Analog Mixed Modules, 12-Bit

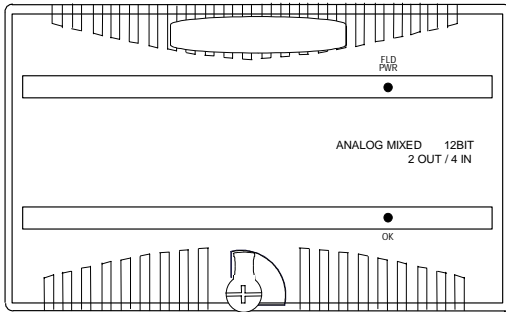## Product Description

Analog mixed module IC200ALG430 / BXIOMA4 provides four analog current inputs and two analog current outputs.

Analog mixed module IC200ALG431 / BXIOMA410 provides four 0 to +10VDC analog inputs and two 0 to +10VDC analog outputs.

Analog mixed module IC200ALG432 provides four -10 to +10VDC analog inputs and two -10 to +10VDC analog outputs.

An external 24V power supply is required for the outputs. For inputs, power for the user's transceivers must be supplied from an external source.

Intelligent processing for this module is performed by the CPU or Network Interface Unit. The module provides 4 words of analog input data and receives 2 words of analog output data.

LED Indicators

The green FLD PWR LED indicates the presence of user-side power for the analog field-side circuits. The green OK LED is on when backplane power is present to the module.

Diagnostics

The module reports a Loss of User Side Power fault for field-side circuits.

I/O Defaults

The module is easily set up with a jumper for the outputs to either hold their last states or default if backplane power or communications are interrupted or the PLC is stopped. External user power must remain uninterrupted. Outputs remain in their default or last state until the module receives different output data from the backplane, or until field power is removed.

When software-configured, inputs can be configured to hold last state or report a selectable value. When the module is autoconfigured using a CPU or NIU that is version 2.x or later, inputs default to 0. If the CPU or NIU is version 1.5 or earlier, the input default matches the jumper-configured output default (0 or Hold Last State).

Preinstallation Check

Carefully inspect all shipping containers for damage. If any equipment is damaged, notify the delivery service immediately. Save the damaged shipping container for inspection by the delivery service. After unpacking the equipment, record all serial numbers. Save the shipping containers and packing material in case it is necessary to transport or ship any part of the system.

Module Specifications

Channels	4 differential inputs, one group, 2 single-ended outputs, one group
Module ID	IC200ALG430, BXIOMA4: FFFF9424 IC200ALG431 / 432, BXIOMA410: FFFF9024
Isolation: User input to logic (optical) and to frame ground	250VAC continuous; 1500VAC for 1 minute
Group to group	Not applicable
Channel to channel	None
LED indicators	FLD PWR LED indicates field power is present OK LED indicates backplane power is present
Backplane current consumption	IC200ALG430, BXIOMA4: 5V output: 50mA max. IC200ALG431 / 432, BXIOMA410: 60mA max.
Thermal derating	None
Configuration parameters	Output default
Diagnostics	Loss of User Side Power
External Power Supply	
Recommended Range	+18 to +30VDC (including ripple)
Current consumption at recommended range	160mA max (including load current)
12V operation range	9.6 to 15VDC, 12VDC nominal (including ripple)
Current consumption at 12V range (including load current)	IC200ALG430, BXIOMA4: 215mA maximum IC200ALG431 / 432, BXIOMA410: 175mA max
Input Characteristics	
Input current	IC200ALG430, BXIOMA4: 4 to 20mA
Input voltage	IC200ALG431, BXIOMA410: 0 to 10V IC200ALG432: +/-10VDC
Input Impedance	IC200ALG430, BXIOMA4: 200 Ohms maximum IC200ALG431, BXIOMA410: 120kOhms minimum IC200ALG432: 125kOhms minimum
Accuracy: 25 degrees C** 0 to 60 degrees C	+/-0.3% typ. of full scale, +/-0.5% max. of full scale +/-1% maximum of full scale
Resolution:	IC200ALG430, BXIOMA4: $4\mu A$ = 8 counts IC200ALG431, BXIOMA410, IC200ALG432: 2.5mV = 8 counts
Filter response	5.0ms
Update rate per module	0.4ms
Common mode voltage	IC200ALG430, BXIOMA4: $\leq$30V IC200ALG431 / 432, BXIOMA410: 0V
Channel-to-channel crosstalk rejection	30dB minimum
Output Characteristics	
Output current	IC200ALG430: 4 to 20mA
Output voltage	IC200ALG431, BXIOMA410: 0 to 10.24VDC IC200ALG432: +/-10.24VDC
Load characteristics: Resistive	IC20ALG430, BXIOMA4: 0 to 1250 Ohms max. ($R_{L(MAX)}$ = ($V_{EXTERNAL\ PS}$ - 4V) / 20.38mA)
	IC200ALG431/ 432, BXIOMA410: 5000 Ohms min
Capacitive	0.1μF maximum
Inductive	IC200ALG430, BXIOMA4: 0.5H maximum
Accuracy at 25 degrees C** Accuracy at 0 to 60 degrees C	+/- 0.3% typ. of full scale, +/- 0.5% max. of full scale +/-1% maximum of full scale
Resolution	IC200ALG430, BXIOMA4: $4\mu A$ = 8 counts IC200ALG431, BXIOMA410: 2.5mV = 8 counts IC200ALG432: 5mV = 16 counts
Update rate per module	0.3ms maximum
Channel-to-channel crosstalk rejection	70dB minimum
Output default	Hold Last State

* In the presence of severe RF interference, (IEC 1000-4-3, 10V/m), accuracy may be degraded:

** IC200ALG430, BXIOMA4: +/-0.75% with the introduction of input common mode voltage.
IC200ALG431 / 432, BXIOMA410: +/-1%

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Field Wiring Terminals

Terminal assignments for the module are shown below.

| Terminal	Connection	Terminal	Connection
A1	OUT AQ1	B1	No connection
A2	RET 1	B2	Shield Termination Point
A3	OUT AQ2	B3	No connection
A4	RET 2	B4	Shield Termination Point
A5	IN AI 1+	B5	No connection
A6	IN AI 1-	B6	Shield Termination Point
A7	IN AI 2+	B7	No connection
A8	IN AI 2-	B8	Shield Termination Point
A9	IN AI 3+	B9	No connection
A10	IN AI 3-	B10	Shield Termination Point
A11	IN AI 4+	B11	No connection
A12	IN AI 4-	B12	Shield Termination Point
A13	No connection	B13	JMP1A
A14	No connection	B14	JMP1B
A15	No connection	B15	No connection
A16	No connection	B16	No connection
A17	Field Return	B17	No connection
A18	Field Power	B18	No connection

Wiring Connections for Carriers with Two Rows of Terminals

The diagram below shows wiring connections for this module when installed on a carrier with two rows of terminals.
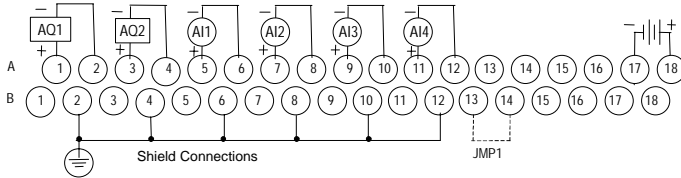
Wiring Connections for Carriers with Three Rows of Terminals

The next diagram shows wiring connections for this module when installed on a carrier with three rows of terminals.
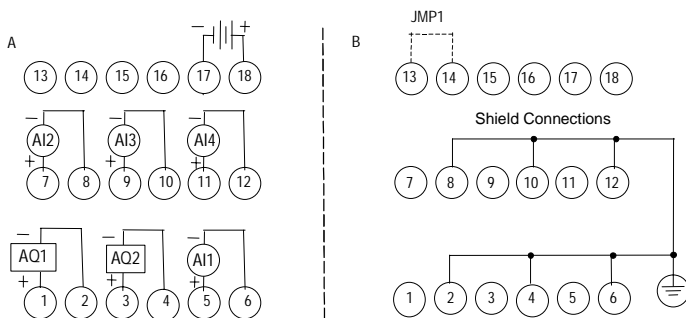

Jumper Selection

A jumper on the carrier can be used to select the output default mode. If no jumper is installed on pins B13 and B14, outputs hold their last state (the last commanded value from the backplane) if backplane power or communications are interrupted or the PLC is stopped. With a jumper installed, if such conditions occur outputs default as listed below. This should only be changed with field power and backplane power removed.

Hold Jumper	ALG430	ALG431, ALG432
None	Hold Last State	Hold Last State
JMP1	Default to 4mA	Default to 0V

Wiring Examples

An external source is needed to power input transceivers.
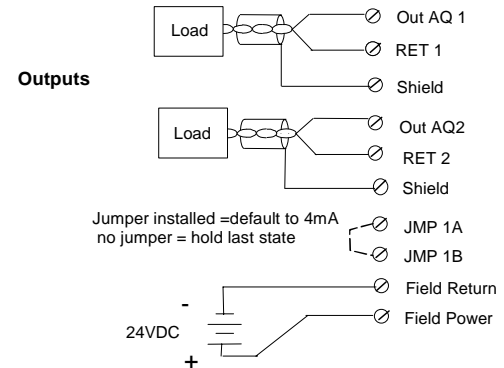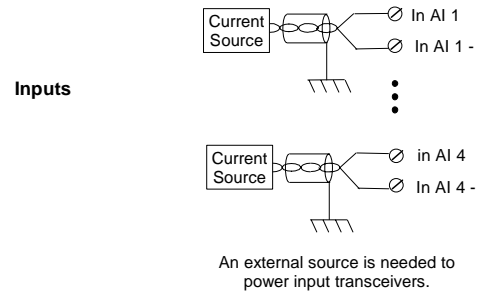
Cable Shield Connections

Shielded twisted pair cable is recommended for all of the analog channel connections.

If the module is installed on a Terminal-style I/O Carrier (IC200CHS001, 002, or 005) or a Compact Terminal-style I/O Carrier (IC200CHS022, 025), the cable shield can be connected directly to the carrier per the Field Wiring Table. An Auxiliary I/O Terminal Strip (IC200TBM001, 002, or 005) can also be added to the Terminal-style I/O Carriers to aid in grounding shields. Be sure to ground the Auxiliary I/O Terminal Strip as well if you plan to use it for this purpose.

If the module is installed on a Connector-style I/O Carrier (IC200CHS003), the cable shield can be connected directly to an Interposing Terminal (IC200CHS011, 012, 015). Be sure to ground the Interposing Terminal. It is recommended to use a shielded interposing cable as well between the Interposing Terminal and the Connector Base. A custom shielded cable can be made using the Connector kit (IC200ACC304). In addition, a custom shield braid can be wrapped around standard Interposing Cables (IC200CBL105, 110, 120, 230). If this approach is used be sure to ground the braid.

All cable shield connections should be connected to earth ground and be kept as short as practical. The power cable does not need to be shielded.
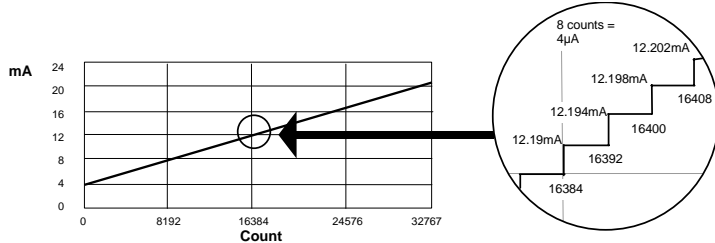
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Scaling for Inputs

The following graphs show the relationship between the input current measured at the field terminals and the data values for the module.

Count vs Input Current

The following equation can be used to calculate counts values:

Counts = (Current in mA - 4mA) x (32768 / 16.38mA)

For a change to be seen in the reported count value, input current must be increased by at least 4µA. If the module receives an increase less than 4µA, the previous count value is still reported. For example:

Current	Count
12.190mA	16384
12.192mA	16384
12.194mA	16392

Count vs Input Voltage
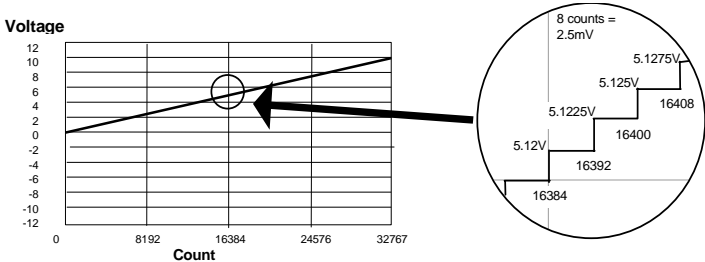
The following equation can be used to calculate counts values:

Counts = (Voltage In) x (3200)

The count value is returned as a multiple of 8. A voltage that would return a count value (using the above equation) that is not a multiple of 8 will return the next highest multiple of 8.

Input Voltage	Count
5.1200	16384
5.1210	16392
5.1220	16392
5.1225	16392

Scaling for Outputs

Count vs Output Current

The graph below shows the relationship between the output data that is provided to the module from the backplane, and the actual output current. The range spans between 4mA and 20mA.
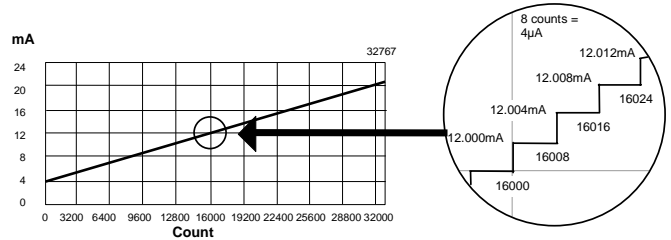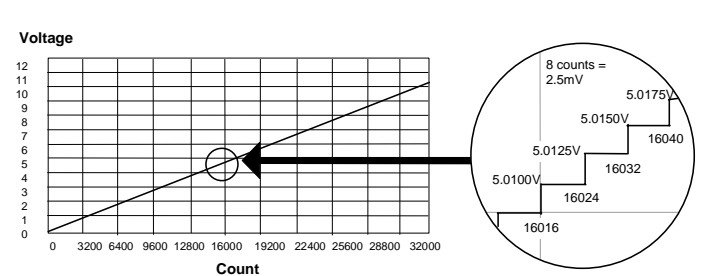

The following equation can be used to calculate specific output currents:

Iout = 4mA + (count/32760) x 16.38mA

The count value must be a multiple of 8. If the module receives a count value that is not a multiple of 8, it rounds the value down to the closest multiple of 8. For example:

Count	mA
16000	12.000
16007	12.000
16008	12.004

Count vs Output Voltage: IC299ALG431

Voltage can be calculated using the following equation:

Vout = ((analog counts x 10.25) / 32768)

The count value must be a multiple of 8. If the module receives a count value that is not a multiple of 8, it rounds the value down to the closest multiple of 8. For example:

Count	Voltage
16024	5.0125V
16030	5.0125V
16032	5.0150V

Count vs Output Voltage: IC200ALG432

Voltage can be calculated using the following equation:

$$Vout = (\ (analog\ counts \times 20.5)\ /\ 65535\ )$$

The count value must be a multiple of 16. If the module receives a count value that is not a multiple of 16, it rounds the value down to the closest multiple of 16. For example:
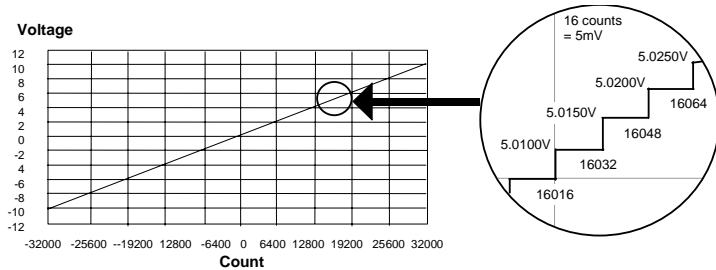
Count	Voltage
16032	5.0150V
16040	5.0150V
16048	5.0200V

Operating Note

If hot insertion of a module is done improperly, the operation of other modules on the same backplane may be disrupted. See *Installing a Module on a Carrier* in the *VersaMax Modules Manual,* GFK-1504.

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 DISCONNECT EQUIPMENT UNLESS POWER HAS BEEN SWITCHED OFF OR THE AREA IS KNOWN TO BE NONHAZARDOUS.

Compatibility

Module version B or later is required for use in expansion racks.

Product Version Information

Rev	Date	Description
IC200ALG430G BXIOMA4G IC200ALG431G BXIOMA410G IC200ALG432F	October 2008	Updated Power Supply OK signal circuitry.
IC200ALG430F BXIOMA4F IC200ALG431F BXIOMA410F IC200ALG432E	April 2005	Improvement to latching mechanism
IC200ALG430E IC200ALG431E IC200ALG432D	April 2004	Changed to V0 plastic for module housing.
BXIOMA4E BXIOMA410E	January 2004	Changed to V0 plastic for module housing. Also ATEX approval for Group 2 Category 3 applications.
IC200ALG430D IC200ALG431D IC200ALG432C	January 2004	ATEX approval for Group 2 Category 3 applications.
IC200ALG430B BXIOMA4B IC200ALG431B BXIOMA410B IC200ALG432B	N/A	Reguired for use in expansion racks
IC200ALG430A BXIOMA4A IC200ALG431A BXIOMA410A IC200ALG432A	March 1999	Initial product release