HE-XT102
12 Digital DC Inputs, 4 Analog Inputs (Medium Resolution), 6 Digital Relay Outputs
OMEGA Engineering, Inc. is a leading provider of temperature, process, and fluid control instrumentation, solutions, and services. With a commitment to quality and innovation, OMEGA offers a wide range of products for industrial applications. They are ISO 9001 certified and comply with all worldwide safety and EMC/EMI regulations. OMEGA Engineering is continually pursuing certification of its products to the European New Approach Directives, adding the CE mark to every appropriate device upon certification. The information in this document is believed to be correct, but OMEGA Engineering 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.
Specifications

Digital DC Inputs

- **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**
  - **Positive Logic**: 0.8 mA - 1.6 mA
  - **Negative Logic**: 0.3 mA - 2.1 mA
- **Upper Threshold**: 8 VDC
- **Lower Threshold**: 3 VDC
- **HSC Max. Switching Rate**
  - Totalizer/Pulse, Edges: 10 kHz
  - Frequency/Pulse, Width: 5 kHz
  - Quadrature: 2.5 kHz

Digital Relay Outputs

- **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 XLe ground**: 1000 VAC
- **Max. Voltage Drop at Rated Current**: 0.5 V
- **Expected Life** (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

Analog Inputs, Medium Resolution

- **Number of Channels**: 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)
  - Current Mode: 100 Ω
  - Voltage Mode: 500 kΩ
- **Nominal Resolution**: 10 bits
- **% 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)**
  - 4-20 mA: 1.000%
  - 0-20 mA: 1.000%
  - 0-10 VDC: 1.500%
- **Additional error for temperatures other than 25°C**: TBD
- **Filtering**: 180 Hz hash (noise) filter, 1-128 scan digital running average filter

General Specifications

- **Required Power (Steady State)**: 130 mA @ 24 VDC
- **Required Power (Inrush)**: 30 A for 1 ms @ 24 VDC
- **Primary Power Range**: 10 – 30 VDC
- **Relative Humidity**: 5 to 95% Non-condensing
- **Clock Accuracy**: ± 7 Minutes/Month at 20°C

Notes: Highest usable frequency for PWM output is 65 KHz

General Specifications continued

- **Operating Temperature**: -10°C to +60°C
- **Terminal Type**: Screw Type, 5 mm Removable
- **Weight**: 12 oz. (340.19 g)

UL

If you require a Compliance Table: 1-888-556-6342

Panel Cut-Out and Dimensions

- **Note**: Max. panel thickness: 5 mm.

Ports / Connectors / Cables

- **Note**: The case of the XLI is black, but for clarity, it is shown in a lighter gray color.

To Remove Back Cover:

Unscrew 4 screws located on the back of the unit. Remove cover.

CAUTION: Do not overtighten screws when replacing the back cover.

I/O Jumpers: (Not Shown):

I/O Jumpers (JP1 / JP2), and External Jumpers (RS-485) 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.

To use the CAN Connector when using CsCAN network:

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

**To Remove Back Cover:**

Unscrew 4 screws located on the back of the unit. Remove cover.

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

I/O Jumpers: (Not Shown):

I/O Jumpers (JP1 / JP2), and External Jumpers (RS-485) 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.
Wiring and Jumpers

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

### Wiring Examples

<table>
<thead>
<tr>
<th>J1 Orange Terminal Connector</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>I1</td>
<td>IN1</td>
</tr>
<tr>
<td>I2</td>
<td>IN2</td>
</tr>
<tr>
<td>I3</td>
<td>IN3</td>
</tr>
<tr>
<td>I4</td>
<td>IN4</td>
</tr>
<tr>
<td>I5</td>
<td>IN5</td>
</tr>
<tr>
<td>I6</td>
<td>IN6</td>
</tr>
<tr>
<td>I7</td>
<td>IN7</td>
</tr>
<tr>
<td>I8</td>
<td>IN8</td>
</tr>
<tr>
<td>H1</td>
<td>HSC1 / IN9</td>
</tr>
<tr>
<td>0V</td>
<td>Ground</td>
</tr>
<tr>
<td>A1</td>
<td>Analog IN1</td>
</tr>
<tr>
<td>A2</td>
<td>Analog IN2</td>
</tr>
<tr>
<td>A3</td>
<td>Analog IN3</td>
</tr>
<tr>
<td>A4</td>
<td>Analog IN4</td>
</tr>
<tr>
<td>0V</td>
<td>Ground</td>
</tr>
</tbody>
</table>

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

### 4.2 Wiring Examples (continued)

#### J2 Black Terminal Connector

<table>
<thead>
<tr>
<th>Name</th>
<th>Digital In / HSC Analog In / Relay Out</th>
</tr>
</thead>
<tbody>
<tr>
<td>C6</td>
<td>Relay 6 COM</td>
</tr>
<tr>
<td>R6</td>
<td>Relay 6 NO</td>
</tr>
<tr>
<td>C5</td>
<td>Relay 5 COM</td>
</tr>
<tr>
<td>R5</td>
<td>Relay 5 NO</td>
</tr>
<tr>
<td>C4</td>
<td>Relay 4 COM</td>
</tr>
<tr>
<td>R4</td>
<td>Relay 4 NO</td>
</tr>
<tr>
<td>C3</td>
<td>Relay 3 COM</td>
</tr>
<tr>
<td>R3</td>
<td>Relay 3 NO</td>
</tr>
<tr>
<td>C2</td>
<td>Relay 2 COM</td>
</tr>
<tr>
<td>R2</td>
<td>Relay 2 NO</td>
</tr>
<tr>
<td>C1</td>
<td>Relay 1 COM</td>
</tr>
<tr>
<td>R1</td>
<td>Relay 1 NO</td>
</tr>
<tr>
<td>H4</td>
<td>HSC4 / IN12</td>
</tr>
<tr>
<td>H3</td>
<td>HSC3 / IN11</td>
</tr>
<tr>
<td>H2</td>
<td>HSC2 / IN10</td>
</tr>
</tbody>
</table>

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

### 4.3 I/O Jumpers Settings (JP1 - JP2)

#### Note:

- Location of I/O jumpers (JP) and wiring connectors (J1 and J2).

#### 4.4 External DIP Switch Settings

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

To terminate, select one of the jumpers shipped with the product and insert it based upon the option that is desired or, select the switch and configure based upon the option that is desired.
5  MJ2 Pinouts in Full and Half Duplex Modes

<table>
<thead>
<tr>
<th>Pin</th>
<th>MJ2 Pins</th>
<th>Signal</th>
<th>Direction</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>TXD</td>
<td>OUT</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>RXD</td>
<td>IN</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>0 V</td>
<td>Ground</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>+5 60mA</td>
<td>OUT</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>TX-</td>
<td>OUT</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>TX+</td>
<td>OUT</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>RX-</td>
<td>IN</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>RX+</td>
<td>IN</td>
<td></td>
</tr>
</tbody>
</table>

* +5Vdc 60mA Max

MJ2 Full Duplex Mode

---

6  Filter

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

![Digital Filtering Chart](image)

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

---

7  Derating

Relay Life Expectancy

![Relay Life Expectancy Chart](image)

---

8  I/O Register Map

<table>
<thead>
<tr>
<th>Registers</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>%I1 to %I24</td>
<td>Digital Inputs</td>
</tr>
<tr>
<td>%I25 to %I31</td>
<td>Reserved</td>
</tr>
<tr>
<td>%Q1 to %Q16</td>
<td>Digital outputs</td>
</tr>
<tr>
<td>%Q17</td>
<td>Clear HSC1 accumulator to 0</td>
</tr>
<tr>
<td>%Q18</td>
<td>Clear HSC3 accumulator to 0</td>
</tr>
<tr>
<td>%Q19</td>
<td>Totalizer: Clear HSC2 Quadrature 1-2: Accumulator 1 Reset to max – 1</td>
</tr>
<tr>
<td>%Q20</td>
<td>Totalizer: Clear HSC4 Quadrature 3-4: Accumulator 3 Reset to max – 1</td>
</tr>
<tr>
<td>%Q21 to %Q32</td>
<td>Reserved</td>
</tr>
<tr>
<td>%A11 to %A16</td>
<td>Analog inputs</td>
</tr>
<tr>
<td>%A17, %A18</td>
<td>HSC1 Accumulator</td>
</tr>
<tr>
<td>%A18, %A10</td>
<td>HSC2 Accuulator</td>
</tr>
<tr>
<td>%A11, %A12</td>
<td>HSC3 Accumulator</td>
</tr>
<tr>
<td>%A21, %A22</td>
<td>PWM Duty Cycle</td>
</tr>
<tr>
<td>%A23, %A24</td>
<td>PWM Duty Cycle</td>
</tr>
<tr>
<td>%A25, %A26</td>
<td>PWM Prescale</td>
</tr>
<tr>
<td>%A27, %A28</td>
<td>PWM Period</td>
</tr>
<tr>
<td>%A29 to %A32</td>
<td>Analog outputs</td>
</tr>
</tbody>
</table>

Note: Not all XL1 units contain the I/O listed in this table.
9 Safety

When found on the product, the following symbols specify:

⚠️ Warning: Electrical Shock Hazard.
⚠️ Warning: Consult user documentation.

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 – 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 EMPLEACEMENTS DE CLASSE 1, DIVISION 2

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: 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.

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 floor 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

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.

*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.
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, 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?
OMET...Of Course!

Shop online at 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
- Data Logging 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