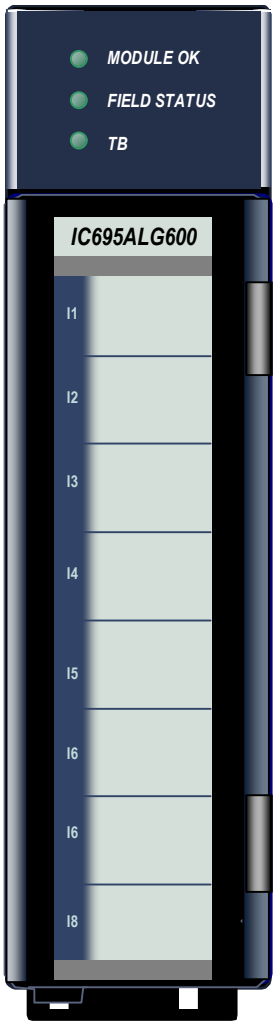
PACSystems™ RX3i

IC695ALG600

Universal Analog Input Module

GFK-2348
October 2004



The Universal Analog Input module IC695ALG600 provides eight general purpose input channels and two Cold Junction Compensation (CJC) channels. Inputs are divided into two equal groups of four. Channels can be individually-configured using the Machine Edition software for:

- Any combination of up to 8 channels of voltage, current, thermocouple, RTD, and resistance inputs.
- Thermocouple Inputs: B, C, E, J, K, N, R, S, T
- RTD Inputs: PT 385 / 3916, N 618 / 672, NiFe 518, CU 426
- Resistance Inputs: 0 to 250 / 500 / 1000 / 2000 / 3000 / 4000 Ohms
- Current: 0–20 mA, 4–20 mA, ±20 mA
- Voltage: ±50mV, ±150 mV, 0–5 V, 1–5 V, 0–10 V, ±10V

Compatibility

This module must be located in an RX3i Universal Backplane.

Programmer: CIMPLICITY® Machine Edition 5.0 SP1A LD-PLC Hotfix 1) or later must be used to configure and program the PACSystems RX3i with the Universal Analog Input Module.

RX3i CPU: RX3i CPU310 Firmware Revision 2.80 (Build ID 43A1) or later is required.

Module Features

- Module supports hot insertion/extraction
- Terminal Block insertion or removal detection
- Module Status, Field Status, and TB LEDs
- Module meets CE, UL/CUL 508 and 1604, and ATEX requirements
- Flash memory for future upgrades
- Autocalibration at power-up
- Completely software-configurable, no module jumpers to set
- Six hardware analog-to-digital filter frequencies, individually-selectable by channel
- Rapid channel acquisition times based on filter frequency
- On-board error-checking
- Open-circuit detection for most input types
- Short-circuit detection for RTDs.
- User-defined scaling
- Module fault reporting
- Overrange, underrange, high alarm, low alarm, high-high alarm, low-low alarm and calibration fault alarm detection and reporting on a per-channel basis.
- Positive and negative Rate of Change Alarms
- Configurable interrupts for channel alarms and faults
- Supports diagnostic point fault contacts in the logic program.
- CJC compensation on terminal block
- Temperature in Celsius or Fahrenheit

Release Information

Release History

Release	Hardware Version	Firmware Revision
Initial Release	1.00	Primary: 1.00 (Build A071) Boot: 1.00 (Build 0016)

Known Restrictions and Open Issues in this Release

Incorrect Display of Deadband limits	When changing configurations from one input type to another, the deadband limits for the module may be incorrect.
IO Fault References	The I/O Fault Table Ref Address field is unreliable for Universal Analog Input module and circuit faults. The rack, slot, and circuit number fields are always correct.

Specifications

Backplane Power Requirements	400 mA maximum @ 5.1V +/- 3% 350 mA maximum @ 3.3V +/- 3%	
Power Dissipation within Module Thermal Dissipation	5.4 watts maximum	
LEDs	One green LED to indicate the module status One bi-color green/yellow LED to indicate the field status One bi-color red/green LED to indicate the terminal block status	
Per Channel Acquisition Time (Each group scanned independently)	10 msec @ 1000 Hz, 13 msec @ 200 Hz, 27 msec @ 40 Hz, 67 msec @ 16 Hz, 87 msec @ 12 Hz, 127 msec @ 8 Hz	
Channel Update Time	The sum of the channel acquisition times for a bank of 4 channels plus one of the following if applicable: 1. RTD Lead resistance measurement time (equals channel acquisition time) 2. CJC acquisition time 7 msec.	
Input resolution	11 to 16 bits, depending on configured range and A/D filter frequency.	
Inputs in Ohms	Resistance	0-250, 0-500, 0-1000, 0-2000, 0-3000, 0-4000
	Platinum 385	100, 200, 500,1000
	Platinum 3916	100, 200, 500,1000
	Nickel 672	120
	Nickel 618	100,200, 500,1000
	Nickel-Iron 518	604
	Copper 426	10
RTD Inputs	Copper 426	-100 to 260 degrees C
	Nickel 618	-100 to 260 degrees C
	Nickel 672	-80 to 260 degrees C
	Nickel-Iron 518	-100 to 200 degrees C
	Platinum 385	-200 to 850 degrees C
	Platinum 3916	-200 to 630 degrees C

Specifications

Thermocouple Inputs	Type B	300 to 1820 degrees C
	Type C	0 to 2315 degrees C
	Type E	-270 to 1000 degrees C
	Type J	-210 to 1200 degrees C
	Type K	-270 to 1372 degrees C
	Type N	-210 to 1300 degrees C
	Type R	0 to 1768 degrees C
	Type S	0 to 1768 degrees C
	Type T	-270 to 400 degrees C
Voltage Inputs	-10V to +10V, 0V to +10V, 0 V to +5V, 1V to +5V, -50mV to +50mV, -150mV to +150mV	
Current Inputs	-20mA to +20mA, 4 to 20 mA, 0 to 20 mA	
Configurable Input Filter	8Hz, 12Hz, 16Hz, 40Hz, 200Hz, 1000Hz	
Scaling	Floating point user scaling.	
Max RTD Cable Impedance	25 ohms	
RTD Wire Length	1000 ft max w/settling time of 1mSec	
Input Impedance	>1M ohm for TC/V/RTD	
Current Input Resistance	249 ohms +/- 1%	
Open circuit detection time	5 seconds max. Open circuit detection is available for all configurations except +/-20mA current, 0-20mA current, and +/-10V voltage.	
Max Overvoltage	+/-14.5VDC continuous	
Max Overcurrent	28mA continuous	
Normal Mode Noise Rejection	95 dB minimum @ 50/60 Hz with 8 Hz filter 85 dB minimum @ 50/60 Hz with 12 Hz filter	
Common Mode Noise Rejection	120dB minimum @ 50/60 Hz with 8 Hz filter 110dB minimum @ 50/60 Hz with 12 Hz filter	
Settling time to 5% of Full Scale (notch filter dependent)	<80mS	
Calibrated Accuracy at 25°C	Better than 0.1% of range (except 10 ohm CU RTD) Accuracy depends on A/D filter, data format, input noise, and ambient temperature.	
Calibration interval	12 months typical to meet accuracy specifications over time. Module will allow for user offset to be applied as a periodic calibration adjustment.	
Input Offset Drift with Temperature	3.0 milliohm/°C maximum 2.0 uV/°C maximum	
Gain Drift with Temperature	50 ppm/°C typical (90 ppm/°C maximum)	
Module error over Full Temp range	0.5% of range typical (depends on range) 1.0% of range maximum	
Module Scan Time (notch filter dependent)	(Assumes 2 ADC's running in parallel, no CJC or lead resistance) 10ms per Channel * 4 Channels = 40ms (1KHz filter) 127ms per Channel * 4 Channels = 508ms (8Hz filter) Channels that are disabled are not scanned, shortening scan time.	

Specifications

Module conversion method	Sigma-delta
Isolation Voltage	Opto-isolated, transformer isolated
channel to channel	+-12.5Vdc channel to channel Tc/V/I/RTD
group to group	250 VAC continuous/1500 VAC for 60 seconds
terminal block to backplane/chassis	250 VAC continuous/1500 VAC for 60 seconds

Installing the Module Label and Door Card

1. Install the small catalog number label ("ALG600") supplied with the module in the slot on the top of a High-density Terminal Block. (High-Density Terminal Blocks, available with either Box-style (IC694TBB032) or Spring-style (IC694TBB032) Terminal Assemblies, are ordered separately. A Terminal Block Assembly is not provided with the module.)
2. The module has an insertable door label with a wiring diagram printed on the back. The front of the label has color bands that indicate the module type, and space to record identifying information about the module's inputs or outputs. After filling in the circuit information, insert the door label into the slots on the inside of the Terminal Block Assembly cover.
3. Complete the module wiring, and secure the wire bundles to the tie-downs on the bottom of the Terminal Block.
4. Align the top of the Terminal Block with the bottom of the cover, making sure that the notches in the Terminal Block match up with the grooves in the cover.
5. Slide the Terminal Block upward until it clicks into place.For more information, see chapter 2 of the *RX3i System Manual*, GFK-2314.
6. Install the Terminal Block Assembly on the module:.
   a. Press the terminal block assembly straight toward the module until it is partially seated.
   b. Open the door on the front of the terminal block and push the latch up very firmly until it reaches the top of the slot and clicks into place.
   c. Check to be sure the terminal block is fully seated.

Removing the Terminal Block Assembly from the Module

1. Open the terminal block door, then push the latch down very firmly until the terminal block is released.
2. Pull the terminal block away from the module until the contacts have separated.
3. To remove a Terminal Block from its cover,
   a. Grasp the sides of the Terminal Block cover.
   b. Pull down on the bottom of the Terminal Block.

Installing the Module in the RX3i Backplane

This module must be installed in an RX3i Universal Backplane (IC695CHS012 or CHS016). It can be installed or removed while power is applied to the system. This includes backplane power and field power supplied to the module.

NOTE: The module must be properly seated on the carrier with the latch engaged and all pins connected within 2 seconds. For removal, the module must be completely disengaged from the carrier within 2 seconds. It is important that the module not remain partially inserted during the insertion or removal process. There must be a minimum of two seconds between the removal and insertion of modules.

Warning

Inserting or removing a module with power applied to the system may cause an electrical arc. This can result in unexpected and potentially dangerous action by field devices. Arcing is an explosion risk in hazardous locations. Be sure that the area is non hazardous or remove system power before removing or inserting a module.

Warning

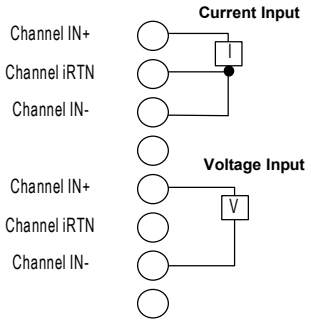
Potentially dangerous voltages from user devices may be present on a module's screw terminals even though power to the backplane is turned off. Always be careful handling a Terminal Board and any wires connected to it.

Module Wiring

The table below lists wiring connections for the module. Except for RTD and resistance type inputs, channels are wired as differential inputs. There are no shield terminals.

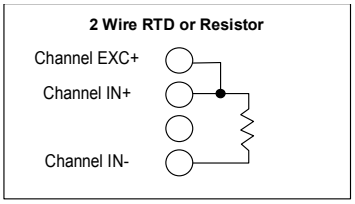
Terminal	*RTD or Resistance*	*TC / Voltage / Current*	*RTD or Resistance*	*TC / Voltage / Current*	*Terminal*
1		CJC1 IN+	Channel 1 EXC+		19
2		CJC1 IN-	Channel 1 IN+	Channel 1 IN+	20
3	Channel 2 EXC+			Channel 1 iRTN	21
4	Channel 2 IN+	Channel 2 IN+	Channel 1 IN-	Channel 1 IN -	22
5		Channel 2 iRTN	Channel 3 EXC+		23
6	Channel 2 IN-	Channel 2 IN -	Channel 3 IN+	Channel 3 IN+	24
7	Channel 4 EXC+			Channel 3 iRTN	25
8	Channel 4 IN+	Channel 4 IN+	Channel 3 IN-	Channel 3 IN-	26
9		Channel 4 iRTN	Channel 5 EXC+		27
10	Channel 4 IN-	Channel 4 IN -	Channel 5 IN+	Channel 5 IN+	28
11	Channel 6 EXC+			Channel 5 iRTN	29
12	Channel 6 IN+	Channel 6 IN+	Channel 5 IN-	Channel 5 IN-	30
13		Channel 6 iRTN	Channel 7 EXC+		31
14	Channel 6 IN-	Channel 6 IN-	Channel 7 IN+	Channel 7 IN+	32
15	Channel 8 EXC+			Channel 7 iRTN	33
16	Channel 8 IN+	Channel 8 IN+	Channel 7 IN-	Channel 7 IN-	34
17		Channel 8 iRTN		CJC2 IN+	35
18	Channel 8 IN-	Channel 8 IN-		CJC2 IN-	36

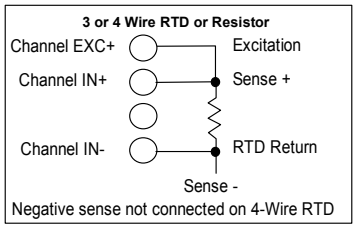
Thermocouple / Voltage / Current



For current inputs, tie the Return to the associated IN- pin.

RTD / Resistance





- For 2 wire RTDs, tie EXC+ and IN+ together at the terminal block.
- For 4 wire RTDs, leave one of the negative sense leads off.
- For 3 wire RTDs, IN+ = Sense+, IN- = RTD Return, and EXC+ = Excitation current.

Installing CJC Sensors

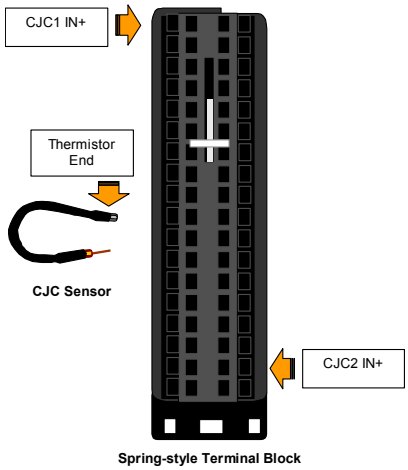
One or two optional cold-junction compensation (CJC) sensors can be connected to the module for accurate readings when using Thermocouple inputs. The sensor compensates for offset voltages introduced into the input signal where the thermocouple wires are connected to the module. A set of two CJC sensors is available as part number IC695ACC600.

Using both CJCs provides highest thermocouple compensation accuracy. Using only CJC1 lowers the thermocouple compensation accuracy, but can improve scan time for channels 5-8. Using only CJC2 lowers the thermocouple compensation accuracy, but can improve scan time for channels 1-4.

The thermistor end of the CJC sensor must be installed in the CJC IN+ or CJC2 IN+ terminal for accurate temperature measurements.

Open the Terminal Block contacts fully before installing the CJC sensor. Insert the sensor into the Terminal Block contact, maintaining metal-to-metal contact between the thermistor and the Terminal Block contact.

For a Box-style Terminal Block, maintain pressure while screwing down the contact.



Isolated Input Groups

This module provides two isolated groups of four input channels each. This allows fast inputs and slower or highly-filtered inputs to be connected to the same module without adversely affecting the update rate of the fast inputs. To take advantage of this feature, up to four inputs requiring fast response should be placed together in one isolated group while slower inputs should be connected to the other isolated group. For example, voltage and current inputs with higher frequency input filter settings should be grouped together on one of the isolated groups while thermocouple, RTD, resistance, or voltage/current inputs with low-frequency input filter settings should be grouped together on the other isolated group.

Each isolated group provides a CJC input. The CJC input is considered a slow-response input and will reduce the update rate for the associated channel group when enabled.

Resolution and Update Time

The actual resolution and update time for each input depend on the channel's configured Range Type and A/D Filter Frequency, as described in the *RX3i System User's Manual*, GFK-2314.. At higher Filter Frequencies, channel update time increases while input resolution decreases. The approximate number of bits for each Filter Frequency and Range Type are shown in the table below.

Filter Frequency	*Range Type: Voltage / Current Approximate Number of Bits*	*Range Type: TC / mV Approximate Number of Bits*	*Channel Update Time*
8 Hz	16	16	127 ms
12 Hz	16	16	87 ms
16 Hz	16	16	67 ms
40 Hz	16	14	27 ms
200 Hz	14	13	13 ms
1000 Hz	11	11	10 ms