

1 DESCRIPTION

The Horner APG Isolated Resistance Temperature Detector (RTD) Input Modules allow RTD temperature sensors to be directly connected to the PLC without external signal processing (transducers, transmitters, etc.). All analog and digital processing of the RTD signal is performed on the module. These backplane-isolated (or bus-isolated) modules have programmable resolutions in increments of 0.05°C, 0.05°F, 0.1°C, 0.1°F, 0.5°C, 0.5°F. The module features six channels whose temperature values are reported to the 6 %AI input registers. There are 6 %I alarm bits and one setpoint alarm for each channel. Alarm setpoints are configured for each channel using 6 %AQ registers. All modules feature support for the following RTD types: PT-100 (platinum, 100W at 0°C), Ni-120 (nickel, 120W at 0°C), Cu-10 (Copper, 10W at 25°C), Pt-1000 (platinum, 1000W at 0°C), and TD5R Silicon (Microswitch).

There are three versions of the Horner APG Isolated RTD Input Module: HE693RTD660, HE693RTD666, and HE693RTD665. The HE693RTD660 is a six-channel module with 1500V AC isolation to the PLC backplane and 5V AC isolation channel-to-channel. The HE693RTD666 is equivalent to the HE693RTD660 with the addition of a 60Hz notch filter. The HE693RTD665 is also equivalent to the HE693RTD660 with the addition of a 50Hz notch filter. The purpose of these filters is to eliminate noise generated by power lines in the United States (60Hz) and Europe (50Hz).

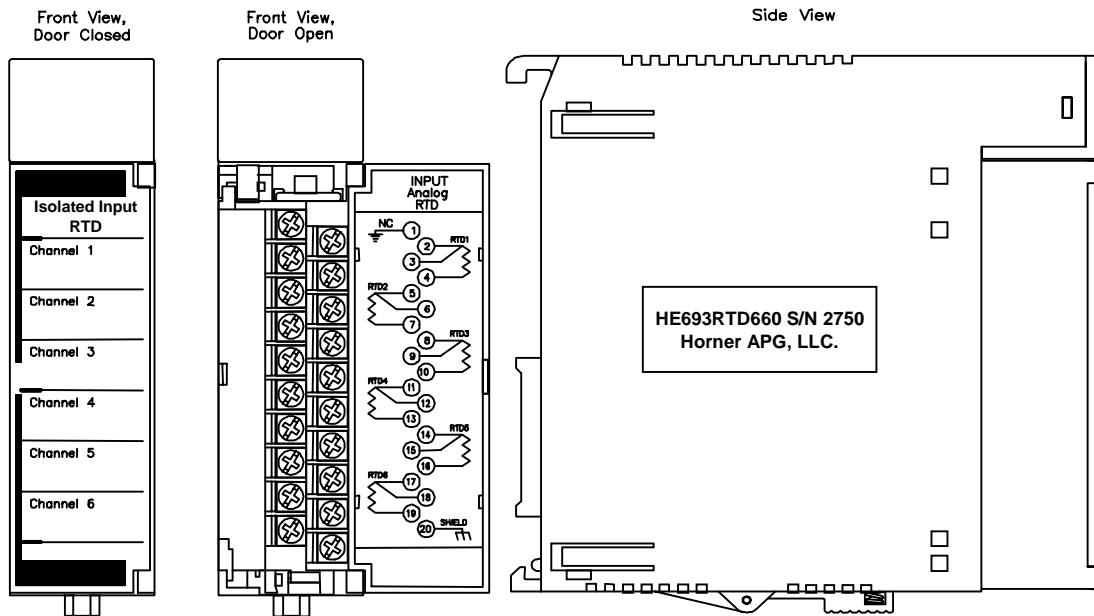


Figure 1 – HE693RTD660 Module

2 SPECIFICATIONS

Table 1 – Specifications			
Specification	RTD660, RTD666, RTD665	Specification	RTD660, RTD666, RTD665
Power Consumption	200mA @ 5VDC	I/O Points Required	6%AI, 6% AQ, 16%I
Number of Channels	6	Input Impedence	>1000 Megohms
Types Supported	Pt-100E @ -100 to 850°C	Input Transient Protection	Suppression Diode
	Pt-100C @ -100 to 650°C	A/D Conversion Type	18-bit, Integrating
	Ni-120 @ -100 to 270°C	Update Time	50 channels/sec. (660) 12.5 Channels/sec. (665/666)
	Cu-10 @ -200 to 260°C	Average RTD Current	330 microamps
	Pt-1000 @ -100 to 850°C	Channel-to-channel Tracking	0.1°C
	TD5R Si @ -40 to 150°C	Operating Temperature	0 to 60°C (32 to 140°F)
Resolution	0.05°C, 0.05°F, 0.1°C, 0.1°F, 0.5°C, or 0.5°F	Relative Humidity	5% to 95%, non-condensing
Accuracy	+/- 0.3°C	Channel-to-Bus Isolation	1500V AC
RTD Short	Indefinite without damage	Channel-to-Channel Isolation	5V AC

3 CONFIGURATION / TEMPERATURE SCALING

		SOFTWARE CONFIGURATION			
SLOT 5	Catalog #:	FOREIGN		FOREIGN MODULE	
FRGN	Module ID :	3			
	%I Ref Adr :	%I0001	Byte 1	: 00000001	Byte 9 : 00
	%I Size :	16	Byte 2	: 00000100	Byte 10 : 00
	%Q Ref Adr :	%Q0001	Byte 3	: 03	Byte 11 : 00
	%Q Size :	0	Byte 4	: 04	Byte 12 : 00
	%AI Ref Adr:	%AI0001	Byte 5	: 00	Byte 13 : 00
	%AI Size :	6	Byte 6	: 00	Byte 14 : 00
	%AQ Ref Adr:	%AQ001	Byte 7	: 00	Byte 15 : 00
	%AQ Size :	6	Byte 8	: 00	Byte 16 : 00

Figure 2 - Foreign Module Configuration

To reach this screen, select I/O Configuration (F1), cursor over to the slot containing the module and select Other (F8), and Foreign (F3).

Example. The example screen above defines the following configuration parameters:

%I Ref. Adr	: %I1	Starting reference for 16 %I bits.
%I Size	: 16	Alarm bits (first six successive bits used for the six channels).
%Q Ref. Adr.	: 0	Not Used.
%Q Size	: 0	Not Used.
%AI Ref. Adr.	: %AI1	Starting reference for 6 %AI words.
%AI Size	: 6	Registers used to store temperatures.
%AQ Ref. Adr.	: %AQ	Starting reference for 6 %AQ words.
%AQ Size	: 6	Registers used to store setpoint values for alarm bits.
Byte 1	: 1	Smart Module.
Byte 2	: 10	Digital filter set to 4 samples (Binary numbers only).
Byte 3	: 3	RTD sensor type configured for Cu-10 (Copper, 10 ohms at 25°C).
Byte 4	: 0	Resolution format set to 0.5 degrees Celsius.

%I Size	%AI Size	%AQ Size	Byte 1	Byte 2	Byte 3	Byte 4	
16	6	6	1	000-111 Binary Numbers Only (See Digital Filtering Chart)	Smart Module	Format Resolution	
					Digital Filtering	RTD sensor type	
						0: PT100E*	00: 0.05°C
						1: Ni120	01: 0.05°F
						2: Pt100C**	02: 0.1°C
						3: Cu10	03: 0.1°F
						4: N/A	04: 0.5°C
	5: PT1000	05: 0.5°F					
	6: TD5R						

Configuration Parameters. The necessary parameters are %I Size, %AI Size, %AQ Size, Byte 1, Byte 2, Byte 3, and Byte 4.

* α = 0.00385

** α = 0.003902

Module Configuration	Temperature Conversion
0.05°C	°C = %AI / 20
0.05°F	°F = %AI / 20
0.1°C	°C = %AI / 10
0.1°F	°F = %AI / 10
0.5°C	°C = %AI / 2
0.5°F	°F = %AI / 2

Temperature Scaling. The RTD module reports values to the %AI table in 0.05, 0.1, or 0.5 increments in either °C or °F. Conversion to actual degrees is shown above.

4 WIRING / INSTALLATION

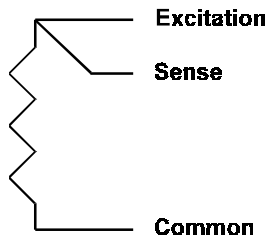


Figure 3 – RTD Wire Configuration

The above diagram depicts the wire configuration for each RTD sensor channel.

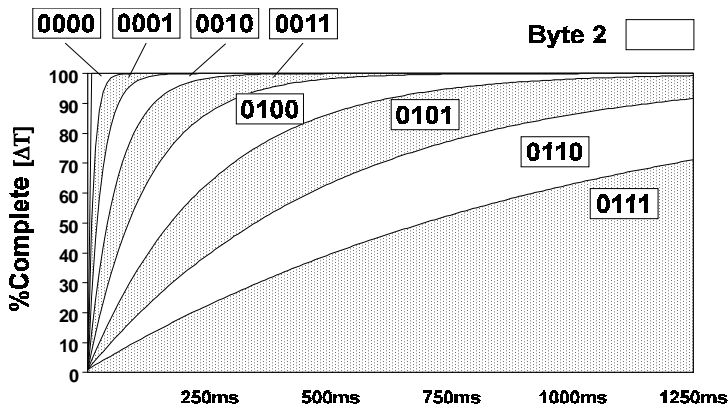


Figure 4 – Digital Filtering

The illustration above demonstrates the effect of digital filtering (set with Byte 2) on module response to a temperature change. The filtering values configured in LogicMaster must be entered in binary format only. (*% temp change completed vs. time*). Note: The digital filtering is 4 times slower for the RTD665 and RTD666 modules.

Table 4 – Fault Response	
Fault Condition	%AI Value
Short Circuit	Low Limit
Excitation Open	Low Limit
Sense Open	Low Limit
Common Open	High Limit

The above chart illustrates the PLC response from the list of RTD faults.

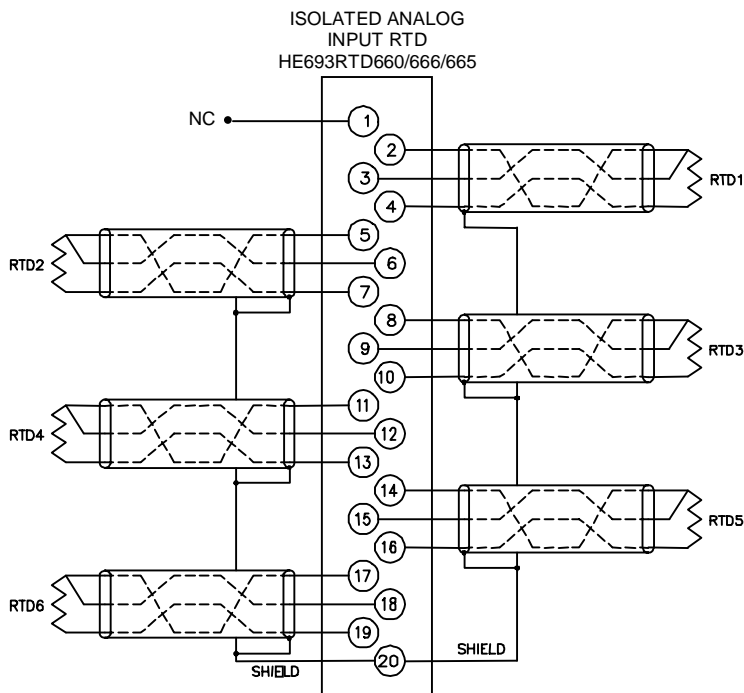


Figure 5 – RTD Wiring Diagram

The above wiring diagram shows all proper RTD connections. Pins 1 and 20 are used to connect shield returns to frame (bus) ground.

5 ALARMS

Table 5 – Alarm Bits and Setpoints	
%AQ 1-6	%I 1-16
%AQ1 = ch.1 setpoint	%I1 = ch.1 setpoint alarm
%AQ2 = ch.2 setpoint	%I2 = ch.2 setpoint alarm
%AQ3 = ch.3 setpoint	%I3 = ch.3 setpoint alarm
%AQ4 = ch.4 setpoint	%I4 = ch.4 setpoint alarm
%AQ5 = ch.5 setpoint	%I5 = ch.5 setpoint alarm
%AQ6 = ch.6 setpoint	%I6 = ch.6 setpoint alarm
N/A	%I7 = Not Used
	%I8 = Not Used
	%I9 = ch.1 open alarm
	%I10 = ch.2 open alarm
	%I11 = ch.3 open alarm
	%I12 = ch.4 open alarm
	%I13 = ch.5 open alarm
	%I14 = ch.6 open alarm
	%I15 = Not Used
	%I16 = Not Used

The above table demonstrates the alarm bits (16 %I) and setpoints (6 %AQ).

ALARM SETPOINTS

There are three reference types used with the RTD660/666/665: %I, %AI, and %AQ. The 6 %AI registers report the RTD temperature in the selected format. The 6 %AQ registers can be used to configure the alarm setpoint registers. The 16 %I bits display the alarm conditions. The first six %I are set while the temperature is above the value specified in the respective %AQ. The setpoint is in the same format as the temperature. The ninth through the fourteenth %I bits are set if the respective RTD is over the maximum readable temperature or is open. See the **Alarms** table above for more details.

Example: Module Configuration is %I1-16, %AI1-6, %AQ1-6 with temperature format = 0.5⁰C. %AQ1 (channel 1 setpoint) is set to a value of 200 (100⁰C). %I1 will remain set (1) while the temperature is above 100⁰C and %I9 will remain open (0) unless the temperature reaches the maximum readable value or is open. In other words, if %AI1 > %AQ1, then %I1 = 1 and %I9 = 0 unless open or maximum readable value is reached.

6 CONFORMANCE TO STANDARDS

The Isolated Analog Input Resistive Thermal Devices are CE-marked to indicate compliance with the EMC Directive. The EMC Directive is concerned with the immunity of electrical equipment to a variety of interference sources and the emissions from electrical equipment which could interfere with the operation of other equipment. The EMC Directive applies to complete installations, and since Horner APG products are included in the installation, Horner APG is supporting the EMC Directive by testing and CE-marking a subset of our equipment.

GENERAL

In order to meet CISPR (EN 55011) Group 1, Class A Radiated Emissions levels, all components in the PLC system require the following.

- ◆ All components must be mounted in a metal enclosure or the equivalent. The wiring must be routed in metal conduit or the equivalent. All surfaces of the enclosure must be adequately grounded to adjacent surfaces to provide electrical conductivity.
- ◆ The metal conduit (flexible conduit is acceptable) for all wiring external to the cabinet must be mounted to the enclosure using standard procedures and hardware to ensure electrical conductivity between the enclosure and the conduit.
- ◆ An external EMI filter must be wired to the AC Main for the PLC. Sprague Electric Part Number 259A9098P3 (available from GE Fanuc), or any other EMI filter which provides equivalent performance, may be used.
- ◆ An external ground wire (16 AWG (1.32 mm²), 6" (15.24 cm) maximum length) must be wired from the Series 90-30 power supply safety ground wire terminal to the metal enclosure.
- ◆ On AC Main Ports connected to PLCs, MOVs shall be connected Line to Line and Line to Ground.
- ◆ All cables and analog signals must use shielded cable with a minimum of overall foil.

SPECIFICS

- ♦ The RTD sensor wire(s) must be fully shielded and grounded to pin 1 and/or 20.



EMC Directive 89/336/EEC 92/31/EEC 93/68/EEC

7 RECOMMENDATIONS / APPROVALS

Installation Recommendations

Use fully-shielded high-grade RTD sensor wire.

Extension wiring must be routed in its own conduit.

A good earth ground (on one end only) is critical for the shielded wire.

Do not expose the module(s) to excessive EMI or RF interference.

Do not expose the module(s) to extreme temperature variations.

Module(s) must be allowed to stabilize for at least 15 minutes after complete connection and power-on.

Keep wire lengths to a minimum. No more than a maximum double lead resistance of 500 ohms (Cu-10) can be used.

Underwriters Laboratories Inc. Approved



IND. CONT. EQ. FOR HAZ. LOC.
CLASS I GROUPS ABCD DIV 2

UL Approved. The RTD660 has been designed to meet the requirements for Underwriters Laboratories, Inc. Class I Div 2 approval.

8 TECHNICAL ASSISTANCE

For user manual updates, contact Horner APG, Technical Support Division, at (317) 916-4274 or visit our web site at www.heapg.com.

NOTES