



# XL+ OCS DATASHEET

## MODEL 6

12 DC In, 12 DC Out, 6 - 14/17-bit Analog In (mA/V/Tc/mV/RTD), 4 - 12-bit Analog Out

### 1 TECHNICAL SPECIFICATIONS

#### 1.1 General

Typical Power-Backlight 100%	800mA @ 24VDC
Power Backlight 50%	385mA (9.6W)
Power Backlight Off	290mA (7W)
Inrush Current	25 A for <1 ms @ 24 VDC DC
Primary Pwr. Range	18-30VDC
Clock Accuracy	+/- 20 ppm maximum at 25° C (+/- 1 Minutes per Month)
Real Time Clock	With Battery (5-10 Yrs life, Replaceable)
Relative Humidity	5 to 95% Non-condensing
Operating Temp.	-10°C to +60°C
Storage Temp.	-30°C to +70°C
Weight	7.63 lbs/3.46kg (without I/O)
Certifications (UL/CE)	USA: <a href="https://hornerautomation.com/certifications/">https://hornerautomation.com/certifications/</a> Europe: <a href="http://www.horner-apg.com/en/support/certification.aspx">http://www.horner-apg.com/en/support/certification.aspx</a>

#### 1.2 Display

Display Type	15" XGA TFT (500 cd/m <sup>2</sup> typical)
Resolution	1024x768
Color	24-bit (16,777,216)
Built-In Storage	4 GB
User-Program. Screens	1023
Backlight	LED - 50,000 hour life
Screen Update Rate	User Configurable within the scan time. (perceived as instantaneous in many cases)
Brightness Control	0-100% via system register
Touchscreen	Resistive w/laminated cover, 1,000,000+ touch life

#### 1.3 Connectivity

3x Serial Ports	RS-232 full handshaking or RS-485 half duplex on first Modular Jack (MJ1) RS-232 or RS-485 on second Modular Jack (MJ2) RS-232 or RS-485 on third Modular Jack (MJ3) (Software Controlled RS-485 Termination/Biasing)
USB mini-B	USB 2.0 (480Mbps) Programming & Data Access
3x USB A	USB 2.0 (480Mbps) for USB FLASH Drives (2TB)
2x CAN	125kbps - 1Mbps, Remote I/O, Peer-to-Peer Comms, Cscape (Isolated Ports)
2 x Ethernet	1 Gigabit (Auto-MDX), Modbus TCP C/S, HTTP, FTP, SMTP, Cscape, Ethernet IP
Remote I/O	SmartRail, SmartStix, SmartBlock, SmartMod
Removable Memory	MicroSD (SDHC, SDXC IN FAT32 format, support for 128GB max. Application Updates, Datalogging, more
Audio	Beeper, Mic In, Line Out

#### 1.4 Control & Logic

Control Lang. Support	Advanced Ladder Logic Full IEC 1131-3 Languages
Logic Program Size & Scan Rate	1MB
Online Programming Changes	Supported in Advanced Ladder
Digital Inputs	2048
Digital Outputs	2048
Analog Inputs	512
Analog Outputs	512
Gen. Purpose Registers	49,999 (words) Retentive 16,384 (bits) Retentive 16,384 (bits) Non-retentive

#### 1.5 Inputs/Outputs

Model	DC In	DC Out	Relays	HS In	HS Out	mA/V In	mA/V RTD/T	mA/V Out
Model 0	-	-	-	-	-	-	-	-
Model 2	12	-	6	4	-	4	-	-
Model 3	12	12	-	4	2	2	-	-
Model 4	24	16	-	4	2	2	-	-
Model 5	12	12	-	4	2	-	2	2
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

High-Speed Counters		Modes Supported	
Number of Counters	4	Totalizer	Quadrature
Maximum Frequency	500 kHz each	Pulse Measurement	Frequency Measurement
Accumulator Size	32-bits each	2 Position Controlled Outputs	10N/OFF Setpoint per Output

## technical specifications continued...

### 1.6 Digital DC Inputs

Inputs per Module	12
Commons per Module	1
Input Voltage Range	0-24 VDC
Absolute Max. Voltage	35 VDC Max.
Input Impedance	10 kΩ
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
Galvanic Isolation	None
Logic Polarity	Positive and Negative Based on Common Pin Level
I/O Indication	None
High Speed Counter Inputs*	4 (IN 9-12)
High Speed Counter Max Freq*	500 kHz
Connector Type	3.5mm Pluggable Cage Clamp Connector

### 1.7 Digital DC Outputs

Outputs per Module	12
Commons per Module	1
Output Type	Half-Bridge
Absolute Max. Voltage	30 VDC Max.
Output Protection	Short Circuit & Overvoltage
Max. Output Current per Point	0.5 A
Max. Total Current per Driver (Q1-4, Q5-8, Q9-12)	2 A Total Current (All Drivers) UL-Rated, 6 A UL Pending
Max. Output Supply Voltage	30 VDC
Min. Output Supply Voltage	10 VDC
Max. Voltage Drop at Rated Current	0.25 VDC
Min. Load	None
I/O Indication	None
Galvanic Isolation	None
OFF to ON Response	150 nS
ON to OFF Response	150 nS
PWM Out	65 kHz
Output Characteristics	Current Sourcing (Pos. Logic)

\*See I/O info below for detail regarding HSC and PWM

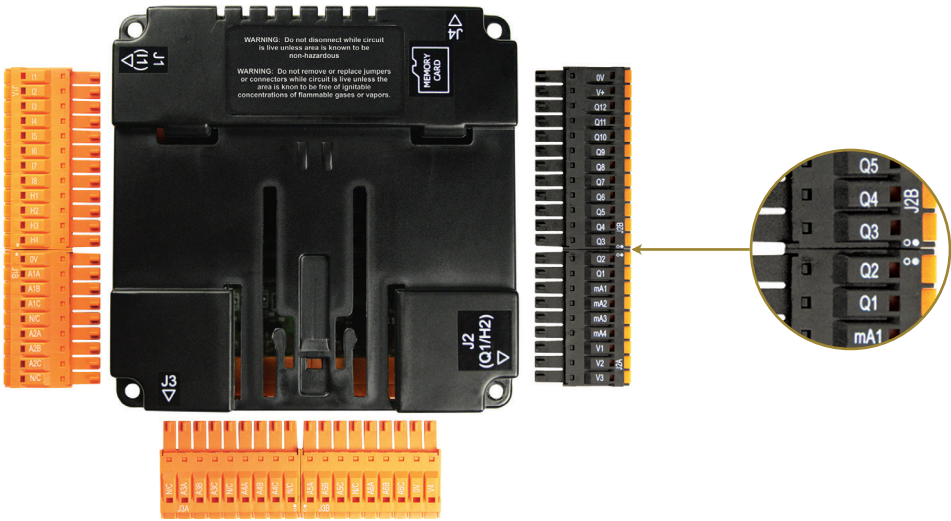
### 1.8 Analog Inputs

Number of Channels	6	Absolute Max. Input Voltage	-0.5 to -12 VDC (+/- 30 VDC)
Input Ranges (Selectable)	0-20 mA; 4-20 mA DC; 0-60 mV; 0-10 VDC; T/C: J, K, N, T, E, R, S, B RTD: PT100, PT1000	Input Impedance (Clamped @ -0.5 to 10.23 VDC)	T/C / RTD / mV > 2 MΩ mA: 15 Ω + 1.5 V V: 1.1 MΩ
Nominal Resolution	16 Bits	Galvanic Isolation	None
		Conversion Speed	Min. All Channels Converted ~150 mS
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
	0-20 mA	0-20 mA	+/- 0.15% FS
0-60 mV	0-60 mV	+/- 0.15% FS	
0-10 V	0-10 V	+/- 0.15% FS	

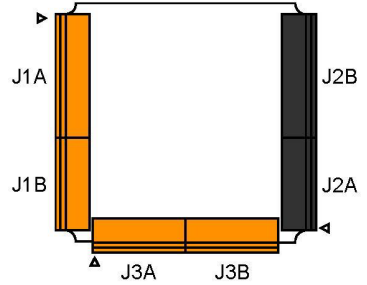
### 1.9 Analog Outputs

Number of Channels	4	Response Time	One Update per Ladder Scan
Output Ranges	0-10 VDC 0-20 mA, 4-20 mA DC	Maximum Current Load	500 Ω
Nominal Resolution	12 Bits	Galvanic Isolation	None
Max. Error at 25°C (Excluding Zero)	0-20 mA 0.1% of FS 0-10 V 0.1% of FS	Conversion Speed	Min. All Channels Once per Scan
		Addtnl. Error for Temp. Other Than 25°C (mA Mode)	20 mA 0.0126%/°C

technical specifications continued...

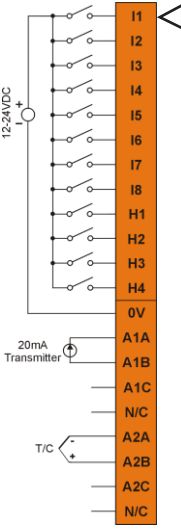


For ease of operability, the high density terminals are divided into more manageable pairs of connectors (J1A + J1B, J2A + J2B, J3A + J3B). To ensure proper installation, connector symbols must match as seen below left:



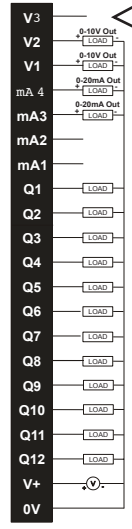
### 1.10 J1 (Orange/Green) Name

J1A	I2	IN1
J1A	I2	IN2
J1A	I3	IN3
J1A	I4	IN4
J1A	I5	IN5
J1A	I6	IN6
J1A	I7	IN7
J1A	I8	IN8
J1A	H1	HSC1 / V IN9
J1A	H2	HSC2 / V IN10
J1A	H3	HSC3 / V IN11
J1A	H4	HSC4 / V IN12
J1B	OV	Common
J1B	A1A	Univ. AI 1 Pin 1
J1B	A1B	Univ. AI 1 Pin 2
J1B	A1C	Univ. AI 1 Pin 3
J1B	NC	No Connect
J1B	A2A	Univ. AI 2 Pin 1
J1B	A2B	Univ. AI 2 Pin 2
J1B	A2C	Univ. AI 2 Pin 3
J1B	NC	No Connect



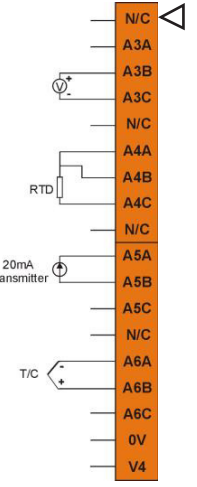
### 1.11 J2 (Black/Green) Name

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



### 1.12 J3 (Orange/Green) Name

J3A	NC	No Connection
J3A	A3A	Univ. AI 3 Pin 1
J3A	A3B	Univ. AI 3 Pin 2
J3A	A3C	Univ. AI 3 Pin 3
J3B	NC	No Connection
J3B	A4A	Univ. AI 4 Pin 1
J3B	A4B	Univ. AI 4 Pin 2
J3B	A4C	Univ. AI 4 Pin 3
J3B	NC	No Connection
J3B	A5A	Univ. AI 5 Pin 1
J3B	A5B	Univ. AI 5 Pin 2
J3B	A5C	Univ. AI 5 Pin 3
J3B	NC	No Connection
J3B	A6A	Univ. AI 6 Pin 1
J3B	A6B	Univ. AI 6 Pin 2
J3B	A6C	Univ. AI 6 Pin 3
J3B	OV	Common
J3B	V4	V OUT 4*

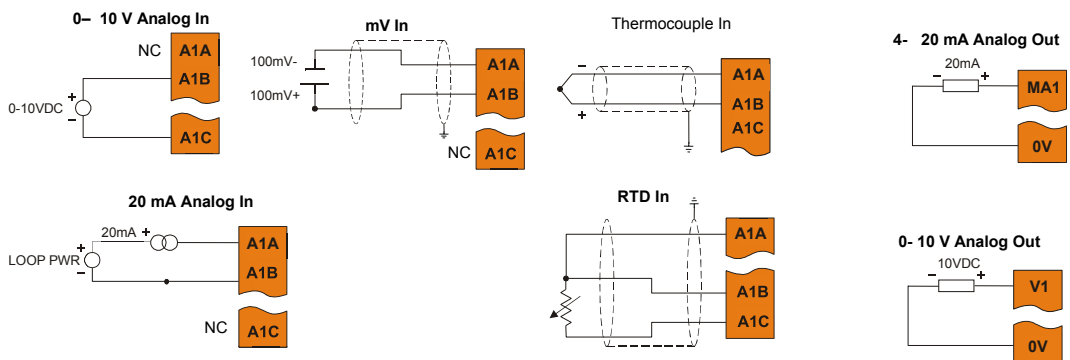


NOTE: \* Both mA & V outputs are active for each output channel, however, only the configured output type is calibrated (maximum 4 channels simultaneously).

### 1.13 Example Universal Input Wiring Schematic

NOTE:  
Loop Power equipments are determined by the transmitter specification. Power supply should be isolated.

**Wiring Details:**  
SPRING CLAMP TERMINALS  
Solid/Stranded wire - 16-24 awg (15-0.2mm<sup>2</sup>).  
Strip length - 0.31" (8mm).  
SCREW TERMINALS  
Solid/Stranded wire; 14-28 awg (21-0.08mm<sup>2</sup>).  
Strip length - 0.24"-0.28 (6-7mm).  
Torque rating: 2 lb-in (0.2 N-m).



**technical specifications continued...**

**2 WIRING & JUMPERS**

**1.14 Configuration**

The data registers are as follows:

Digital Inputs	%I1-12
Digital Outputs	%Q1-12
Analog Inputs	%AI33-38
Analog Outputs	%AQ9-12

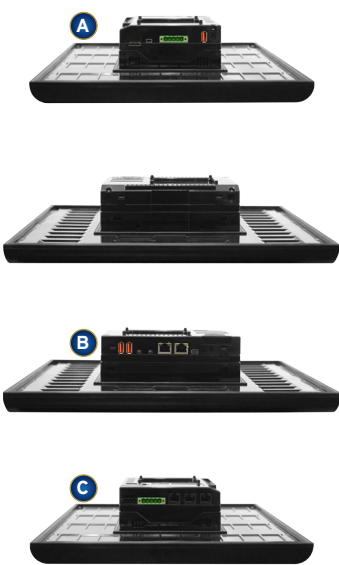
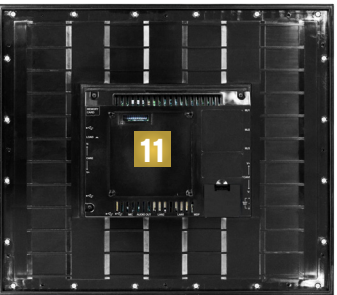
Note that the first four analogue inputs are mapped to both %AI1-4 and %AI33-36, analogue input channels 5 & 6 are mapped to %AI37 and %AI38 respectively only.

**1.15 Data Values**

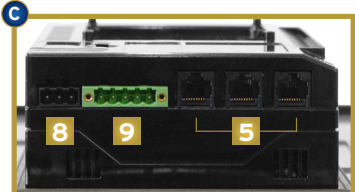
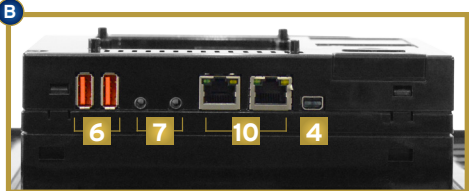
The analogue inputs return data types as follows:

INPUT MODE:	DATA FORMAT:
0-20 mA, 4-20 mA	0-32000
0-10 V, 0-60 mV	0-32000
T/C / RTD	Temperature in °C or °F to 1 decimal place (xxx.y)

**2.1 - Port Connectors**



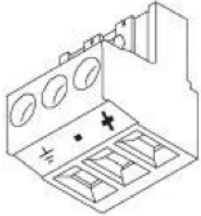
1. Virtual Function Keys Slide in from the Right Upon Touching Top Right Corner of Screen
2. USB Mini-B Port
3. High Capacity microSD Slot
4. Mini DisplayPort Video Output (Future)
5. RS232/RS485 Serial Ports (3)
6. USB A Ports (3)
7. Mic Input / Audio Output
8. Wide-Range DC Power
9. Dual CAN Port
10. Dual Ethernet LAN Port
11. Optional Built-In I/O



## wiring & jumpers continued...

## communications continued...

### 2.2 - Power Wiring



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

DC Input / Frame

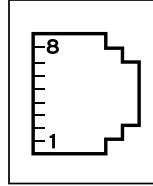
Solid/Stranded wire; 12-24 awg (2.5-0.2mm). Strip length - 0.28" (7mm).

Torque rating: 4.5 - 7 in-lbs (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.

### 3.3 - Serial Communications Continued...



MJ2/3 PINS		
PIN	SIGNAL	DIRECTION
8	TXD RS232	OUT
7	RXD RS232	IN
6	0 V	Ground
5	+5V@60mA	OUT
4	TS- RS485	OUT
3	TS+ RS485	OUT
2	RX- RS485	IN
1	RX+ RS485	IN

MJ2/3 SERIAL PORTS

**MJ2/3:** RS-232 or RS-485 half or full-duplex, software selectable

RS-485 termination and biasing, software selectable

## 3 COMMUNICATIONS

### 3.1 - CAN Communications



CAN Pin Assignments			
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	-

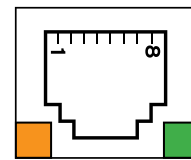
CAN

Solid/Stranded wire; 12-24 awg (2.5-0.2mm). Strip length - 0.28" (7mm).

Locking spring-clamp, two-terminators per conductor. Torque Rating: 4.5-7in-lbs (0.50 - 0.78N-m).

SHLD and V+ pins are not internally connected to XL+

### 3.4 - Ethernet Communications



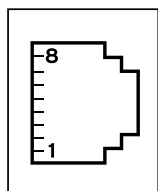
Green LED indicates link - when illuminated, data communication is available.

Orange LED indicates activity - when flashing, data is in transmission.

## 4 BUILT-IN I/O

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

All XL-Plus models (except the HE-XP7E0) 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 XL-Plus OCS User's Manual (MAN1106).



MJ1 PINS		
PIN	SIGNAL	DIRECTION
8	TXD	OUT
7	RXD	IN
6	0V	GROUND
5	+5V at 60mA	OUT
4	RTS	OUT
3	CTS	IN
2	RX-/TX-	IN/OUT
1	RX+/TX+	IN/OUT

**MJ1:** RS-232 w/full handshaking or RS-485 half-duplex via software switch

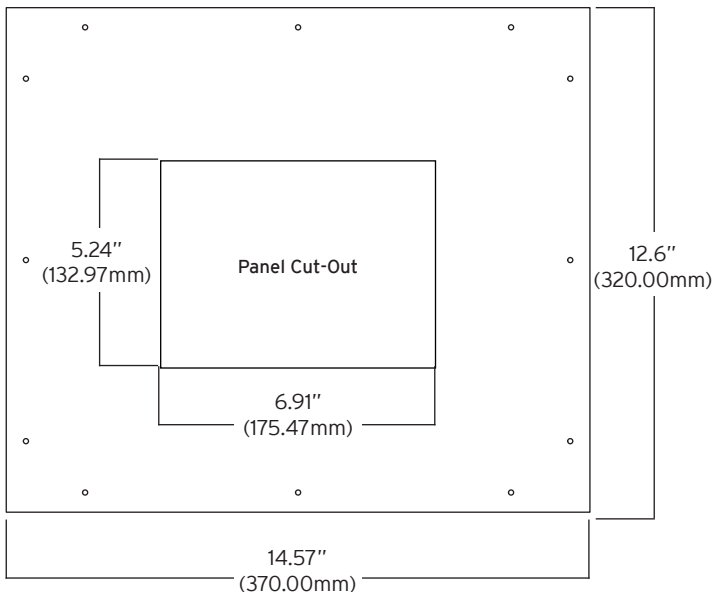
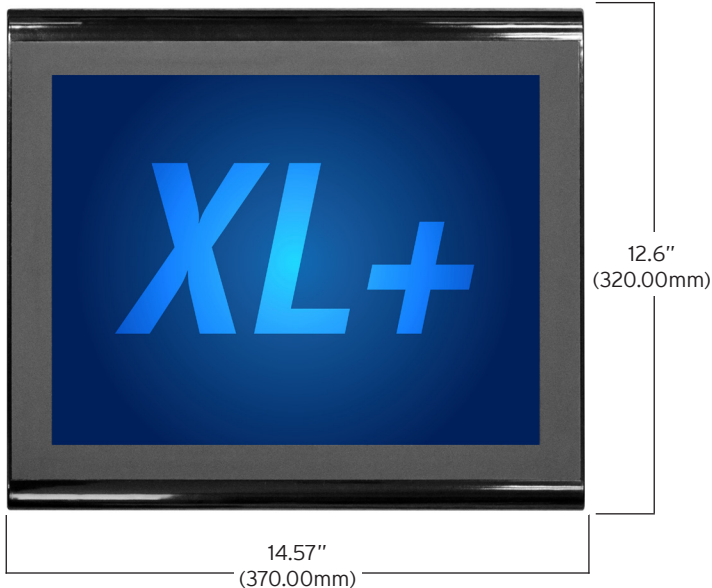
RS-485 termination and biasing via software

FIXED ADDRESS	DIGITAL/ANALOG I/O FUNCTION	MODEL 2	MODEL 3	MODEL 4	MODEL 5	MODEL 6
%I	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
%Q	Digital Outputs	1-6	1-12	1-16	1-12	1-12
	Reserved	7-24	13-24	17-24	13-24	13-24
%AI	Analog Inputs	1-4	1-2	1-2	1-2	33-38 (1-4 reserved)
	Reserved	5-12	3-12	3-12	3-12	n/a1-12
%AQ	Analog Outputs	n/a	n/a	n/a	9-10	9-12
	Reserved	n/a	1-8	1-8	1-8	1-12

Reserved areas maintain backward compatibility with other XL Series OCS models

## 5 INSTALLATION DIMENSIONS

## installation dimensions continued...



### 5.1 - Installation Procedure

The XL Plus allows unique installation options that simplify installation for systems that may not need robust vibration or water resistance.

If the system does not experience shock or vibration and will not be exposed to weather or wash down conditions the unit can be installed by cutting the rectangular opening and installing the 4 supplied clips.

For system that may experience shock or vibration or are installed outdoors or in wash down environments, the rectangular cut and clips are used and perimeter holes must be drilled in the panel. The supplied studs are then inserted into the perimeter of the controller and supplied nuts will secure the perimeter of the unit to the panel.

Please reference the XL Plus installation cutout drawing document (MAN1108) for further details.

- Carefully locate an appropriate place to mount the XL-Plus. 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
- Carefully cut the host panel per the diagram above, creating a 288.5mm x 216 +/- 0.1mm opening into which the XL-Plus 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.
- 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.
- Install and tighten the screws on the clips such that the gasket is compressed against the panel. Recommended torque is 7-10 in-lbs (0.79-1.13 Nm). If the perimeter studs are needed, it is recommended to use a thread locker (similar to 242 Blue Loctite). Use supplied lock washers and nut. Recommended torque is 3-4 in-lbs (0.34-0.45 Nm).
- Reinstall the I/O Removable Terminal Blocks. Connect communications cables to the serial port, USB ports, Ethernet port, and CAN port as required.

## 6 BATTERY

The XL+ uses a replaceable non-rechargeable 3V Lithium coin-cell battery to run the Real-Time Clock and to keep the retained register values. This battery is designed to maintain the clock and memory for 7-10 years. Please reference MAN1106 providing instructions on how to replace the battery.

For detailed product and panel cutout dimensions, please refer to MAN1108

Torque Rating: 4.5-7in-lbs (0.50 - 0.78N-m).  
SHLD and V+ pins are not internally connected to XL+

## 7 SAFETY

### 7.1 - WARNINGS

1. To avoid the risk of electric shock or burns, always connect the safety (or earth) ground before making any other connections.
2. 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.
3. Replace fuse with the same type and rating to provide protection against risk of fire and shock hazards.
4. In the event of repeated failure, do NOT replace the fuse again as repeated failure indicates a defective condition that will NOT clear by replacing the fuse.
5. 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.

### 7.2 - FCC COMPLIANCE

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference
2. This device must accept any interference received, including interference that may cause undesired operation

### 7.3 - PRECAUTIONS

All applicable codes and standards need to be followed in the installation of this product. Adhere to the following safety precautions whenever any type of connection is made to the module:

1. Connect the safety (earth) ground on the power connector first before making any other connections.
2. When connecting to the electric circuits or pulse-initiating equipment, open their related breakers.
3. Do NOT make connection to live power lines.
4. Make connections to the module first; then connect to the circuit to be monitored.
5. Route power wires in a safe manner in accordance with good practice and local codes.
6. Wear proper personal protective equipment including safety glasses and insulated gloves when making connections to power circuits.
7. Ensure hands, shoes, and floor are dry before making any connection to a power line.
8. Make sure the unit is turned OFF before making connection to terminals.
9. Make sure all circuits are de-energized before making connections.
10. Before each use, inspect all cables for breaks or cracks in the insulation. Replace immediately if defective.
11. Use copper conductors in Field Wiring only, 60/75° C.

## 8 TECHNICAL SUPPORT

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

#### North America

(317) 916-4274  
www.hornerautomation.com  
techspt@heapg.com

#### Europe

(+) 353-21-4321-266  
www.horner-apg.com  
technical.support@horner-apg.com

## 9 PART NUMBER BUILDER

### EXAMPLE PART NUMBERS

I/O  
HEXT751C

**100** (model 0)  
**112** (model 2)  
**113** (model 3)  
**114** (model 4)  
**115** (model 5)  
**116** (model 6)