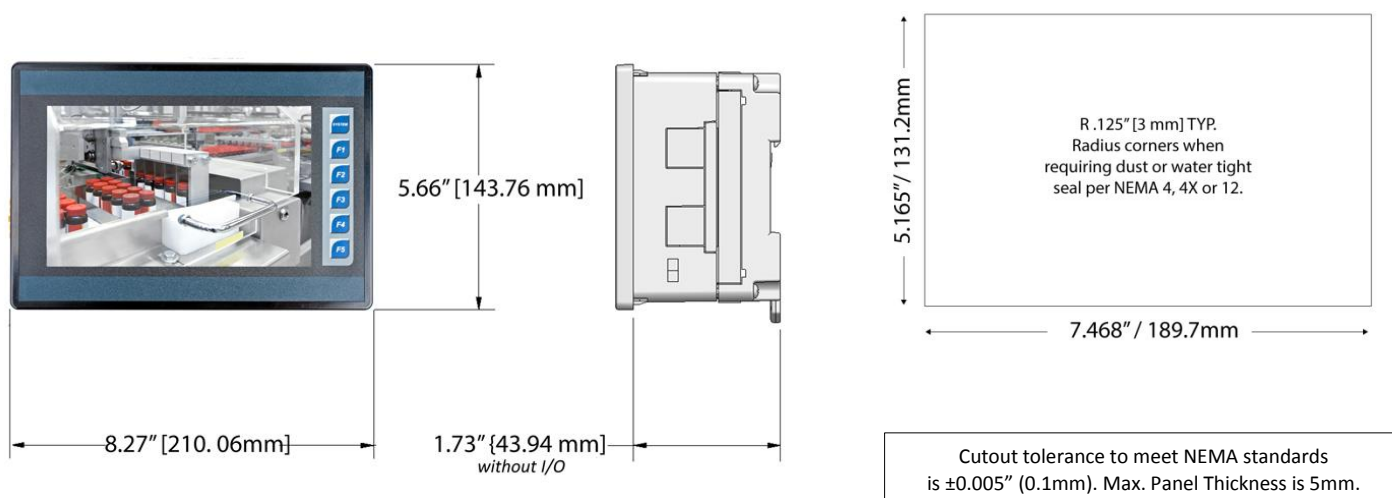# XL7 OCS Datasheet for

HE-XW1E0, HE-XW1E2, HE-XW1E3, HE-XW1E4, HE-XW1E5
HEXT391C100, HEXT391C112, HEXT391C113, HEXT391C114, HEXT391C115

1. Specifications

General Specifications			Control & Logic Specifications		
	Standard Model	**-22 (Heater) Add-On**	Control Language Support		Advanced Ladder Logic Full IEC 1131-3 Languages Tag-based Editor
Required Power (Steady state)	170mA @ 24VDC	Up to 740mA @ 24VDC (heater duty cycle)			
Required Power (Inrush)	7A for <1 ms @ 24 VDC		Logic Program Size & Logic Scan Rate		1MB, maximum 0.013mS/K
Primary Power Range	10–30VDC	10-24VDC	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	-40°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	2lb. (*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	7" TFT Transmissive Color		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	800x480		USB mini-B		USB 2.0 (480MHz) Programming & Data Access
Color	16-bit (65,535)		USB A		USB 2.0 (480MHz) for USB FLASH Drives (2TB)
Screen Memory	27 MB		CAN		2x Remote I/O, Peer-to-Peer Comms, Cscape
User-Programmable Screens	1023		Ethernet		2x 10/100 Mb (Auto-MDX), Modbus TCP C/S, HTTP, FTP, SMTP, Cscape, Ethernet IP
Backlight	LED – 50,000 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									High-Speed Counters	
Model	**DC In**	**DC Out**	**Relays**	**HS In**	**HS Out**	**mA/V In**	**mA/V RTD/Tc**	**mA/V Out**	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
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.									Pulse Measurement	Frequency Measurement
									2 Position Controlled Outputs 1 ON/OFF Setpoint per Output	

2. Dimensions & Panel Cutout

5.66" [143.76 mm]

8.27" [210. 06mm]

1.73" {43.94 mm}
without I/O

R .125" [3 mm] TYP.
Radius corners when requiring dust or water tight seal per NEMA 4, 4X or 12.

5.165" / 131.2mm

7.468" / 189.7mm

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

3. Additional Controller Options

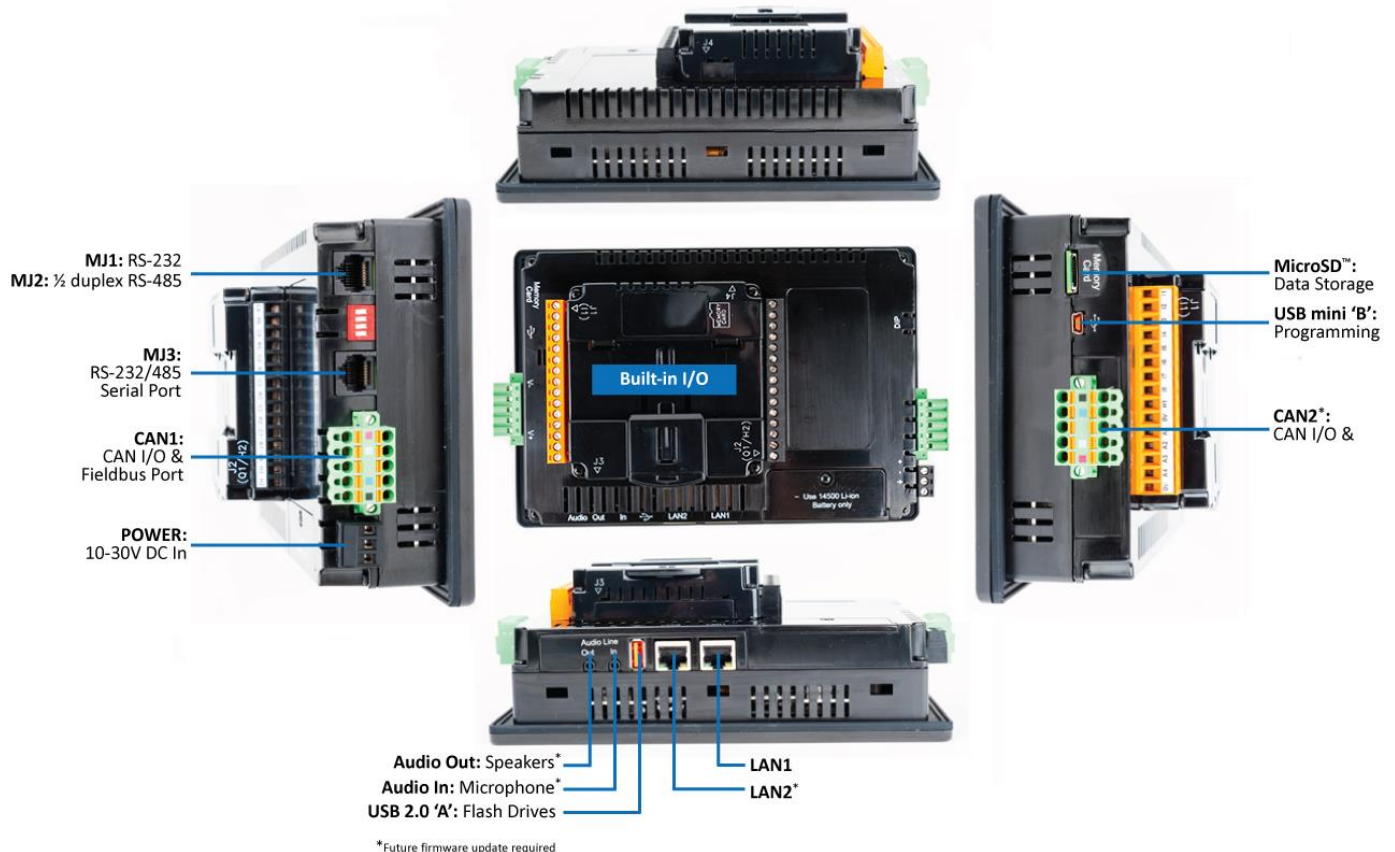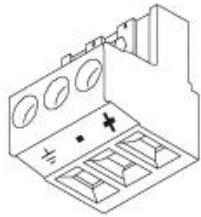| Part Number	Description
-10 (part number suffix)	Add -10 to the part number for Thermistor Support for analog inputs 1 and 2 (AI1 & AI2) Example: HE-XW1E3-10
-22 (part number suffix)	Display Heater for lower temperatures (rated at -40°C) Example: HE-XW1E3-22

Note: When using the -22 Heater Option in XL7 (in extreme low temps), the controller must reach 0°C for 8 hours once every six months. This allows time for the internal battery to charge, as it will not charge under 0°C. If the internal battery dies, volatile data could be lost.

4. Installation Procedures

1. Carefully locate an appropriate place to mount the XL7. 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

2. Carefully cut the host panel per the diagram on Page 1, creating a 189.7mm x 131.2mm ±0.1mm opening into which the XL7 may be installed. If the opening is too large, water may leak into the enclosure, potentially damaging the XL7. If the opening is too small, the OCS may not fit through the hole without damage.

3. Remove all Removable Terminals from the XL7. Insert the XL7 through the panel cutout (from the front). The gasket needs to be between the host panel and the XL7.

4. Install and tighten the four 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 XL7 I/O Removable Terminal Blocks. Connect communications cables to the serial port, USB ports, Ethernet port, and CAN port as required.

6. Ports & Connectors

MJ1: RS-232
MJ2: ½ duplex RS-485

MJ3: RS-232/485 Serial Port

CAN1: CAN I/O & Fieldbus Port

POWER: 10-30V DC In

Built-in I/O

MicroSD™: Data Storage

USB mini 'B': Programming

CAN2*: CAN I/O &

Audio Out: Speakers*
Audio In: Microphone*
USB 2.0 'A': Flash Drives

LAN1
LAN2*

*Future firmware update required

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	—
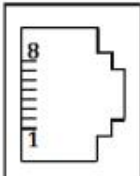
MJ1/2 Independent Serial Ports

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
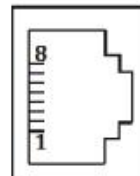
MJ3 Serial Port

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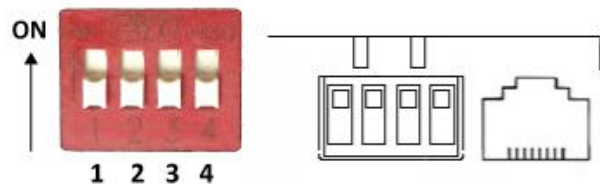
SWITCH	NAME	FUNCTION	DEFAULT
1	MJ3 RS485 Termination	ON = Terminated	OFF
2	MJ3 Duplex	ON = Half OFF = Full	OFF
3			
4	MJ2 RS485 Termination	ON = Terminated	OFF

7. Safety

|	
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. **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. 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.

8. 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.)*
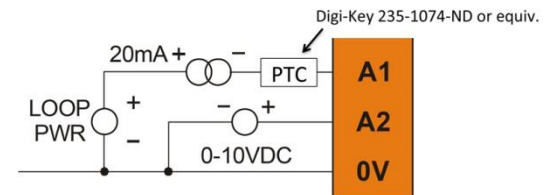
9. Fail-Safe Functionality

All XL7 models have a built in fail-safe feature that can back up program and register data to flash memory from battery-backed RAM. This way, the controller will retain data in the event of battery power loss or file corruption. The Backup / Restore functions are available from the system menu, and are described in more detail in the full product manual (**MAN0974**).

To use the fail-safe feature, the user needs to do the following:

1. Backup the current Battery-Backed RAM Register contents in On-Board Flash memory using System Menu options.
2. From Cscape, 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.

It is especially recommended to use this functionality in conjunction with the -22 heater option in extreme cold temperatures.

10. Technical Support

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

North America
Toll Free: 1-877-665-5666
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

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

All XL7 models (except the HE-XW1E0) 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 XL7 OCS User's Manual (MAN0974-01).

Fixed Address	Digital/Analog I/O Function	XL7 Model			
		2	3	4	5
%I1	Digital Inputs	1-12	1-12	1-24	1-12
	Reserved	13-32	13-31	25-31	13-31
	ESCP Alarm	n/a	32	32	32
%Q1	Digital Outputs	1-6	1-12	1-16	1-12
	Reserved	7-24	13-24	17-24	13-24
%AI1	Analog Inputs	1-4	1-2	1-2	1-2
	Reserved	5-12	3-12	3-12	3-12
%AQ1	Reserved		1-8	1-8	1-8
	Analog Outputs	n/a	n/a	n/a	9-10
Reserved areas maintain backward compatibility with other XL Series OCS models					

| Default Address*	High-Speed Counter Function	XL7 Models 2-5
%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		

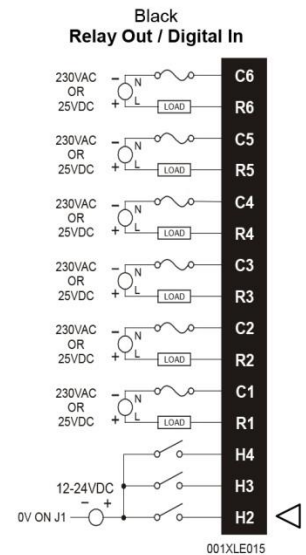| Default Address*	High-Speed Output Function	XL7 Models 2-5
%I1617	Status Bits	1-8
%Q1**	Command Bits	1-2
n/a	n/a	n/a
%AQ421	PWM or Pulse-Train Parameters	1-20
*Starting Address locations for %I & %AQ may be remapped by user		
**Q1-Q2 are part of the Fixed I/O Map. In High-Speed Output mode they can be used to initiate a Stepper/PTO Move		

Model 2 – I/O

The XL7 model 2 (HE-XW1E2) features 12 DC Inputs, 6 Relay outputs, and 4 Analog Inputs. The DC Inputs are 12/24Vdc compatible, and can be jumpered for Positive Logic (sinking), or Negative Logic (sourcing). Two of the inputs (H1-H2) can be used for high-speed functions up to 500kHz. The 12-bit Analog Inputs can be jumpered for voltage (0-10V) or current (4-20mA) on a channel by channel basis. The Relay outputs are isolated, supporting AC and DC voltages, with output currents of up to 3A/relay, 5A total.

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

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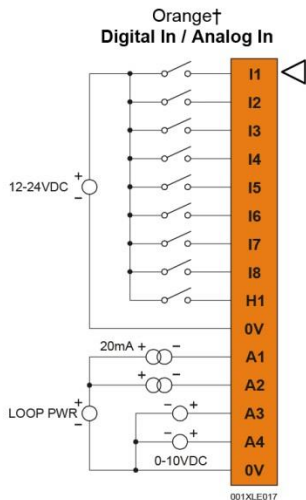
J2 (Black)	Name
C6	Relay 6 COM
R6	Relay 6 NO
C5	Relay 5 COM
R5	Relay 5 NO
C4	Relay 4 COM
R4	Relay 4 NO
C3	Relay 3 COM
R3	Relay 3 NO
C2	Relay 2 COM
R2	Relay 2 NO
C1	Relay 1 COM
R1	Relay 1 NO
H4	HSC4 / IN12
H3	HSC3 / IN11
H2	HSC2 / IN10

Black
Relay Out / Digital In

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

Model 2 Jumper Setting Details

JP1 Digital DC In / HSC
Positive Logic — Default
Negative Logic — 001XLE026

JP2 Analog In (A1 – A4)
Current (20 mA) — Default (A1 A2 A3 A4)
Voltage (10 V) — 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

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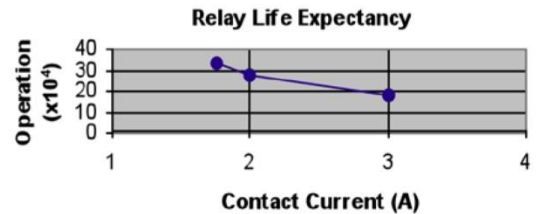
"**WARNING**: EXPOSURE TO SOME CHEMICALS MAY DEGRADE THE SEALING PROPERTIES OF MATERIALS USED IN THE Tyco relay PCJ

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

Model 3 & 4 – I/O

The XL7 model 3 (HE-XW1E3) features 12 DC Inputs, 12 DC outputs, and 2 Analog Inputs. The XL7 model 4 (HE-XW1E4) increases the I/O count up to 24 DC Inputs, and 16 DC Outputs and 2 Analog Inputs. The DC Inputs are 12/24Vdc compatible, and can be jumpered for Positive Logic (sinking), or Negative Logic (sourcing). Two of the inputs (H1-H2) can be used for high-speed functions up to 500 kHz. The 12-bit Analog Inputs can be jumpered for voltage (0-10V) or current (4-20mA) on a channel by channel basis. The 12/24VDC Outputs feature Electronic Short Circuit protection, and support currents up to 0.5A per point, and 4A total. Two of the DC Outputs can be used for high speed functions (PWM or PTO). The output frequency is limited by the switching capability of the output drivers (about 10kHz), although an optional accessory (HE-XHSQ) can be added to provide parallel output drivers supporting frequencies up to 200kHz.

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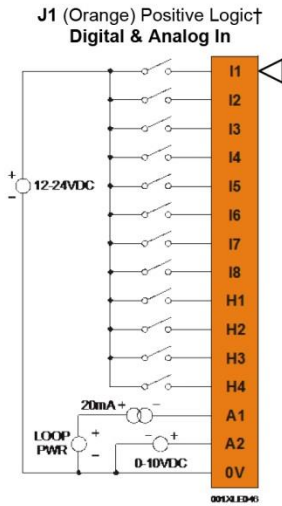
J3 (Orange)	Model 4 only Signal Name
I13	IN13
I14	IN14
I15	IN15
I16	IN16
I17	IN17
I18	IN18
I19	IN19
I20	IN20
I21	IN21
I22	IN22
I23	IN23
I24	IN24
0V	Common

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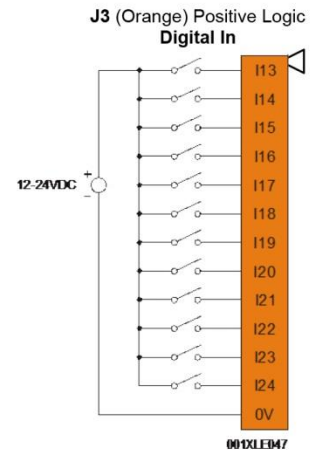
J2 (Black)	Model 3 Name	Model 4 Name
0V	Common	
V+	V+ *	
NC	No Connect	OUT13
Q12	OUT12	
Q11	OUT11	
Q10	OUT10	
Q9	OUT9	
Q8	OUT8	
Q7	OUT7	
Q6	OUT6	
Q5	OUT5	
Q4	OUT4	
Q3	OUT3	
Q2	OUT2 / PWM2	
Q1	OUT1 / PWM1	
*V+ Supply for Sourcing Outputs		
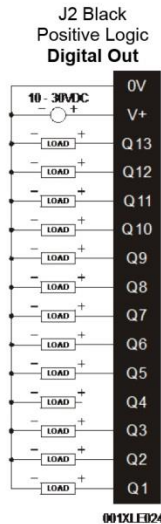
Jumper Setting Details

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

JP1 Digital DC Inputs

Positive Logic   Negative Logic
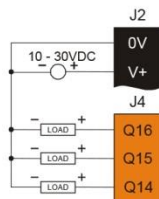
Default

JP3 Analog Inputs

20mA   10VDC

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.

Model 5 – I/O

The XL7 model 5 (HE-XW1E5) features 12 DC Inputs, 12 DC outputs, with high performance, highly configurable Analog Inputs (2) and Analog Outputs (2). , The DC Inputs are 12/24Vdc compatible, and can be jumpered for Positive Logic (sinking), or Negative Logic (sourcing). Two of the inputs (H1-H2) can be used for high-speed functions up to 500kHz. The 12/24VDC Outputs feature Electronic Short Circuit protection, and support currents up to 0.5A per point, and 4A total. Two of the DC Outputs can be used for high speed functions (PWM or PTO). The output frequency is limited by the switching capability of the output drivers (about 10kHz), although an optional accessory (HE-XHSQ) can be added to provide parallel output drivers supporting frequencies up to 200kHz.

The two high resolution Analog Inputs can be configured for 4-20mA, 0-10V, or 0-100mV at 14-bit resolution. They also can be configured for 16-bit temperature measurement – supporting Thermocouples or RTDs with 0.05°C resolution. The Analog Outputs are sourcing, and can be configured for 4-20mA or 0-10V at 14-bit resolution. Each Analog Input or Output channel can be configured independently for maximum flexibility.

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

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

001XLE007

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.

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

001XLE030