X-Series 106 I/O Board
Datasheet

1. Hardware Specification

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	0 VDC - 24 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 Minimum 'On' current Maximum 'Off' current.	Positive Logic 0.8 mA 0.3 mA	Negative Logic -1.6 mA -2.1 mA	Max. Output Current per point	0.5 A
			Max. Total Current per driver (Q1-4, Q5-8, Q9-12).	2A Continuous
Min 'On' Input	8 VDC		Max. Output Supply Voltage	30 VDC
Max 'Off' Input	3 VDC		Minimum Output Supply Voltage	10 VDC
OFF to ON Response	1 ms		Max. Voltage Drop at Rated Current	0.25 VDC
ON to OFF Response	1 ms		Min. Load	None
Galvanic Isolation	None.		I/O Indication	None
Logic Polarity	Positive and Negative based on Common pin level.		Galvanic Isolation	None
I/O Indication	None.		OFF to ON Response	150nS
High Speed Counter Inputs*	4 - DIN 8-12		ON to OFF Response	150nS
High Speed Counter Max Freq*	XLE/T/6/10 / XL4/7 10KHz / 500KHz		PWM Out*	XLE/T/6/10 / XL4/7 65KHz / 500KHz
Connector Type	3.5mm Pluggable cage clamp connector		Output Characteristics	Current Sourcing (Pos logic)

Analog Inputs				
Number of Channels	6		Absolute max Input Voltage	-0.5 -12V dc. (+/-30Vdc)
Input Range	0–20mA, 4-20 mA dc. 0-60mV, 0-10V dc. T/C - J, K, N, T, E, R, S, B RTD - PT100, PT1000		Input Impedance (Clamped @ -0.5 to 10.23VDC).	T/C / 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.			

Analog Outputs			
Number of Channels	4	Minimum Current load	500Ω
Output Ranges	0 – 10Vdc. 0 – 20mA, 4-20mA dc	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)	0-20 mA 0.1% of full scale. 0-10 V 0.1% of full scale	Additional Error for temperatures other than 25°C	20mA 0.0126%/°C.

***see I/O information below for detail regarding HSC and PWM**

2. Connection Details

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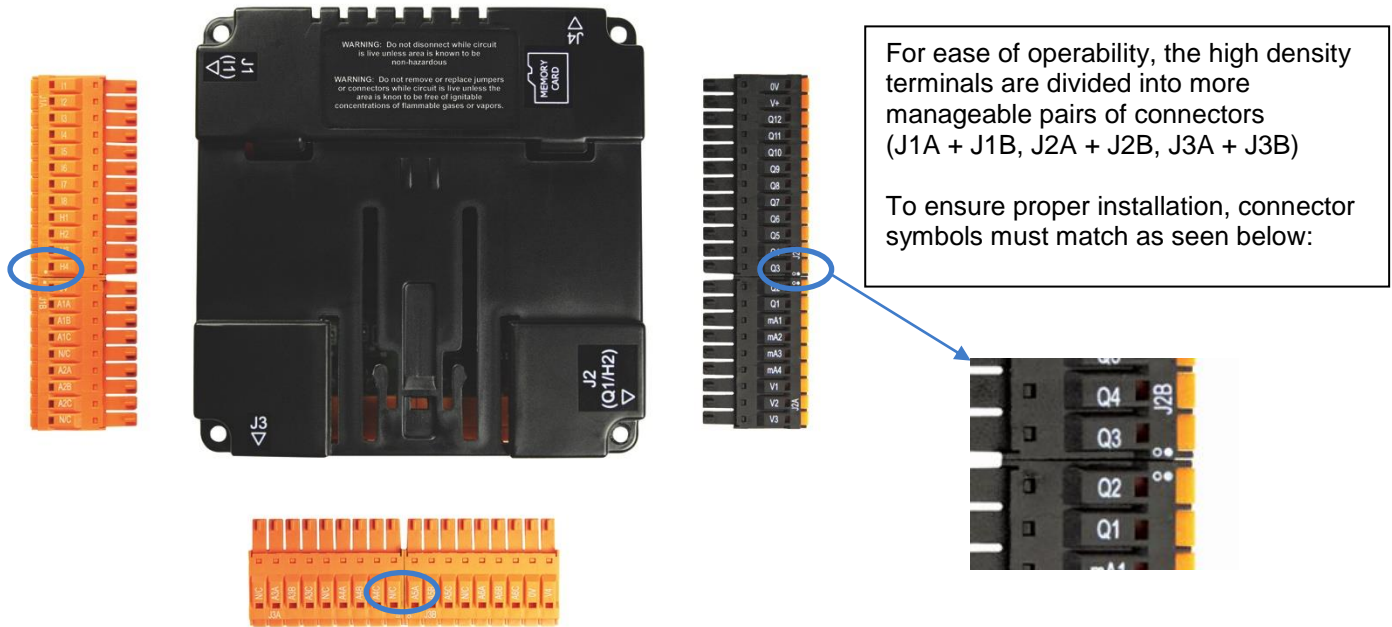
J1 (Orange/ Green)		Signal Name
J1A	I1	V IN1
	I2	V IN2
	I3	V IN3
	I4	V IN4
	I5	V IN5
	I6	V IN6
	I7	V IN7
	I8	V IN8
	H1	HSC1 / V IN9
	H2	HSC2 / V IN10
	H3	HSC3 / V IN11
	H4	HSC4 / V IN12
J1B	0V	Common
	A1A	Univ. AI 1 pin 1
	A1B	Univ. AI 1 pin 2
	A1C	Univ. AI 1 pin 3
	N/C	No Connection
	A2A	Univ. AI 2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

J3 (Orange/ Green)		Signal Name
Univ. AI	N/C	No Connection
	A3A	Univ. AI 3 pin 1
	A3B	Univ. AI 3 pin 2
	A3C	Univ. AI 3 pin 3
	N/C	No Connection
	A4A	Univ. AI 4 pin 1
	A4B	Univ. AI 4 pin 2
	A4C	Univ. AI 4 pin 3
	N/C	No Connection
Univ. AI	A5A	Univ. AI 5 pin 1
	A5B	Univ. AI 5 pin 2
	A5C	Univ. AI 5 pin 3
	N/C	No Connection
	A6A	Univ. AI 6 pin 1
	A6B	Univ. AI 6 pin 2
	A6C	Univ. AI 6 pin 3
	0V	Common
	V4	V OUT4*

(Black/ Green)		Signal Name
2A	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
	Q2	OUT 2 / PWM2
2B	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).
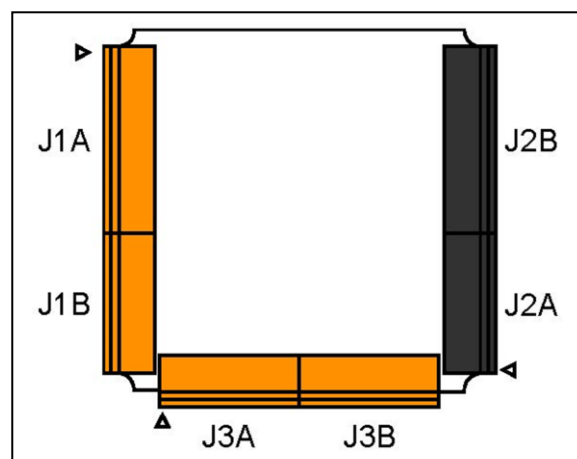
2.2 Example Universal Input Wiring Schematic

mA Connection   mV Connection   V Connection   T/C Connection   RTD Connection
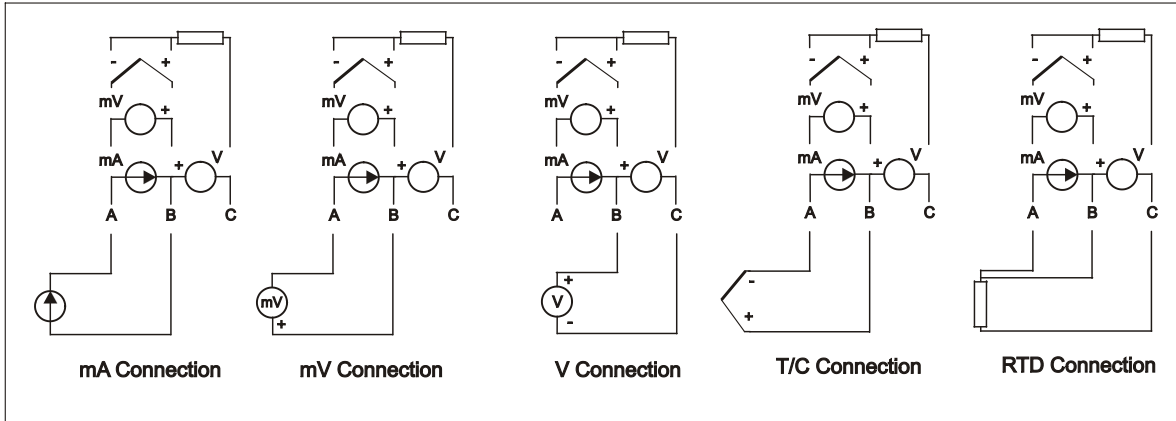
3. Configuration

The data registers are as follows:

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

Note that 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.

3.1 Data values:

The analogue inputs return data types as follows:

Input Mode	Data format	Comment
0-2mA, 4-20mA	0-32000	
0-10V, 0-60mV	0-32000	
T/C, 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.

3.2 Status Register

Register	Description							
%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 106 board (average) in units of 100µS.							
%R6	Scan rate of the 106 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 T/C	Open RTD	Out of Limits	Shorted RTD	Open T/C
%R8	Channel Status Channel 4				Channel 3			
	8	7	6	5	4	3	2	1
	Open RTD	Out of Limits	Shorted RTD	Open T/C	Open RTD	Out of Limits	Shorted RTD	Open T/C
%R9	Channel Status Channel 6				Channel 5			
	8	7	6	5	4	3	2	1
	Open RTD	Out of Limits	Shorted RTD	Open T/C	Open RTD	Out of Limits	Shorted RTD	Open T/C
%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.