

Non-Isolated Analog Input Modules with HART Communications

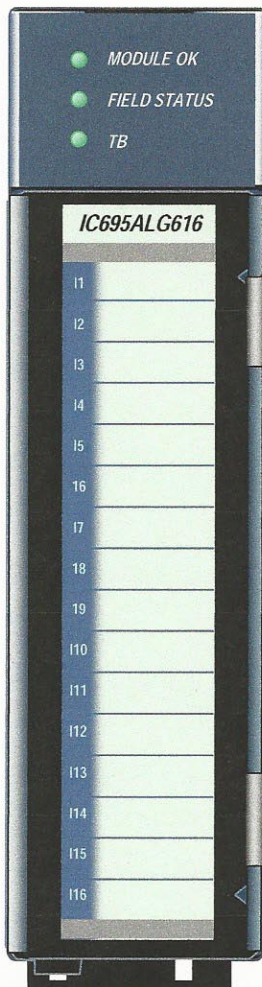
IC695ALG626, IC695ALG628

Non-Isolated Analog Input Modules

IC695ALG608, IC695ALG616

GFK-2372F

July 2010



Non-Isolated Differential Analog Voltage/Current Input module IC695ALG608 and **Non-Isolated Differential Analog Voltage/Current Input** module IC695ALG628 provide eight single-ended or four differential input channels. Module IC695ALG628 also features HART version 5.0 communications capability on each channel.

Non-Isolated Differential Analog Voltage/Current Input module IC695ALG616, shown at left, and **Non-Isolated Differential Analog Voltage/Current Input** module IC695ALG626 provide 16 single-ended or 8 differential input channels. Module IC695ALG626 also features HART version 5.0 communications capability on each channel.

Analog input channels can be configured for these ranges:

- Current: 0 to 20mA, 4 to 20mA, +/- 20mA
- Voltage: +/- 10V, 0 to 10V, +/- 5V, 0 to 5V, 1 to 5V.

On modules IC695ALG626 and ALG628, channels that will use HART communications must be configured for the 4-20mA range.

These modules must be located in an RX3i Universal Backplane. Modules IC695ALG608 and IC695ALG616 require an RX3i CPU with firmware version 3.0 or later. Modules IC695ALG626 and IC695ALG628 require an RX3i CPU with firmware version 3.5 or later. Machine Edition Version 5.0 SP3 Logic Developer-PLC or later must be used for configuration.

These modules can be used with a Box-style (IC694TBB032), Extended Box-style (IC694TBB132), Spring-style (IC694TBS032), or Extended Spring-style (IC694TBS132) Terminal Block. Extended terminal blocks provide the extra shroud depth needed for shielded wiring. See the *PACSystems RX3i System Manual*, GFK-2314 revision B or later for more information about Terminal Blocks. Terminal Blocks are ordered separately.

Module Features

- Completely software-configurable, no module jumpers to set
- Full autocalibration
- On-board error-checking
- Open-circuit detection for all voltage and 4-20mA inputs
- Configurable scaling and offsets per channel
- High alarm, low alarm, high-high alarm, low-low alarm detection and reporting selectable per channel
- Module fault reporting
- Supports diagnostic point fault contacts in the logic program
- Flash memory for future upgrades
- Positive and negative Rate of Change Alarms
- Autocalibration at startup
- Configurable interrupts for channel alarms and faults
- Terminal Block insertion or removal detection
- Version 5.0 HART communications on modules IC695ALG626 and IC695ALG628.

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Release Information

Release History

Version	Revision	Description
IC695ALG608-EA, IC695ALG616-EA, IC695ALG626-EA, IC695ALG628-EA	1.01	Label change only. No change in functionality, performance or compatibility.
IC695ALG608-DA, IC695ALG616-DA, IC695ALG626-DA, IC695ALG628-DA	1.01	Modified the terminal block detector switch to increase the size of the switch lever. The increased size of the switch lever allows additional tolerance to assure contact with the terminal block actuator.
IC695ALG608-CA, IC695ALG616-CA, IC695ALG626-CA, IC695ALG628-CA	1.01	Updated Hardware
IC695ALG608-BA, IC695ALG616-BA, IC695ALG626-BA, IC695ALG628-BA	1.01	Updated Hardware
IC695ALG608-AA, IC695ALG616-AA, IC695ALG626-AA, IC695ALG628-AA	1.01	Initial Release

Known Restrictions and Open Issues for Modules IC695ALG608 and IC695ALG616

1. Problem: The module should generate a Loss of Terminal Block fault if its terminal block is not present or not properly locked when the module is hot-inserted and power-cycled. When the module is operating with its first configuration, it generates the Loss of Terminal Block fault properly. However, after the module is reconfigured, it does not.

Recommendation: To restore operation of this fault message you can:

- A. Clear the hardware configuration from the PLC's memory then download a new configuration.
- B. Power cycle the PLC without a battery and configure the module.

2. Problem: Using a SVC_REQ 24 to reset an ALG608 or ALG616 module causes the module to lose its configuration and become inoperable.

Recommendations: To restore the configuration and resume module operation, reset or power cycle the module.

To prevent problems, use SVC_REQ 24 only as a one-shot and wait at least 5 seconds between re-execution of a SVC_REQ 24 reset request to the same module.

Operating Note

These modules have separate enable/disable options for Diagnostic Reporting and Interrupts. Normally, disabling a diagnostic (such as Low/High Alarm or Over/Under range) in the configuration means that its diagnostic bit is never set. However, if interrupts are enabled for a condition and that interrupt occurs, the diagnostic bit for that condition is also set during the same PLC scan. The next PLC input scan always clears this interrupt status bit back to 0, because Diagnostic Reporting has it disabled.

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Specifications

Input Ranges	Current: 0 to 20mA, 4 to 20mA, +/- 20mA Voltage: +/- 10V, 0 to 10V, +/- 5V, 0 to 5V, 1 to 5V		
Backplane Power Requirements	ALG608: 330 mA maximum @ 5.0V +5% / -2.5%, 600 mA maximum @ 3.3V +5% / -3% ALG616: 450 mA maximum @ 5.0V +5% / -2.5%, 600 mA maximum @ 3.3V +5% / -3% ALG626: 600mA maximum @ 5.0V +5% / -2.5%, 625 mA maximum @ 3.3V +5% / -3% ALG628: 450 mA maximum @ 5.0V +5% / -2.5%, 625 mA maximum @ 3.3V +5% / -3%		
CPU Version	PACSystems RX3i CPU required. ALG608 and ALG616: CPU firmware version 3.0 and later ALG626 and ALG628: CPU firmware version 3.5 and later		
Programmer Version	ALG608 and ALG616: Machine Edition version 5.0 SP3 and later ALG626 and ALG628: Machine Edition version 5.5 and later		
Power Dissipation within Module	IC695ALG608: 4.83 watts maximum; IC695ALG616: 6.48 watts maximum IC695ALG626: 7.35 watts maximum; IC695ALG628: 5.55 watts maximum		
Thermal Derating	IC695ALG608 and ALG616: no derating IC695ALG626 and ALG628: please refer to the <i>RX3i System Manual</i> , GFK-2314C or later for information.		
Resolution	24 bit ADC converted to Floating Point or Integer		
Input Data Format	Configurable as floating point IEEE 32 bit or 16-bit integer in a 32-bit field		
Filter Options	8Hz, 12Hz, 16Hz, 40Hz, 200Hz, 500Hz		
HART Communications	Version 5.0 HART protocol supported on modules IC695ALG626 and IC695ALG628.		
Input Impedance	>100 Kohm voltage inputs		
Current Input Resistance	249 ohms +/- 1%		
Open Circuit Detection time	1 second maximum		
Overvoltage	+/-60 VDC continuous, maximum		
Overcurrent	+/-28mA continuous, maximum		
Normal Mode Noise Rejection in dB		<i>At 50Hz</i>	<i>At 60Hz</i>
	8 Hz filter	103	97
	12 Hz filter	94	89
	16 Hz filter	39	65
	40 Hz filter	4	7
	200 Hz filter	0.1	0.2
	500 Hz	0.0	0.0
Common Mode Noise Rejection	120dB minimum @ 50/60 Hz with 8 Hz filter 110dB minimum @ 50/60 Hz with 12 Hz filter		
Channel-Channel DC Crosstalk	-80 dB minimum (single ended mode) -80 dB minimum (differential mode, grounded common) -60 dB minimum (differential mode, floating common)		
Isolation Voltage terminal block to backplane/chassis	Opto-isolated, transformer isolated 250 VAC continuous/1500 VAC for 1 minute		

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Specifications, continued

Analog Module Scan Time (in milliseconds)	The module scan for analog signals can consist of up to four acquisition cycles. Each cycle includes a specific set of channels. Total Scan Time depends on the number of acquisition cycles in the scan, the configured filter option, and whether channels are analog or HART.							
	Configured Filter	Number of Acquisition Cycles in the Scan						
	1		2		3		4	
	<i>Analog</i>	<i>HART</i>	<i>Analog</i>	<i>HART</i>	<i>Analog</i>	<i>HART</i>	<i>Analog</i>	<i>HART</i>
8 Hz filter	121	128	241	254	362	380	482	506
12 Hz filter	81	88	161	174	242	260	322	346
16 Hz filter	61	68	121	134	182	200	242	266
40 Hz filter	21	28	41	54	62	80	82	106
200 Hz filter	5	12	9	22	14	32	18	42
500 Hz filter <i>[with filtering and rate detection disabled]</i>	3	N/A	5 <i>[6]</i>	N/A	7 <i>[9]</i>	N/A	9 <i>[12]</i>	N/A
HART Data Scan Time (in seconds)	The HART data scan can consist of up to four acquisition cycles (similar but asynchronous to the analog scan time). Each cycle includes a specific set of channels. Total HART scan time depends on the number of channels enabled for HART within a specific set of channels, number of retries, enabling/disabling of slot variables, and use and configuration settings of pass-thru commands.							
	Channels in Group Enabled for HART:				Each HART Data channel updates every:			
	One				0.7 second (typical)			
	Two				1.9 seconds (typical)			
	Three				3.0 seconds (typical)			
Four				4.0 seconds (typical)				
Calibrated Accuracy In the presence of severe RF interference (IC 801-3, 10V/M), accuracy may be degraded by 1.5% of range.	From 13°C – 33°C: +/- 5V, +/- 10V, +/- 20 mA: 0.05% of range. 0 to 10V, 0 to 5V, 1 to 5V, 0 to 20 mA: 0.1% of range. 4 to 20 mA: 0.125% of range							
	From 0°C – 60°C: 0 to 10V, 0 to 5V, 1 to 5V, 0.2% of range. 0 to 20 mA: 0.25% of range. 4 to 20 mA: 0.3125% of range. +/- 5V, +/- 10V: 0.1% +/- 20 mA: 0.125% of range							
Calibration Interval	12 months typical to meet accuracy specifications over time. Offset can be applied as a periodic calibration adjustment.							

Installation in Hazardous Locations

- EQUIPMENT LABELED WITH REFERENCE TO CLASS I, GROUPS A, B, C & D, DIV. 2 HAZARDOUS LOCATIONS IS SUITABLE FOR USE IN CLASS I, DIVISION 2, GROUPS A, B, C, D OR NON-HAZARDOUS LOCATIONS ONLY
- 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; AND
- WARNING - EXPLOSION HAZARD - DO NOT CONNECT OR DISCONNECT EQUIPMENT UNLESS POWER HAS BEEN SWITCHED OFF OR THE AREA IS KNOWN TO BE NONHAZARDOUS.

LEDs

The **Module OK** LED indicates module status. The **Field Status** LED indicates the presence of a fault on at least one channel or a terminal block error. The **TB (Terminal Block)** LED indicates the presence or absence of the terminal block. LEDs are powered from the backplane power bus.

LED	Indicates
Module OK	ON Green: Module OK and configured. Slow Flashing Green or Amber: Module OK but not configured. Quick Flashing Green: Error. OFF: Module is defective or no backplane power present
Field Status	ON Green: No faults on any enabled channel, and Terminal Block is present. ON Yellow: Fault on at least one channel. OFF: Terminal block not present or not fully seated.
TB	ON Red: Terminal block not present or not fully seated. ON Green: Terminal block is present. OFF: No backplane power to module.

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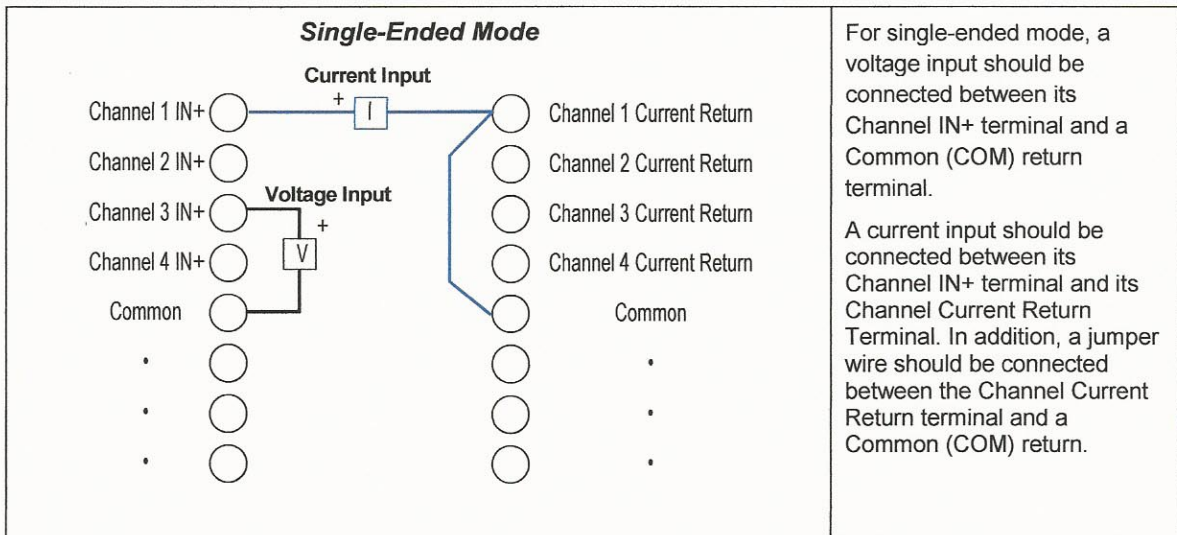
Field Wiring, Single-Ended Mode

The table below lists wiring connections for Non-Isolated Analog Input Modules in Single-ended mode. Single-ended mode is the configured default operating mode.

Terminal	8 Channel Modules	16 Channel Modules	8 Channel Modules	16 Channel Modules	Terminal
1	Channel 1 IN+		Channel 1 Current Return (IRTN1)		19
2	Channel 2 IN+		Channel 2 Current Return (IRTN2)		20
3	Channel 3 IN+		Channel 3 Current Return (IRTN3)		21
4	Channel 4 IN+		Channel 4 Current Return (IRTN4)		22
5	Common		Common		23
6	Channel 5 IN+		Channel 5 Current Return (IRTN5)		24
7	Channel 6 IN+		Channel 6 Current Return (IRTN6)		25
8	Channel 7 IN+		Channel 7 Current Return (IRTN7)		26
9	Channel 8 IN+		Channel 8 Current Return (IRTN8)		27
10	No Connection	Channel 9 IN+	No Connection	Channel 9 Current Return (IRTN9)	28
11	No Connection	Channel 10 IN+	No Connection	Channel 10 Current Return (IRTN10)	29
12	No Connection	Channel 11 IN+	No Connection	Channel 11 Current Return (IRTN11)	30
13	No Connection	Channel 12 IN+	No Connection	Channel 12 Current Return (IRTN12)	31
14	Common		Common		32
15	No Connection	Channel 13 IN+	No Connection	Channel 13 Current Return (IRTN13)	33
16	No Connection	Channel 14 IN+	No Connection	Channel 14 Current Return (IRTN14)	34
17	No Connection	Channel 15 IN+	No Connection	Channel 15 Current Return (IRTN15)	35
18	No Connection	Channel 16 IN+	No Connection	Channel 16 Current Return (IRTN16)	36

There are no shield terminals on these modules. For shielding, tie cable shields to the ground bar along the bottom of the backplane. M3 tapped holes are provided in the ground bar for this purpose.

All the common terminals are connected together internally, so any common terminal can be used for the negative lead of the external power supply.



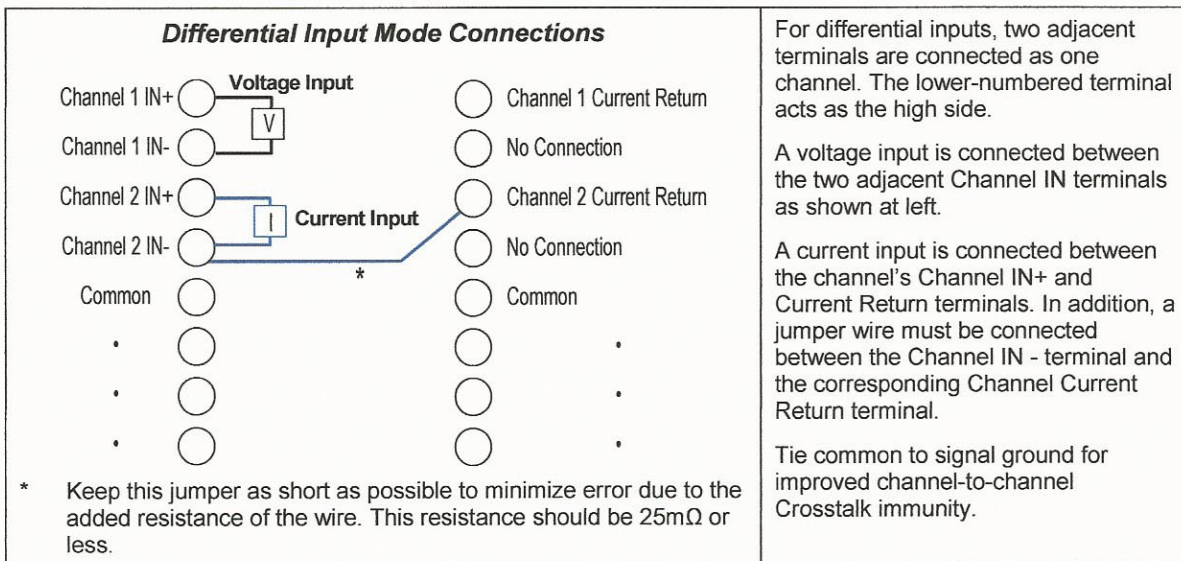
Field Wiring, Differential Mode

The table below lists wiring connections for Non-Isolated Analog Input Modules configured for Differential mode.

Terminal	8 Channel Modules	16 Channel Modules	8 Channel Modules	16 Channel Modules	Terminal
1	Channel 1 IN+		Channel 1 Current Return (IRTN1)		19
2	Channel 1 IN -		No Connection		20
3	Channel 2 IN+		Channel 2 Current Return (IRTN3)		21
4	Channel 2 IN -		No Connection		22
5	Common		Common		23
6	Channel 3 IN+		Channel 3 Current Return (IRTN5)		24
7	Channel 3 IN-		No Connection		25
8	Channel 4 IN+		Channel 4 Current Return (IRTN7)		26
9	Channel 4 IN-		No Connection		27
10	No Connection	Channel 5 IN+	No Connection	Channel 5 Current Return (IRTN9)	28
11	No Connection	Channel 5 IN-	No Connection	No Connection	29
12	No Connection	Channel 6 IN+	No Connection	Channel 6 Current Return (IRTN11)	30
13	No Connection	Channel 6 IN-	No Connection	No Connection	31
14	Common		Common		32
15	No Connection	Channel 7 IN+	No Connection	Channel 7 Current Return (IRTN13)	33
16	No Connection	Channel 7 IN-	No Connection	No Connection	34
17	No Connection	Channel 8 IN+	No Connection	Channel 8 Current Return (IRTN15)	35
18	No Connection	Channel 8 IN-	No Connection	No Connection	36

There are no shield terminals on these modules. For shielding, tie cable shields to the ground bar along the bottom of the backplane. M3 tapped holes are provided in the ground bar for this purpose.

All the common terminals are connected together internally, so any common terminal can be used for the negative lead of the external power supply.



Two door cards are provided with the module: one shows connections for single-ended mode and the other shows connections for differential mode. Insert the card that matches the wiring that will be used.