24VDC Bipolar Digital In
3AMP Relay Digital Out
Thermistor/5V/20ma In
10VDC/20mA Analog Out
HE800MIX905 / HE-MIX905*
* HE- denotes plastic case.

This datasheet also covers products starting with IC300.

1   SPECIFICATIONS

ANALOG INPUT	MIX905			MIX905
Number of Channels	4		Input Points Required	4
Input Ranges (including over-range) Thermistor Current Voltage	-37 to 115°C (-35°F to 240°F) Nominal: 0-20.47 mA 0-5.11 VDC		Input Impedance Thermistor Current Voltage	10K Ohms = 25°C 250 Ohms 1 Megohm < 12VDC, Clamped @ 12VDC, 35mA Max. Continuous
Resolution	12-Bits		Converter Type	Successive Approximation
Conversion Time (PLC Update Rate)	4 Channels per PLC Scan		Additional error for temperatures other than 25°C	0.01% / °C (except Thermistors)
Maximum Error at 25°C Thermistor Current Voltage	±1.8°F (±1°C) ±0.1% ±0.1%		Maximum Over-Current	35mA
DIGITAL INPUT	**MIX905**			**MIX905**
Inputs per Module	8		Input Characteristics	Bidirectional
Commons per Module	1		Input Impedance	10K Ohms
Input Voltage Range	12-24VDC		Minimum ON Current	1mA
Peak Voltage	35VDC Max.		Maximum OFF Current	200µA
Isolation (Channel to Ground)	500VDC		OFF to ON Response	1ms + 1 scan
ON Voltage Level	9VDC		ON to OFF Response	1ms + 1 scan
OFF Voltage Level	3VDC			
ANALOG OUTPUT	**MIX905**			**MIX905**
Number of Channels	2		Output Points Required	2
Output Ranges	0-10.23V 0-20.47mA		Additional error for temperatures other than 25°C	0.01%/°C
Resolution	12 Bits		Maximum Error at 25°C	0.2% for 0-10 Scale 0.1% of 0 to 20mA Scale
Maximum 20mA Output Voltage	Clamped at -0.5 and +33VDC		Maximum Error (%AQ=0)	0.5%
20mA Output Compliance	4-30VDC		10V Load Impedance 20mA Load Impedance	2K Ohms Minimum 1K ohms @ 24VDC Loop Voltage

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Information is subject to change without notice.   SmartStack is a trademark of Horner APG, LLC.

Conversion Time	2 Channels per PLC Scan		10V Load Capacitance	0.01μF Maximum

DIGITAL OUTPUT	MIX905			MIX905
Outputs per Module	6 Relays		Maximum Inrush Current	5A
Commons per Module	4		Minimum Load	None
Contact Voltage	250VAC / 30VDC Max.		OFF to ON Response	8 ms + 1 scan
Maximum Load Current	3A		ON to OFF Response	4 ms + 1 scan
Contact On Voltage	0.2V		Contact Life	See derating charts
Relay Coil Power	Internal		Output Protection	Transient Voltage Suppressor across contacts
Isolation	500VAC			

General Specifications				
	MIX905			MIX905
Required Power (Steady State)	0.96W (40mA @ 24VDC)		Operating Temperature	0° to 60° Celsius
Required Power (Inrush)	Negligible		Terminal Type	Spring Clamp, Removable
Relative Humidity	5 to 95% Non-condensing		Weight	9.5 oz. (270 g)
CE	See Compliance Table at http://www.heapg.com/Support/compliance.htm			
UL				

2   WIRING

2.1   Digital (P1)

OCS Bottom View – Shows Corresponding I/O Pin

001MIX011
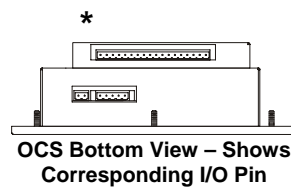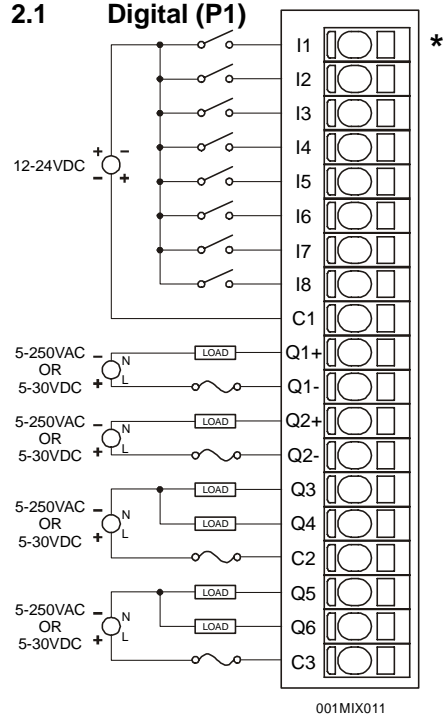
Warning: To protect the module and associated wiring from load faults, use external fuses.

Q1: 3A
Q2: 3A
C2: 6A
C3: 6A

MIX905 Signal	Pin
Input 1	I1
Input 2	I2
Input 3	I3
Input 4	I4
Input 5	I5
Input 6	I6
Input 7	I7
Input 8	I8
Input common (isolated)	C1
Output 1	Q1+
Output	Q1-
Output 2	Q2+
Output 2	Q2-
Output 3	Q3
Output 4	Q4
Output 3,4 common	C2
Output 5	Q5
Output 6	Q6
Output 5, 6 common	C3

> Warning: Connecting high voltage to any I/O pin may cause high voltage to appear at other I/O pins.

> **Warning:** Wiring the line side of the AC source to loads connected to outputs 1 through 6 and the neutral side of the AC source to the output common(s) would create a Negative Logic condition, which may be considered an unsafe practice.

2.2   Analog Wiring (P2)

001MIX012

Jumper Block

OCS Top View – Shows Corresponding I/O Pin

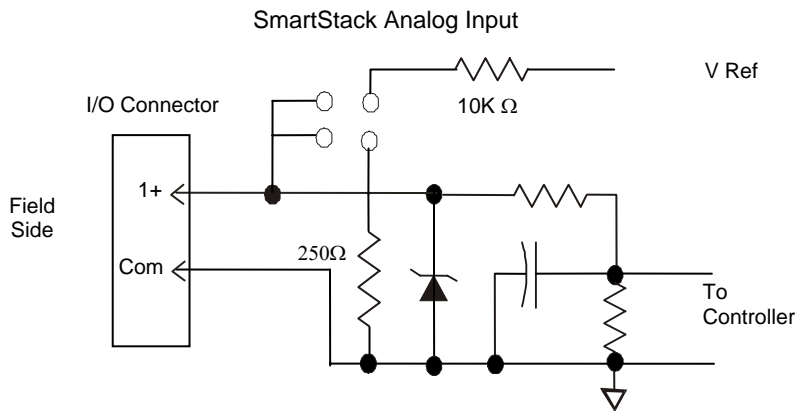| MIX905 Signal	Pin
Input 1	I1
Input 2	I2
Input 3	I3
Input 4	I4
VT Common (Voltage / Thermistor Common)	C4
Output 1	Q1
Output 2	Q2
mA Common (Milliamp Common)	C5
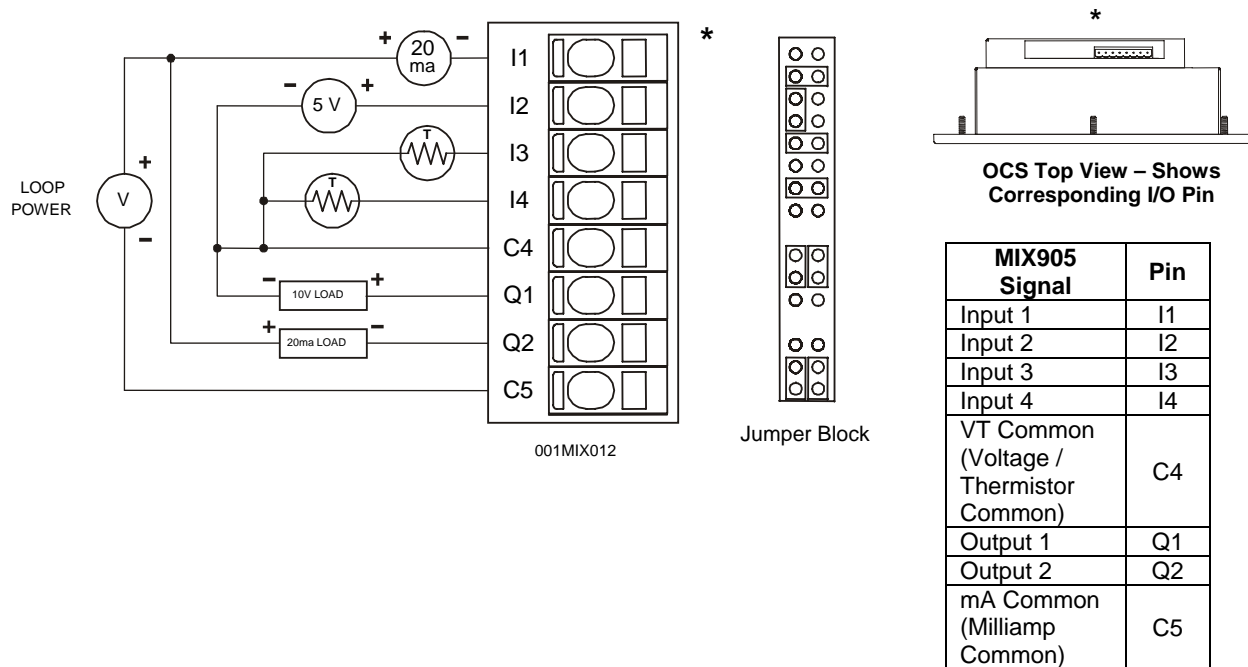
The jumper block indicates the correct jumper positions for the wiring shown above. For more information, refer to Section 4.2, *Hardware Configuration.*
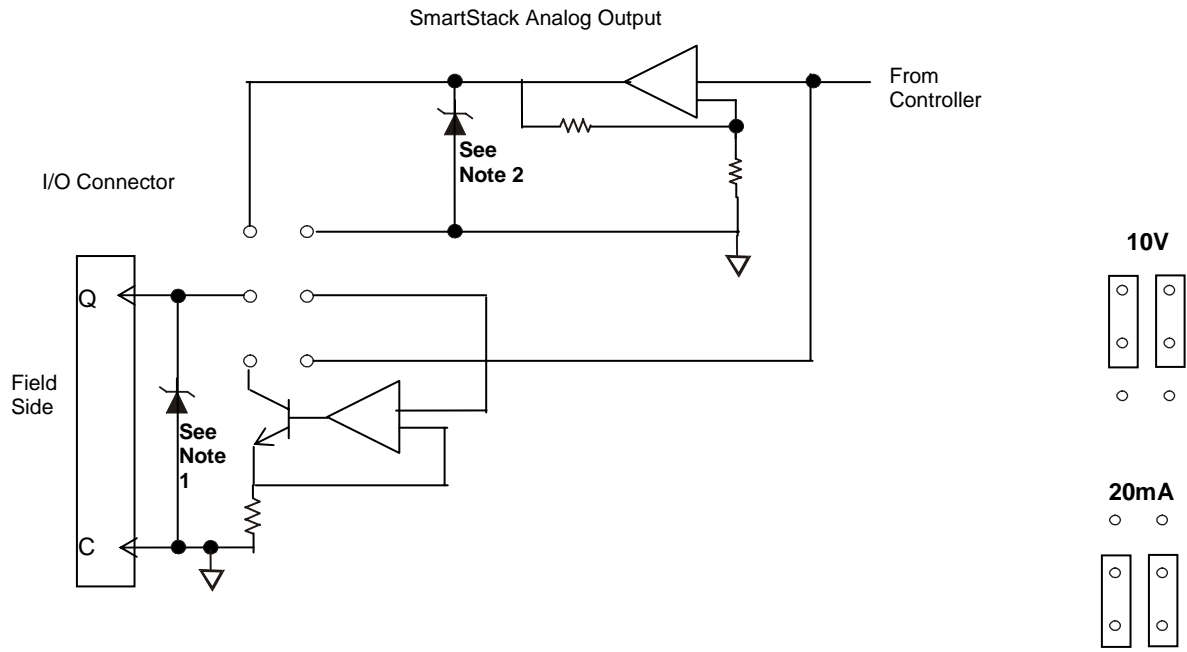
3   INTERNAL SCHEMATIC DRAWING

SmartStack Digital Input

SmartStack Relay Output
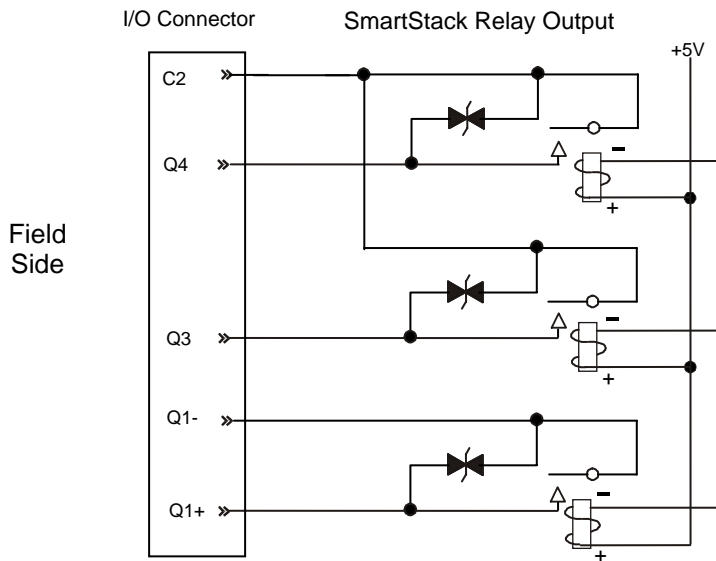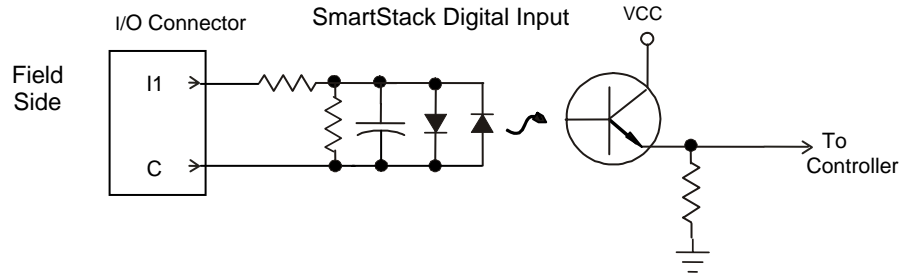
Specification for transient voltage suppressors used on output circuitry is 400VDC, bi-directional 400 watts.

Electro-mechanical relays comply with IEC1131-2.

SmartStack Analog Input

SmartStack Analog Output

I/O Connector

See Note 2

10V

Field Side

See Note 1

Q

C

20mA

Jumper Positions

Note 1: Specification for transient voltage suppressors used on output circuitry is 30V, 300W.

Note 2: Specification for transient voltage supp ressors used on output circuitry is 11V, 400W.

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4   CONFIGURATION

Note: The status of the I/O can be monitored in Cscape Software.

Preliminary configuration procedures that apply to SmartStack™ Modules are contained in the hardware manual of the controller you are using. Refer to the **Additional References** section in this data sheet for a listing of hardware manuals.

Module Setup Tab

The **Module Setup** is used in applications where it is necessary to change the default states or values of the outputs when the controller (e.g., OCS100) enters idle/stop mode.

1. For Digital Outputs: The default turns the outputs OFF when the controller enters idle/stop mode. By selecting the Module Setup tab, each output can be set to either turn ON, turn OFF or to hold the last state. Generally, most applications use the default settings.

2. For Analog Outputs: The default sets the output values to zero when the controller enters idle/stop mode. By selecting the Module Setup tab, each output can be set to a specific value or hold the last value. Generally, most applications use the default settings.

Warning: The default sets the output values to zero when the controller enters idle/stop mode. To avoid injury of personnel or damages to equipment, exercise extreme caution when changing the default setting using the **Module Setup** tab.

3. For Analog Inputs:

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

I/O Map Tab

The I/O Map describes which I/O registers are assigned to a specific SmartStack™ Module and where the module is located in the point map. The I/O Map is determined by the model number and location within the SmartStack™. The I/O Map is not edited by the user.
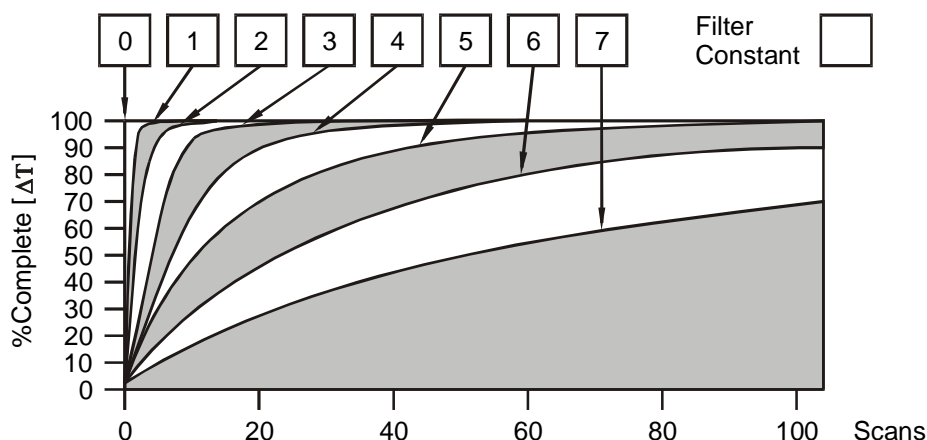
Digital Filtering. The illustration above demonstrates the effect of digital filtering (set with Fillter Constant) on module response to a temperature change.

4.2   Hardware Configuration

a.   Analog Inputs

The analog inputs are referenced to the bus common. Each of the inputs can be jumper-selected for one of the three input types. Behind each of the input pins is a corresponding group of four jumper pins with a programming plug.

- a) To select 5V input: Connect the two pins nearest the connector.
- b) To select thermistor input 1: Connect the two pins nearest input 1.
- c) To select 20mA input: Connect the two pins nearest input 4.

Note: It is also necessary to specify the input channel type in Cscape along with the temperature format.

Thermistor Curve for PreCon TYPE III (Model 3)								
Temperature		Resistance	Temperature		Resistance	Temperature		Resistance
°F	°C		°F	°C		°F	°C	
-35	-37.2	203.6K	60	15.6	14.78K	155	68.3	2.098K
-30	-34.4	173.6K	65	18.3	13.15K	160	71.1	1.920K
-25	-31.7	148.3K	70	21.1	11.72K	165	73.9	1.759K
-20	-28.9	127.1K	75	23.9	10.46K	170	76.7	1.614K
-15	-26.1	109.2K	80	26.7	9.354K	175	79.4	1.482K
-10	-23.3	94.07K	85	29.4	8.378K	180	82.2	1.362K
-5	-20.6	81.23K	90	32.2	7.516K	185	85.0	1.254K
0	-17.8	70.32K	95	35.0	6.754K	190	87.8	1.156K
5	-15.0	61.02K	100	37.8	6.078K	195	90.6	1.066K
10	-12.2	53.07K	105	40.6	5.479K	200	93.3	984.0
15	-9.4	46.27K	110	43.3	4.947K	205	96.1	909.8
20	-6.7	40.42K	115	46.1	4.472K	210	98.9	841.9
25	-3.9	35.39K	120	48.9	4.049K	215	101.7	779.8
30	-1.1	31.06K	125	51.7	3.671K	220	104.4	723.0
35	1.7	27.31K	130	54.4	3.333K	225	107.2	671.0
40	4.4	24.06K	135	57.2	3.031K	230	110.0	623.3
45	7.2	21.24K	140	60.0	2.759K	235	112.8	579.5
50	10.0	18.79K	145	62.8	2.515K	240	115.6	539.4
55	12.8	16.65K	150	65.6	2.296K			

b.   Analog Outputs

Each **output** can be independently programmed for 0 to10 volts or 0 to 20mA. There are two jumpers to be set for each output. Six jumper pins in two rows of three are associated with each output. For voltage output, out of each group of six, the two pins nearest connector pin 1 (marked with * - refer to Section 2.2, [p2]) in each row are to be jumpered. For current output, out of each group of six, the two pins in each row near connector pin 8 are to be jumpered. The mode for each output must also be specified in the module setup in Cscape.

5   CONVERSION FACTORS (ANALOG INPUT and OUTPUT)

5.1   Input Conversion Factor

The following table describes how real-world inputs are scaled into the controller. Given a known input current, the data value is configured by using the conversion factor from the table. The following formula is used: **Data = Input Current (mA) / Conversion Factor**

Example: The user selects a current range of 0 to +20mA:

1) The known input current is 14mA.
2) Using the table, the conversion factor for the current range of 0 to +20mA is 0.000625.
3) To determine the data value, the formula is used:
    Data = Input Current (mA) / Conversion Factor
    22400 = 14mA / 0.000625

Conversion of Real-World Inputs into Controller			
Selected Voltage Range	**Voltage In (Vin) VDC**	**Data Out**	**Conversion Factor**
0 to +5.00 VDC	+5.11	32704	0.00015625
	+5.00	32000	
	0	0	
	NA	NA	
	NA	NA	
0 to +20mA	+20.47	32736	0.000625
	+20.00	32000	
	0	0	
	NA	NA	
	NA	NA	
°C	+115	1150	0.1
	0	0	
	-37	-370	
°F	+240	2400	0.1
	0	0	
	-35	-350	

5.2   Output Conversion Factor

The following table describes how program data values are scaled to real-world analog voltage outputs by the module. Given a desired output current, the data value is converted by using the conversion factor from the table. The following formula is used: **Data = Output Current (mA) / Conversion Factor**

Example: The user selects a current range of 0 to +20mA:

1) The desired output current is 12mA.
2) Using the table, the conversion factor for the current range of 0 to +20 mA is 0.000625.
3) To determine the data value, the formula is used:
    Data = Output Current (mA) / Conversion Factor
    19200 = 12mA / 0.000625

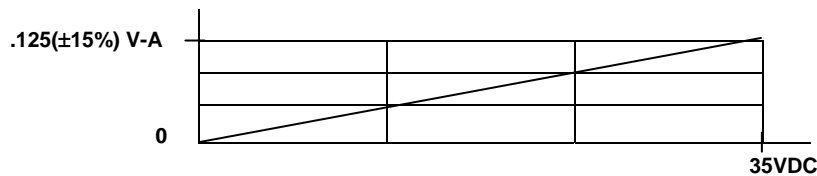| Conversion of Real-World Outputs into Controller			
Selected Current Range	**Output Current (mA)**	**Data**	**Conversion Factor**
0 to +20mA	+20.47	32752	0.000625
	+20.00	32000	
	0	0	
Selected Voltage Range	**Output Voltage (V)**	**Data**	**Conversion Factor**
0 to +10V	10.23	32736	0.0003125
	10.00	32000	
	0	0	

6   DIGITAL INPUT / OUTPUT CHARACTERISTICS

6.1   Digital Input

Digital Input Chart

6.2   Digital Output

Derating Output Chart
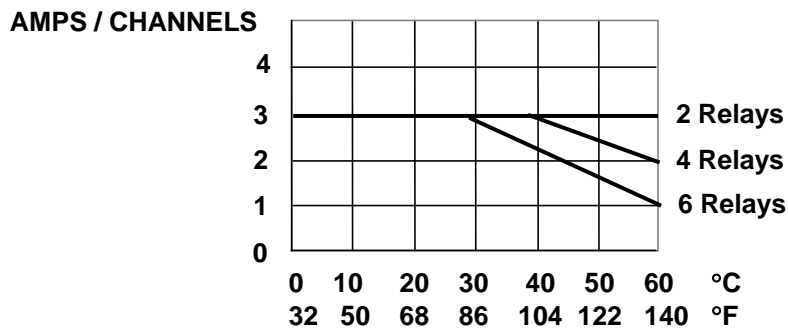
Typical Relay Life			
Voltage (Resistive)	**Load Current**		
	1 Amp	**2 Amp**	**3 Amp**
30VDC	600K	250K	125K
125VAC	750K	300K	150K
250VAC	500K	200K	100K

7   ANALOG OUTPUT CHARACTERISTICS *IN 20mA* OPERATING MODE
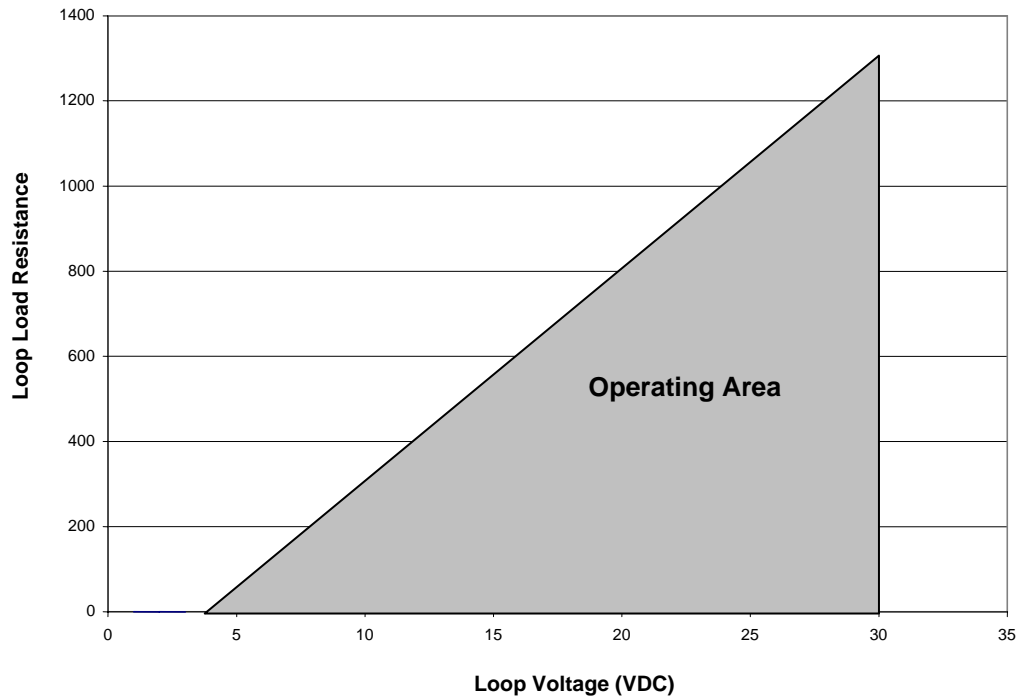
8   INSTALLATION / SAFETY

> **Warning:** Remove power from the OCS controller, CAN port, and any peripheral equipment connected to this local system before adding or replacing this or any module.

  a) All applicable codes and standards should be followed in the installation of this product.
  b) Shielded, twisted-pair wiring should be used for best performance (Analog I/O).
  c) Shields may be terminated at the module terminal strip.
  d) In severe applications, shields should be tied directly to the ground block within the panel.
  e) see the following wire type or equivalent: Belden 8917, 16 AWG or larger for digital I/O and Belden 8441 for Analog I/O.

When found on the product, the following symbols specify:

⚠ | **Warning:** Consult user documentation.

⚡ | **Warning:** Electrical Shock Hazard.

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 <u>not</u> replace the fuse again as a repeated failure indicates a defective condition that will <u>not</u> 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.

For detailed installation and a <u>handy checklist</u> that covers panel box layout requirements and minimum clearances, refer to the hardware manual of the controller you are using. (See the **Additional References** section in this document.)

- All applicable codes and standards need to be followed in the installation of this product.
- For I/O wiring (discrete), use the following wire type or equivalent: Belden 9918, 18 AWG or larger.

Adhere to the following safety precautions whenever any type of connection is made to the module.

- Connect the green safety (earth) ground first before making any other connections.
- When connecting to electric circuits or pulse-initiating equipment, open their related breakers. Do <u>not</u> 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.

9   ADDITIONAL REFERENCES

The following information serves as a *general* listing of Horner controller products and other references of interest and their corresponding manuals numbers. Visit our website listed in the **Technical Support** section to obtain user documentation and updates.

Note: This list is <u>not</u> intended for users to determine which products are appropriate for their application; controller products differ in the features that they support. If assistance is required, see the **Technical Support** section in this document.	
Controller	**Manual Number**
XLE Series (e.g., HE-XExxx)	MAN0805
QX Series (e.g., HE-QXxxx)	MAN0798
NX Series (e.g., HE-NXxxx)	MAN0781
LX Series (e.g., LX-xxx; also covers RCS116)	MAN0755
Color Touch OCS (e.g., OCSxxx)	MAN0465
OCS (Operator Control Station) (e.g., OCS1xx / 2xx; Graphic OCS250)	MAN0227
Remote Control Station (e.g., RCS2x0)	
MiniOCS (e.g., HE500OCSxxx, HE500RCSxxx)	MAN0305
Other Useful References	
CAN Networks	MAN0799
Cscape Programming and Reference	MAN0313
Wiring Accessories and Spare Parts Manual	MAN0347
DeviceNet™ Implementation	SUP0326
Wiring Accessories and Spare Parts Manual	MAN0347

For detailed installation and a <u>handy checklist</u> that covers panel box layout requirements and minimum clearances, refer to the hardware manual of the controller you are using. (See the **Additional References** section in this document.)

10   TECHNICAL SUPPORT

For assistance and manual up-dates, contact Technical Support at the following locations:

North America: **Europe:**
(317) 916-4274   (+) 353-21-4321-266
<u>www.heapg.com</u>   <u>www.horner-apg.com</u>