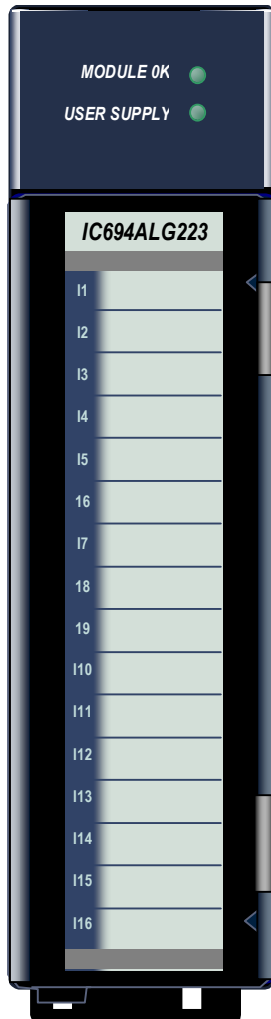


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Analog Input Module, 16 Channel, Current: IC694ALG223



The **16-Channel Analog Current Input** module, IC694ALG223, provides 16 single-ended inputs. Each input can be configured using the configuration software for any of three input ranges:

- 4 to 20 mA
- 0 to 20 mA
- 4 to 20 mA Enhanced

High and Low alarm limits are available on all ranges. In the 4 to 20 mA Enhanced range, a low alarm limit can be set up to detect input current from 4 mA to 0 mA, providing open-wire fault detection in 4 to 20 mA applications.

The module also reports module status and external power supply status to the CPU using its assigned program reference addresses.

This module can be installed in any I/O slot in an RX3i system.

Module Power

This module consumes 120 mA from the 5 VDC bus on the PLC backplane. It also requires 65 mA plus current loop current(s) from a user-supplied +24 VDC supply.

LEDs

The **MODULE OK** LED provides module status information on power-up as follows:

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

The **User Supply** LED indicates that the external 24 VDC supply is within specifications.

Specifications: IC694ALG223

Number of Channels	1 to 16 selectable; single-ended
Input Current Ranges	0 to 20 mA, 4 to 20 mA and 4 to 20 mA Enhanced (selectable per channel)
Calibration	Factory calibrated to: 4 μ A per count on 4 to 20 mA range 5 μ A per count on 0 to 20 mA and 4 to 20 mA Enhanced range
Update Rate	13 milliseconds (all 16 channels)
Resolution at 4–20 mA	4 μ A (4 μ A/bit)
Resolution at 0–20 mA	5 μ A (5 μ A/bit)
Resolution at 4–20 mA Enhanced	5 μ A (5 μ A/bit)
Absolute Accuracy *	+/-0.25% of full scale @ 25°C (77°F): +/- 0.5% of full scale over specified operating temperature range
Linearity	< 1 LSB from 4 to 20 mA (4 to 20 mA range) < 1 LSB from 100 μ A to 20 mA (0 to 20 mA and 4 to 20 mA Enhanced ranges)
Isolation, Field to Backplane (optical) and to frame ground	250 VAC continuous; 1500 VAC for 1 minute
Common Mode Voltage	0 volts (single-ended channels)
Cross-Channel Rejection	> 80dB from DC to 1kHz
Input Impedance	250 Ohms
Input Low Pass Filter Response	19 Hz
External Supply Voltage Range	20 to 30 VDC
External Supply Voltage Ripple	10%
Internal Power Consumption	120 mA from the +5 VDC bus on the backplane 65 mA from 24 VDC external user power supply (in addition to current loop currents)

Refer to Appendix A for product standards and general specifications.

* In the presence of severe RF interference (IEC 801–3, 10V/m), accuracy may be degraded to +/-5% FS.

Configuration: IC694ALG223

Module IC694ALG223 is configured with the configuration software. Its configurable parameters are described below.

Parameter	Choices	Description
<i>Active Channels</i>	1 to 16	The number of channels to be scanned. Channels are scanned in sequential, contiguous order.
<i>Reference Address for Input Data</i>		The memory location for input data from the module. Each channel provides 16 bits of analog input data to the PLC CPU.
<i>Reference Address for Status Data</i>		The memory location for where status information from the module starts.
<i>Length</i>	8, 16, 24, 32, 40	The number of status bits reported to the PLC. Bits 1 – 8 provide basic module diagnostics. Bits 9 – 24 contain channel 1 – 8 high alarm and low alarm status. Bits 25 – 40 contain channel 9 – 16 high alarm and low alarm status. Data formats are shown in this section.
<i>Range</i>	4-20 mA (default), 0-20 mA, or 4-20 mA enhanced	In the 4-20 mA range, input currents from 4 to 20 mA are reported to the CPU as values from 0 to 32000 units. In the 0 to 20 mA range, input currents from 0 to 20 mA are reported to the CPU as values from 0 to 3200 units. In the 4 to 20 mA enhanced range, currents from 4 to 20 mA are reported to the CPU as values from 0 to 32000 units. Currents below 4 mA are reported as negative values with 0 represented as –8000 units.
<i>Alarm Low</i>	4-20 mA = 0 to 32759	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.
	0-20 mA = 0 to 32759	
	4-20 mA enhanced = -8000 to +32759	
<i>Alarm High</i>	4-20 mA = 1 to 32760	Each channel can also 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.
	0-20 mA = 1 to 32760	
	4-20 mA enhanced = -7999 to +32760	
<i>I/O Scan Set</i>	Default = 1	Assign the module to one of the I/O Scan Sets defined in the CPU configuration.

Data Format: IC694ALG223

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

MSB												LSB			
X	11	10	9	8	7	6	5	4	3	2	1	0	X	X	X

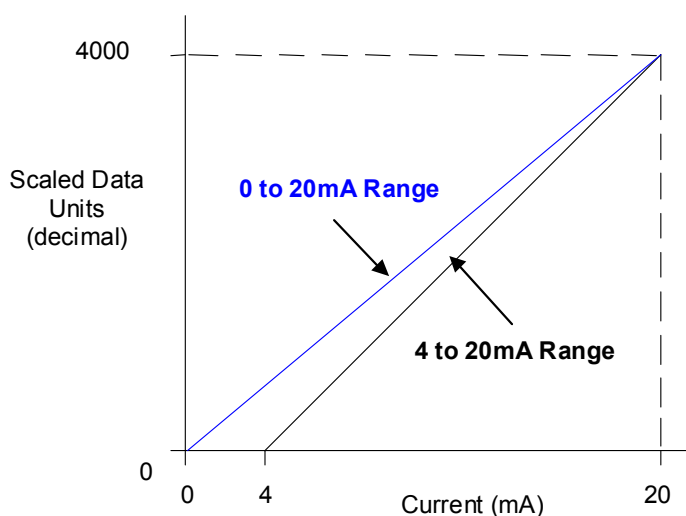
Input Scaling

In the 4 to 20 mA range, input data is scaled so that 4 mA corresponds to a count of 0 and 20 mA corresponds to a count of 32000.

In the 0 to 20 mA range, 0 mA corresponds to a count of 0 and 20 mA corresponds to a count of 32000. Full 12-bit resolution is available over the 4 to 20 mA and 0 to 20 mA ranges.

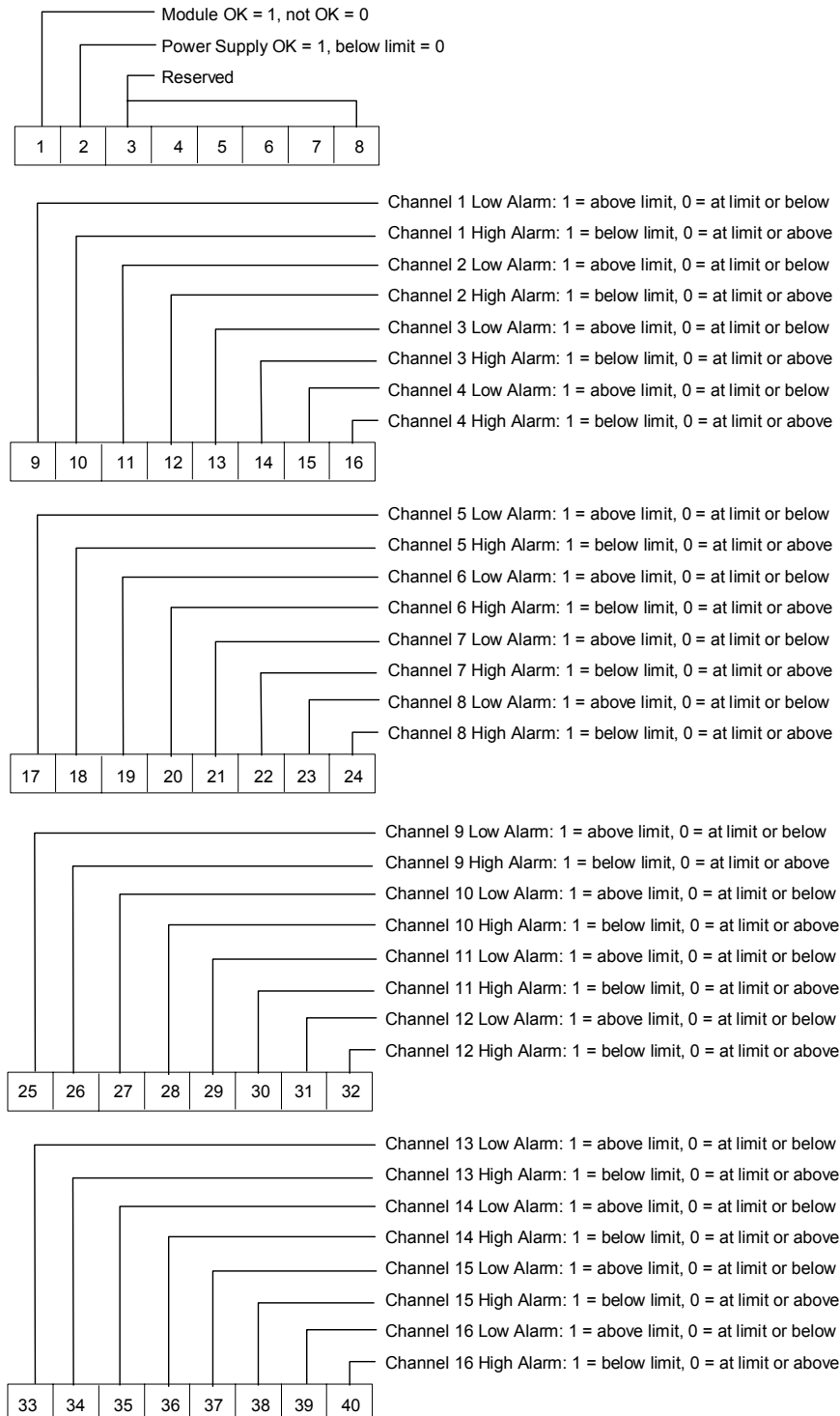
4 to 20 mA Enhanced range can also be configured. In that range, 0 mA corresponds to a count of -8000, 4 mA corresponds to a count of 0 (zero) and 20 mA corresponds to a count of +32000. A low alarm limit can be set up to detect input current from 4 mA to 0 mA, providing open-wire fault detection in 4 to 20 mA applications.

Analog values are scaled over the range of the converter. Factory calibration adjusts the analog value per bit (resolution) to a multiple of full scale ($4 \mu\text{A/bit}$). This calibration leaves a normal 12-bit converter with 4000 counts (normally $2^{12} = 4096$ counts). The data is then scaled with the 4000 counts over the analog range. The data is scaled as shown below.



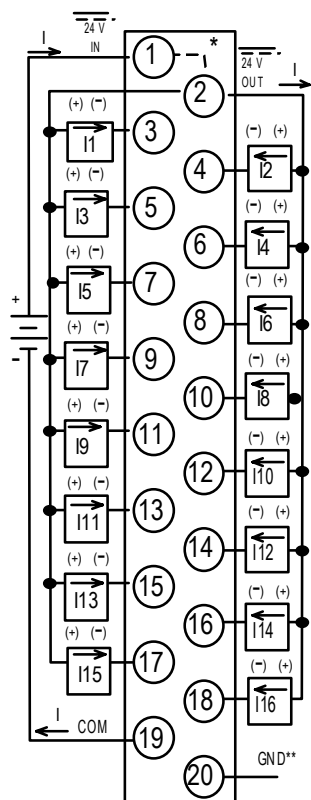
Status Data: IC694ALG223

Analog Module IC694ALG223 can be configured to return 8, 16, 24, 32, or 40 status bits to the PLC CPU. This status data provides the following information about module operation:



Field Wiring: IC694ALG223

Field Wiring Terminals Field Wiring

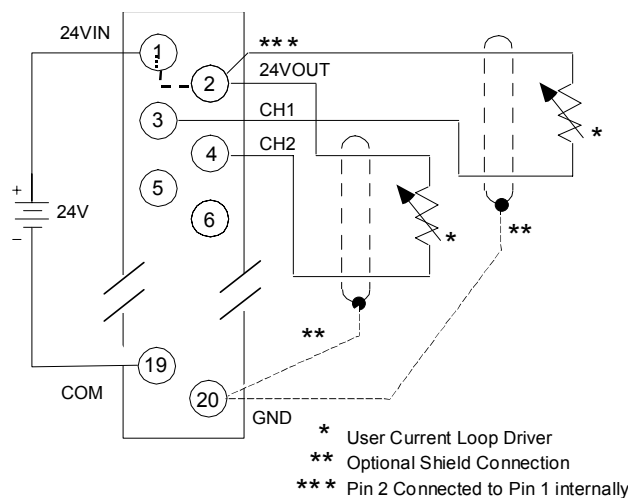


* Internally Connected

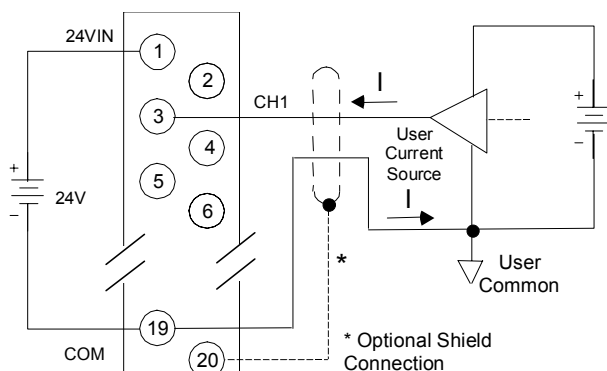
** Optional Shield Connection

Terminal	Connection
1	User supplied 24V Input; provides loop power via 24VOUT terminal (pin 2)
2	+24V loop power tie point
3	Current Input, Channel 1
4	Current Input, Channel 2
5	Current Input, Channel 3
6	Current Input, Channel 4
7	Current Input, Channel 5
8	Current Input, Channel 6
9	Current Input, Channel 7
10	Current Input, Channel 8
11	Current Input, Channel 9
12	Current Input, Channel 10
13	Current Input, Channel 11
14	Current Input, Channel 12
15	Current Input, Channel 13
16	Current Input, Channel 14
17	Current Input, Channel 15
18	Current Input, Channel 16
19	Common connection to input current sense resistors; user supplied 24V input return or 24VIN return
20	Frame ground connections for cable shields

Connection Example 1



Connection Example 2



To limit common-mode voltages, the current source can be tied to the COM terminal if the source is floating.