

MANUFACTURER DOCUMENT PACKAGE

Manufacturer's Manual

Reference package for procurement and maintenance review

GE PACSYSTEMS RX3i

IC695ALG626

16-CHANNEL HART INPUT MODULE

Used with the applicable PACSystems RX3i analog I/O configuration.

REFERENCE PACKAGE

OFFICIAL DOCUMENT

Selected official manufacturer pages follow this cover.

Source: IC694ALG390C.pdf

Analog Input Module 8-/4-Channel Current/Voltage with HART: IC695ALG628

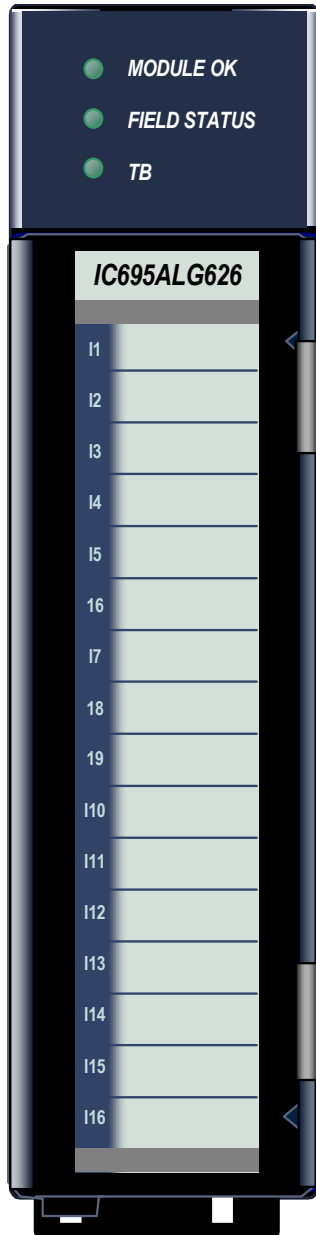


Figure 312: IC695ALG626

Non-Isolated Differential Analog Current/Voltage Input module, IC695ALG628, provides 8 single-ended or 4 differential input channels. Non-Isolated Differential Analog Current/Voltage Input module, IC695ALG626, provides 16 single-ended or 8 differential input channels. Both modules feature HART version 5.0 communications capability on each channel. Module IC695ALG626 has four internal HART modems. Module IC695ALG628 has two internal HART modems. In single-ended mode, four single-ended channels are multiplexed into each HART modem. In differential mode, two differential channels are multiplexed into each HART modem.

Analog input channels can be configured for these ranges:

- Current: 0 to 20mA, 4 to 20mA, ± 20 mA
- Voltage: ± 10 Vdc, 0 to 10 Vdc, ± 5 Vdc, 0 to 5Vdc, 1 Vdc to 5Vdc.

Channels that will use HART communications must be configured for the 4-20mA range.

11.2.1 Features

- Completely software-configurable, no module jumpers to set
- Full auto-calibration
- 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
- Auto-calibration at startup
- Configurable interrupts for channel alarms and faults
- Terminal Block insertion or removal detection
- Version 5.0 HART communications
- These modules must be located in an RX3i Universal Backplane.
- Modules support insertion into and removal from an RX3i Universal Backplane which is under power. Refer to *Hot Insertion and Removal*, Section 2.6.4.1.

The 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. Terminal Blocks are ordered separately.

11.2.2 Specifications: ALG626 and ALG628

Input Ranges	Current: 0 to 20mA, 4 to 20mA, ±20mA Voltage: ±10 Vdc, 0 to 10 Vdc, ±5Vdc, 0 to 5Vdc, 1Vdc to 5Vdc								
Backplane Power Requirements	Module	FB & later		EA & earlier		Specification			
	ALG626	400 200		600 625		mA maximum at 5.0V +5% / - 2.5% mA maximum at 3.3V +5% / - 3%			
	ALG628	260 200		450 625		mA maximum at 5.0V +5% / - 2.5% mA maximum at 3.3V +5% / - 3%			
Power Dissipation within Module	Module	FB & later		EA & earlier		Specification			
	ALG626	4.50		7.35		Watts maximum			
	ALG628	2.83		5.55		Watts maximum			
Thermal De-rating	Module IC695ALG628 has no thermal derating. Module IC695ALG626 has no thermal derating in voltage mode. Thermal derating for IC695ALG626 in current mode is shown in Figure 313.								
Resolution	Refer to <i>Resolution and Range Type</i> table below.								
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								
Analog Module Scan Time (ms)	The module scan can consist of up to four acquisition cycles. Each cycle includes a specific set of channels, as described in the <i>Channel Scanning</i> section below. Total Scan Time depends on the number of acquisition cycles in the scan, the configured filter option, and whether the channels are analog or HART.								
Configured Filter	Number of Acquisition Cycles in the Scan								
	1		2		3		4		
	Analog	HART	Analog	HART	Analog	HART	Analog	HART	
	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	3	N/A	5	N/A	7	N/A	9	N/A
	500 Hz filter with rate detection enabled	N/A	N/A	6	N/A	9	N/A	12	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: for ALG626 single ended: channels 1-4, 5-8, 9-12, 13-16 are separate channel groups for ALG626 differential: channels 1-2, 3-4, 5-6, 7-8 are separate channel groups. for ALG628 single ended: channels 1-4, 5-8 are separate channel groups. for ALG628 differential: channels 1-2, 3-4 are separate channel groups. Note: If you have only four Hart Devices on an ALG626 module, to minimize update times it is best to connect them to channels 1, 5, 9, and 13 so you only have one Hart-enabled channel per channel group. Total HART scan time depends on the number of acquisition cycles in the scan, number of retries, enabling/disabling of slot variables, and use of Pass-Through commands. If slot variables are enabled, update times are doubled.		
	# Channels in Group Enabled for HART:	Each HART Data Channel updates every:	
	1	0.7 second (typical)	
	2	1.9 seconds (typical)	
	3	3.0 seconds (typical)	
	4	4.0 seconds (typical)	
Input Impedance	>100kΩ voltage inputs		
Current Input Resistance	249Ω ±1%		
Open Circuit Detection time	1 second maximum		
Over-voltage	±60 Vdc continuous, maximum		
Overcurrent	±28mA continuous, maximum		
Normal Mode Noise Rejection in dB		At 50Hz	At 60Hz
	8 Hz filter	85	85
	12 Hz filter	85	85
	16 Hz filter	35	62
	40 Hz filter	3	6
	200 Hz filter	0	0
	500 Hz	0	0
Common Mode Noise Rejection	120dB minimum at 50/60 Hz with 8 Hz filter 110dB minimum at 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)		
Calibrated Accuracy ⁶⁷ at 13°C – 33°C with 8 Hz, 12 Hz and 16 Hz filter	±5Vdc, ±10 Vdc, ±20mA		0.05% of range
	0 to 10 Vdc, 0 to 5Vdc, 1Vdc to 5Vdc, 0 to 20mA		0.1% of range
	4 to 20mA		0.125% of range
Calibrated Accuracy ⁶⁷ at 0°C – 60°C with 8 Hz, 12 Hz and 16 Hz filter	0 to 10 Vdc, 0 to 5Vdc, 1Vdc to 5Vdc		0.2% of range
	0 to 20mA		0.25% of range.

⁶⁷ In the presence of severe RF interference (IC 801-3, 10V/m), accuracy may be degraded to $\pm$ 1% FS.

	4 to 20mA	0.3125% of range
	±5Vdc, ±10 Vdc	0.1% of range
	±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.	
Isolation Voltage terminal block to backplane/chassis	Opto-isolated, transformer isolated 250 Vac continuous/1500 Vdc for 1 minute	

For product standards and general specifications, refer to *Appendix A*.

11.2.2.1 Thermal Derating: ALG626 Current Mode

For module IC695ALG626 in current mode, the number of inputs that can be on at the same time depends on the ambient temperature as displayed in Figure 313.

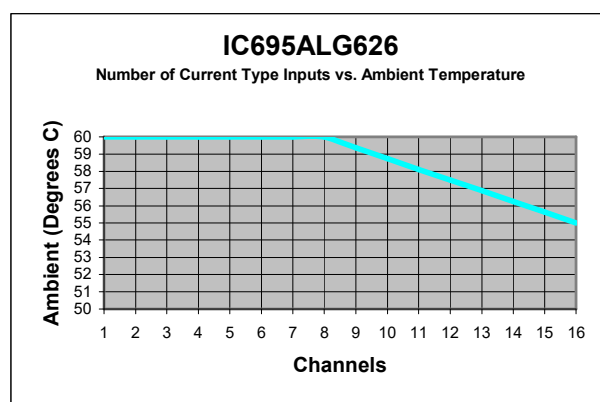


Figure 313: Thermal Derating ALG626 Current Mode

11.2.2.2 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	State	Indicates
Module OK	ON Green	Module OK and configured
	Green or Amber, blinking slowly	Error
	Green, blinking rapidly	Module OK but not configured

11.2.4.1 Channel Value Reference Data: ALG626 and ALG628

The module reports its input channel data in its configured *Channel Value Reference* input words, beginning at its assigned Channel Value Reference Address. Each channel value occupies 2 words, whether the channel is used or not:

Channel Value Reference Address	Contains this Input
+0, 1	Channel 1
+2, 3	Channel 2
+4, 5	Channel 3
+6, 7	Channel 4
+8, 9	Channel 5
+10, 11	Channel 6
+12, 13	Channel 7
+14, 15	Channel 8

For Module IC695ALG626 Only:

+16, 17	Channel 9
+18, 19	Channel 10
+20, 21	Channel 11
+22, 23	Channel 12
+24, 25	Channel 13
+26, 27	Channel 14
+28, 29	Channel 15
+30, 31	Channel 16

Depending on its configured Channel Value Format, each enabled channel reports a 32-bit floating-point or 16-bit integer value to the CPU.

In the 16-bit integer mode, the low word of the 32-bit channel data area contains the 16-bit integer channel value. The high word (upper 16-bits) of the 32-bit value is set with the sign extension of the 16-bit integer. This sign-extended upper word allows the 16-bit integer to be read as a 32-bit integer type in logic without losing the sign of the integer. If the 16-bit integer result is negative, the upper word in the 32-bit channel data has the value 0xFFFF. If the 16-bit integer result is positive, the upper word is 0x0000.

11.2.4.1.1 Resolution and Range Type

The actual resolution for each input depends on the Range Type and A/D Filter Frequency configured for that channel. At higher Filter Frequencies, input resolution decreases. The approximate resolution in bits for each Filter Frequency and Range Type are displayed in the following table.

Filter Frequency	Range Type		
	± 10 Vdc	0 to 10 Vdc, ± 5 Vdc, ± 20 Vdc	0 to 5Vdc, 1Vdc to 5Vdc, 0 to 20mA, 4 to 20mA
8 Hz	18	17	16
12 Hz	17	16	15
16 Hz	17	16	15
40 Hz	16	15	14
200 Hz	15	14	13
500 Hz	14	13	12

11.2.4.1.2 Channel Scanning

These modules use 4 A/D converters to achieve the fastest possible channel scan times. The module has up to four acquisition cycles for each module scan. The acquisition cycles and channels acquired during each cycle are:

Acquisition Cycle	Channels Acquired	
	IC695ALG628	IC695ALG626
1	1, 5	1, 5, 9, 13
2	2, 6	2, 6, 10, 14
3	3, 7	3, 7, 11, 15
4	4, 8	4, 8, 12, 16

To bypass an acquisition cycle, all channels that would be acquired during that cycle must be disabled.

For fastest scan times, always wire by acquisition cycle. For example, if only eight channels were used on the 16-channel module, IC695ALG626, channels 1, 2, 5, 6, 9, 10, 13, and 14 should be used for optimum performance.

11.2.4.2 Input Channel Diagnostic Reference Data: ALG626 and ALG628

If the module is configured to use a *Diagnostic Reference Address*, it reports channel diagnostics status data to the CPU. The CPU stores this data at the *Diagnostic Reference Address* configured for this module. Use of this feature is optional.

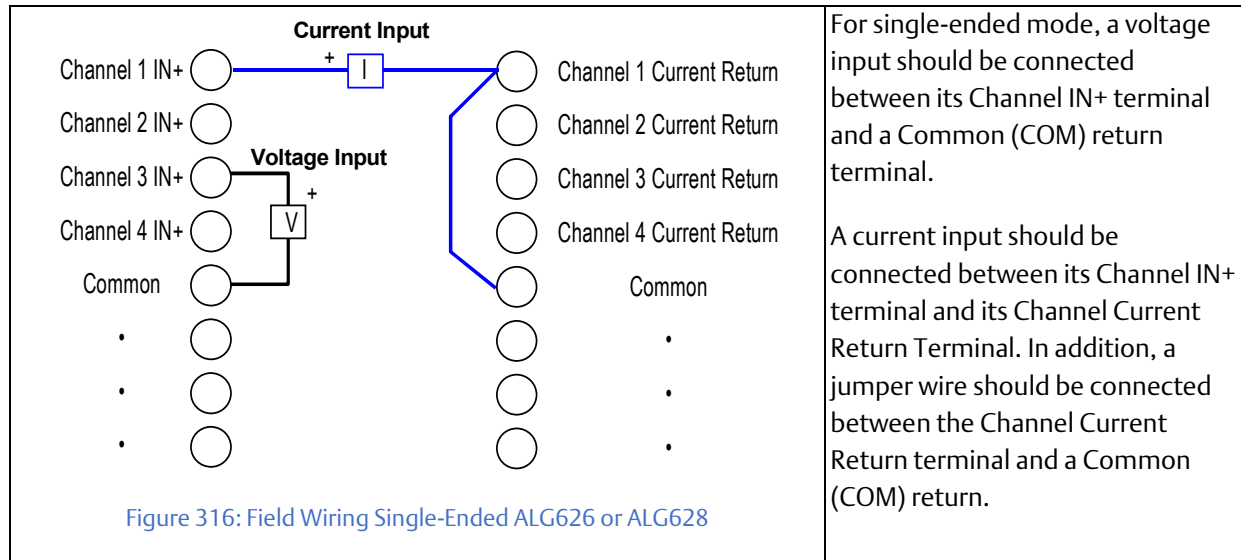
The diagnostics data for each channel occupies 2 words (whether the channel is used or not):

Diagnostic Reference Address	Contains Diagnostics Data for:
+0, 1	Channel 1
+2, 3	Channel 2
+4, 5	Channel 3
+6, 7	Channel 4
+8, 9	Channel 5
+10, 11	Channel 6
+12, 13	Channel 7
+14, 15	Channel 8

For Module IC695ALG626 Only:

+16, 17	Channel 9
+18, 19	Channel 10
+20, 21	Channel 11
+22, 23	Channel 12
+24, 25	Channel 13
+26, 27	Channel 14
+28, 29	Channel 15
+30, 31	Channel 16

When a diagnostic bit equals 1, the alarm or fault condition is present on the channel. When a bit equals 0 the alarm or fault condition is either not present or detection is not enabled in the configuration for that channel. For each channel, the format of this data is:



11.2.6 Field Wiring: IC695ALG626 and ALG628, Differential Mode

The following table lists wiring connections for modules configured for Differential mode.

Terminal	ALG628	ALG626	ALG628	ALG626	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		29
12	No Connection	Channel 6 IN+	No Connection	Channel 6 Current Return (IRTN11)	30
13	No Connection	Channel 6 IN-	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		34
17	No Connection	Channel 8 IN+	No Connection	Channel 8 Current Return (IRTN15)	35
18	No Connection	Channel 8 IN-	No Connection		36