

# User's Guide

*Shop online at*



*omega.com*

*e-mail: info@omega.com*

*For latest product manuals:*

*omegamanual.info*



## HE-XL102

12 Digital DC Inputs, 4 Analog  
Inputs (Medium Resolution),  
6 Digital Relay Outputs



**OMEGAnet® Online Service**  
**omega.com**

**Internet e-mail**  
**info@omega.com**

### Servicing North America:

**U.S.A.:**  
ISO 9001 Certified

Omega Engineering, Inc., One Omega Drive, P.O. Box 4047  
Stamford, CT 06907-0047 USA  
Toll Free: 1-800-826-6342                      TEL: (203) 359-1660  
FAX: (203) 359-7700                                e-mail: info@omega.com

**Canada:**

976 Bergar  
Laval (Quebec), Canada H7L 5A1  
Toll-Free: 1-800-826-6342                      TEL: (514) 856-6928  
FAX: (514) 856-6886                                e-mail: info@omega.ca

### For immediate technical or application assistance:

**U.S.A. and Canada:** Sales Service: 1-800-826-6342/1-800-TC-OMEGA®  
Customer Service: 1-800-622-2378/1-800-622-BEST®  
Engineering Service: 1-800-872-9436/1-800-USA-WHEN®

**Mexico:**

En Español: 001 (203) 359-7803                      FAX: (001) 203-359-7807  
info@omega.com.mx                                e-mail: espanol@omega.com

### Servicing Europe:

**Benelux:**

Managed by the United Kingdom Office  
Toll-Free: 0800 099 3344                      TEL: +31 20 347 21 21  
FAX: +31 20 643 46 43                                e-mail: sales@omega.nl

**Czech Republic:**

Frystatska 184  
733 01 Karviná, Czech Republic  
Toll-Free: 0800-1-66342                      TEL: +420-59-6311899  
FAX: +420-59-6311114                                e-mail: info@omegashop.cz

**France:**

Managed by the United Kingdom Office  
Toll-Free: 0800 466 342                      TEL: +33 (0) 161 37 29 00  
FAX: +33 (0) 130 57 54 27                                e-mail: sales@omega.fr

**Germany/Austria:**

Daimlerstrasse 26  
D-75392 Deckenpfronn, Germany  
Toll-Free: 0 800 6397678                      TEL: +49 (0) 7059 9398-0  
FAX: +49 (0) 7056 9398-29                                e-mail: info@omega.de

**United Kingdom:**  
ISO 9001 Certified

OMEGA Engineering Ltd.  
One Omega Drive, River Bend Technology Centre, Northbank  
Irlam, Manchester M44 5BD England  
Toll-Free: 0800-488-488                      TEL: +44 (0)161 777-6611  
FAX: +44 (0)161 777-6622                                e-mail: sales@omega.co.uk

---

It is the policy of OMEGA Engineering, Inc. to comply with all worldwide safety and EMC/EMI regulations that apply. OMEGA is constantly pursuing certification of its products to the European New Approach Directives. OMEGA will add the CE mark to every appropriate device upon certification.

The information contained in this document is believed to be correct, but OMEGA accepts no liability for any errors it contains, and reserves the right to alter specifications without notice.

**WARNING:** These products are not designed for use in, and should not be used for, human applications.

1 Specifications

Specifications		
<b>Digital DC Inputs</b>		
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 kΩ	
Input Current	<u>Positive Logic</u>	<u>Negative Logic</u>
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	
<b>Digital Relay Outputs</b>		
Outputs per Module	6 relay	
Commons per Module	6	
Max. Output Current per Relay	3 A at 250 VAC, resistive	
Max. Total Output Current	5 A continuous	
Max. Output Voltage	275 VAC , 30 VDC	
Max. Switched Power	1250 VA, 150 W	
Contact Isolation to XL6 ground	1000 VAC	
Max. Voltage Drop at Rated Current	0.5 V	
Expected Life (See Derating section for chart.)	No load: 5,000,000 Rated load: 100,000	
Max. Switching Rate	300 CPM at no load 20 CPM at rated load	
Type	Mechanical Contact	
Response Time	One update per ladder scan plus 10 ms	
<b>Analog Inputs, Medium Resolution</b>		
Number of Channels	4	
Input Ranges	0 - 10 VDC 0 - 20 mA 4 - 20 mA	
Safe input voltage range	-0.5 V to +12V	
Input Impedance (Clamped @ -0.5 VDC to 12 VDC)	<u>Current Mode:</u> 100 Ω	<u>Voltage Mode:</u> 500 k Ω
Nominal Resolution	10 Bits	
%AI full scale	32,000 counts	
Max. Over-Current	35 mA	
Conversion Speed	All channels converted once per ladder scan	
Max. Error at 25°C (excluding zero) *can be made tighter (~0.25%) by adjusting the digital filter setting to 3.	4-20 mA	1.00%
	0-20 mA	1.00%
	0-10 VDC	1.50%*
Additional error for temperatures other than 25°C	TBD	
Filtering	160 Hz hash (noise) filter 1-128 scan digital running average filter	

General Specifications	
Required Power (Steady State)	500 mA @ 24 VDC
Required Power (Inrush)	30 A for 1 ms @ 24 VDC – DC Switched 2.5 A for 4 ms @ 24 VDC - AC Switched
Primary Power Range	10 - 30 VDC
Relative Humidity	5 to 95% Non-condensing
Clock Accuracy	+/- 35 ppm maximum at 25° C (+/- 1.53 Minutes per Month)
Operating Temperature	-10°C to +60°C
Terminal Type	Screw Type, 5 mm Removable
Weight	26.5 oz. (.751 kg)
CE UL	If you require a Compliance Table: 1-888-556-6342



HE-XL102

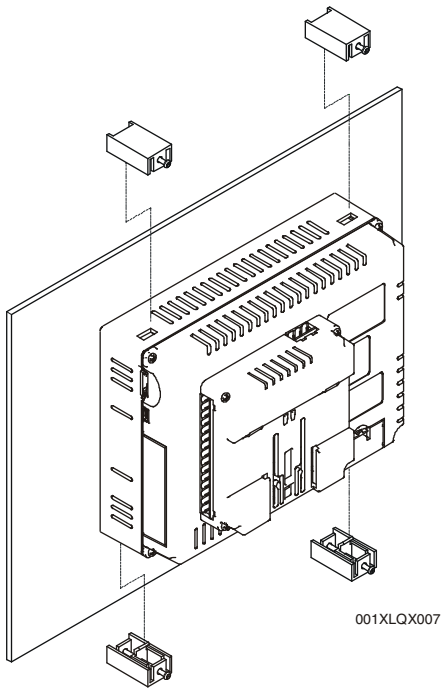
Note: Highest usable frequency for PWM output is 65 KHz

**2 Installation**

1. Prior to mounting, observe requirements for the panel layout design and spacing/clearances in the OCS XL6 Series Manual (MAN0883).
2. Cut the host panel.
3. Insert the OCS through the panel cutout (from the front). The gasket material needs to be between the host panel and the OCS.

**Caution: Do not force the OCS into the panel cutout. An incorrectly sized panel cutout can damage the touch screen.**

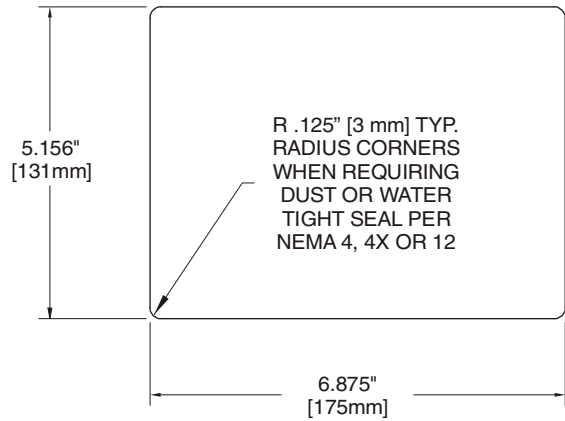
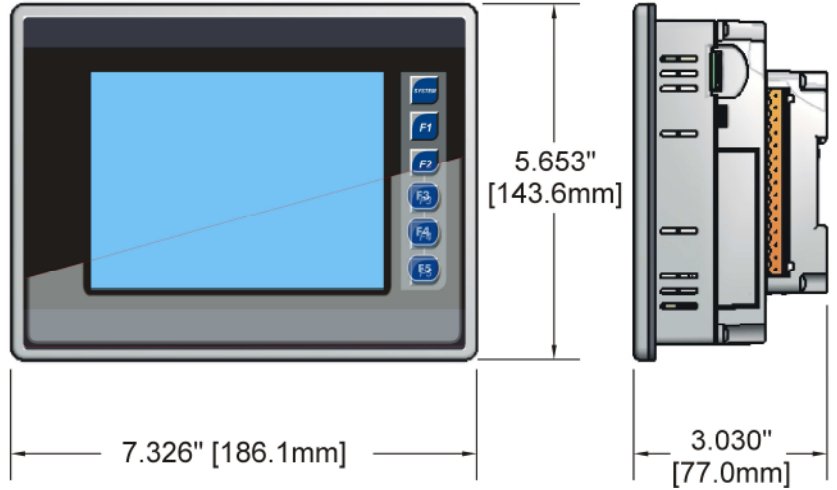
4. Install and tighten the mounting clips (provided with the OCS) until the gasket material forms a tight seal.
5. Connect cables as needed such as communications, programming, power and CsCAN cables to the ports using the provided connectors.
6. Begin configuration procedures.



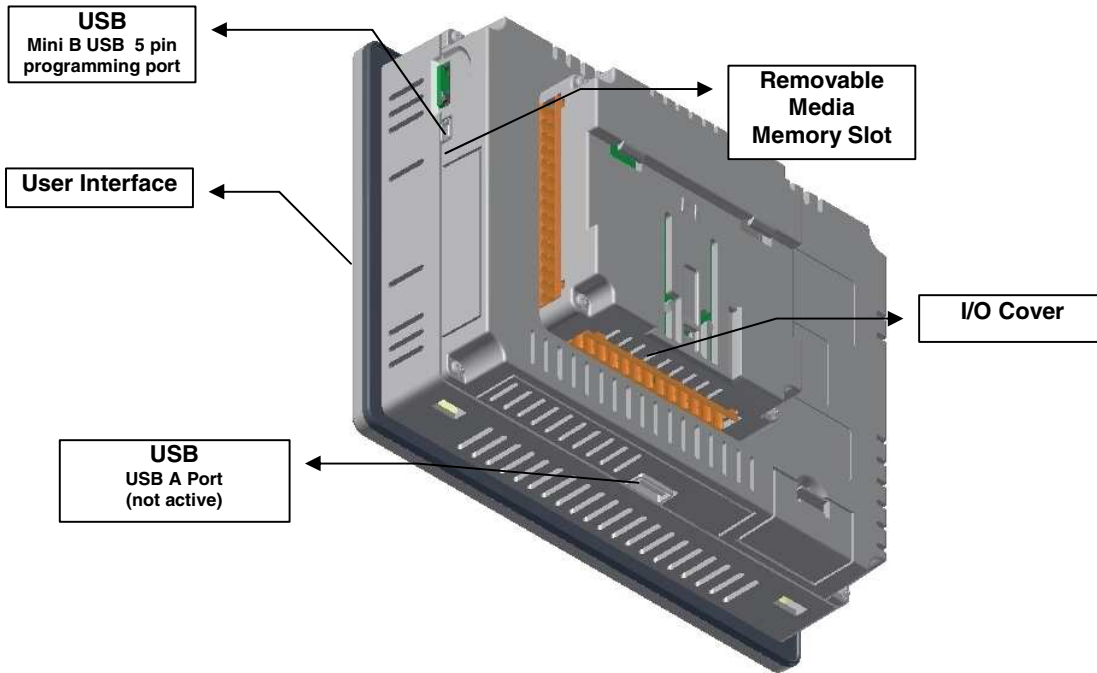
**3 Panel Cut-Out and Dimensions**

**Note:** The tolerance to meet NEMA standards is  $\pm 0.005"$  (0.1 mm).

Note: Max. panel thickness: 5 mm



001OCS003-R1



**To Remove I/O Cover:**  
 Unscrew 4 screws located on the cover.  
 Remove cover.

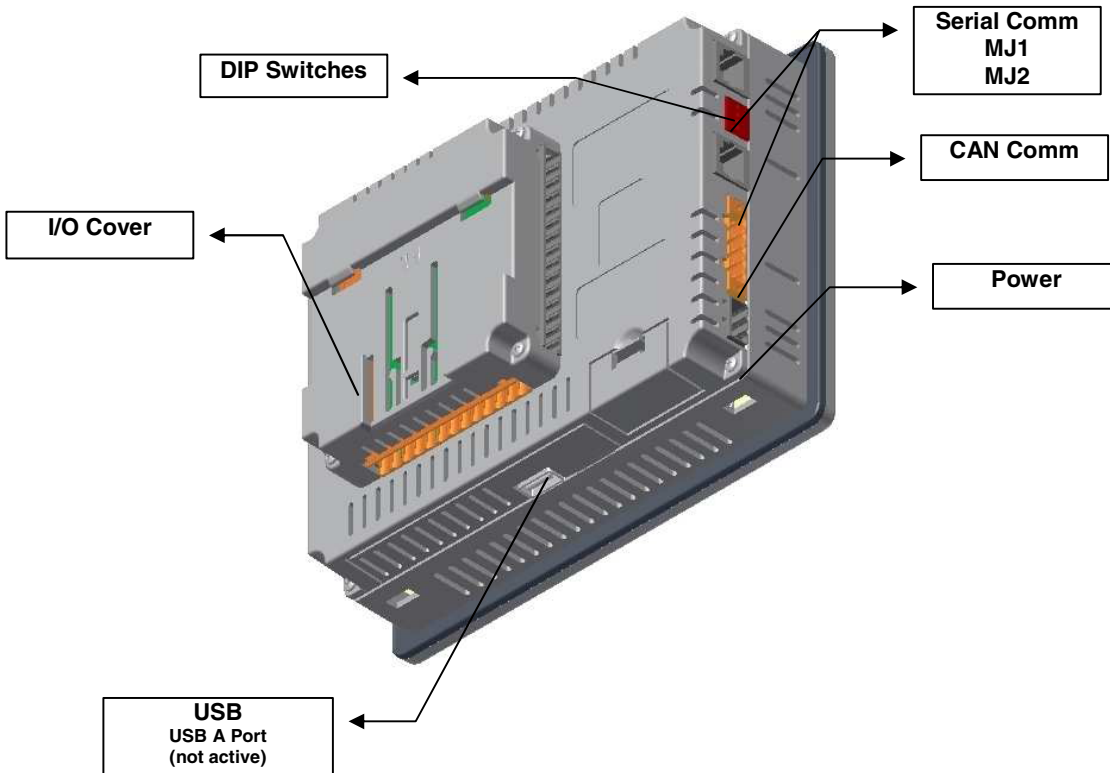
**CAUTION:** Do not over tighten screws when replacing the back cover.

**I/O Jumpers:**  
 I/O Jumpers (JP) are located internally. To access, remove I/O cover of unit.

**Wiring Connectors (J1 / J2) and I/O Jumpers (JP1 and JP2)** are described in the *Wiring and Jumpers* section of this document.

**Memory Slot:**  
 Uses **Removable Memory** for data logging, screen captures, program loading and recipes.  
**Horner Part No.: HE-MC1**

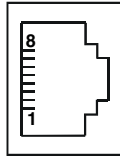
**Serial Communications:**  
**MJ1:** (RS-232 / RS-485) Use for Cscape programming and Application-Defined Communications.  
**MJ2:** (RS-232 / RS-485) Use for Application-Defined Communications.



#### 4.1 Serial Communications:

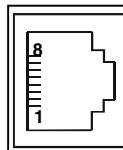
**MJ1:** (RS-232 / RS-485) Use for Cscape programming and Application-Defined Communications.

**MJ2:** (RS-232 / RS-485) Use for Application-Defined Communications.



Pin	MJ1 Pins		MJ2 Pins	
	Signal	Direction	Signal	Direction
8	TXD	OUT	TXD	OUT
7	RXD	IN	RXD	IN
6	0 V	Ground	0 V	Ground
5*	+5 60mA	OUT	+5 60mA	OUT
4	RTS	OUT	TX-	OUT
3	CTS	IN	TX+	OUT
2	RX- / TX-	IN / OUT	RX-	IN
1	RX+ / TX+	IN / OUT	RX+	IN

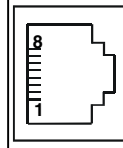
#### MJ2 Pinouts in Half and Full Duplex Modes



Pin	MJ2 Pins	
	Signal	Direction
8	TXD	OUT
7	RXD	IN
6	0 V	Ground
5*	+5 60mA	OUT
4	TX-	OUT
3	TX+	OUT
2	TX-/RX-	IN/OUT
1	TX+/RX+	IN/OUT

\* +5V 60mA Max

MJ2 Half Duplex Mode



Pin	MJ2 Pins	
	Signal	Direction
8	TXD	OUT
7	RXD	IN
6	0 V	Ground
5*	+5 60mA	OUT
4	TX-	OUT
3	TX+	OUT
2	RX-	IN
1	RX+	IN

\* +5V 60mA Max

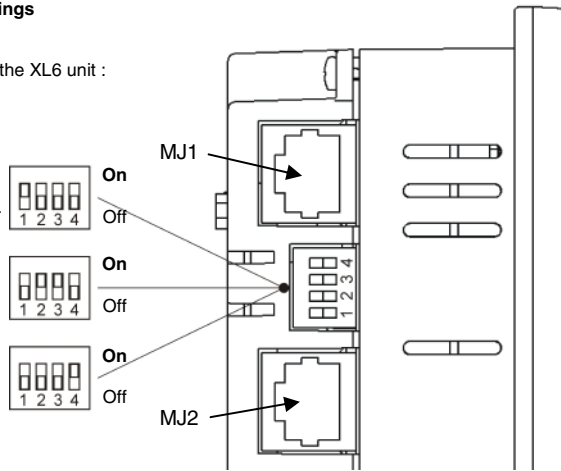
MJ2 Full Duplex Mode

#### 4.2 External DIP Switch Settings

As seen when looking at the side of the XL6 unit :

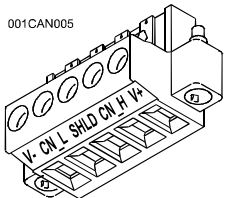
The DIP Switches are used for termination of the RS-485 ports. The XL6 is shipped un-terminated.

To terminate, select one of the DIP Switches and configure it based upon the option that is desired.



- SW1 - ON enables **MJ2** RS485 port termination (121 Ohms). OFF disables **MJ2** RS485 port termination.
- SW2 & SW3 - ON places **MJ2** RS485 port in half-duplex mode. OFF places **MJ2** RS485 port in full-duplex mode.
- SW4 - ON enables **MJ1** RS485 port termination (121 Ohms). OFF disables **MJ1** RS485 port termination.

#### 4.3 CAN Network Port and Wiring



##### CAN Connector

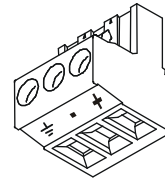
Use the CAN Connector when using Cscape network.

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

##### NET1 Port Pin Assignments

Pin	Signal	Signal Description	Direction
1	V-	CAN Ground	-
2	CN_L	CAN Data Low	In/Out
3	SHLD	Shield Ground	-
4	CN_H	CAN Data High	In/Out
5	NC	No Connect	-

#### 4.4 Power Port and Wiring



##### Power Connector

##### Power Up:

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

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

##### Primary Power Port Pins

Pin	Signal	Description
1	Ground	Frame Ground
2	V-	Input Power Supply Ground
3	V+	Input Power Supply Voltage

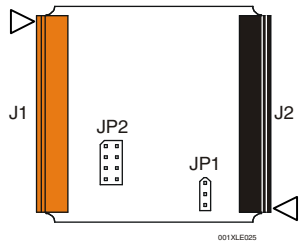
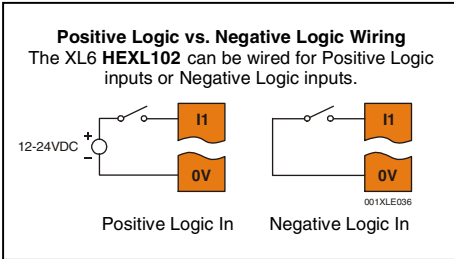
5 Wiring and Jumpers

Wire according to the type of inputs / outputs used, and select the appropriate jumper option.

**Wiring Specifications**

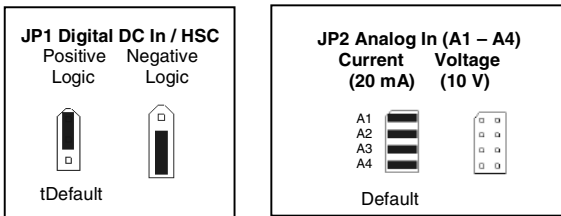
- For I/O wiring (discrete), use the following wire type or equivalent: Belden 9918, 18 AWG (0.8 mm<sup>2</sup>) or larger.
- For shielded Analog I/O wiring, use the following wire type or equivalent: Belden 8441, 18 AWG (0.8 mm<sup>2</sup>) or larger.
- For CAN wiring, use the following wire type or equivalent: Belden 3084, 24 AWG (0.2 mm<sup>2</sup>) or larger.

Use copper conductors in field wiring only, 60/75° C



Location of I/O jumpers (JP2 and JP1) and wiring connectors (J1 and J2).

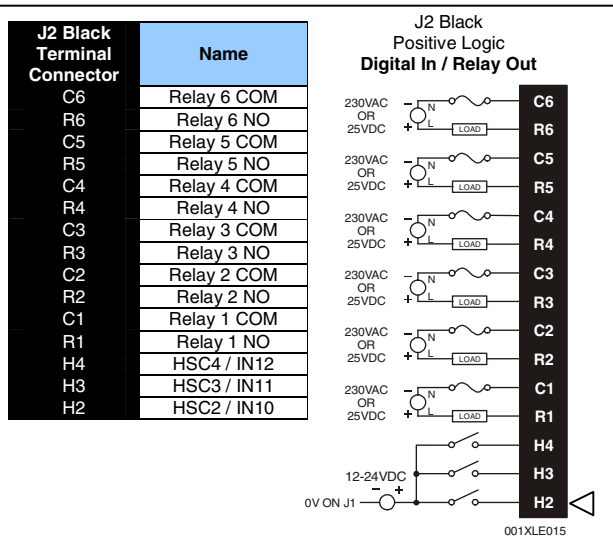
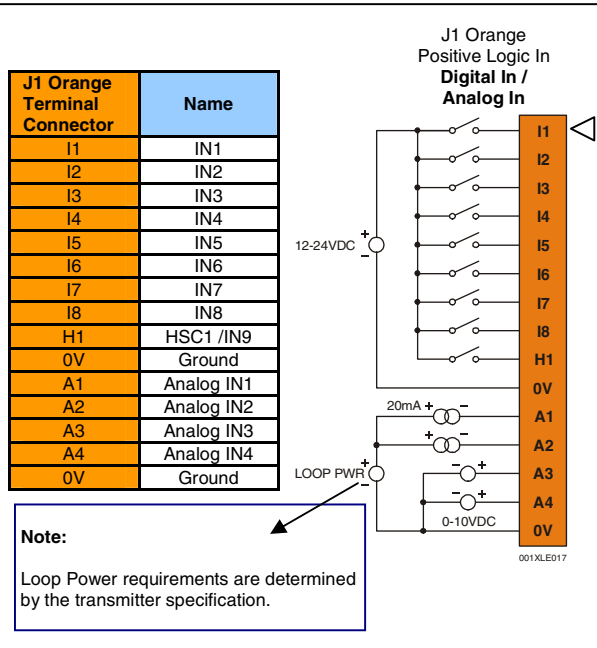
5.1 I/O Jumpers Settings (JP1 - JP2)



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

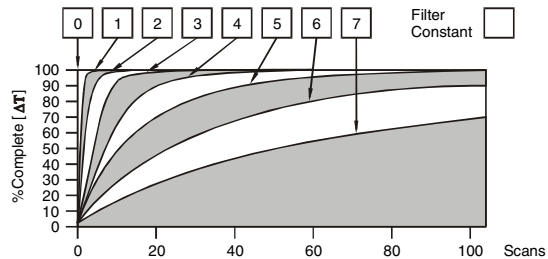
**Note:**  
When using JP2 (A1-A4), each channel can be independently configured.

5.2 Wiring Examples



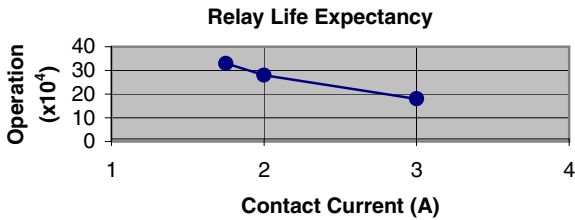
6 Filter

Filter Constant sets the level of digital filtering according to the following chart.



**Digital Filtering.** The illustration above demonstrates the effect of digital filtering (set with Filter Constant) on module response to a temperature change.

7 Derating



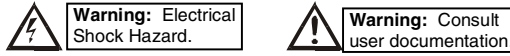
8 I/O Register Map

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	Analog 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 XL6 units contain the I/O listed in this table.

9 Safety

When found on the product, the following symbols specify:



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 DECONNECTER 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 EMBLEMES DE CLASSE 1, DIVISION 2

**WARNING** - The USB parts are for operational maintenance only. Do not leave permanently connected unless area is known to be non-hazardous.

**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.

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.

**Radiated Emission Compliance:** For compliance requirement, a ferrite (Horner P/N FBD006 supplied with the unit) needs to be placed on the AC/DC line with one loop.

**"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*

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





## WARRANTY/DISCLAIMER

OMEGA ENGINEERING, INC. warrants this unit to be free of defects in materials and workmanship for a period of **13 months** from date of purchase. OMEGA's WARRANTY adds an additional one (1) month grace period to the normal **one (1) year product warranty** to cover handling and shipping time. This ensures that OMEGA's customers receive maximum coverage on each product.

If the unit malfunctions, it must be returned to the factory for evaluation. OMEGA's Customer Service Department will issue an Authorized Return (AR) number immediately upon phone or written request. Upon examination by OMEGA, if the unit is found to be defective, it will be repaired or replaced at no charge. OMEGA's WARRANTY does not apply to defects resulting from any action of the purchaser, including but not limited to mishandling, improper interfacing, operation outside of design limits, improper repair, or unauthorized modification. This WARRANTY is VOID if the unit shows evidence of having been tampered with or shows evidence of having been damaged as a result of excessive corrosion; or current, heat, moisture or vibration; improper specification; misapplication; misuse or other operating conditions outside of OMEGA's control. Components in which wear is not warranted, include but are not limited to contact points, fuses, and triacs.

**OMEGA is pleased to offer suggestions on the use of its various products. However, OMEGA neither assumes responsibility for any omissions or errors nor assumes liability for any damages that result from the use of its products in accordance with information provided by OMEGA, either verbal or written. OMEGA warrants only that the parts manufactured by it will be as specified and free of defects. OMEGA MAKES NO OTHER WARRANTIES OR REPRESENTATIONS OF ANY KIND WHATSOEVER, EXPRESS OR IMPLIED, EXCEPT THAT OF TITLE, AND ALL IMPLIED WARRANTIES INCLUDING ANY WARRANTY OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY DISCLAIMED. LIMITATION OF LIABILITY: The remedies of purchaser set forth herein are exclusive, and the total liability of OMEGA with respect to this order, whether based on contract, warranty, negligence, indemnification, strict liability or otherwise, shall not exceed the purchase price of the component upon which liability is based. In no event shall OMEGA be liable for consequential, incidental or special damages.**

CONDITIONS: Equipment sold by OMEGA is not intended to be used, nor shall it be used: (1) as a "Basic Component" under 10 CFR 21 (NRC), used in or with any nuclear installation or activity; or (2) in medical applications or used on humans. Should any Product(s) be used in or with any nuclear installation or activity, medical application, used on humans, or misused in any way, OMEGA assumes no responsibility as set forth in our basic WARRANTY/DISCLAIMER language, and, additionally, purchaser will indemnify OMEGA and hold OMEGA harmless from any liability or damage whatsoever arising out of the use of the Product(s) in such a manner.

## RETURN REQUESTS/INQUIRIES

Direct all warranty and repair requests/inquiries to the OMEGA Customer Service Department. BEFORE RETURNING ANY PRODUCT(S) TO OMEGA, PURCHASER MUST OBTAIN AN AUTHORIZED RETURN (AR) NUMBER FROM OMEGA'S CUSTOMER SERVICE DEPARTMENT (IN ORDER TO AVOID PROCESSING DELAYS). The assigned AR number should then be marked on the outside of the return package and on any correspondence.

The purchaser is responsible for shipping charges, freight, insurance and proper packaging to prevent breakage in transit.

FOR **WARRANTY** RETURNS, please have the following information available BEFORE contacting OMEGA:

1. Purchase Order number under which the product was PURCHASED,
2. Model and serial number of the product under warranty, and
3. Repair instructions and/or specific problems relative to the product.

FOR **NON-WARRANTY** REPAIRS, consult OMEGA for current repair charges. Have the following information available BEFORE contacting OMEGA:

1. Purchase Order number to cover the COST of the repair,
2. Model and serial number of the product, and
3. Repair instructions and/or specific problems relative to the product.

OMEGA's policy is to make running changes, not model changes, whenever an improvement is possible. This affords our customers the latest in technology and engineering.

OMEGA is a registered trademark of OMEGA ENGINEERING, INC.

© Copyright 2009 OMEGA ENGINEERING, INC. All rights reserved. This document may not be copied, photocopied, reproduced, translated, or reduced to any electronic medium or machine-readable form, in whole or in part, without the prior written consent of OMEGA ENGINEERING, INC.

# Where Do I Find Everything I Need for Process Measurement and Control? OMEGA...Of Course! *Shop online at [omega.com](http://omega.com)*

## TEMPERATURE

- Thermocouple, RTD & Thermistor Probes, Connectors, Panels & Assemblies
- Wire: Thermocouple, RTD & Thermistor
- Calibrators & Ice Point References
- Recorders, Controllers & Process Monitors
- Infrared Pyrometers

## PRESSURE, STRAIN AND FORCE

- Transducers & Strain Gages
- Load Cells & Pressure Gages
- Displacement Transducers
- Instrumentation & Accessories

## FLOW/LEVEL

- Rotameters, Gas Mass Flowmeters & Flow Computers
- Air Velocity Indicators
- Turbine/Paddlewheel Systems
- Totalizers & Batch Controllers

## pH/CONDUCTIVITY

- pH Electrodes, Testers & Accessories
- Benchtop/Laboratory Meters
- Controllers, Calibrators, Simulators & Pumps
- Industrial pH & Conductivity Equipment

## DATA ACQUISITION

- Data Acquisition & Engineering Software
- Communications-Based Acquisition Systems
- Plug-in Cards for Apple, IBM & Compatibles
- Datalogging Systems
- Recorders, Printers & Plotters

## HEATERS

- Heating Cable
- Cartridge & Strip Heaters
- Immersion & Band Heaters
- Flexible Heaters
- Laboratory Heaters

## ENVIRONMENTAL MONITORING AND CONTROL

- Metering & Control Instrumentation
- Refractometers
- Pumps & Tubing
- Air, Soil & Water Monitors
- Industrial Water & Wastewater Treatment
- pH, Conductivity & Dissolved Oxygen Instruments