IMPORTANT PRODUCT INFORMATION

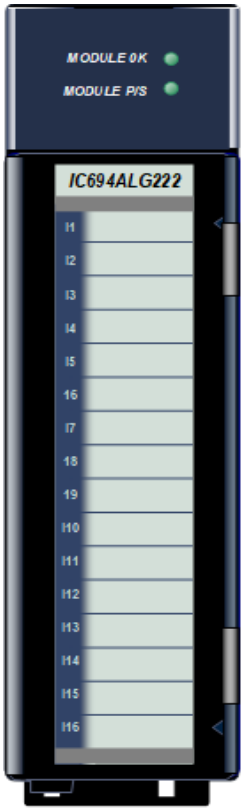
GFK-2654E

Dec 2020

PACSystems™ RX3i

ANALOG VOLTAGE INPUT MODULE

(IC694ALG222)



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Warning Notes as Used in this Publication

Warning

Warning notices are used in this publication to emphasize that hazardous voltages, currents, temperatures, or other conditions that could cause personal injury to exist in this equipment or may be associated with its use.
In situations where inattention could cause either personal injury or damage to equipment, a Warning notice is used.

Notes: Notes merely call attention to information that is especially significant to understanding and operating the equipment.

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Introduction

The PACSystems RX3i/Series 90, 16-Channel Analog Voltage Input module provides 16 single-ended or 8 differential input channels.

Each channel can be configured using the configuration software for either of two input ranges:

- 0 to 10 V (unipolar), default
- -10 to +10 V (bipolar)

High and Low alarm limits can be configured for both ranges.

This module can be installed in any I/O slot that has a serial connector in an RX3i or Series 90 30 system.

Isolated +24 VDC Power

If the module is in an RX3i Universal Backplane, an external source of Isolated +24 VDC is required to provide power for the module. The external source must be connected via the TB1 connector on the left side of the backplane.

If this module is in an Expansion Backplane or Series 90-30 backplane, the backplane's power supply provides the Isolated +24 VDC for the module.

LEDs

The MODULE OK LED provides module status information on powerup:

- ON: status is OK, module configured
- OFF: no backplane power or software not running (watchdog timer timed out)
- Continuous rapid blinking: configuration data not received from CPU
- Slow blinking, then OFF: failed power–up diagnostics or encountered code execution error

The Module P/S LED indicates that the module's internally-generated +5 VDC supply is above a minimum designated level.

Specifications: ALG222

Specification	Description
Number of Channels	1 to 16 selectable, single-ended 1 to 8 selectable, differential
Input Voltage Ranges	0 V to +10 V (unipolar) or -10 V to +10 V (bipolar); selectable each channel
Calibration	Factory calibrated to: 2.5 mV per count on 0 V to +10 V (unipolar) range 5 mV per count on -10 to +10 V (bipolar) range
Update Rate	Single Ended Input Update Rate: 5ms Differential Input Update Rate: 2ms
Resolution at 0V to +10V	2.5 mV (1 LSB = 2.5 mV)
Resolution at -10V to +10V	5 mV (1 LSB = 5 mV)
Absolute Accuracy [1, 2]	±0.25% of full scale @ 25°C (77°F) ±0.5% of full scale over specified operating temperature range
Linearity	< 1 LSB

Specification	Description
Isolation, Field to Backplane (optical) and to frame ground	250VAC continuous; 1500 VAC for 1 minute
Common Mode Voltage (Differential)[3]	±11 V (bipolar range)
Cross-Channel Rejection	> 70dB from DC to 1 kHz
Input Impedance	>500K Ohms (single-ended mode) >1 Megohm (differential mode)
Input Filter Response	23 Hz (single-ended mode) 57 Hz (differential mode)
Internal Power Consumption	112 mA (maximum) from the backplane +5 VDC bus 110 mA (maximum) from the backplane isolated +24 VDC supply

1. In the presence of severe Radiated RF interference (IEC 61000-4-3, 10V/m), accuracy may be degraded to ±5% of full scale.
2. In the presence of severe Conducted RF interference (IEC 61000-4-6, 10Vrms), accuracy may be degraded to ±1% of full scale.
3. The sum of the differential input, common-mode voltage, and noise must not exceed ±11 volts when referenced to COM.

Refer to the applicable manual for product standards, general operating specifications, and installation requirements:

Series 90-30 systems: Installation Requirements for Conformance to Standards, GFK-1179

PACSystems RX3i System Manual, GFK-2314.

ALG222 Configuration

Configurable parameters for the ALG222 module are described below.

Module Settings

Parameter	Choices	Description
Active Channels	1 to 16 for Single-ended mode, or 1 to 8 for Differential mode	The number of channels to be scanned. Channels are scanned in sequential, contiguous order.
Mode	Single-ended (default), or Differential	In Single-ended mode, there are 16 inputs referenced to a single common. In Differential mode, each of the 8 inputs has its own signal and common.
Channel Value Reference Address	Valid memory type: %AI	The starting address for input data from the module.
Channel Value Reference Length	Read-only.	Each channel provides 16 bits (1 word) of analog input data to the Controller CPU.
Module Status Reference Address	Valid memory type: %I	The starting address for status information from the module.
Module Status Reference Length	0, 8, 16, 24, 32, 40	The number of status bits (0 to 40) reported to the Controller. When set to 0, status reporting is disabled. To enable status reporting, set this parameter to a value other than 0. Data formats are shown on page 5.
I/O Scan Set	1 through 32	Assigns the module to an I/O Scan Set defined in the CPU configuration

Input Channel Data

Parameter	Choices	Description
Voltage	0 to 10 V (default) or -10 to 10 V	In the 0 to 10 V default range, input voltage values from 0 to 10 V the module reports 0 to 32,000 integer values to the CPU. In the -10 to 10 V range, input voltage values from -10 to 10 V, the module report s-32000 to 32,000 integer values to the CPU.
Alarm Low (Engineering Units)	0 to 10 V Range = 0 to 32760 -10 to 10 V Range = -32767 to 32752	Each channel can be assigned a low alarm limit alarm. Values entered without a sign are assumed to be positive. Be sure the alarm low values are appropriate for the selected range.
Alarm High (Engineering Units)	0 to 10 V Range = 0 to 32760 -10 to 10 V Range = -32767 to 32752	Each channel can be assigned a high alarm limit. Values entered without a sign are assumed to be positive. Be sure the alarm high values are appropriate for the selected range.

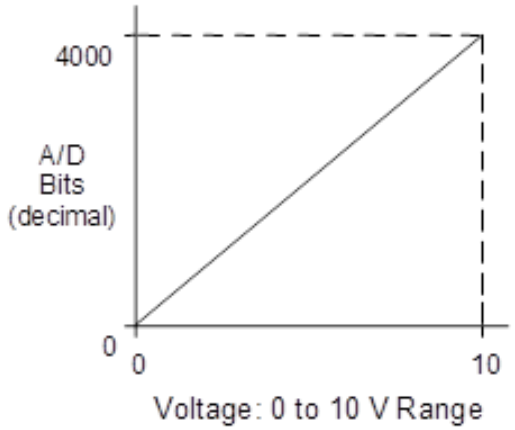
Input Scaling

The default input mode and range is single-ended, unipolar. In 0 to 10V mode, input data is scaled so that 0 volts corresponds to a count of 0 and 10 volts corresponds to a count of +32000.

The bipolar range and mode can be selected by changing the module's configuration parameters. In bipolar mode, -10 V corresponds to a count of -32000, 0 V corresponds to a count of 0, and +10 V corresponds to a count of +32000.

Factory calibration adjusts the analog value per bit (resolution) to a multiple of full scale (2.5 mV per bit for unipolar; 5 mV per bit for bipolar). The data is then scaled with the 4000 counts over the analog range. The data is scaled as shown below.

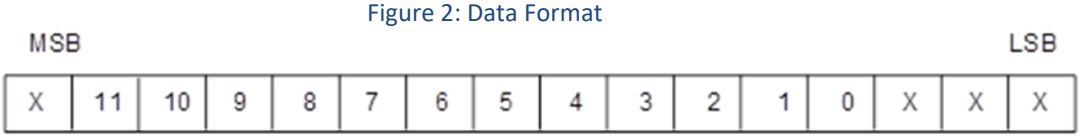
Figure 1: Input Scaling



ALG222 Data Format

The 12-bit resolution module analog input data is stored in the Controller CPU in 16-bit 2's complement format in the unipolar range as shown below.

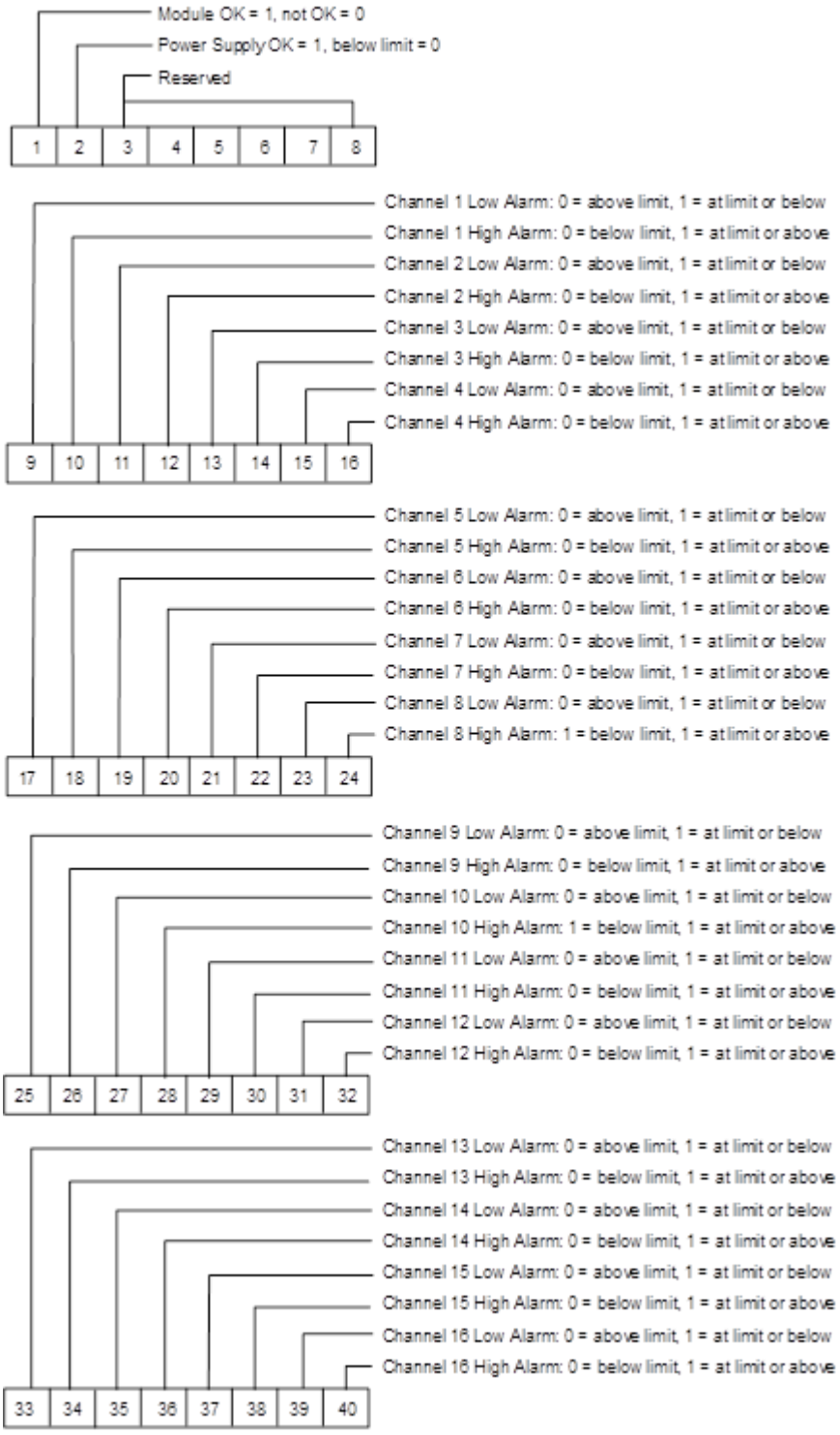
Figure 2: Data Format



ALG222 Status Data

Analog Module ALG222 can be configured to return 8, 16, 24, 32, or 40 status bits to the Controller CPU. This status data provides the following information about module operation:

Figure 3: Data Status

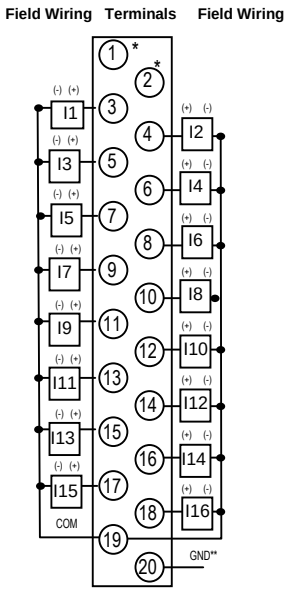


Field Wiring: ALG222

Terminal	Single-ended Mode	Differential Mode
1, 2	not used	
3	Channel 1	Channel 1 +
4	Channel 2	Channel 1 -
5	Channel 3	Channel 2 +
6	Channel 4	Channel 2 -
7	Channel 5	Channel 3 +
8	Channel 6	Channel 3 -
9	Channel 7	Channel 4 +
10	Channel 8	Channel 4 -
11	Channel 9	Channel 5 +
12	Channel 10	Channel 5 -
13	Channel 11	Channel 6 +
14	Channel 12	Channel 6 -
15	Channel 13	Channel 7 +
16	Channel 14	Channel 7 -
17	Channel 15	Channel 8 +
18	Channel 16	Channel 8 -
19	Common	Common
20	Ground	Ground

Connections are shown below for 16-channel single-ended mode and 8-channel differential mode. Single-ended mode is the module's default operating mode. Differential mode must be set up by configuration.

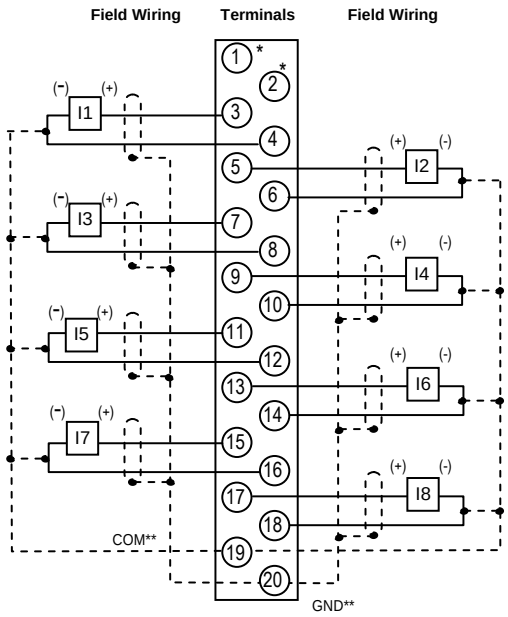
Figure 4: 16-Single Ended Channels



* Not Connected

** Optional Shield Connection

Figure 5: 8-Differential Channels



* Not Connected

** Optional Connections

Release History

Module Version	Firmware Version	Date	Description
IC694ALG222-FC	2.00	Dec 2020	This release addresses the module hardware obsolescence.
IC694ALG222-EB	1.60	Sep 2019	Following Emerson's acquisition of this product, changes have been made to apply appropriate branding and registration of the product with required certification agencies. No changes to material, process, form, fit or functionality.
IC694ALG222-DB IC693ALG222-HB	1.60	May 2012	Resolves several rarely occurring issues that were identified in field and factory testing.
IC694ALG222-CA IC693ALG222-GA	1.10	Feb. 2012	Hardware revision to correct delayed detection of a disconnected input.
IC694ALG222-BA IC693ALG222-FA	1.10	May 2011	Adds ability to perform field upgrades in RX3i targets. Adds display of module serial number, revision and date code in programming software in RX3i targets.

Important Product Information for this Revision

Firmware Upgrades

An upgrade kit containing firmware version 2.00, 41G1485-MS10-000-A3, is available for download at https://www.emerson.com/Industrial-Automation-Controls/support.

Note: *Only ALG222 modules in RX3i racks support firmware upgrades in the field. ALG222 modules in Series 90-30 racks cannot be field upgraded.*

Compatibility

The new version of the ALG222 is fully compatible with earlier versions of the ALG222 module, except the IC694ALG222-BA and IC693ALG222-FA and later versions do not support the Series 90-30 Hand-Held Programmer.

Programmer version requirements	PAC Machine Edition version 6.50 SIM 5 or later is required to configure the ALG222.
CPU requirements	RX3i: All versions of the RX3i CPUs support the ALG222. Series 90-30: The ALG222 is compatible with all versions of CPU models 311 and higher, and NIU004.
Power requirements	The IC694ALG222-BA, IC693ALG222-FA and later versions require more current from the isolated 24 V supply. The new ALG222 requires 110 mA from the isolated 24 V supply. Earlier versions required 41mA from the isolated 24 V supply.
Module firmware upgrade	The module revision IC694ALG222-EB or before cannot be upgraded with the firmware revision 2.00 or later as the firmware is not backward compatible. Similarly, module revision IC694ALG222-FC or later cannot be updated with any firmware revision earlier than 2.00.

Problems Resolved in this Revision

Subject	Description
Loss of I/O fault is logged for analog modules when a Clear All Memory command is sent through the RX3i CPU's serial port.	This release resolves the issue from IC694ALG222-FC, since the firmware is not compatible to revision IC694ALG222-EB or earlier. When the Rx3i CPU has more than three analog modules in a rack, PAC Machine Edition is communicating with serial port and sends a Clear All Memory command, then any module may unexpectedly log a Loss of I/O Module fault. To recover from this issue, power cycle the CPU and download configuration. Or while clearing, do not use Clear All, but select the configuration item checkboxes.

Restrictions and Open Issues

Subject	Description
Loss of I/O fault is logged for analog modules when a Clear All Memory command is sent through the RX3i CPU's serial port.	This is applicable from IC694ALG222-BA to IC694ALG222-EB revisions and IC693ALG222-FA to IC693ALG222-HB revisions. When the Rx3i CPU has more than three analog modules in a rack, PAC Machine Edition is communicating with serial port and sends a Clear All Memory command, then any module may unexpectedly log a Loss of I/O Module fault. To recover from this issue, power cycle the CPU and download configuration. Or while clearing, do not use Clear All, but select the configuration item checkboxes.
Constant Sweep Exceeded fault is logged when ALGxxx modules are in different racks, with at least one ALGxxx in a remote rack.	With the CPU in constant sweep mode, if two or more ALG modules are placed in a system such that one ALG module is in a remote expansion rack and the others are elsewhere in the system –either in the main rack, a local expansion rack, or a remote rack–as soon the hardware configuration is downloaded and the CPU is returned to run mode, the CPU logs a fault stating "Constant sweep exceeded" in the Controller fault table

Operational Notes

Subject	Description
ALG222 requires more current for 24V isolated power supply	IC693ALG222-Fx, IC694ALG222-Bx and later revisions require more current (110mA maximum) from the backplane Isolated +24 VDC supply compared to 41mA specification for earlier versions (IC693ALG222E and earlier revisions & IC694ALG222A). For IC694ALG222-BA, Isolated +24 VDC is supplied by the external power supply. For IC693ALG222-FA, Isolated +24 VDC is supplied by the power supply module on the Series 90-30 rack.
Restrictions on Hot Swap	ALG222 module should not be Hot swapped in any of the Expansion and Remote expansion Rx3i backplane racks. Doing so may damage the module or backplane hardware and disrupt the module operations.

Installation in Hazardous Locations

⚠ WARNING

- 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.
- EXPLOSION HAZARD - SUBSTITUTION OF COMPONENTS MAY IMPAIR SUITABILITY FOR CLASS I, DIVISION 2;
- EXPLOSION HAZARD - WHEN IN HAZARDOUS LOCATIONS, TURN OFF POWER BEFORE REPLACING OR WIRING MODULES; AND
- EXPLOSION HAZARD - DO NOT CONNECT OR DISCONNECT EQUIPMENT UNLESS POWER HAS BEEN SWITCHED OFF OR THE AREA IS KNOWN TO BE NONHAZARDOUS.

Technical Support & Contact Information

Home link: http://www.Emerson.com/Industrial-Automation-Controls

Knowledge Base: https://www.emerson.com/Industrial-Automation-Controls/support

Note: If the product is purchased through an Authorized Channel Partner, please contact the seller directly for any support.

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