

# Analog Input, 16-Bit RTD Module

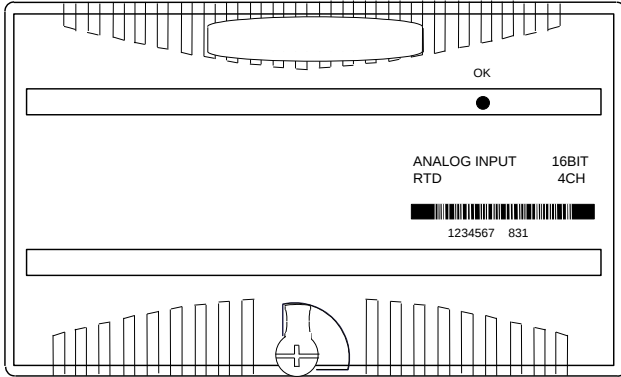
## IC200ALG620

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:<br>User input to logic (optical) and to frame ground<br>Group to group<br>Channel to channel | 250VAC continuous; 1500VAC for 1 minute<br><br>Not applicable<br>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<br>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<br>10, 50, and 100 ohm copper<br>100 and 120 ohm nickel<br>604 ohms nickel/iron |
| Resistance ranges                    | 0 to 500 ohms<br>0 to 3000 ohms                                                                                |
| Accuracy, at 25° C                   | +/-0.15% on resistance measurement<br>+/-0.15% on RTD (temperature) measurement                                |
| Temperature sensitivity (0° to 60°C) | +/-0.004% of reading,<br>+/-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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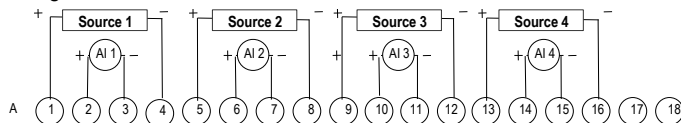
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## Field Wiring Terminals

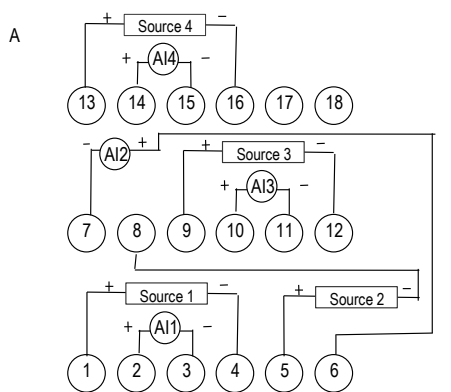
Terminal assignments for the module are shown below.

| 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

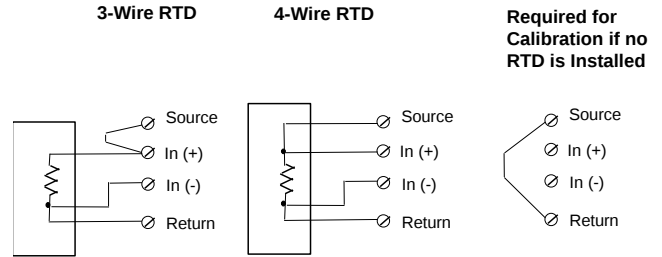


### Wiring Connections for Carriers with Three Rows of Terminals



## 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<br>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<br>BXIOAIRTD4-FD  | October 2008   | Updated Power Supply OK signal circuitry.                                                                          |
| IC200ALG620- ED<br>BXIOAIRTD4-ED | September 2007 | Firmware release 1.20. Improved I/O scanning.                                                                      |
| IC200ALG620- EC<br>BXIOAIRTD4-EC | September 2006 | Improved accuracy tolerance in 3-wire mode.                                                                        |
| IC200ALG620- DC<br>BXIOAIRTD4-DC | April 2005     | Firmware release 1.11 RTD lead resistance changed to 50 Ohms.                                                      |
| IC200ALG620- DB<br>BXIOAIRTD4-DB | April 2005     | Plastic change on locking mechanism                                                                                |
| IC200ALG620- CB<br>BXIOAIRTD4-CB | August 2004    | Firmware release 1.1. 50Hz setting does not cause error code.                                                      |
| IC200ALG620-CA<br>BXIOAIRTD4-CA  | April 2004     | Changed to V0 plastic for module housing.                                                                          |
| IC200ALG620-BA<br>BXIOAIRTD4-BA  | January 2004   | ATEX approval for Group 2 Category 3 applications.                                                                 |
| IC200ALG620-AA<br>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-68         |
| 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         |