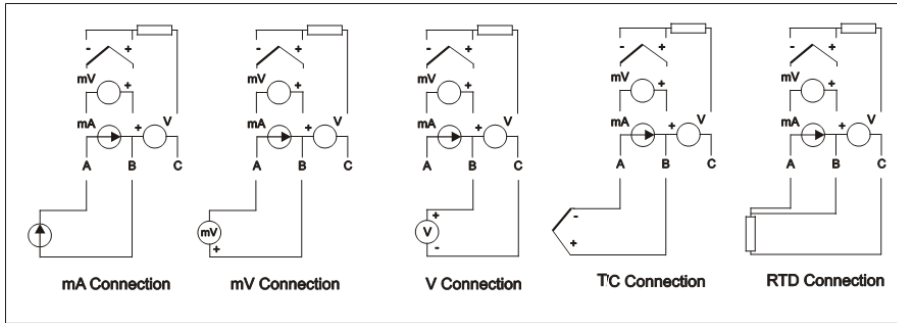
J2 (Black/Green)		Signal Name
J2A	V3	V OUT 3*
	V2	V OUT 2*
	V1	V OUT 1*
	mA4	mA Out 4*
	mA3	mA Out 3*
	mA2	mA Out 2*
	mA1	mA Out 1*
	Q1	OUT 1 / PWM1
J2B	Q2	OUT 2 / PWM2
	Q3	OUT 3
	Q4	OUT 4
	Q5	OUT 5
	Q6	OUT 6
	Q7	OUT 7
	Q8	OUT 8
	Q9	OUT 9
	Q10	OUT 10
	Q11	OUT 11
	Q12	OUT 12
	V+	V External+
0V	Common	



Note \* Both mA & V outputs are active for each output channel, however, only the configured output type is calibrated (maximum 4 channels simultaneously).

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## Example of Universal Input Wiring Schematic



## Configuration

The data registers as follows:-

Digital Inputs	Digital Outputs	Analogue Inputs	Analogue Outputs
%I1-12	%Q1-12	%AI1-4, %AI33-38	%AQ9-12

Note: The first four Analogue inputs are mapped to both %AI1-4 and %AI33-36, analogue input channels 5 & 6 are mapped to %AI37 and %AI38 respectively only.

## Data Values

The analogue inputs return data types as follows:-

Input Mode	Data Format	Comment
0-20mA, 4-20mA	0-32000	
0-10V, 0-60mV	0-32000	
TC, RTD	Temperature in °C or °F to 1 decimal place xxx.y	°C or °F may be selected in the I/O config section. The value is an integer, the user should divide by 10.

## Status Register

Register	Descriptions							
%R1	Bit-wise status register enable – R1.1 – R1.9 enable for registers R2 to R9							
%R2	Firmware version							
%R3	Watchdog count – cleared on power-up.							
%R4	Status bits -				16...4	3	2	1
					Reserved	Normal	Config	Calibration
%R5	Scan rate of the 10E24 board (average) in units of 100µS.							
%R6	Scan rate of the 10E24 board (max) in units of 100µS.							
%R7	Channel Status Channel 2				Channel 1			
	8	7	6	5	4	3	2	1
	Open RTD	Out of Limits	Shorted RTD	Open TC	Open RTD	Out of Limits	Shorted RTD	Open TC
%R8	Channel Status Channel 4				Channel 3			
	8	7	6	5	4	3	2	1
	Open RTD	Out of Limits	Shorted RTD	Open TC	Open RTD	Out of Limits	Shorted RTD	Open TC
%R9	Channel Status Channel 6				Channel 5			
	8	7	6	5	4	3	2	1
	Open RTD	Out of Limits	Shorted RTD	Open TC	Open RTD	Out of Limits	Shorted RTD	Open TC
%R10-14	Reserved							

Note: For the purposes of the example, the block is shown starting at %R1, but it can be set to anywhere in the %R memory map.



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## Safety

**WARNING:** Battery may explode if mistreated. Do not recharge, disassemble or dispose of in fire.

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

This equipment is suitable for use in Class 1, Division 2, Groups A, B, C and D or Non-hazardous locations only.

**FOR U.S. & CANADA ONLY**

Power input and output (I/O) wiring must be in accordance with Class 1, Division 2 wiring methods of the National Electric Code, NFPA70 for installations in the U.S. or as specified in Section 18-1J2 of the Canadian Electric Code for installations within Canada and in accordance with the authority having jurisdiction.

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

**WARNING: EXPLOSION HAZARD - Substitution of components may impair suitability for Class 1, Division 2.**

Digital outputs shall be supplied from the same source as the i3 Controller.

**WARNING:** Only qualified electrical personnel familiar with the construction and operation of this equipment and the hazards involved should install, adjust, operate, or service this equipment. Read and understand this manual and other applicable manuals in their entirety before proceeding. Failure to observe this precaution could result in severe bodily injury or loss of life.

**WARNING:** To avoid the risk of electric shock or burns, always connects the 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 all Power Sources connected to the i3 controller. 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.

Jumpers on connector JP1 and others shall not be removed or replaced while the circuit is live unless the area is known to be free of ignitable concentrations of flammable gases or vapours.

## Common Cause of Analogue Input Transorb Failure

If a 4-20mA circuit is initially wired with loop power, but without a load, the analogue input could see 24VDC. This is higher than the rating of the transorb. This can be solved by NOT connecting loop power prior to load connection, or by installing a low-cost PTC in series between the load and analogue input.

