

Analog Input, 16-Bit RTD Module

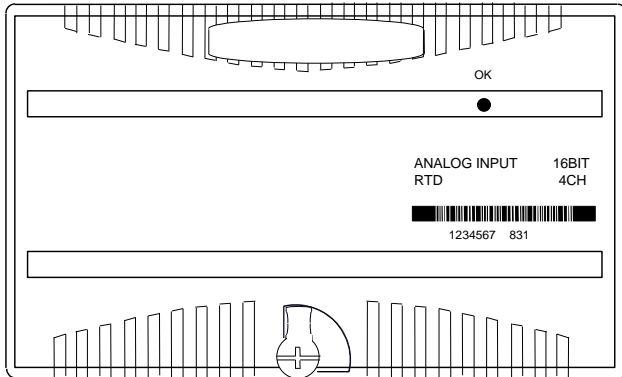
IC200ALG620

January 2012

GFK-1523L

Product Description

The IC200ALG620 Analog Input RTD Module is an intelligent module that accepts input signals from up to four RTD input devices and provides input data with 16 bits of resolution.



No external power supply is required for this module. The excitation current for the RTDs is provided by the module, which automatically matches the excitation current to each configured RTD type.

The module accepts inputs from four independent 3-wire and/or 4-wire platinum, nickel, nickel/iron, or copper RTDs.

Module features include:

- Selectable resistance measurements in tenths of ohms, tenths of degrees Fahrenheit, or tenths of degrees Celsius
- Individual channel configuration
- Selectable resistance ranges: 0 – 500 ohms and 0 – 3000 ohms
- Selectable RTD input as resistance or temperature (Celsius or Fahrenheit)
- Reports high/low, under-range/over-range, open wire and input short alarms.
- Two data acquisition rates based on 50 Hz and 60 Hz line frequencies
- Configurable channel activation

The module automatically performs A/D calibration at powerup. Automatic calibration is then repeated periodically to compensate for changes in the ambient temperature.

Host Interface

The RTD Module provides four words of analog input data.

Diagnostics

Over/under range, open wire, input short, non-volatile memory storage fault, wiring fault, and high/low alarm.

LED Indicator

The OK LED indicates module status:

- On green indicates normal operation
- Flashing green indicates boot mode or update
- Flashing amber indicates self-diagnostic error
- Off indicates no 3.3V backplane power

Module Characteristics

Channels	Four 3-wire and/or 4-wire RTDs
Module ID	FFFF9803
Isolation: User input to logic (optical) and to frame ground	250VAC continuous; 1500VAC for 1 minute
Group to group	Not applicable
Channel to channel	50VDC
LED indicators	OK LED: Green indicates backplane power is present. Amber indicates a module fault.
Backplane current consumption	5V output: 125mA maximum. 3.3V output: 125mA
External power supply	None
Thermal derating	None
Configuration parameters	See configuration table
Diagnostics	Open RTD, input short, under-range, over-range, non-volatile memory storage fault, wiring fault and high/low alarm
Update rate	60 Hz: approximately 210 ms per channel 50 Hz: approximately 230 ms per channel
Normal mode rejection	60dB, at 50/60 Hz, 100% span
Common mode rejection	120 dB at 50/60Hz, 100 ohm imbalance
Common mode voltage	3V maximum
Normal mode voltage	5V maximum
Digital Resolution	15 bits plus sign
Operating temperature range	0 to 60 Degrees C ambient

Input Characteristics:

RTD types	25, 100, and 1000 ohm platinum 10, 50, and 100 ohm copper 100 and 120 ohm nickel 604 ohms nickel/iron
Resistance ranges	0 to 500 ohms 0 to 3000 ohms
Accuracy, at 25° C	+/-0.15% on resistance measurement +/-0.15% on RTD (temperature) measurement
Temperature sensitivity (0° to 60°C)	+/-0.004% of reading, +/-1.5µV per °C referred to input
Maximum lead resistance	50 ohms per lead

Preinstallation Check

Carefully inspect all shipping containers for damage. If any equipment is damaged, notify the delivery service immediately. Save the damaged shipping container for inspection by the delivery service. After unpacking the equipment, record all serial numbers. Save the shipping containers and packing material in case it is necessary to transport or ship any part of the system.

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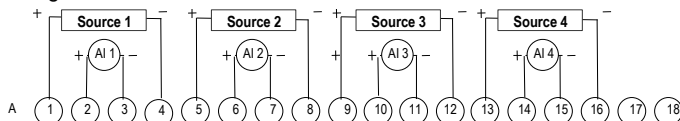
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Field Wiring Terminals

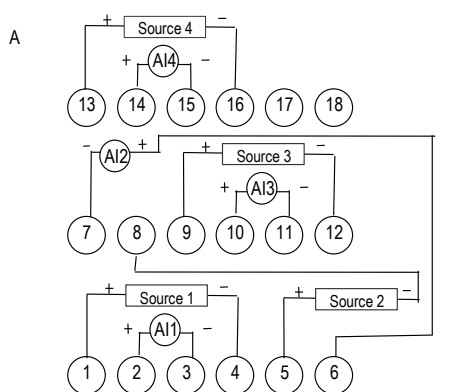
Terminal assignments for the module are shown below.

Number	Connection	Number	Connection
A1	Source 1	B1	No connection
A2	In (+) 1	B2	Shield Termination Point
A3	In (-) 1	B3	No connection
A4	Return 1	B4	Shield Termination Point
A5	Source 2	B5	No connection
A6	In (+) 2	B6	Shield Termination Point
A7	In (-) 2	B7	No connection
A8	Return 2	B8	Shield Termination Point
A9	Source 3	B9	No connection
A10	In (+) 3	B10	Shield Termination Point
A11	In (-) 3	B11	No connection
A12	Return 3	B12	Shield Termination Point
A13	Source 4	B13	No connection
A14	In (+) 4	B14	Shield Termination Point
A15	In (-) 4	B15	No connection
A16	Return 4	B16	No connection
A17	No connection	B17	No connection
A18	No connection	B18	No connection

Wiring Connections for Carriers with Two Rows of Terminals

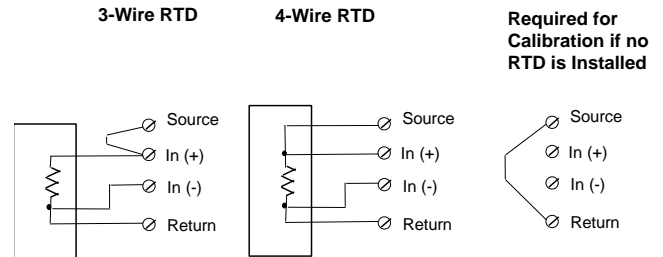


Wiring Connections for Carriers with Three Rows of Terminals



Wiring Examples

The following illustration shows connections for 3-wire and 4-wire RTDs. No external power supply is required for this module. The excitation current for the RTDs is provided by the module, which automatically matches the excitation current to each configured RTD type.



Cable Shield Connections

If possible, the cable should be grounded at the source device. If that is not possible, the cable shield must be grounded at the source device. If that is not possible, the cable shield must be grounded at the I/O module. This can be done using an Auxiliary I/O Terminal (TBM001, 002 or 005).

If the module is installed on a Terminal-style I/O Carrier (IC200CHS001, 002, or 005), shield connections can be made on an Auxiliary I/O Terminal that is attached to the I/O carrier.

If the module is installed on a Compact Terminal-style I/O Carrier (IC200CHS022, 025), shield connections can be made on an Auxiliary I/O Terminal that is mounted near the I/O carrier. Be sure to ground the Auxiliary I/O Terminal Strip if you plan to use it for this purpose.

If the module is installed on a Connector-style I/O Carrier (IC200CHS003), the cable shield can be connected directly to an Interposing Terminal (IC200CHS011, 012, 015). Be sure to ground the Interposing Terminal. It is recommended to use a shielded interposing cable as well between the Interposing Terminal and the Connector Base. A custom shielded cable can be made using the Connector kit (IC200ACC302). In addition, a custom shield braid can be wrapped around standard Interposing Cables (IC200CBL105, 110, 120, 230). If this approach is used be sure to ground the braid.

Using the Module in Hazardous Locations

- **WARNING - EXPLOSION HAZARD - SUBSTITUTION OF COMPONENTS MAY IMPAIR SUITABILITY FOR CLASS I, DIVISION 2;**
- **WARNING - EXPLOSION HAZARD - WHEN IN HAZARDOUS LOCATIONS, TURN OFF POWER BEFORE REPLACING OR WIRING MODULES.**
- **WARNING - EXPLOSION HAZARD - DO NOT DISCONNECT EQUIPMENT UNLESS POWER HAS BEEN SWITCHED OFF OR THE AREA IS KNOWN TO BE NONHAZARDOUS.**
- Equipment labeled with reference to Class I, Div. 2, Groups A, B, C and D, Hazardous Locations is suitable for use in Class I, Div. 2, Groups A, B, C, D or non-hazardous locations only.
- Equipment labeled with reference to Class I, Zone 2, Groups A, B, C and D, hazardous locations is suitable for use in Class I, Zone 2, Groups A, B, C, D or non-hazardous locations only.
- Be sure to read the installation instructions provided with the module and its terminal assembly. These instructions specify the use of copper conductors and wire gauge and type requirements.

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Product Version Information

Revision Letters:	JF
Firmware version:	1.25
Firmware upgrade kit:	44752834-G05

Product Revision History

Rev	Date	Description
IC200ALG620-JF	January 2012	Label change. No changes to features, performance or compatibility.
IC200ALG620-HF	April 2011	Firmware release 1.25. Resolves component obsolescence issue. No change to features, performance or compatibility.
IC200ALG620-GE IC200ALG620-FE	September 2010	Firmware release 1.24. Resolved fault reporting issue in Remote/Local IO configuration.
IC200ALG620-GD	August 2009	Changed manufacturing location. No changes to compatibility, functionality or performance.
IC200ALG620-FD BXIOAIRTD4-FD	October 2008	Updated Power Supply OK signal circuitry.
IC200ALG620- ED BXIOAIRTD4-ED	September 2007	Firmware release 1.20. Improved I/O scanning.
IC200ALG620- EC BXIOAIRTD4-EC	September 2006	Improved accuracy tolerance in 3-wire mode.
IC200ALG620- DC BXIOAIRTD4-DC	April 2005	Firmware release 1.11 RTD lead resistance changed to 50 Ohms.
IC200ALG620- DB BXIOAIRTD4-DB	April 2005	Plastic change on locking mechanism
IC200ALG620- CB BXIOAIRTD4-CB	August 2004	Firmware release 1.1. 50Hz setting does not cause error code.
IC200ALG620-CA BXIOAIRTD4-CA	April 2004	Changed to V0 plastic for module housing.
IC200ALG620-BA BXIOAIRTD4-BA	January 2004	ATEX approval for Group 2 Category 3 applications.
IC200ALG620-AA BXIOAIRTD4-AA	July 1999	Initial product release

Compatibility

Firmware version 1.25 is compatible with all hardware versions of the ALG620.

Module version –DC and later can be installed on an isolation barrier if the RTD lead resistance is not greater than 50 Ohms.

The module is compatible with:

- PLC CPU firmware version 1.20 or later.
- Ethernet NIU EBI001 all versions.
- Genius NIU GBI001 Firmware version 1.10 or later*
- Profibus NIU PBI001 Firmware version 1.10 or later*
- DeviceNet NIU DBI001 Firmware version 1.10 or later. The DeviceNet NIU does not support software configuration. Therefore, analog modules used with a DeviceNet NIU must be autoconfigured and use only their default configuration settings.

* For GBI001, NIU version 2.0 or above is required to perform software configuration. For PBI001, NIU version 2.01 or above is required to perform software configuration.

Restrictions and Open Issues

- Additional faults may be logged when a new configuration containing parameter changes such as the Alarm High limit or Alarm Low limit in the hardware configuration of an analog module is stored followed by a Clear All operation. The additional faults are logged against the previous configuration. This issue is observed when Machine Edition is connected to Versamax CPUs (IC200CPU001, IC200CPU002, IC200CPU005 and IC200CPUE05) and does not occur with Versamax NIUs (IC200GBI001, IC200EBI001, IC200PBI001, and IC200DBI001).
- When more than 20 faults are sent to a GBC70 within a single Genius scan, under rare conditions one fault or fault contact may not be reported by the GBC70. This has been observed when simultaneous open wire condition occurs in all eight channels of IC200ALG240 module or if several I/O modules in a GNIU rack generate multiple faults simultaneously. This issue has only been observed when the GBC70 was in a rack with an RX7i CPU.
- When 45 or more faults are sent to a GBC70 within a single Genius scan, a few faults or fault contacts may not be reported by the GBC70. This is most likely to be caused by the sudden loss of numerous blocks at each bus controller in the system. The resulting PLC diagnostics and diagnostic contacts may be incorrect.
- After rapid power cycles or certain brownout conditions, an IC200ALG620 module may blink a 6-3 error code, indicating a hardware failure. Cycle power to the module to restore operation.
- When at least one IC200ALG620 channel is configured to measure 0-3000 Ohms, other channels that are configured as active but have nothing connected may report an Input Open Wire fault (fault code 2) rather than the expected Wiring Fault Error (fault code 4) to the I/O Fault table.

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Operational Notes

- If hot insertion of a module is done improperly, the operation of other modules on the same backplane may be disrupted. See "Installing a Module on a Carrier" in the *VersaMax Modules Manual*, GFK-1504.
- Clarification of Default/Hold Last State configurations:
If there is an error on a specific input channel, the module will always report the Channel Default value from the Input Parameters tab of the module configuration.
When a Loss of I/O Module fault is logged for a module, the CPU or NIU will use the Default/Hold Last State setting from the Module Parameters tab of the module configuration to determine what value should be reported to the reference tables.
- If an IC200ALG620 module is configured to measure 0-500 or 0-3000 Ohms resistance, and the actual resistance is at the low end of the range, then the analog-to-digital conversion produces zero (a short circuit). When this occurs, the module reports the configured Channel Default value from the Input Parameters tab of the module configuration. If configured for 0-500, this happens below 2.9 Ohms. If configured for 0-3000, this happens below 22.1 Ohms.
- The module documentation previously specified the maximum lead resistance as 5 Ohms per lead. Release 1.11 of the ALG620 firmware changes this limit to 50 Ohms per lead.
- The IC200ALG620 has four RTD channels. When all four channels are configured to inactive mode, head-ends including CPUs or NIUs will report a "loss of IO module" fault that points to the IC200ALG620 itself. To avoid this fault, you should configure at least one channel as active.
- When IC200ALG630 or IC200ALG620 modules are present in GNIU or PNIU rack and a 'Clear all' command is issued from Machine Edition software, Machine Edition may get disconnected, displaying timeout error "error 8097 - host disconnect has occurred". When this error is logged, the Configuration is still cleared. To avoid this error "Request Timeout" value in "Additional Configuration" in "Target Properties" should be increased to 30s or more.

Configurable Features

The default parameters of this module can be used in many applications. The module can be software-configured when it is installed in a PLC system, or an I/O Station controlled by a Network Interface Unit that supports software configuration, as listed on the previous page.

The module is configured at startup. After configuration, the module begins providing signals from the voltage or current output devices connected to it to the CPU or NIU.

Parameter	Default	Choices
Analog Input Data Length	4	0-4
Analog Input Data Reference		user selectable
Line Frequency	60 Hz	50 Hz, 60 Hz
Channel Active	Active	Inactive (off), Active (on)
Units	Deg C	tenths of ohms, tenths of degrees C, or tenths of degrees F
RTD Type	100 PT 385	10 PT, 25 PT, 25.5 PT 392, 100 PT 385, 100 PT 3902, 100 PT 392, 100 PT 3923, 100 PT 3916, 1K PT 375, 10 CU, 10 CU 427, 50 CU 427, 100 CU 427, 100 NI, 100 NI 618, 120 NI 672 604 NI/FE 518, 1K NI/FE 527, 500 Ohm, 3000 Ohm
Wire Type	3 Wire	3 Wire, 4 Wire
Alarm Low	-200	-32,768 to +32,767
Alarm High	800	-32,768 to +32,767
Nominal Resistance	0	0 to 3276.7
Channel Default Input	0	± 3276.7

Description of Configurable Features

Channel Active: Each channel can be configured as either active or inactive. If a channel is inactive, it is not scanned and a value of 0 is returned by the module.

Input Units: Inputs can be measured as tenths of Ohms, tenths of degrees C, or tenths of degrees F. The default is tenths of degrees C. The measurable ranges for each type of input units are shown below.

Units Selected	Integer Ranges	Engineering Units Ranges
Tenths of Degrees	-32767 to +32767	-3276.7° to +3276.7°
Tenths of Ohms	0 to 65535	0 Ohms to 6553.5 Ohms

Low Alarm Limit and High Alarm Limit: Each input channel can have a low alarm limit and a high alarm limit. If an input reaches one of its limits, the module reports the actual value and sends the appropriate diagnostic input bit. Alarms do not stop the process or change the value of the input.

Alarm limits can be set anywhere over the dynamic range of the signal. The range for each is -32,768 to +32,767. The high alarm limit must be greater than the low alarm limit. If alarm reporting is not wanted, alarm limits can be set beyond the dynamic range of the signal so they will never be activated.

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Input Selection to Include RTD Type: Each input channel can have a different RTD type. The module supports the RTD types listed below. If the actual RTD resistance does not match a defined type, an adjustment factor can be configured in tenths of ohms.

Selection	Comments
25.5 PT 392	25.5 Ohm Platinum, $\alpha = .00392$ at 0°C Lab Std
100 PT 385	100 Ohm Platinum, DIN43760, $\alpha = .00385$
100 PT 3902	100 Ohm Platinum, $\alpha = .003902$
100 PT 392	100 Ohm Platinum, $\alpha = .00392$ IPTS-6 8
100 PT 3923	98.13 Ohm Platinum, $\alpha = .003923$
100 PT 3916	100 Ohm Platinum, $\alpha = .003916$
1K PT 375	1 KOhm Platinum, $\alpha = .00375$
10 CU	10 Ohm Copper, at 25°C, IPTS-68
9.035 CU 427	9.035 Ohm Copper, at 25°C, $\alpha = .00427$
50 CU 427	50 Ohm Copper, $\alpha = .00427$
100 CU 427	100 Ohm Copper, $\alpha = .00427$
100 NI 618	100 Ohm Nickel At 0°C, DIN43760, $\alpha = .00618$
120 NI 672	120 Ohm Nickel, at 0°C, $\alpha = .00672$
604 NI/FE 518	604 Ohm Nickel/Iron, at 0°C, $\alpha = .00518$
500 OHM	Select UNITS of 1/10 Ohms
3000 OHM	Select UNITS of 1/10 Ohms

RTD Limits: The table below lists the ohms and temperature limits for different RTD types.

RTD Type	Low Ohms Limit	High Ohms Limit	Low Temp. °C	High Temp. °C
10 Ohm Copper @ 25°C	6.13600	14.8200	-75.00	150.00
10 Ohm Platinum @ 25°C	7.02000	37.2599	-70.00	1000.00
1 KOhm Platinum, $\alpha = .00375$	199.4880	2754.620	-200.00	500.00
100 Ohm Platinum $\alpha = .00385$	27.01	389.936	-180.0	850.0
100 Ohm Platinum, $\alpha = .003902$	93.5400	135.000	-17.7777	99.9999
100 Ohm Platinum IPTS68 (PA)	26.5	327.744	-200.0	630.0
100 Ohm Platinum SAMA-RC21-4 (PC)	26.5	311.874	-200.0	600.0
100 Ohm Platinum JISC-1604-81	26.5	323.780	-200.0	620.0
25.5 Ohm Platinum Lab Std (PJ)	4.50	83.575	-200.0	630.0
9.035 Ohm Copper (CA)	6.05	16.400	-100.0	260.0
50 Ohm Copper (CB/2)	28.379	105.787	-100.0	260.0
100 Ohm Copper (CB)	56.757	211.574	-100.0	260.0
100 Ohm Nickel (NB)	69.520	223.221	-60.0	180.0
120 Ohm Nickel (NA)	66.600	380.310	-80.0	260.0
604 Ohm Nickel/Iron (FA)	372.789	1318.722	-100.0	204.0