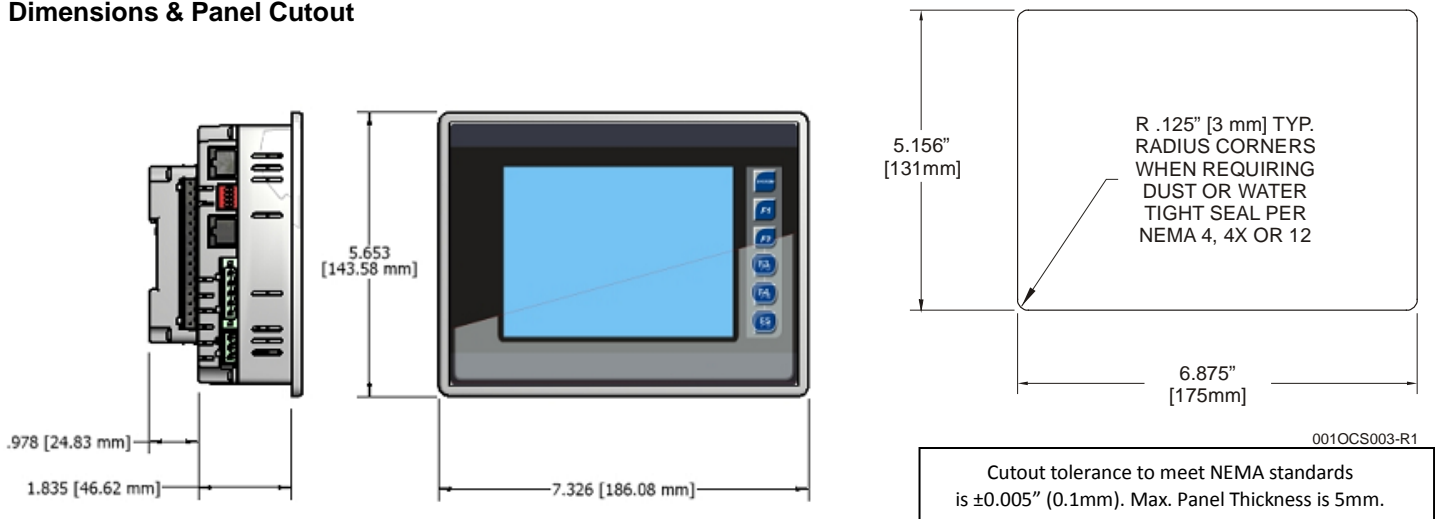HORNER
AUTOMATION GROUP

EXL6 OCS Datasheet for

HE-EXL1E0, HE-EXL1E2, HE- EXL1E3, HE- EXL1E4, HE- EXL1E5, HE-EXL1E6
HEXT371C100, HEXT371C112, HEXT371C113, HEXT371C114, HEXT371C115, HEXT371C116

1. Specifications

General Specifications		Control & Logic Specifications		
Required Power (Steady state)	420mA @ 12VDC / 230 mA @24VDC	Control Language Support	Advanced Ladder Logic Full IEC 1131-3 Languages	
Required Power (Inrush)	25A for <1 ms @ 24 VDC DC Switched	Logic Program Size & Logic Scan Rate	1MB, maximum 0.013mS/K	
Primary Power Range	10–30VDC	Online Programming Changes	Supported in Advanced Ladder	
Relative Humidity	5 to 95% Non-condensing	I/O Support	Digital Inputs	2048
Clock Accuracy	+/- 20 ppm maximum at 25° C (+/- 1 Minutes per Month)		Digital Outputs	2048
			Analog Inputs	512
Surrounding Air Temp	-10°C to +60°C		Analog Outputs	512
Storage Temp	-40°C to +60°C	General Purpose Registers	50,000 (words) Retentive 16,384 (bits) Retentive 16,384 (bits) Non-retentive	
Weight	4.375 lbs (without I/O)			
UL / CE	USA: http://www.heapg.com/Pages/TechSupport/ProductCert.html Europe: http://www.horner-apg.com/en/support/certification.aspx			
Display Specifications		Connectivity		
Display Type	5.7" VGA TFT (450 nit typical)	Serial Ports	1 RS-232 & 1 RS-485 on first Modular Jack (MJ1/2) 1 RS-232 or 1 RS-485 on second Modular Jack (MJ3)	
Resolution	640x480	USB mini-B	USB 2.0 (480MHz) Programming & Data Access	
Color	16-bit (65,536)	USB A	USB 2.0 (480MHz) for USB FLASH Drives (2TB)	
Screen Memory	27 MB	CAN	Remote I/O, Peer-to-Peer Comms, Cscape	
User-Programmable Screens	1023	Ethernet	10/100 Mb (Auto-MDX), Modbus TCP C/S, HTTP, FTP, SMTP, Cscape, Ethernet IP	
Backlight	LED – 30,000 hour life	Remote I/O	SmartRail, SmartStix, SmartBlock, SmartMod	
Screen Update Rate	User Configurable within the scan time. (perceived as instantaneous in many cases)	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	
									Number of Counters	2
Model 2	12		6	4		4			Maximum Frequency	500 kHz each
Model 3	12	12		4	2	2			Accumulator Size	32-bits each
Model 4	24	16		4	2	2			Modes Supported	
Model 5	12	12		4	2		2	2	Totalizer	Quadrature
Model 6	12	12		4	2		6*	4*		

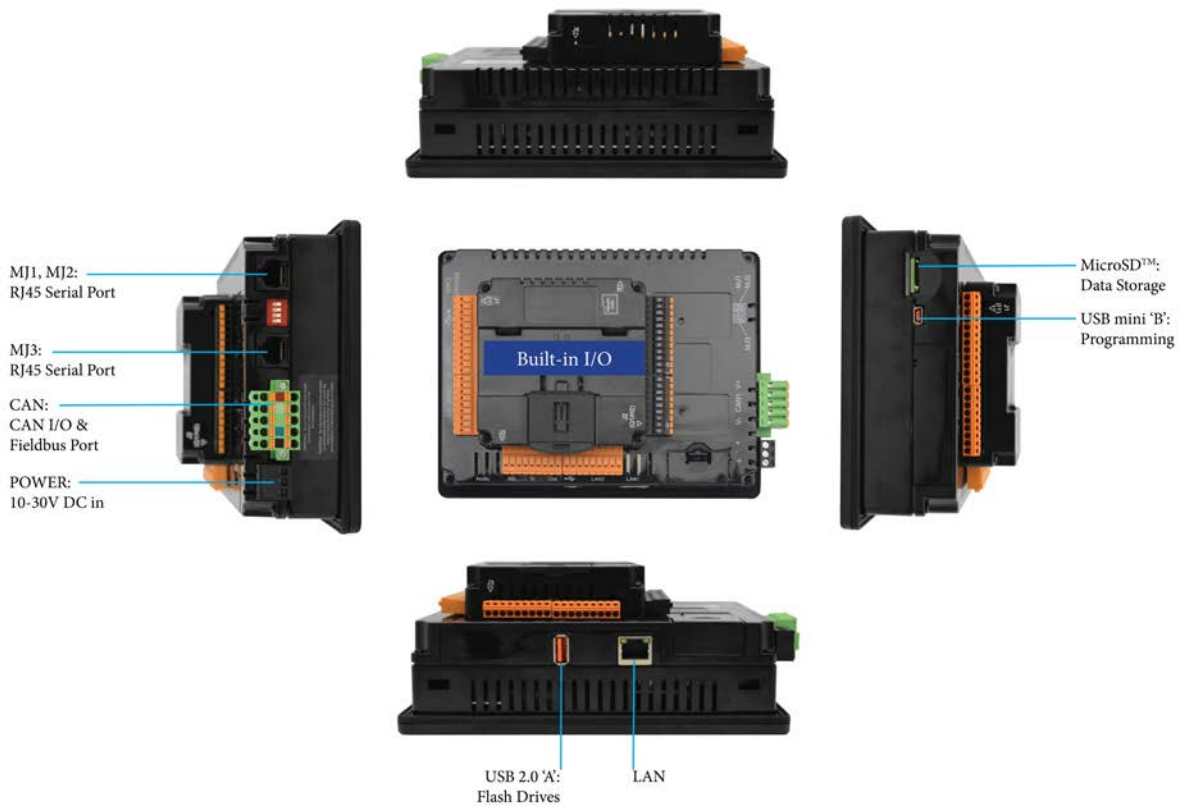|		
There are 4 high-speed inputs of the total DC Inputs. There are 2 high-speed outputs of the total DC outputs. Model 2, 3 & 4 feature 12-bit Analog I/O. Model 5 features 14/16-bit Analog I/O. High-speed Outputs can be used for PWM and Pulse Train Outputs, currently limited to <65kHz.. Model 6 Features a 14/17 bit Analog I/O *Up To six mA/V In, mA/V RTD/Tc, and mA/V Out	Pulse Measurement	Frequency Measurement
	2 Position Controlled Outputs 1 ON/OFF Setpoint per Output	

2. Dimensions & Panel Cutout

5.156" [131mm]

R .125" [3 mm] TYP. RADIUS CORNERS WHEN REQUIRING DUST OR WATER TIGHT SEAL PER NEMA 4, 4X OR 12

6.875" [175mm]

5.653 [143.58 mm]

.978 [24.83 mm]

1.835 [46.62 mm]

7.326 [186.08 mm]

001OCS003-R1

Cutout tolerance to meet NEMA standards is ±0.005" (0.1mm). Max. Panel Thickness is 5mm.
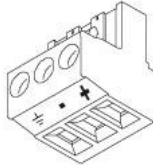
3. Installation Procedures

1. Carefully locate an appropriate place to mount the EXL6. Be sure to leave enough room at the top of the unit for insertion and removal of the microSD card. Also leave enough room at the bottom for the insertion and removal of USB FLASH drives and wiring

2. Carefully cut the host panel per the diagram above, creating a 175mm x 216 ± 0.1mm opening into which the EXL6 may be installed. If the opening is too large, water may leak into the enclosure, potentially damaging the OCS. If the opening is too small, the OCS may not fit through the hole without damage.

3. Remove all Removable Terminals from the OCS. Insert the OCS through the panel cutout (from the front). The gasket needs to be between the host panel and the OCS.

4. Install and tighten the mounting clips (provided in the box) until the gasket forms a tight seal (max torque 7-10 lb-in. [0.8 – 1.13 Nm])

5. Reinstall the I/O Removable Terminal Blocks. Connect communications cables to the serial port, USB ports, Ethernet port, and CAN port as required.
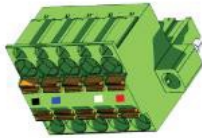
4. Ports & Connectors

MJ1, MJ2:
RJ45 Serial Port

MJ3:
RJ45 Serial Port

CAN:
CAN I/O &
Fieldbus Port

POWER:
10-30V DC in

Built-in I/O

MicroSD™:
Data Storage

USB mini 'B':
Programming
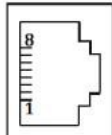
USB 2.0 'A':
Flash Drives

LAN

DC Input / Frame

Torque rating: 4.5 – 7 Lb-In
(0.50 – 0.78 N-m)

DC- is internally connected to I/O V–,
but is isolated from CAN V–

A Class 2 power supply must be used.

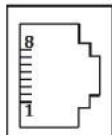| Primary Power Port Pins		
PIN	SIGNAL	DESCRIPTION
1	Ground	Frame Ground
2	DC-	Input Power Supply Ground
3	DC+	Input Power Supply Voltage

CAN

Locking Spring-Clamp,
Two-terminators Per Conductor

Torque rating: 4.5 Lb-In
(0.50 N-m)

SHLD and V+ pins are not
internally connected to XL7

CAN1 / CAN2 Port Pin			
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

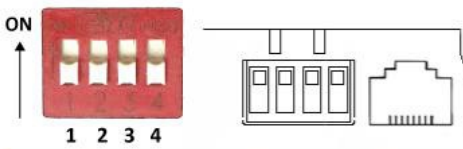MJ1: RS-232 w/Full Handshaking

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

MJ3 Serial Port

Two multiplexed Serial Ports on One
Modular Jack (8posn)

PIN	MJ3 PINS	
	SIGNAL	DIRECTION
8	TXD RS232	OUT
7	RXD RS232	IN
6	0 V	Ground
5	+5V@60mA	OUT
4	TX- RS485	OUT
3	TX+ RS485	OUT
2	RX- RS485	IN
1	RX+ RS485	IN

DIP Switches

ON

1 2 3 4

SWITCH	NAME	FUNCTION	DEFAULT
1	MJ3 RS485 Termination	ON = Terminated	OFF
2	MJ3 Duplex	ON = Half	OFF
3		OFF = Full	
4	MJ2 RS485 Termination	ON = Terminated	OFF

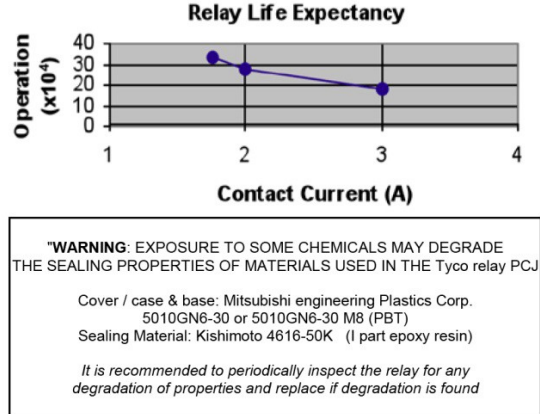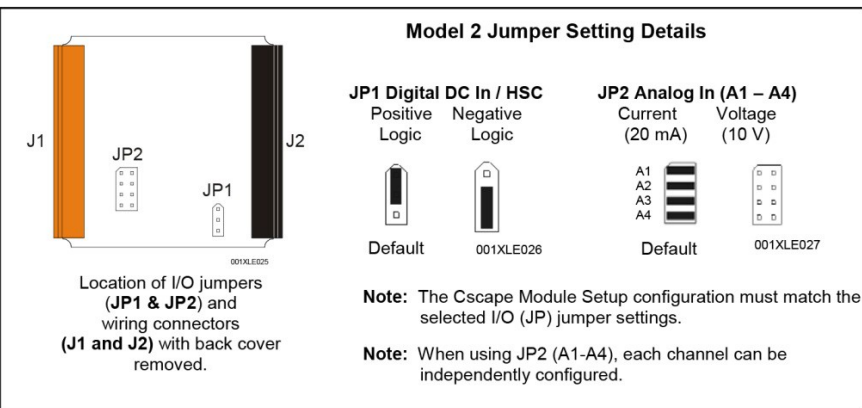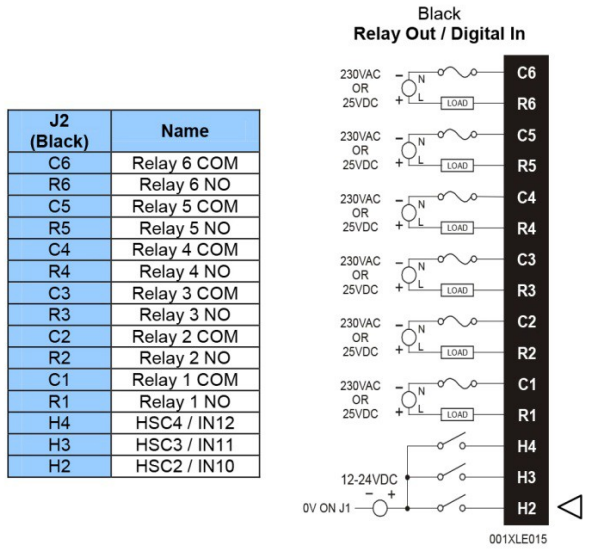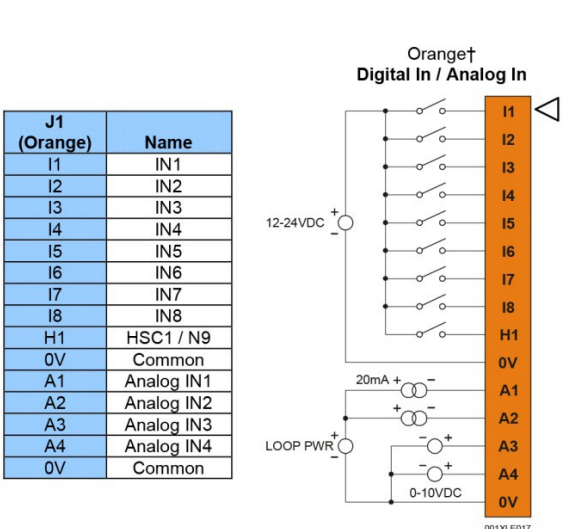## 5. Built-in I/O (Model 2, 3, 4, 5 & 6)

All EXL6 models (except the HE-EXL1E0) feature built-in I/O. The I/O is mapped into OCS Register space, in three separate areas – Digital/Analog I/O, High-Speed Counter I/O, and High-speed Output I/O. Digital/Analog 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 EXL6 OCS User's Manual (MAN0974-01).

Fixed Address	Digital/Analog I/O Function	EXL10e Model					Default Address*	High-Speed Counter Function	EXL10e Models 2-6	Default Address*	High-Speed Output Function	EXL10e Models 2-6
		2	3	4	5	6						
%I1	Digital Inputs	1-12	1-12	1-24	1-12	1-12	%I1601	Status Bits	1-8	%I1617	Status Bits	1-8
	Reserved	13-32	13-31	25-31	13-31	13-31	%Q1601	Command Bits	1-32	%Q1**	Command Bits	1-2
	ESCP Alarm	n/a	32	32	32	32	%AI0401	Accumulator 1 & 2	1-8	n/a	n/a	n/a
%Q1	Digital Outputs	1-6	1-12	1-16	1-12	1-12				%AQ421	PWM or Pulse-Train Parameters	1-20
	Reserved	7-24	13-24	17-24	13-24	13-24	%AQ0401	Preload & Match Values	1-12			
%AI1	Analog Inputs	1-4	1-2	1-2	1-2	1-4 ; 33-38	*Starting Address locations for %I, %Q, %AI & %AQ may be re-mapped by user			*Starting Address locations for %I & %AQ may be remapped by user		
	Reserved	5-12	3-12	3-12	3-12	n/a						
%AQ1	Reserved	n/a	1-8	1-8	1-8	1-12				**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		
	Analog Outputs	n/a	n/a	n/a	9-10	n/a						
Reserved areas maintain backward compatibility with other XL Series OCS models												

5.1 Model 2 – I/O

Specifications			
Digital DC Inputs		**Digital Relay Outputs**	
Inputs per Module	12 including 4 configurable HSC inputs	Outputs per Module	6 Relay
Commons per Module	1	Commons per Module	6
Input Voltage Range	12 VDC / 24 VDC	Max Output Current per Relay	3A @ 250 VAC, resistive
Absolute Max. Voltage	35 VDC Max.	Max. Total Output Current	5A continuous
Input Impedance	10 kΩ	Max. Output Voltage	275VAC, 30 VDC
Input Current	Positive Logic / Negative Logic	Max Switched Power	1250VAC, 150W
Upper Threshold	0.8 mA / -1.6 mA		
Lower Threshold	0.3 mA / -2.1 mA		
Max Upper Threshold	8 VDC	Contact Isolation to Ground	1000VAC
Min Lower Threshold	3 VDC	Max. Voltage Drop at Related Current	0.5V
OFF to ON Response	1 ms	Expected life (see below derating chart for detail)	No Load: 5,000,000 Rated Load: 100,000
ON to OFF Response	1 ms	Max. Switching Rate	300 CPM at no load 20CPM at rated load
HSC Max. Switching Rate	10 kHz Totalizer/Pulse, Edges 5 kHz Frequency/Pulse, Width 2.5 kHz Quadrature	Type	Mechanical Contact
		Response Time	One update per ladder scan plus 10ms
Analog Inputs, Medium Resolution			
Number of channels	4	Input Ranges	0-10 VDC 0-20mA 4-20mA
Safe input voltage range	-0.5V to 12V	Input impedance (clamped @ -0.5VDC to 12 VDC)	Current Mode: 100 Ω / Voltage Mode: 500 k Ω
Nominal Resolution	10 Bits	%AI full Scale	32,000
Max. Over Current	35 mA	Conversion Speed	Once per Ladder Scan
Max. Error at 25°C (excluding zero) Adjusting filtering may tighten	4-20 mA 1.00% 0-20 mA 1.00% 0-10 VDC 1.50%*	Filtering	160 Hz hash (noise) filter 1-128 scan digital running average filter

Orange†
Digital In / Analog In

J1 (Orange)	Name
I1	IN1
I2	IN2
I3	IN3
I4	IN4
I5	IN5
I6	IN6
I7	IN7
I8	IN8
H1	HSC1 / N9
0V	Common
A1	Analog IN1
A2	Analog IN2
A3	Analog IN3
A4	Analog IN4
0V	Common

001XLE017

Black
Relay Out / Digital In

J2 (Black)	Name
C6	Relay 6 COM
R6	Relay 6 NO
C5	Relay 5 COM
R5	Relay 5 NO
C4	Relay 4 COM
R4	Relay 4 NO
C3	Relay 3 COM
R3	Relay 3 NO
C2	Relay 2 COM
R2	Relay 2 NO
C1	Relay 1 COM
R1	Relay 1 NO
H4	HSC4 / IN12
H3	HSC3 / IN11
H2	HSC2 / IN10

001XLE015

J1 JP2 JP1 J2

Location of I/O jumpers (**JP1 & JP2**) and wiring connectors (**J1 and J2**) with back cover removed.

001XLE025

Model 2 Jumper Setting Details

JP1 Digital DC In / HSC
Positive Logic / Negative Logic

Default   001XLE026

JP2 Analog In (A1 – A4)
Current (20 mA) / Voltage (10 V)

A1
A2
A3
A4

Default   001XLE027

Note: The Cscape Module Setup configuration must match the selected I/O (JP) jumper settings.

Note: When using JP2 (A1-A4), each channel can be independently configured.

Relay Life Expectancy

Operation (x10⁴) vs Contact Current (A)

"**WARNING**: EXPOSURE TO SOME CHEMICALS MAY DEGRADE THE SEALING PROPERTIES OF MATERIALS USED IN THE Tyco relay PCJ

Cover / case & base: Mitsubishi engineering Plastics Corp. 5010GN6-30 or 5010GN6-30 M8 (PBT)
Sealing Material: Kishimoto 4616-50K (I part epoxy resin)

It is recommended to periodically inspect the relay for any degradation of properties and replace if degradation is found

5.2 Model 3 & 4 – I/O

Specifications					
Digital DC Inputs	Model 3	Model 4	Digital DC Outputs	Model 3	Model 4
Inputs per Module	12 including 4 configurable HSC inputs	24 including 4 configurable HSC inputs	Outputs per Module	12 including 2 configurable PWM outputs	16 including 2 configurable PWM outputs
Commons per Module	1		Commons per Module	1	
Input Voltage Range	12 VDC / 24 VDC		Output Type	Sourcing / 10 K Pull-Down	
Absolute Max. Voltage	35 VDC Max.		Absolute Max. Voltage	28 VDC Max.	
Input Impedance	10 kΩ		Output Protection	Short Circuit	
Input Current	Positive Logic	Negative Logic	Max. Output Current per point	0.5 A	
Upper Threshold	0.8 mA	-1.6 mA	Max. Total Current	4 A Continuous	
Lower Threshold	0.3 mA	-2.1 mA	Max. Output Supply Voltage	30 VDC	
Max Upper Threshold	8 VDC		Minimum Output Supply Voltage	10 VDC	
Min Lower Threshold	3 VDC		Max. Voltage Drop at Rated Current	0.25 VDC	
OFF to ON Response	1 ms		Max. Inrush Current	650 mA per channel	
ON to OFF Response	1 ms		Min. Load	None	
HSC Max. Switching Rate	500KHz each		OFF to ON Response	1 ms	
ON to OFF Response	1 ms		Output Characteristics	Current Sourcing (Pos logic)	

J1 (Orange) Positive Logic†
Digital & Analog In

J1 (Orange)	Model 3 & 4 Signal Name
I1	IN1
I2	IN2
I3	IN3
I4	IN4
I5	IN5
I6	IN6
I7	IN7
I8	IN8
H1	HSC1 / IN9
H2	HSC2 / IN10
H3	HSC3 / IN11
H4	HSC4 / IN12
A1	Analog IN1
A2	Analog IN2
0V	Common

J3 (Orange) Positive Logic
Digital In

J3 (Orange)	Model 4 only Signal Name
I13	IN13
I14	IN14
I15	IN15
I16	IN16
I17	IN17
I18	IN18
I19	IN19
I20	IN20
I21	IN21
I22	IN22
I23	IN23
I24	IN24
0V	Common

J2 Black
Positive Logic
Digital Out

J2 (Black)	Model 3 Name	Model 4 Name
0V	Common	
V+	V+ *	
NC	No Connect	OUT13
Q12	OUT12	
Q11	OUT11	
Q10	OUT10	
Q9	OUT9	
Q8	OUT8	
Q7	OUT7	
Q6	OUT6	
Q5	OUT5	
Q4	OUT4	
Q3	OUT3	
Q2	OUT2 / PWM2	
Q1	OUT1 / PWM1	
*V+ Supply for Sourcing Outputs		

Jumper Setting Details

JP1 Digital DC Inputs

Positive Logic   Negative Logic

Default

JP3 Analog Inputs

20mA   10VDC

Location of I/O jumpers (JP1 & JP3) and wiring connectors (J1, J2, J3 & J4) with back cover removed.

Note: The Cscape Module Setup configuration must match the selected I/O (JP) jumper settings.

Note: When using JP3 (A1-A2), each channel can be independently configured.

J4 Orange
Positive Logic
Digital Out

J4 (Orange)	Model 4 Name
Q16	OUT16
Q15	OUT15
Q14	OUT14

Note:
Model 3 uses
J1 & and J2 only.

Model 4 uses
J1, J2, J3 & J4.

5.3 Model 5 – I/O

Digital DC Inputs			Digital DC Outputs	
Inputs per Module	12 including 4 configurable HSC inputs		Outputs per Module	12 including 2 configurable PWM outputs
Commons per Module	1		Commons per Module	1
Input Voltage Range	12 VDC / 24 VDC		Output Type	Sourcing / 10 K Pull-Down
Absolute Max. Voltage	35 VDC Max.		Absolute Max. Voltage	28 VDC Max.
Input Impedance	10 kΩ		Output Protection	Short Circuit
Input Current	Positive Logic	Negative Logic	Max. Output Current per point	0.5 A
Upper Threshold	0.8 mA	-1.6 mA	Max. Total Current	4 A Continuous
Lower Threshold	0.3 mA	-2.1 mA	Max. Output Supply Voltage	30 VDC
Max Upper Threshold	8 VDC		Minimum Output Supply Voltage	10 VDC
Min Lower Threshold	3 VDC		Max. Voltage Drop at Rated Current	0.25 VDC
OFF to ON Response	1 ms		Max. Inrush Current	650 mA per channel
ON to OFF Response	1 ms		Min. Load	None
HSC Max. Switching Rate	10 kHz Totalizer/Pulse, Edges 5 kHz Frequency/Pulse, Width 2.5 kHz Quadrature		OFF to ON Response	1 ms
			ON to OFF Response	1 ms
			Output Characteristics	Current Sourcing (Positive Logic)

| Analog Inputs, High Resolution			
Number of Channels	2	Thermocouple	Temperature Range
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	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)	
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	Thermocouple Common Mode Range	±10V
Nominal Resolution	10V, 20mA, 100mV: 14 Bits RTD, Thermocouple: 16 Bits	Converter Type	Delta Sigma
Input Impedance (Clamped @ -0.5 VDC to 12 VDC)	Current Mode: 100 Ω, 35mA Max. Continuous Voltage Mode: 500 kΩ, 35mA Max. Continuous	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%
%AI full scale	10 V, 20 mA, 100 mV: 32,000 counts full scale. RTD / T/C: 20 counts / °C	Max Thermocouple Error (After Warm Up Time of One Hour)	±0.2% (±0.3% below -100°C)
		Conversion Speed, Both Channels Converted	10V, 20mA, 100mV: 30 Times/Second RTD, Thermocouple: 7.5 Times/Second
Max. Over-Current	35 mA	Conversion Time per Channel	10V, 20mA, 100mV: 16.7mS RTD, Thermocouple: 66.7mS
Open Thermocouple Detect Current	50 nA	RTD Excitation Current	250 μA

J1 (Orange) Positive Logic
Digital Inputs

J1 (Orange)	Name
I1	IN1
I2	IN2
I3	IN3
I4	IN4
I5	IN5
I6	IN6
I7	IN7
I8	IN8
H1	HSC1 / IN9
H2	HSC2 / IN10
H3	HSC3 / IN11
H4	HSC4 / IN12
NC	No Connect
NC	No Connect
0V	Common

001XLE007
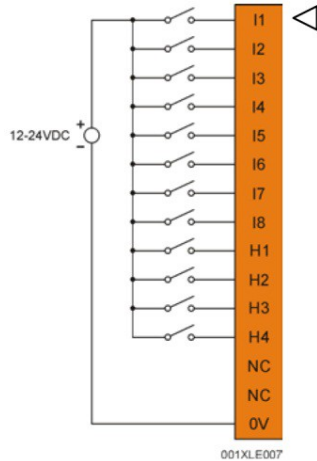
J2 (Black) Positive Logic
Digital Outputs

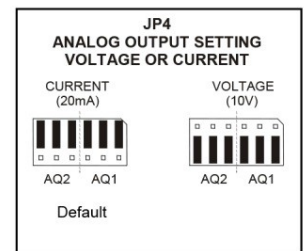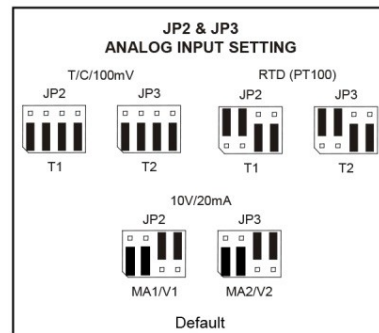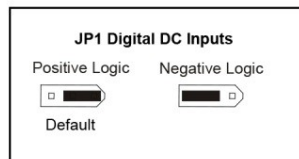| J2 (Black)	Name
0V	Common
V+*	Output Power
NC	No Connect
Q12	OUT12
Q11	OUT11
Q10	OUT10
Q9	OUT9
Q8	OUT8
Q7	OUT7
Q6	OUT6
Q5	OUT5
Q4	OUT4
Q3	OUT3
Q2	OUT2 / PWM2
Q1	OUT1 / PWM1

001XLE008
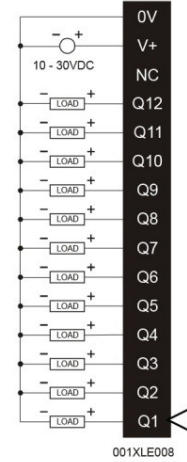
J3 (Orange)	Name
T1+	Tc (1 +) or RTD (1+) or 100mV (1+)
T1-	Tc (1-) or RTD (1-) or 100mV (1-)
T2+	Tc (2+) or RTD (2+) or 100mV (2+)
T2-	Tc (2-) or RTD (2-) or 100mV (2-)
AQ1	10V or 20mA Out (1)
AQ2	10V or 20mA Out (2)
0V	Common
MA1	0-20mA In (1)
V1	0-10V In (1)
0V	Common
MA2	0-20mA In (2)
V2	0-10V In (2)
0V	Common

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

Note:
Loop Power requirements are determined by the transmitter specification.

Jumper Setting Details
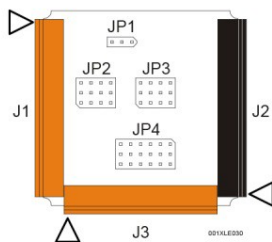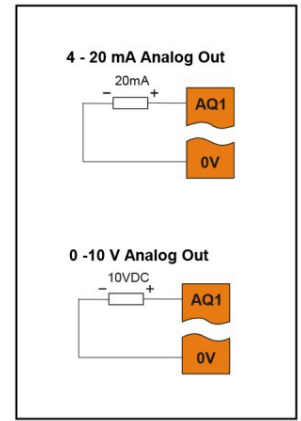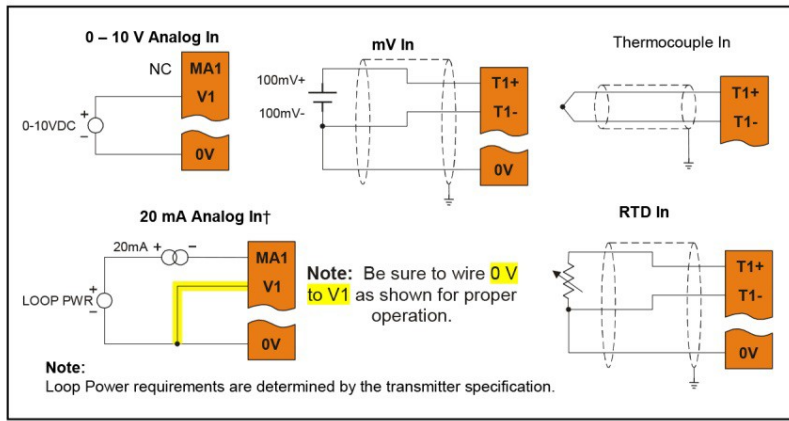
Location of I/O jumpers (**JP1-JP4**) and wiring connectors (**J1-J4**) with back cover removed.

001XLE030

JP1 Digital DC Inputs

Positive Logic   Negative Logic

Default

JP2 & JP3 ANALOG INPUT SETTING

JP4 ANALOG OUTPUT SETTING VOLTAGE OR CURRENT

5.4 Model 6 – I/O

5.4.1 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	Half-Bridge
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 total current (all drivers) UL-rated, 6A UL pending
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 (10KHz max) XL4/7 EXL6/10 (500KHz max)		PWM Out*	XLE/T/6/10 (65KHz max) XL4/7 EXL6/10 (500KHz max)
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

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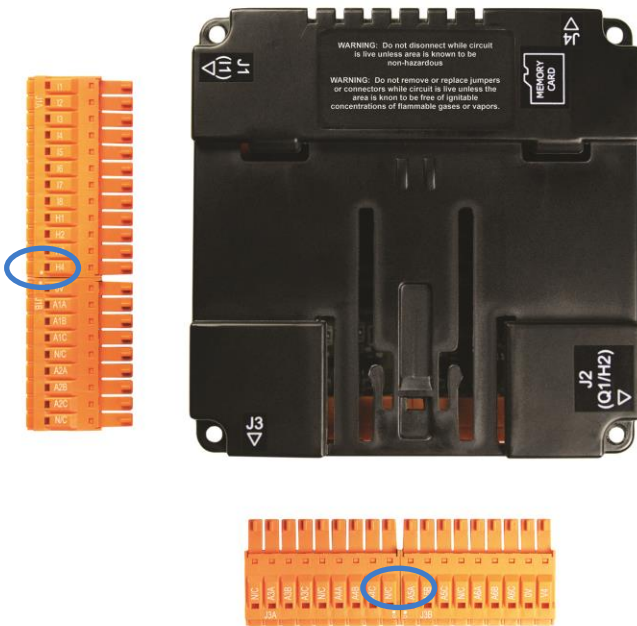
For ease of operability, the high density terminals are divided into more manageable pairs of connectors (J1A + J1B, J2A + J2B, J3A + J3B)

To ensure proper installation, connector symbols must match as seen below:
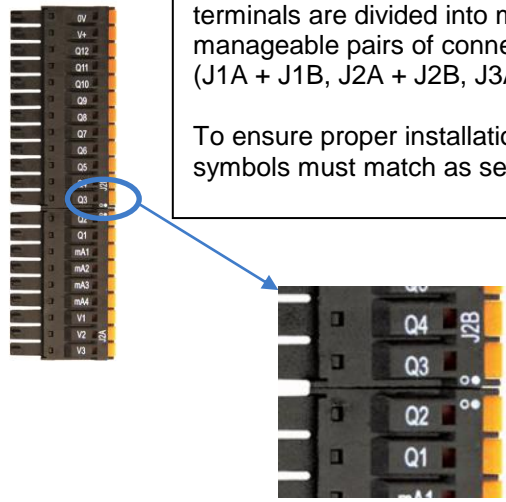
J1 (Orange/ Green)		Signal Name
J1A	I1	V IN1
	I2	V IN2
	I3	V IN3
	I4	V IN4
	I5	V IN5
	I6	V IN6
	I7	V IN7
	I8	V IN8
	H1	HSC1 / V IN9
	H2	HSC2 / V IN10
	H3	HSC3 / V IN11
	H4	HSC4 / V IN12
J1B	0V	Common
	A1A	Univ. AI 1 pin 1
	A1B	Univ. AI 1 pin 2
	A1C	Univ. AI 1 pin 3
	N/C	No Connection
	A2A	Univ. AI 2 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
	A5A	Univ. AI 5 pin 1
	A5B	Univ. AI 5 pin 2
	A5C	Univ. AI 5 pin 3
Univ. AI	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).
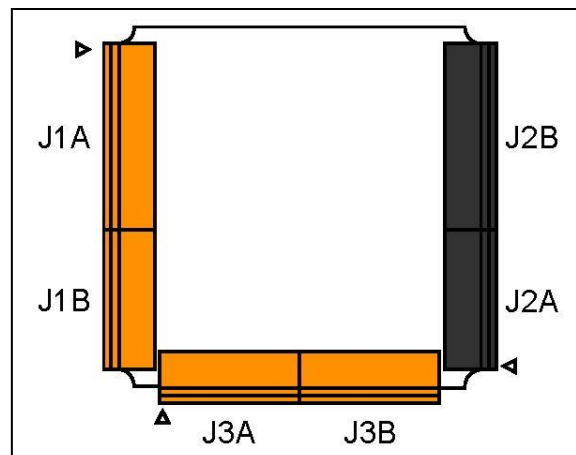
5.4.3 Example Universal Input Wiring Schematic

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

Notes:
Loop Power requirements are determined by the transmitter specification.
Power supply should be isolated.
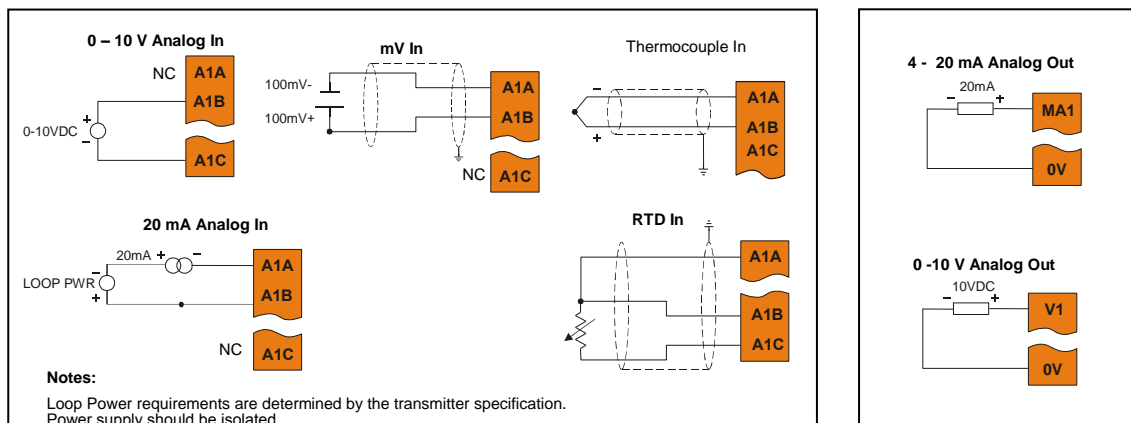
Configuration

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.

5.4.4 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.

5.4.5 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.

6. 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 Power input and output (I/O) wiring must be in accordance with Class I, Division 2 wiring methods of the National Electric Code, NFPA 70 for installations in the U.S., or as specified in Section 18-1J2 of the Canadian Electrical Code for installations within Canada and in accordance with the authority having jurisdiction. 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. **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 Operator Control Station.	**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 connect 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 OCS. 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 gasses or vapors.

7. Common Cause of Analog Input Tranzorb Failure

A common cause of Analog Input Tranzorb Failure on Analog Inputs Model 2, 3, 4 & 5: If a 4-20mA circuit is initially wired with loop power, but without a load, the Analog input could see 24Vdc. This is higher than the rating of the tranzorb. 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 Analog input.

NOTE†: Refers to Model 2 – orange *(pg.5,)* Models 3 & 4 – J1 *(pg.6)* and Model 5 – 20mA Analog In *(pg.7.)*
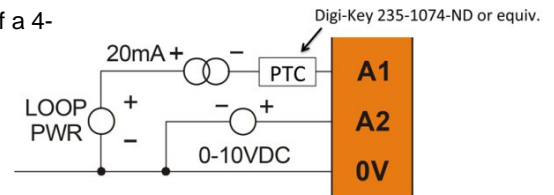
8. Technical Support

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

North America
(317) 916-4274
Toll Free: 877-665-5666
http://www.heapg.com
e-mail: techsppt@heapg.com

Europe
(+) 353-21-4321-266
http://www.horner-apg.com
e-mail: tech.support@horner-apg.com