Temperature I/O Module

HE800MIX963 / HE-MIX963*

*** HE- denotes plastic case.**

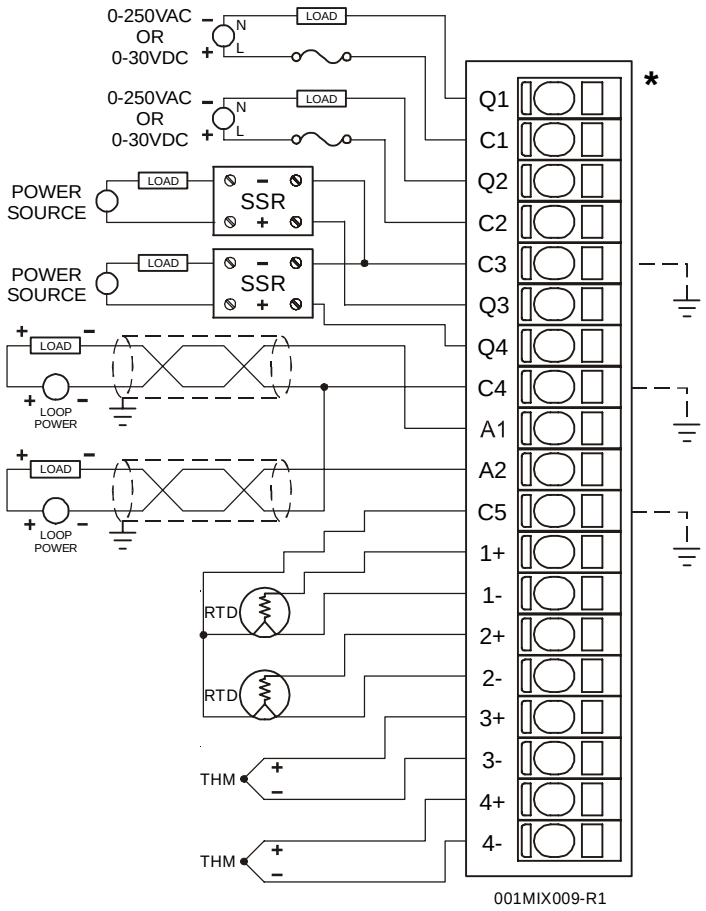
This datasheet also covers products starting with IC300.

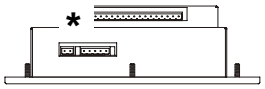
1 SPECIFICATIONS

Relay Outputs	MIX963			MIX963
Number of Channels	2 N.O. Relays		Maximum Load Current (resistive) per channel	10A Max.
Commons per Module	2		Maximum Leakage Current	5μA
Digital Output Registers Consumed by Cscape (%Q)	1,2 of 8		ON Voltage Level	0.15V
Isolation (Channel to Channel) (Channel to Ground)	500VDC		OFF to ON Response	10ms Max.
Output Type	N.O.		ON to OFF Response	5ms. Max.
Maximum Load Voltage	250VAC or 30VDC Max.		Protection	Transient voltage suppressor across contacts.
Analog Outpus	**MIX963**			**MIX963**
Number of Channels	2		Analog Output Registers Consumed by Cscape (%AQ)	2
Commons per Module	1			
Output Ranges (including over-range)	20.47mA; Clamped @-0.5 - +33VDC Nominal		Additional error for temperatures other than 25°C	0.01% / °C
Resolution	12 Bits		Maximum Error at 25°C	0.1%
Output Voltage	4 - 30VDC		Load Impedance	≤ 1.1kΩ @ 24VDC Loop Voltage
SSR Driver	**MIX963**			**MIX963**
Number of Channels	2		Minimum Load	None
Commons per Module	1		OFF to ON Response	1ms.
Digital Output Registers Consumed by Cscape (%Q)	3,4 of 8		ON to OFF Response	1ms.
Output Type	Sourcing		Output Characteristics	Current Sourcing
Output Voltage	12VDC Min.		Output Protection	Transient voltage suppressors
Maximum Load Current per Output	15mA internally limited			

MIX963 Specifications Continued				
Thermocouple Inputs	**MIX963**			**MIX963**
Number of Channels	4		A/D Conversion Time	16 channels/second
Commons per Module	1 (for grounding shielded T/Cs only)		Analog Input Registers Consumed by Cscape (%AI)	4
Input Impedance	20Meg Ohm clamped @ ±24VDC		PLC Update Rate	Set by PLC Scan Rate
A/D Conversion Type	Integrating		Cold Junction	Internal
Types Supported	J, K, T, & E			
Open Thermocouple Response	High Temperature		Maximum Sustained Differential O/L	±15VDC
Thermocouple Common Mode Range	-10.5VDC to + 12VDC		Resolution	0.05°C
Thermocouple Type	**J**	**K**		**T**
Input Range Temperature	-210°C to 770°C (-346°F to 1418°F)	-270°C to 1380°C (-454°F to 2516°F)		-270°C to 410°C (-454°F to 770°F)
	E			
	-270°C to 1010°C (-454°F to 1850°F)			
Accuracy of: Types J, K, T, & E	**Typical:** 25°C ±1°C	**Under Extremes:** 0°C, 60°C, or full load	**J:** ±5°C **K:** ±3°C	**E:** ±1°C **T:** ±4°C
Note: Accuracy Specifications not guaranteed below -100°C for Thermocouple.				
RTD Inputs				
Number of Channels	4		Input Transient Protection	Zener/Capacitor
Commons per Module	1		Resolution	0.05°C
Analog Input Registers Consumed by Cscape (%AI)	4		RTD Types Supported	PT100 (100 Ohms at 0°C, Platinum, Alpha 0.00385, DIN43760)
RTD Excitation Current	200µA, 25% duty cycle		Input Impedance	10Meg Ohm clamped @ ±24VDC
RTD Short	Indefinite		Input Range	-206.2°C to +856.8°C
Notch Filter	50-60 Hz. Software Selectable		PLC Update Rate	Set by PLC Scan Rate
A/D Conversion Time	8 channels/second		Accuracy	± 1°C
A/D Conversion Type	Integrating		Channel-to-Channel Tracking	0.1°C
General Specifications				
Required Power (Steady State)	1.92W (80mA @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 UL	See Compliance Table at http://www.heapg.com/Support/compliance.htm			

2 WIRING





OCS Bottom View – Shows Corresponding I/O Pin

Pin	MIX963 Signal
Q1	Relay 1 NO Contact
C1	Relay 1 NO Contact
Q2	Relay 2 NO Contact
C2	Relay 2 NO Contact
C3	SSR Common
Q3	SSR Source 1
Q4	SSR Source 2
C4	20mA Analog Output Common
A1	20 mA Analog Output 1
A2	20mA Analog Output 2
C5	THM Shield or RTD Common
1+	THM/RTD Channel 1+
1-	THM/RTD Channel 1-
2+	THM/RTD Channel 2+
2-	THM/RTD Channel 2-
3+	THM/RTD Channel 3+
3-	THM/RTD Channel 3-
4+	THM/RTD Channel 4+
4-	THM/RTD Channel 4-

Note regarding Pin C5: The pin is not a THM common but is a thermocouple shielding termination point.

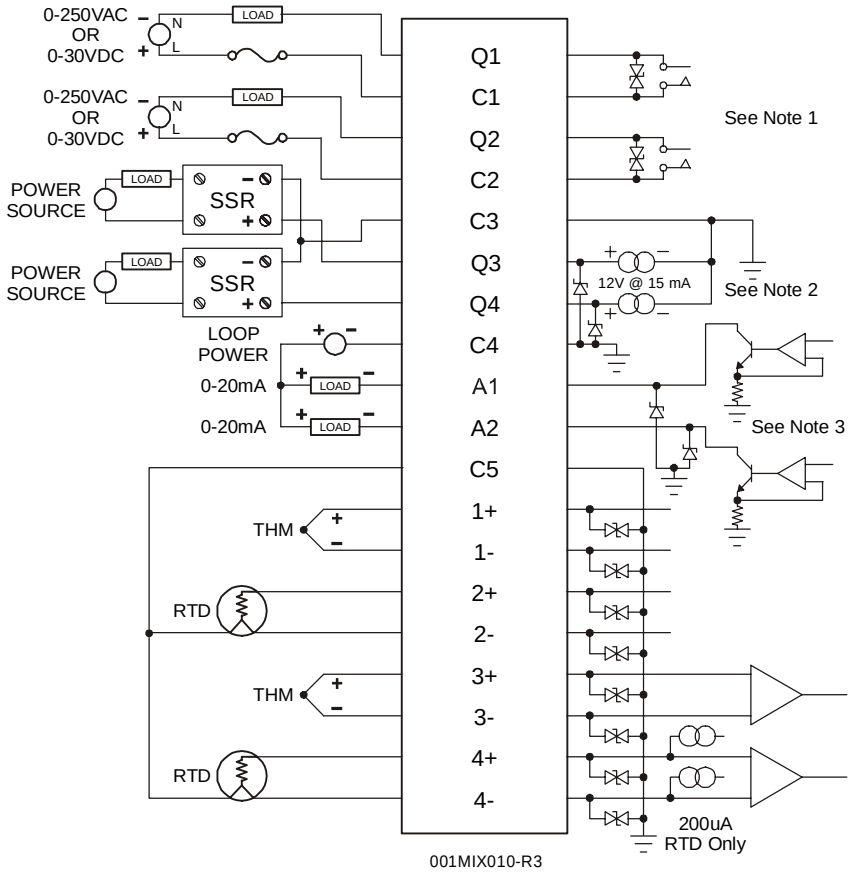
Note: All temperature inputs can be either Thermocouple or RTD inputs.

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

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 Q1 through Q2 and the neutral side of the AC source to the output common(s) create a Negative Logic condition, which may be considered an unsafe practice.

3 INTERNAL CIRCUIT SCHEMATIC



Note 1: Specification for transient voltage suppressors (transorbs) used on output circuitry is 400VDC bi-directional 400 watts.

Note 2: Specification for transient voltage suppressors (transorbs) used on output circuitry is 15VDC, 300 watts.

Note 3: Specification for transient voltage suppressors (transorbs) used on output circuitry is 30VDC, 500 watts.

Electro-mechanical relays comply with IEC1131-2.

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.

Warning: The default turns the digital outputs OFF when the controller enters idle/stop mode. To avoid injury of personnel or damages to equipment, exercise extreme caution when changing the default settings.

The digital outputs are assigned as follows assuming a start at %Q1:

%Q1 Relay 1

%Q2 Relay 2

%Q3 SSR Drive 1

%Q4 SSR Drive 2

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 Temperature Setup

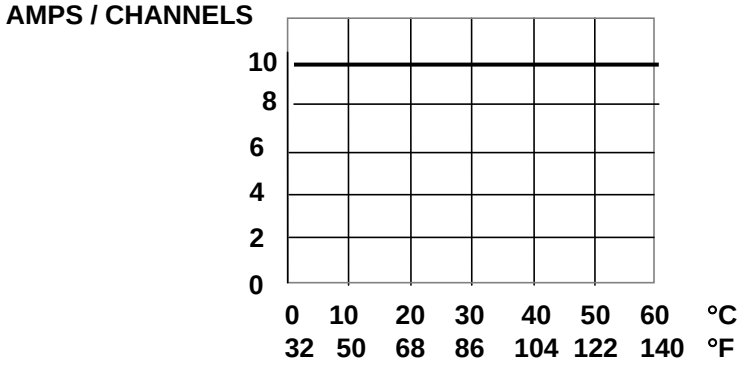
a) Sensor Type for each channel must match what is physically attached.
b) Temperature format may be set for various C° or F° ranges.
c) Filter Constant sets the level of digital filtering according to the chart below.
d) Reject Rates sets the frequency level for noise rejection at 50 or 60HZ.

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.

5 RELAY OUTPUT CHARACTERISTICS

Derating Chart for Relay Outputs



Typical Relay Life (Number of Cycles)			
Voltage and Load Type	Load Current 1 Amp	5 Amp	10 Amp
30VDC Resistive	800K	180K	100K
30VDC Inductive	500K	100K	Not Rated
250VAC Resistive	800K	180K	100K
250VAC Inductive	500K	100K	Not Rated

6 ANALOG OUTPUTS

6.1 Conversion Factor

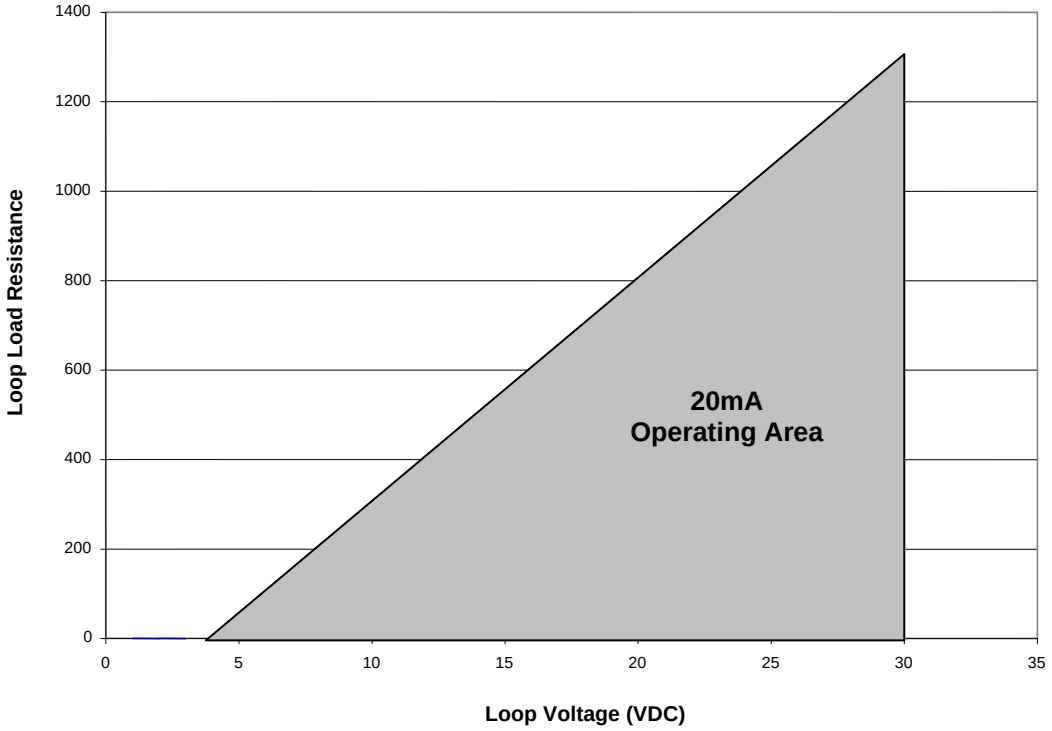
The following table describes how program data values are scaled to real-world analog voltage outputs by the module. Given a desired output current, the data value is converted by using the conversion factor from the table. The following formula is used: **Data = Output Current (mA) / Conversion Factor**

Example:

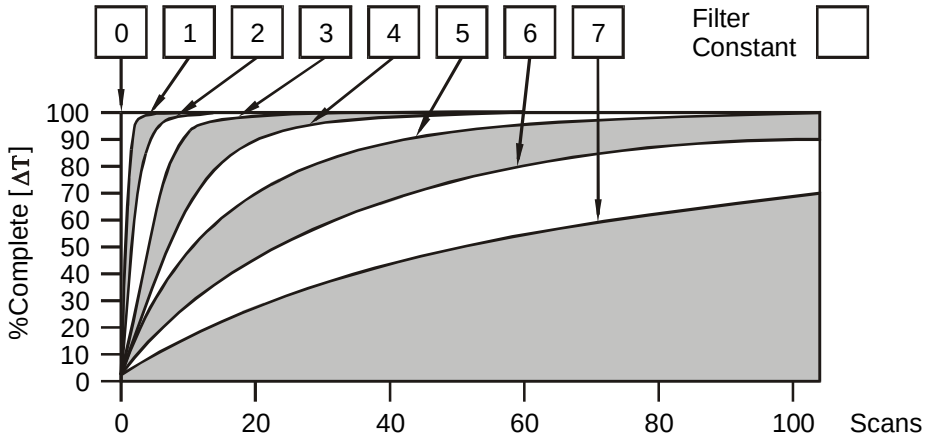
1) The desired output current is 12mA.
2) Using the table, the conversion factor for the current range of +20 mA is 0.000625.
3) To determine the data value, the formula is used:
   Data = Output Current (mA) / Conversion Factor
   19200 = 12mA / 0.000625

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	

6.2 Operating Area



7 THERMOCOUPLE / RTD SCALING & CONVERSION FACTOR



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

For a given module configuration, use the appropriate formula in the table to obtain the actual temperature (°C or °F) that is represented by the value in the %AI register.

Thermocouple or RTD Configuration	**Temperature Conversion**	
	Celsius	**Fahrenheit**
0.05°	°C = %AI / 20 *****	°F = %AI / 20 *****
0.1°	°C = %AI / 10	°F = %AI / 10
0.5°	°C = %AI / 2	°F = %AI / 2
***** Maximum reading in 0.05°F or 0.05°C format is limited to 1638.3 because of %AI resolution.		

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) Use the following wire type or equivalent: Belden 8917, 16 AWG or larger for digital I/O; Belden 8441 for analog I/O; Omega TT-J-20-TWSH for thermocouple inputs; and Omega EXTT-3CU-26S for RTD inputs.
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) Interposing electrical devices (such as relays) in the analog signal path (RTD, Thermocouple) can cause errors due to resistive imbalance.

For detailed installation and a handy checklist 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.)

When found on a 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 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.

For detailed installation and a handy checklist 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 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.

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 not 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

10 TECHNICAL SUPPORT

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

North America:
(317) 916-4274
www.heapg.com

Europe:
(+) 353-21-4321-266
www.horner-apg.com

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