MANUFACTURER DOCUMENT PACKAGE

# Manufacturer's Manual

Reference package for procurement and maintenance review

GE FANUC

## IC200ALG328D

**12-CHANNEL 13-BIT CURRENT OUTPUT MODULE REVISION D**

Used with the applicable VersaMax configuration.

REFERENCE PACKAGE

OFFICIAL DOCUMENT

Selected official manufacturer pages follow this cover.

Source: GE Fanuc IC200ALG328 analog output module data

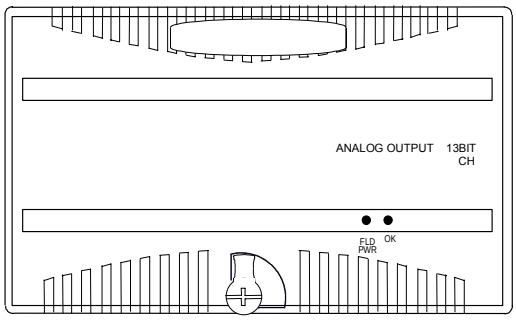
# Analog Output Module, 13-Bit, 8 or 12 Channels

October 2008 GFK-2526

## Product Description

Analog output modules IC200ALG325 and BXIOAO8210 provide eight analog voltage outputs. Analog output modules IC200ALG327and BXIOAO12210 provide twelve analog voltage outputs. The output range for these modules can be either –10VDC to +10VDC (bipolar) or 0V to +10VDC (unipolar).

Analog output module IC200ALG326 provides eight 4mA to 20mA analog current-sourcing outputs. Analog output module IC200ALG328 provides twelve 4mA to 20mA analog current-sourcing outputs. Including a modest amount of overrange current, approximately 20.38mA of output current per channel is available to drive output loads.




An external power supply is required for the outputs.

Intelligent processing for this module is performed by the CPU or Network Interface Unit.

## 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.

## Configuration Parameters

The module has a default output range, but is easily set up with a jumper to change the output range.

The module is also 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.

## 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 Characteristics*** | |
|---|---|
| Channels | IC200ALG325, BXIOAO8210, IC200ALG326:<br>8 single ended, one group<br>IC200ALG327, BXIOAO12210, IC200ALG328:<br>12 single-ended, one group |
| Module ID | IC200ALG325 / BXIOAO8210: FFFF9080<br>IC200ALG326: FFFF9480<br>IC200ALG327, BXIOAO12210: FFFF90C0<br>IC200ALG328: FFFF94C0 |
| Isolation: | User input to logic (optical) and to frame ground:<br>250VAC continuous; 1500VAC for 1 minute<br>Group to group: Not applicable<br>Channel to channel: None |
| LED indicators | FLD PWR LED indicates field power is present<br>OK LED indicates backplane power is present |
| Backplane current consumption | 5V output: 50mA max. |
| Thermal derating | IC200ALG328 only: see diagram.<br>Other modules, no derating. |
| Configuration parameters | Range, output default |
| Diagnostics | Loss of User Side Power |
| ***External Power Supply*** | |
| IC200ALG325, BXIOAO8210 | Range: +10 to +30VDC including ripple |
| | Current consumption: 102mA maximum |
| IC200ALG326 | Range: +18 to +30VDC |
| | Current consumption:<br>2A inrush maximum,<br>100mA maximum (no load)<br>185mA maximum (all 8 outputs at full scale) |
| IC200ALG327, BXIOAO12210 | Range: +18 to +30VDC including ripple |
| | Current consumption: 112mA maximum |
| IC200ALG328 | Range: +18 to +30VDC |
| | Current consumption:<br>2A inrush maximum,<br>100mA maximum (no load)<br>270mA maximum (all 12 outputs at full scale) |
| ***Output Characteristics*** | |
| Output voltage for IC200ALG325, BXIOAO8210, IC200ALG327, BXIOAO12210 | -10.24 to +10.24VDC (bipolar range)<br>0 to +10.24VDC (unipolar range) |
| Output current for IC200ALG326, IC200ALG328 | 4 to 20mA (default)<br>0 to 20mA (configured with jumper) |
| Load characteristics for IC200ALG325, BXIOAO8210, IC200ALG327, BXIOAO12210 | Resistive: 5000 Ohms minimum<br>Capacitive: 1.0µF maximum |
| Load characteristics for IC200ALG326, IC200ALG328 | Resistive: 0 to 800 Ohms maximum*<br>Capacitive: 1.0µF maximum<br>Inductive: 0.5H maximum |
| Accuracy at 25 degrees C**<br>0 to 60 degrees C | +/-0.3% typical of full scale,<br>+/-0.5% maximum of full scale<br>+/-1% maximum of full scale |
| Resolution | IC200ALG325, BXIOAO8210, IC200ALG327, BXIOAO12210: 1.25mV = 4 counts |
| | IC200ALG326, IC200ALG328:<br>4-20 mA: 5 counts = 2.5 µA (~12.7 bits)<br>0-20 mA: 4 counts = 2.5 µA (13 bits) |
| Update rate per module | IC200ALG325, BXIOAO8210: 10 mSec maximum |
| | IC200ALG326, IC200ALG327, BXIOAO12210:<br>15 mSec maximum |
| Channel-to-channel crosstalk rejection | 70dB minimum |
| Output default | Configurable |

* $R_{L(MAX)} = (V_{FIELD\ PS} – 4V) / 20.38mA$

** In the presence of severe RF interference, (IEC 1000-4-3, 10V/m), accuracy may be degraded an additional +/-1%.

# Analog Output Module, 13-Bit, 8 or 12 Channels



## Field Wiring Terminals

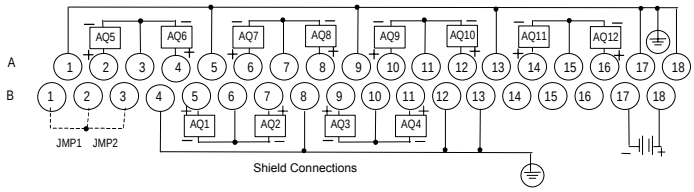
Terminal assignments for the module are shown below.

| Number | Connection | Number | Connection |
|---|---|---|---|
| A1 | Shield Termination Point | B1 | JMP 1 (Range) |
| A2 | OUT AQ5 | B2 | Jumper (1-2) RTN |
| A3 | RET (5-6) | B3 | JMP 2 (Hold) |
| A4 | OUT AQ6 | B4 | Shield Termination Point |
| A5 | Shield Termination Point | B5 | OUT AQ1 |
| A6 | OUT AQ7 | B6 | RTN (1-2) |
| A7 | RTN (7-8) | B7 | OUT AQ2 |
| A8 | OUT AQ8 | B8 | Shield Termination Point |
| A9 | Shield Termination Point | B9 | OUT AQ3 |
| A10 | * OUT AQ9 | B10 | RTN (3-4) |
| A11 | * RTN (9-10) | B11 | OUT AQ4 |
| A12 | * OUT AQ10 | B12 | Shield Termination Point |
| A13 | * Shield Termination Point | B13 | Shield Termination Point |
| A14 | * OUT AQ11 | B14 | No connection |
| A15 | * RTN (11-12) | B15 | No connection |
| A16 | * OUT AQ12 | B16 | No connection |
| A17 | Shield Termination Point | B17 | Field Return |
| A18 | Shield Termination Point | B18 | Field Power |

* Connections for modules IC200ALG327, IC200ALG328, or BXIOAI12210 only.

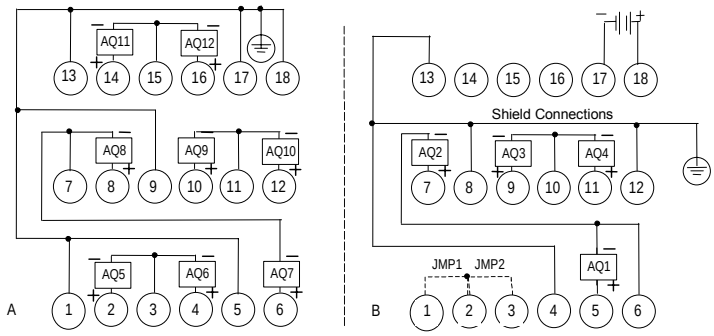
### Wiring Connections for Carriers with Two Rows of Terminals

The diagram below shows wiring connections for this module when installed on a carrier with two rows of terminals. Terminal A10 to A16 connections shown below are for modules IC200ALG327, IC200ALG328, or BXIOAO12210 only.




### 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. Terminal A10 to A16 connections shown below are for module IC200ALG327, IC200ALG328, or BXIOAO12210 only.




## Jumper Selection

Jumpers on the carrier can be used to select the output range and output default mode.

## Range Jumper

If no jumper is installed on pins B1 and B2, outputs are configured for their default range. Installing a jumper changes the range as shown below. This should only be done with field power and backplane power removed. The corresponding parameter in the module configuration must be adjusted accordingly.

| Range Jumper | Range for IC200ALG325, BXIOAO8210, IC200ALG327, BXIOAO12210 | Range for IC200ALG326, IC200ALG328 |
|---|---|---|
| None | -10V to +10V | 4mA to 20mA |
| JMP1 | 0V to +10V | 0mA to 20mA |

## Hold Jumper

If no jumper is installed on pins B2 and B3, 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, outputs default as shown below. This should only be changed with the field power and backplane power removed.

| Hold Jumper | Default for IC200ALG325, BXIOAO8210, IC200ALG327, BXIOAO12210 | Default for IC200ALG326, IC200ALG328 |
|---|---|---|
| None | Hold Last State | Hold Last State |
| JMP2 | 0V | 0 or 4mA |

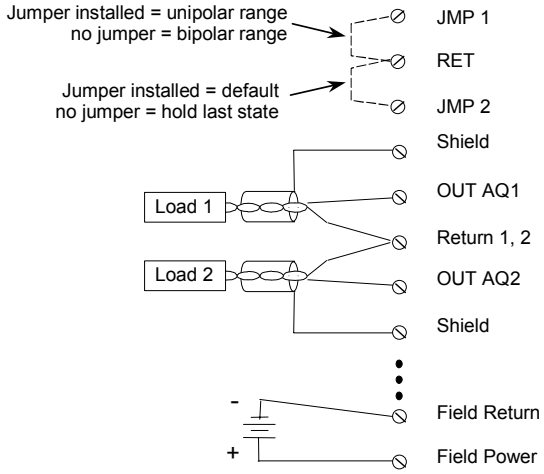
*For current modules only*, the Default Low End of Range value can be either 4mA or 0mA. The default depends on the PLC status, output current range selected, and whether the module is controlled by a PLC CPU or a Network Interface Unit (NIU) module. In some cases, the module will output 0mA instead of 4mA, even when configured for the 4-20mA range as shown in the following chart.

| *Status* | *Default to Low End of Range* | | *Hold Last State (HLS)* | |
|---|---|---|---|---|
| | *0-20mA* | *4-20mA* | *0-20mA* | *4-20mA* |
| ***Module is in PLC CPU Rack*** | | | | |
| Run to Stop | 0mA | 0mA | HLS | HLS |
| Loss of Field Power | 0mA | 0mA | 0mA | 0mA |
| Loss of Backplane Power | 0mA | 0mA | HLS | HLS |
| Loss of Communication | N/A | N/A | N/A | N/A |
| Loss of Module | 0mA | 0mA | 0mA | 0mA |
| Loss of CPU/NIU Power | 0mA | 0mA | HLS | HLS |
| ***Module is in NIU Rack*** | | | | |
| Run to Stop | 0mA | 4mA | HLS | HLS |
| Loss of Field Power | 0mA | 0mA | 0mA | 0mA |
| Loss of Backplane Power | 0mA | 0mA | HLS | HLS |
| Loss of Communication | 0mA | 4mA | HLS | HLS |
| Loss of Module | 0mA | 0mA | 0mA | 0mA |
| Loss of CPU/NIU Power | 0mA | 0mA | HLS | HLS |

# Analog Output Module, 13-Bit, 8 or 12 Channels



## Wiring Example




## 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.

## 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

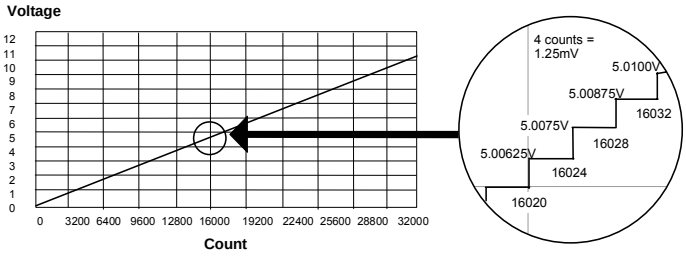
- EQUIPMENT LABELED WITH REFERENCE TO CLASS I, GROUPS A, B, C & D, DIV. 2 HAZARDOUS LOCATIONS IS SUITABLE FOR USE IN CLASS I, DIVISION 2, GROUPS A, B, C, D OR NON-HAZARDOUS LOCATIONS ONLY
- WARNING - EXPLOSION HAZARD - SUBSTITUTION OF COMPONENTS MAY IMPAIR SUITABILITY FOR CLASS I, DIVISION 2;
- WARNING - 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.

## Scaling for Voltage Outputs

The charts below show analog scaling for modules IC200ALG325, BXIOAO8210, IC200ALG327, BXIOAO12210.

### Count vs Output Voltage, Unipolar

The graph below shows the relationship between the output voltage measured at the field terminals and the data that is output by the module, when outputs are set up for the **unipolar range.**




Voltage can be calculated using the following equation:

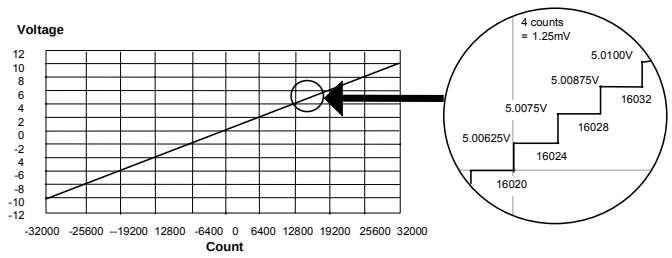
Vout = ( (analog counts x 10.24) / 32768 )

The count value must be a multiple of 4. If the module receives a count value that is not a multiple of 4, it rounds the value down to the closest multiple of 4. For example:

| Count | Voltage |
|---|---|
| 16024 | 5.0075V |
| 16026 | 5.0075V |
| 16028 | 5.00875V |

### Count vs Output Voltage, Bipolar

The graph below shows the relationship between the output voltage measured at the field terminals and the data that is output by the module, when outputs are set up for the **bipolar range.**




Voltage can be calculated using the following equation:

Vout = ( (analog counts x 20.48) / 65536 )

The count value must be a multiple of 4. If the module receives a count value that is not a multiple of 4, it rounds the value down to the closest multiple of 4. For example:

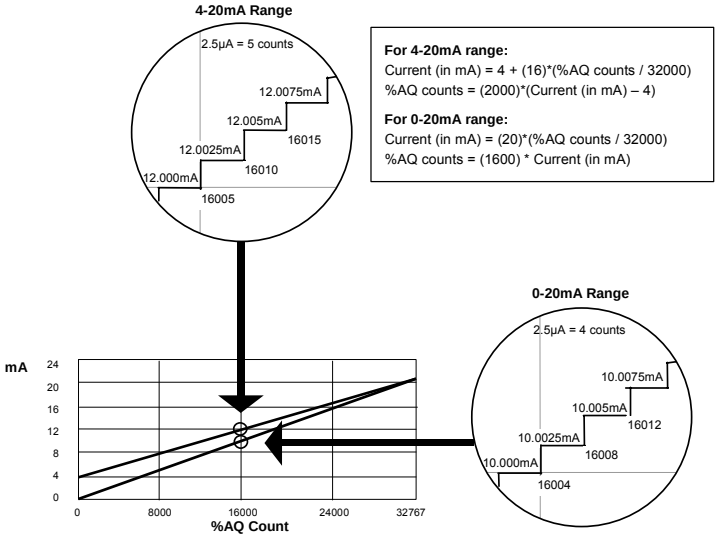
| Count | Voltage |
|---|---|
| 16024 | 5.0075V |
| 16026 | 5.0075V |
| 16028 | 5.00875V |

## Scaling for Current Outputs

The diagrams below show scaling for analog outputs of modules IC200ALG326 and IC200ALG328.

In 0-20mA range mode, a current output signal value of 0mA corresponds to a %AQ value of 0 counts, and 20mA corresponds to a %AQ value of +32,000 counts. In 4-20mA range mode, a value of 0 %AQ counts corresponds to an output current of 4mA and a value of +32,000 %AQ counts corresponds to an output current of 20mA. If the module is installed in a PLC rack, it converts negative value commands to 0 mA regardless of range selected. If the module is controlled by a Network Interface Unit (NIU), it converts any negative value commands to the low end of range.

The illustration below shows the relationship between output signal strength and commanded %AQ counts. It depicts the step change in output current level for various command values. Not every command value results in a change in the output current level due to the module's resolution.




### 4-20 mA Range Step Change Example

| Count | Current |
|---|---|
| 16000 | 12.0000 mA |
| 16005 | 12.0025 mA |
| 16008 | 12.0025 mA |
| 16009 | 12.0025 mA |
| 16010 | 12.0050 mA |

## Compatibility

This module is compatible with:

- PLC CPU firmware version 2.1 or later.
- VersaPro software version 2.0 or later.
- Ethernet NIU EBI001 firmware version 1.10 or later
- Genius NIU GBI001: firmware version 2.20 or later.
- Profibus NIU PBI001: firmware version 2.20 or later.
- DeviceNet NIU DBI001: not supported.

## Product Version Information

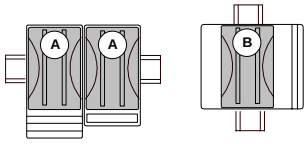
| Rev | Date | Description |
|---|---|---|
| IC200ALG325E<br>BXIOAO8210E<br>IC200ALG326E<br>IC200ALG327E<br>BXIOAO12210E<br>IC200ALG328E | October 2008 | Updated Power Supply OK signal circuitry. |
| IC200ALG325D<br>BXIOAO8210D<br>IC200ALG326D<br>IC200ALG327D<br>BXIOAO12210D<br>IC200ALG328D | April 2005 | Improvement to latching mechanism |
| IC200ALG325C<br>IC200ALG326C<br>IC200ALG327C<br>IC200ALG328C | April 2004 | Changed to V0 plastic for module housing. |
| IC200ALG325B<br>IC200ALG326B<br>IC200ALG327B<br>IC200ALG328B | January 2004 | ATEX approval for Group 2 Category 3 applications. |
| BXIOAO8210C<br>BXIOAO12210C | January 2004 | ATEX approval for Group 2 Category 3 applications. Changed to V0 plastic for module housing. |
| IC200ALG325A<br>BXIOAO8210A<br>IC200ALG326A<br>IC200ALG327A<br>BXIOAO12210A<br>IC200ALG328A | April 2001 | Initial product release |

## Thermal Derating: IC200ALG328

Of the modules covered in this document, only module IC200ALG328 has a thermal derating.

For module IC200ALG328, the number of channels that can be active at the same time depends on the ambient temperature, the external voltage, and the orientation of the module and DIN rail.

There is no thermal derating for this module at 24V. The chart below shows thermal deratings for this module, on certain carriers, at 30VDC with the module and DIN rail in the orientations shown. There is no derating at 30V in other orientation and carrier combinations.




inactive channels should be distributed evenly across the total number of outputs. For example, the "A" orientation graph below reflects the derating with channels 1, 5, and 9 inactive.

