i^3 User Start-up Guide

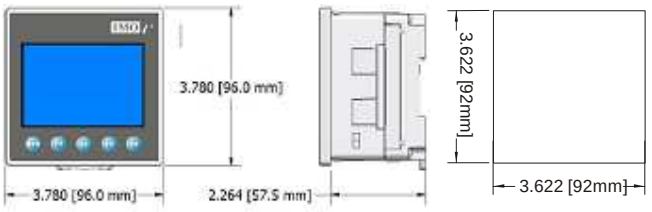
IMO The World's Finest

Getting Started:

1. Connect the 24VDC power as shown on the connector below.
2. Install i^3 Configurator onto your PC.
3. Connect serial programming cable into port MJ1 port.
4. If using a USB to serial convertor (PC501), please check in Window Device Manager which com port has been assigned. Then enter menu Tools->Editor Options-> Communications port->Configure, and set accordingly.
5. Press the 'SYS' key on the front of the unit and check Network ID. Then press the target sign in the Configurator and make the Target ID match that of the i^3

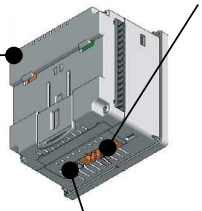
WARNING: Please ensure power is ON and i^3 is in Idle mode before inserting SanDisk™ MicroSD.

Panel Cut out



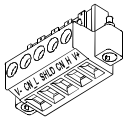
i3B1Y/	160x128 Touch Display, 4 programmable keys
13	12 Digital Inputs (4 HSC + Universal Analogues)
C	2 Analogue Inputs (14-bit)
1	2 Analogue Outputs (12 bit)
4	12 Digital Outputs (2 PWM)
-SCH	2 Serial Ports, 1 CAN port, iCAN Protocol
A	CANopen Protocol
F	MicroSD Card

Back cover screws. Remove the 4 screws and back plate to access the Internal jumpers.
WARNING: Do not Over-tighten screws.

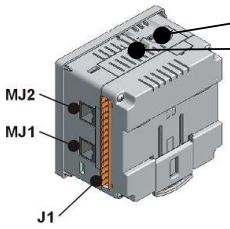


CAN Connector

1 – V+
2 – CN_H
3 – SHIELD
4 – CN_L
5 – V-



WARNING: After installing CANopen firmware, part number suffix becomes SCAF. See CANopen Application Note for more details.



MicroSD Card slot

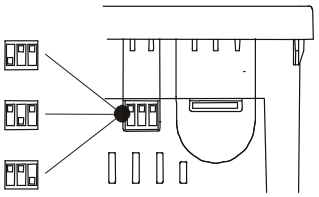
External Jumper Configuration.

As seen when looking at the top of the i^3 unit

DIPSW3: FACTORY USE ONLY (tiny bootloader firmware downloading). NOT FOR NORMAL OPERATION.

DIPSW2: MJ2 Termination (default – none)

DIPSW1: MJ1 Termination (default – none)



Power Connector

Power Up:
Connect to Earth Ground.
Apply 10 - 30 VDC.
Screen lights up.

1 - Positive
2 - Negative
3 - Ground

Serial Ports
MJ1 / MJ2

MJ1 Serial Port Pin Assignments

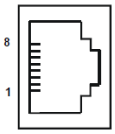
Pin	Signal	Signal Description	Direction
8	TD[1]	RS-232 Transmit Data	Out
7	RD[1]	RS-232 Receive Data	In
6	0V	Ground	-
5	+5	+5 VDC 60mA max	Out
4	RTS[1]	RS-232 Request to Send	In
3	CTS[1]	RS-232 Clear to Send	Out
2	RX/TX−	Receive/Transmit Negative	In/Out
1	RX/TX+	RS-485 Receive/Transmit Positive	In/Out

MJ2 Serial Port Pin Assignments

Pin	Signal	Signal Description	Direction
8	TD[1]	RS-232 Transmit Data	Out
7	RD[1]	RS-232 Receive Data	In
6	0V	Ground	-
5	+5	+5 VDC 60mA max	Out
4	TX-	RS-485 Transmit Negative	In
3	TX+	RS-485 Transmit Positive	Out
2	RX−	RS-485 Receive Negative	In
1	RX+	RS-485 Receive Positive	In

[1]Signals are labeled for connection to a DTE device
* +5 on i^3 H/W Rev E and later

MJ2 RS485 Connection Examples:



MJ2 - Full Duplex Mode

Pin	MJ2 Pins Signal	MJ2 Pins Direction
8	-	-
7	-	-
6	0V	Ground
5	-	-
4	TX-	OUT
3	TX+	OUT
2	RX-	IN
1	RX+	IN

MJ2 - Half Duplex Mode

Pin	MJ2 Pins Signal	MJ2 Pins Direction
8	-	-
7	-	-
6	0V	Ground
5	-	-
4	-	-
3	-	-
2	TX-/RX-	IN/OUT
1	TX+/RX+	IN/OUT

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

WARNING: EXPLOSION HAZARD – Do not disconnect equipment unless power has been switched off or the area is known to be non-hazardous.
AVERTISSEMENT - RISQUE D'EXPLOSION - AVANT DE DECONNECTOR L'EQUIPMENT, COUPER LE COURANT OU S'ASSURER QUE L'EMPLACEMENT EST DESIGNE NON DANGEREUX.

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
AVERTISSEMENT - RISQUE D'EXPLOSION - LA SUBSTITUTION DE COMPOSANTS PEUT RENDRE CE MATERIAL INACCEPTABLE POUR LES EMPLACEMENTS DE CLASSE 1, DIVISION 2

WARNING: EXPLOSION HAZARD - BATTERIES MUST ONLY BE CHANGED IN AN AREA KNOWN TO BE NON-HAZARDOUS
AVERTISSEMENT - RISQUE D'EXPLOSION - AFIN D'EVITER TOUT RISQUE D'EXPLOSION, S'ASSURER QUE L'EMPLACEMENT EST DESIGNE NON DANGEREUX AVANT DE CHANGER LA BATTERIE

WARNING: Battery May Explode If Mistreated. Do Not Recharge, Disassemble or Dispose Of In Fire

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

i3B_IBD5F REV4_0909

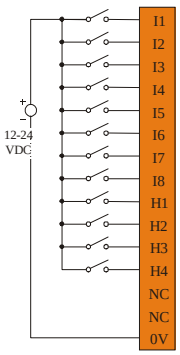
I/O Register Map

Registers	Description
%I1 to %I24	Digital Inputs
%I32	Output Fault
%I25 to %I31	Reserved
%Q1 to %Q16	Digital outputs
%Q17	Clear HSC1 accumulator to 0
%Q18	Totalizer: Clear HSC2 Quadrature 1-2: Accumulator 1 Reset to max – 1
%Q19	Clear HSC3 Accumulator to 0
%Q20	Totalizer: Clear HSC4 Quadrature 3-4: Accumulator 3 Reset to max – 1
%Q21 to %Q32	Reserved
%AI1 to %AI4	Analogue inputs
%AI5, %AI6	HSC1 Accumulator
%AI7, %AI8	HSC2 Accumulator
%AI9, %AI10	HSC3 Accumulator
%AI11, %AI12	HSC4 Accumulator
%AQ1, %AQ2	PWM1 Duty Cycle
%AQ3, %AQ4	PWM2 Duty Cycle
%AQ5, %AQ6	PWM Prescale
%AQ7, %AQ8	PWM Period
%AQ9 to %AQ14	Analog outputs

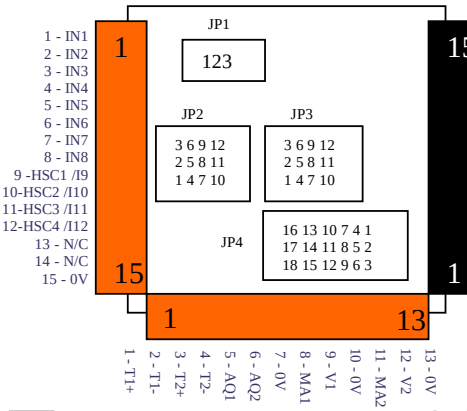
Note: Not all *i*^{3} units contain the I/O listed in this table.

Registers	PWM	HSC	Stepper
%AQ1	PWM1 Duty Cycle	HSC1 Preset Value	Start Frequency
%AQ2	(32 bit)		Run Frequency
%AQ3	PWM2 Duty Cycle	HSC2 Preset Value	Accel Count (32 bit)
%AQ4	(32 bit)		
%AQ5	PWM Prescale		Run Count (32 bit)
%AQ6	(32 bit)		
%AQ7	PWM Period		Decel Count (32 bit)
%AQ8	(32 bit)		
%Q1			Run
%I30			Ready/Done
%I31			Error

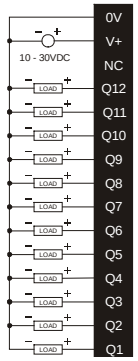
Positive Logic
Digital In



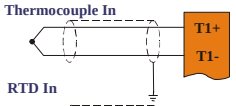
Analogue I/O and Digital I/O



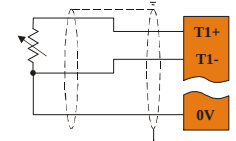
Positive Logic
Digital Outputs



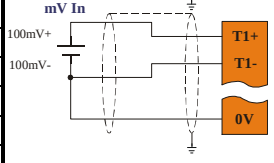
Thermocouple In



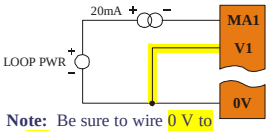
RTD In



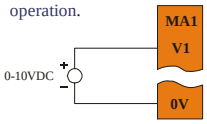
mV In



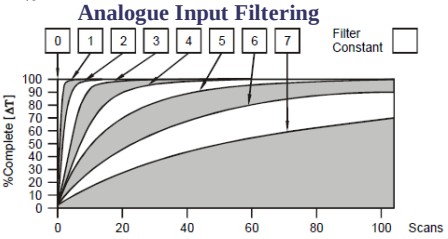
A total of 2 analogue inputs and 2 analogue outputs can be utilised.



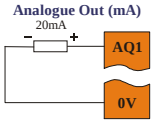
Note: Be sure to wire 0 V to V1 as shown for proper operation.



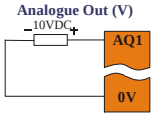
Analogue Input Filtering



Analogue Out (mA)



Analogue Out (V)



WARNING: Do not short loop power source directly to analogue inputs, more than 35mA load can damage input circuit.

Wiring Specifications

- For I/O wiring (discrete), use the following wire type or equivalent: Belden 9918, 18 AWG (0.8 mm^2) or larger.
- For shielded Analogue I/O wiring, use the following wire type or equivalent: Belden 8441, 18 AWG (0.8 mm^2) or larger.

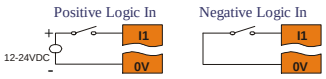
I/O Configuration

I/O Jumper settings are located internally. Remove the 4 screws on the back and lift casing off to access. **Only access when power is removed from the *i*^{3}.** Care must be taken to avoid over tightening of the case screws.

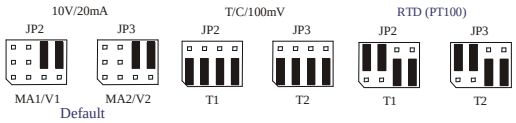
JP1 Digital DC Inputs

Positive Logic vs. Negative Logic Wiring

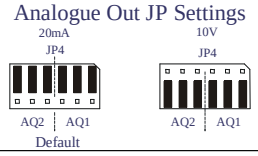
The *i*^{3} can be wired for Positive Logic inputs or Negative Logic inputs depending on the position of JP1.



Analogue In JP Settings



Analogue Out JP Settings



Expansion I/O Modules

All *i*^{3} controllers can have extra analogue and digital I/O added by connecting expansion modules to either MJ1 or MJ2 ports.

iCAN based expansion I/O is also available on special request. Please inquire at IMO technical support. automation@imopc.com

Basic Options

Input - 4 Channel RTD (0-2000ohm, 0-500ohm, PT100, Ni100, PT1000, Ni1000)	iOS / M 4 I P X - D1
Input - 8 Channel DC Current (-20mA to +20mA)	iOS / M 8 I C X - D1
Input - 8 Channel DC Voltage (-10V to +10V)	iOS / M 8 I V X - D1
Input - 8 Channel Thermocouple (J, K, R, S, B, E, T, N, -/+ 50mV, -/+100mV)	iOS / M 8 I T X - D1
Output - 4 Channel DC Voltage / Current (0-20mA, 0-10V)	iOS / M 4 O X A - D1
16 Digital Input, 16 Transistor output (0.1A / Channel, 2A / Common)	GSL - D T 4 A
16 Relay Output (2A / Channel, 5A / Common)	GSL - R Y 2 A
32 Digital Input	GSL - D 2 4 A

Note: Other I/O configurations and Fieldbus options are available. Please inquire at IMO. automation@imopc.com

For further information on Remote I/O please consult the Remote I/O datasheet, and the *i*^{3} Remote I/O tutorial in the downloads section of the IMO website. www.imopc.com/manuals

Technical Specifications

Digital DC Inputs

Inputs per Module	12 including 4 configurable HSC inputs	
Commons per Module	1	
Input Voltage Range	12 VDC / 24 VDC	
Absolute Max. Voltage	35 VDC Max.	
Input Impedance	10 kW	
Input Current	Positive Logic	Negative Logic
Upper Threshold	0.8 mA	-1.6 mA
Lower Threshold	0.3 mA	-2.1 mA
Max Upper Threshold	8 VDC	
Min Lower Threshold	3 VDC	
OFF to ON Response	1 ms	
ON to OFF Response	1 ms	
HSC Max. Switching Rate	10 kHz Totalizer/Pulse, Edges 5 kHz Frequency/Pulse, Width 2.5 kHz Quadrature	

Digital DC Outputs

Outputs per Module	12 including 2 configurable PWM outputs
Commons per Module	1
Output Type	Sourcing / 10 K Pull-Down
Absolute Max. Voltage	28 VDC Max.
Output Protection	Short Circuit
Max. Output Current per point	0.5 A
Max. Total Current	4 A Continuous
Max. Output Supply Voltage	30 VDC
Minimum Output Supply Voltage	10 VDC
Max. Voltage Drop at Rated Current	0.25 VDC
Max. Inrush Current	650 mA per channel
Min. Load	None
OFF to ON Response	1 ms
ON to OFF Response	1 ms
Output Characteristics	Current Sourcing (Positive Logic)

Analogue Inputs High Resolution

Number of Channels	2
Input Ranges (Selectable)	0 - 10 VDC 0 – 20 mA 4 – 20 mA 100mV PT100 RTD, and J, K, N, T, E, R, S, B Thermocouples
Safe input voltage range	10 VDC: -0.5 V to +15 V 20 mA: -0.5 V to +6 V RTD / T/C: ±24 VDC
Nominal Resolution	10V, 20mA, 100mV: 14 Bits RTD, Thermocouple: 16 Bits
Input Impedance (Clamped @ -0.5 VDC to 12 VDC)	Current Mode: 100 W, 35mA Max. Continuous Voltage Mode: 500 kW, 35mA Max. Continuous
%AI full scale	10 V, 20 mA, 100 mV: 32,000 counts full scale. RTD / T/C: 20 counts / °C
Max. Over-Current	35 mA
Open Thermocouple Detect Current	50 nA

Thermocouple	**Temperature Range**
B / R / S	2912°F to 32.0°F (1600°C to 0°C)
E	1652°F to -328°F (900°C to -200°C)
T	752.0°F to -400.0°F (400°C to -240°C)
J	1382.0°F to -346.0°F (750°C to -210°C)
K / N	2498.0°F to -400°F (1370°C to -240°C)

Thermocouple Common Mode Range	±10V
Converter Type	Delta Sigma
Max. Error at 25°C (*excluding zero)	*4-20 mA ±0.10%* *0-20 mA ±0.10%* *0-10 VDC ±0.10%* RTD (PT100) ±1.0 °C 0-100 mV ±0.05%
Max Thermocouple Error (After 1Hr Warm Up)	±0.2% (±0.3% below -100°C)
Conversion Speed, Both Channels Converted	10V, 20mA, 100mV: 30 Times/Second RTD, Thermocouple: 7.5 Times/Second
Conversion Time per Channel	10V, 20mA, 100mV: 16.7mS RTD, Thermocouple: 66.7mS
RTD Excitation Current	250 mA

Analogue Outputs

Number of Channels	2
Output Ranges	0-10 VDC, 0-20 mA
Nominal Resolution	12 Bits
Update rate	Once per PLC scan
Minimum 10 V load	1 kW
Maximum 20 mA load	500 W
Analogue Outputs; Output Points Required	2
Maximum Error at 25°C (excluding zero)	0.10%
Additional error for temperatures other than 25°C	0.01% / °C

General Specifications

Required Power (Steady State)	130 mA @ 24 VDC
Required Power (Inrush)	30 A for 1 ms @ 24 VDC – DC Switched
Primary Power Range	10 - 30 VDC
Operating Temperature	-10° to 60° Celsius
Storage Temperature	14 to 140°F (-10 to 60°C)
Relative Humidity	5 to 95% Non-condensing
Filtering	15Hz hash (noise) filter 1-128 scan digital running average filter
Terminal Type	Screw Type,5 mm Removable
Weight	12.5 oz. (354.36g)
Shock / Vibration	IEC68-2-6 and IEC68-2-27
CE	Approved
UL	
Clock Accuracy	+/- 35 ppm maximum at 25° C (+/- 1.53 Minutes per Month)

IMO Precision Controls Ltd
1000 North Circular Rd, Staples Corner, London. NW2 7JP
Tel: +44 (0) 208 452 6444, Fax: +44 (0) 208 450 2274, Web: www.imopc.com

For further technical information and a full specification, please consult the Hardware Manual

Small Extras:

RS232 Serial Programming Cable
For programming any i^3 Model.

PART No: i3PC45

IP65 RJ45 Panel-Mounted Socket
Bring either MJ1 or MJ2 ports to the outside world by installing this into a 22.5mm cut-out.

PART No: i3PAD

USB to RS232 Convertor
For PCs without a serial Com Port. Add one with this device.

PART No: PC501

Communication:

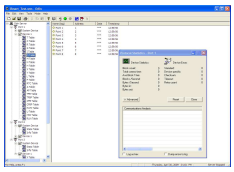
Ethernet Expansion card
Link an i^3 to an Ethernet network. Program monitor and debug remotely, or run i^3 as a Modbus TCP server.

PART No: i^3-E

GSM Modem Expansion Card
Send and Receive SMS messages via the i^3, dial-up connection over GSM data link for remote programming, debugging etc. Or, use a GPRS always-on data connection ideal for programming, debugging, monitoring and connection to a SCADA package for constant data logging and remote control.

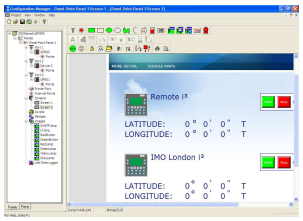
PART No: i^3-M

ODIN OPC SERVER (With LOKI data-logger)
With no tag limit and 30+ Protocols to choose from (including IMO products, Mitsubishi, Allen Bradley, Siemens), ODIN can be used with LOKI to log data either to an Excel spreadsheet or an Access database.



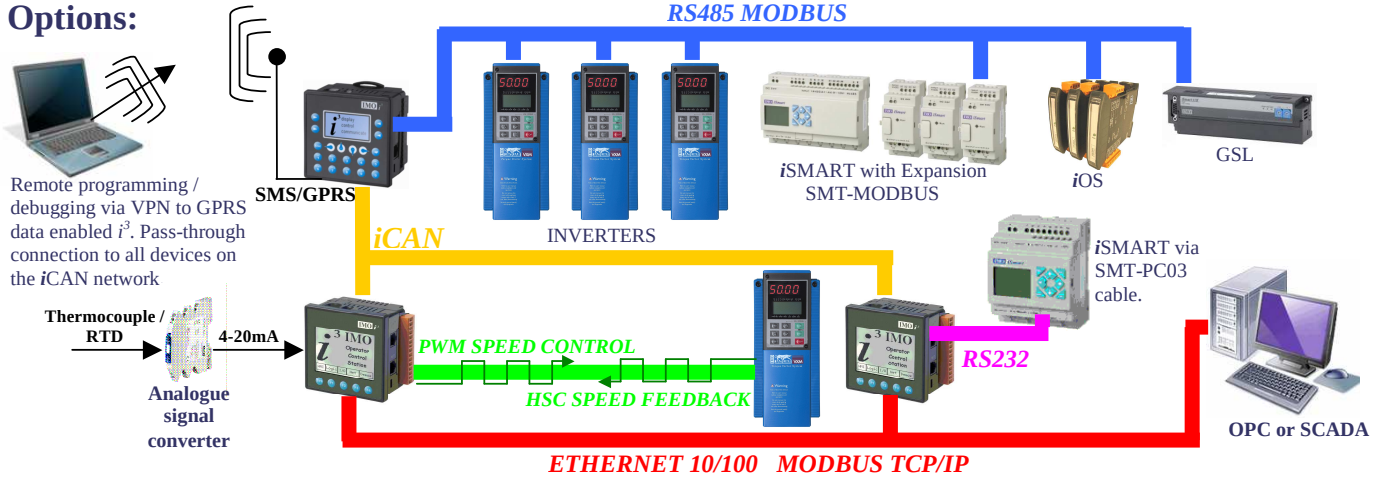
PART No: IMO-OPC-SERVER

Panel Point SCADA*lite*
With no tag limit and 30+ Protocols to choose from (including IMO products, Mitsubishi, Allen Bradley, Siemens), a powerful graphical editor, and a VB-based scripting language, Panel-Point allows a PC to become the central data hub of an application.



PART No: PANELPOINT (Developer)
PART No: PANELPOINTRT (Runtime)

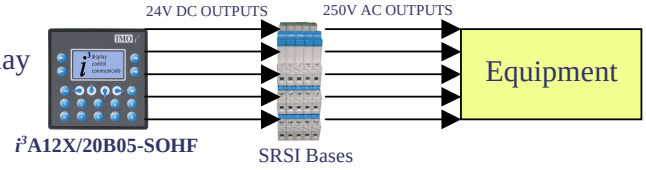
Options:



Miscellaneous:

DIN rail mounted SRSI Base and ETS Relay
Use the Transistor outputs of the i^3 to operate the relay coils to switch up to 6A @ 250VAC.

Part Numbers: SRSI-24AC/DC, ETS-1AN-SL-24VDC

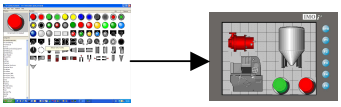


i^3A12X/20B05-SOHF

SRSI Bases & ETS Relays

i^3 Configurator with Symbol Library
Obtain a copy of the i^3 Software with a library of colour buttons, pipes, vessels, motors, pumps, fans etc. To enhance the look and feel of applications on the i^3C.

Part Numbers: IMO-CDSUITE



Custom screen overlays
Ask at IMO for custom overlays. Overlays are tooled to a customer's design.

GPS Receiver
Locate your i^3 Controller anywhere in the world by connecting this device to MJ2 of a unit equipped with a GPRS enabled modem.

Part Number: i^3-GPS