



**High Resolution
Analog Input / Output
Expansion Board**

Catalog No. EXBHH005A01

Installation and Operating Manual

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Section 1

General Information

Introduction

The Baldor controls represent the latest technology in microprocessor based motor controls. In addition to the user programmable parameters available in every control, many different expansion boards are available from Baldor to further customize the control to most any application. Originally designed for the H2 controls, these same boards are compatible with our flagship products, the VS1SP, VS1GV and VS1SD controls.

Table 1-1 VS1 Expansion Boards

| Board Name | Catalog No. | Manual No. |
|--|--------------------|-------------------|
| Ethernet Server Expansion Board | EXBHH001AXX | MN751 |
| Mint® Expansion Board | EXBHH002AXX | MN752 |
| Isolated Input Expansion Board | EXBHH003AXX | MN753 |
| High Resolution Analog Board | EXBHH005AXX | MN754 |
| Master Pulse Reference / Isolated Pulse Follower | EXBHH007AXX | MN755 |
| DeviceNet / Ethernet/IP Expansion Board | EXBHH013AXX | MN756 |
| Profibus DP Expansion Board | EXBHH014AXX | MN758 |
| LonWorks Communications Expansion Board | EXBHH016AXX | MN759 |

Limited Warranty

For a period of two (2) years from the date of original purchase, BALDOR will repair or replace without charge controls and accessories which our examination proves to be defective in material or workmanship. This warranty is valid if the unit has not been tampered with by unauthorized persons, misused, abused, or improperly installed and has been used in accordance with the instructions and/or ratings supplied. This warranty is in lieu of any other warranty or guarantee expressed or implied. BALDOR shall not be held responsible for any expense (including installation and removal), inconvenience, or consequential damage, including injury to any person or property caused by items of our manufacture or sale. (Some states do not allow exclusion or limitation of incidental or consequential damages, so the above exclusion may not apply.) In any event, BALDOR's total liability, under all circumstances, shall not exceed the full purchase price of the control. Claims for purchase price refunds, repairs, or replacements must be referred to BALDOR with all pertinent data as to the defect, the date purchased, the task performed by the control, and the problem encountered. No liability is assumed for expendable items such as fuses.

Goods may be returned only with written notification including a BALDOR Return Authorization Number and any return shipments must be prepaid.

Safety Notice

This equipment contains voltages that may be as great as 1000 volts! Electrical shock can cause serious or fatal injury. Only qualified personnel should attempt the start-up procedure or troubleshoot this equipment.

This equipment may be connected to other machines that have rotating parts or parts that are driven by this equipment. Improper use can cause serious or fatal injury. Only qualified personnel should attempt the start-up procedure or troubleshoot this equipment.

PRECAUTIONS

WARNING: Do not touch any circuit board, power device or electrical connection before you first ensure that power has been disconnected and there is no high voltage present from this equipment or other equipment to which it is connected. Electrical shock can cause serious or fatal injury. Only qualified personnel should attempt the start-up procedure or troubleshoot this equipment.

WARNING: Be sure that you are completely familiar with the safe operation of this equipment. This equipment may be connected to other machines that have rotating parts or parts that are controlled by this equipment. Improper use can cause serious or fatal injury. Only qualified personnel should attempt the start-up procedure or troubleshoot this equipment.

WARNING: Be sure the system is properly grounded before applying power. Do not apply AC power before you ensure that all grounding instructions have been followed. Electrical shock can cause serious or fatal injury.

WARNING: Do not remove cover for at least five (5) minutes after AC power is disconnected to allow capacitors to discharge. Dangerous voltages are present inside the equipment. Electrical shock can cause serious or fatal injury.

Continued on next page

WARNING: Improper operation of control may cause violent motion of the motor shaft and driven equipment. Be certain that unexpected motor shaft movement will not cause injury to personnel or damage to equipment. Peak torque of several times the rated motor torque can occur during control failure.

WARNING: Motor circuit may have high voltage present whenever AC power is applied, even when motor is not rotating. Electrical shock can cause serious or fatal injury.

Caution: To prevent equipment damage, be certain that the electrical service is not capable of delivering more than the maximum line short circuit current amperes listed in the appropriate control manual, 240 VAC, 480 VAC or 600 VAC maximum per control rating.

Caution: Before you proceed, be sure to read and become familiar with the safety precautions at the beginning of this manual. If you have any questions, seek expert advice before you proceed. Do not proceed if you are unsure of the safety precautions or any procedure.

Caution: Be sure all packing materials are removed from the board. Conductive foam may be present on the connectors to prevent static build up during shipping. This can prevent proper circuit operation.

Caution: Static electricity damages electrical components. This board has static sensitive components installed. Be sure to comply with ESD (Electro Static Discharge) procedures when handling circuit boards and components.

Section 2

Expansion Board Description

Introduction

High Resolution Analog Expansion Board
Catalog No. EXBHH005AXX.

When this board is installed, two high resolution analog inputs are provided in addition to the two standard analog outputs.

Features:

- Two (2) Analog Inputs
- Two (2) Analog Outputs
- 16 Bit Digital Resolution

The Analog I/O expansion board provides two high resolution analog inputs to the motor control board and two high resolution outputs from the motor control board. Each input and output may be configured for 0-5VDC, +5VDC, 0-10VDC, +10VDC, 0-20 mA or 4-20mA.

Each analog input and output may be independently configured to a voltage or current.

Table 2-1 identifies the characteristics of the High Resolution Analog Input/Output Expansion Board.

Table 2-2 specifies the signal resolutions for each type of input and output signal.

Figure 3-3 and 3-4 identify the internal configuration and external connections for the analog input and output signals.

Installation Considerations

Two expansion board slots are available in the control. When this board is installed, there are a total of four (4) analog inputs and four (4) analog outputs. The parameters used depend on the slot into which the expansion board is installed.

If a High Resolution Analog expansion board is:

installed in **Slot 1**, OP1 ANA IN1 & 2 etc. are active.

installed in **Slot 2**, OP2 ANA IN1 & 2 etc. are active.

Note: Slot 3 is reserved for a feedback board only.

Table 2-1 Characteristics

| | | |
|-------------------------|----------------------------|---|
| High Resolution Inputs | Number of Inputs | Two |
| | Input Signal Levels | +5VDC, +10VDC, 0-20 mA or 4-20mA |
| | Maximum Digital Resolution | 16 bits |
| High Resolution Outputs | Number of Outputs | Two |
| | Output Signal Levels | 0-5VDC, +5VDC, 0-10VDC, +10VDC, 0-20 mA or 4-20mA |
| | Maximum Digital Resolution | 16 bits |

Table 2-2 Signal Resolution

| Input Signal | Signal Type | Digital Resolution | Analog Resolution |
|--------------------------------|-------------|-----------------------|---------------------------------|
| High Resolution Inputs | | | |
| ±10VDC | Voltage | 16 Bits (65636 Parts) | 305 μ VDC (0.000305 VDC) |
| ±5VDC | Voltage | 15 Bits (65636 Parts) | 305 μ VDC (0.000305 VDC) |
| 4-20mA 0-20 mA | Current | 15 Bits (65636 Parts) | 0.061 μ A (0.000061 AMP) |
| High Resolution Outputs | | | |
| ±10VDC | Voltage | 16 Bits (65636 Parts) | 305 μ VDC (0.000305 VDC) |
| 0-10VDC | Voltage | 15 Bits (65636 Parts) | 305 μ VDC (0.000305 VDC) |
| ±5VDC | Voltage | 15 Bits (65636 Parts) | 305 μ VDC (0.000305 VDC) |
| 0-5VDC | Voltage | 14 Bits (65636 Parts) | 305 μ VDC (0.000305 VDC) |
| 4-20mA 0-20 mA | Current | 15 Bits (65636 Parts) | 0.061 μ A (0.000061 AMP) |

Section 3

Installation

Caution: Before you proceed, be sure to read and become familiar with the safety precautions at the beginning of this manual. If you have any questions, seek expert advise before you proceed. Do not proceed if you are unsure of the safety precautions or any procedure.

This section describes the expansion board installation procedure.

Receiving & Inspection

1. Observe the condition of the shipping container and report any damage immediately to the commercial carrier that delivered your control.
2. Remove the control from the shipping container and remove all packing materials from the control. The container and packing materials may be retained for future shipment.
3. Verify that the part number of the control you received is the same as the part number listed on your purchase order.
4. Inspect the control for external physical damage that may have been sustained during shipment and report any damage immediately to the commercial carrier that delivered your control.
5. If the control is to be stored for several weeks before use, be sure that it is stored in a location that conforms to published storage humidity and temperature specifications stated in this manual.

Board Installation

Caution: Static electricity damages electrical components. This board has static sensitive components installed. Be sure to comply with ESD (Electro Static Discharge) procedures when handling circuit boards and components.

1. Remove the expansion board from the shipping container.
2. Remove all packing material from the board.

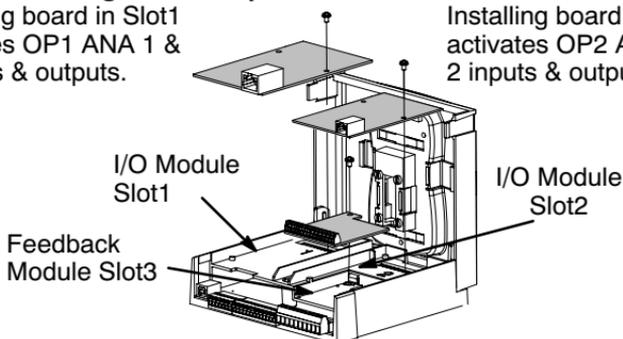
Caution: Be sure all packing materials are removed from the board. Conductive foam may be present on the connectors to prevent static build up during shipping. This can prevent proper circuit operation.

-
3. Be sure drive operation is terminated and secured.
 4. Remove all power sources from the control.
 5. Wait at least 5 minutes for internal capacitors to discharge.
 6. Refer to the control manual and remove the enclosure cover.
 7. Open the control cover and locate Slots 1 & 2, see Figure 3-1.
Note: Slot 3 is reserved for a feedback board only, encoder or resolver.
 8. Install the expansion board in Slot 1 or 2. Be sure the board is securely pressed downward and makes good contact with the 48 pin connector in the slot position.
 9. Secure the expansion board in the slot using the screw provided.

Figure 3-1 Expansion Board Slot Locations

Installing board in Slot1
activates OP1 ANA 1 &
2 inputs & outputs.

Installing board in Slot2
activates OP2 ANA 1 &
2 inputs & outputs.

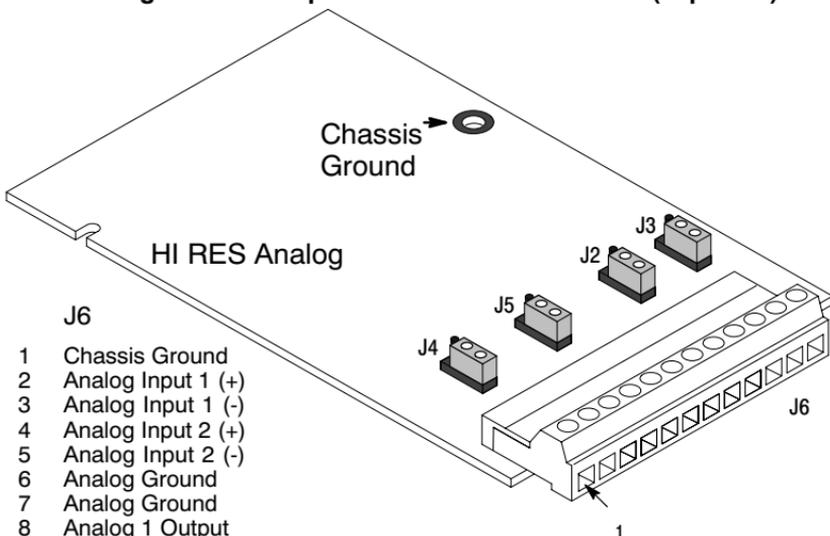


10. The mechanical installation of the expansion board is complete.
11. Refer to Jumper Definitions and configure the jumpers as desired.
12. Refer to Figures 3-3 and 3-4 and complete the wiring of the Analog Inputs and Outputs before you proceed to step 13.
13. When jumpers are set and connections are complete, close the control cover.
14. Refer to the control manual and close and secure the enclosure cover.
15. Restore all power sources to the control.
16. Restore drive operation.

Jumper Definitions

The settings for jumpers J2 to J5 are shown in Figure 3-2.

Figure 3-2 Jumper and Terminal Locations (Top View)



J6

- 1 Chassis Ground
- 2 Analog Input 1 (+)
- 3 Analog Input 1 (-)
- 4 Analog Input 2 (+)
- 5 Analog Input 2 (-)
- 6 Analog Ground
- 7 Analog Ground
- 8 Analog 1 Output
- 9 Analog 2 Output
- 10 Chassis Ground
- 11 Not Used
- 12 Not Used

J# Description

- | | |
|----|-----------------|
| J2 | Analog Output 1 |
| J3 | Analog Output 2 |
| J4 | Analog Input 1 |
| J5 | Analog Input 2 |

Function



Voltage



I (current)

Voltage

I (current)

Voltage

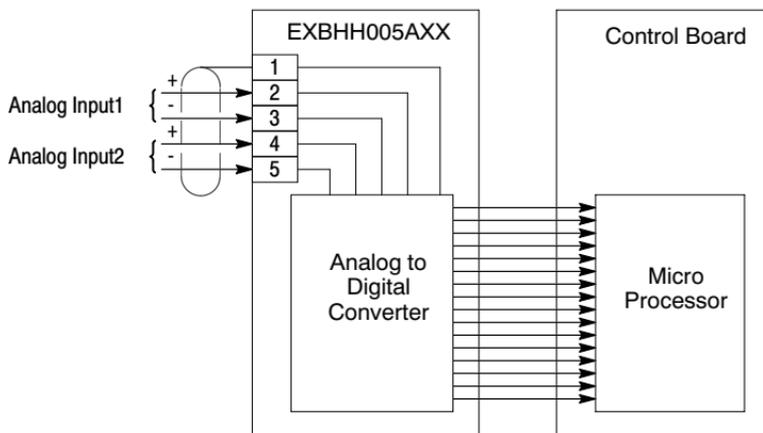
I (current)

Voltage

I (current)

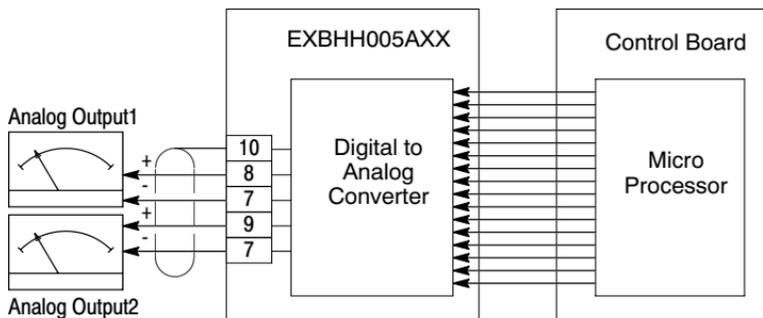
Terminal tightening torque is 2 lb-in (0.24 Nm) maximum.

Figure 3-3 High Resolution Input Connections



Terminal tightening torque is 2 lb-in (0.24 Nm) maximum.

Figure 3-4 High Resolution Output Connections



Terminal tightening torque is 2 lb-in (0.24 Nm) maximum.

Section 4 Software Setup

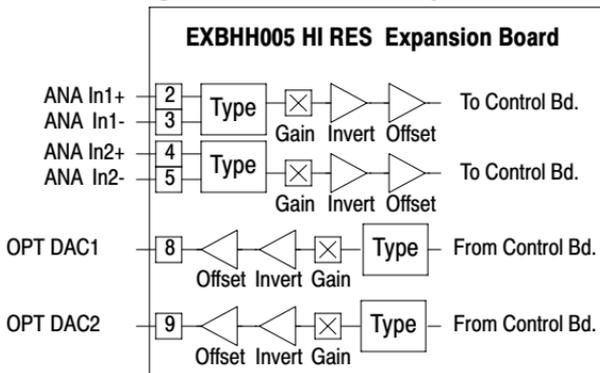
Overview

Programming setup is accomplished using the keypad of the control. General programming steps are defined in the appropriate control manual.

To install the expansion board see Section 3 of this manual.

1. Install EXBHH005 expansion board. If the board is in **Slot 1**, the **OP1** inputs and outputs are used. If the board is in **Slot 2**, the **OP2** inputs and outputs are used.
2. Set the Level 1 Input Setup block Command Source (P#1402) to select the desired analog input to use.
3. Refer to Figure 4-1 and the Optional Analog Parameter tables and set the parameter values as desired for each input or output used.

Figure 4-1 Relationship of Parameters



Hi RES Parameters

Level 1, Input Setup Block

| Parameter | P# | Adjustable Range | Factory | User Setting |
|----------------------|------|---|---------|--------------|
| COMMAND SOURCE | 1402 | 3-KEYPAD 4-NETWORK 5- Opt1 Ana In1 6- Opt1 Ana In2 7- Opt2 Ana In1 8- Opt2 Ana In2 9-EXB PULSE FOLL | 1 | |
| OP1 ANA IN1 TYPE | 1451 | 0-None, 1-(-10V to+10V), 2-(-5V to+5V), 3-(4to20mA), 4-(0to20mA) | 1 | |
| OP1 ANA IN1 Invert | 1452 | 0-OFF, 1-ON | 0 | |
| OP1 ANA IN1 Gain | 1453 | 0.0% TO 300.0% | 100.0 | |
| OP1 ANA IN1 Offset | 1454 | -100.0% TO 100.0% | 0.0 | |
| OP1 ANA IN1 Deadband | 1455 | 0.0% TO 75.0% | 0.0 | |
| OP1 ANA IN1 Filter | 1456 | 0 (No Filter) TO 6 (Max Filter) | 0 | |
| OP1 ANA IN2 TYPE | 1457 | 0-None, 1-(-10V to+10V), 2-(-5V to+5V), 3-(4to20mA), 4-(0to20mA) | 1 | |
| OP1 ANA IN2 Invert | 1458 | 0-OFF, 1-ON | 0 | |
| OP1 ANA IN2 Gain | 1459 | 0.0% TO 300.0% | 100.0 | |
| OP1 ANA IN2 Offset | 1460 | -100.0% TO 100.0% | 0.0 | |
| OP1 ANA IN1 Deadband | 1461 | 0.0% TO 75.0% | 0.0 | |
| OP1 ANA IN1 Filter | 1462 | 0 (No Filter) TO 6 (Max Filter) | 0 | |

OP1 parameter selections (P#1451 to 1462) are available if the expansion board is installed in Slot1 of the Control.

Hi RES Parameters Continued

Level 1, Input Setup Block Continued

| Parameter | P# | Adjustable Range | Factory | User Setting |
|----------------------|------|--|---------|--------------|
| OP2 ANA IN1 TYPE | 1463 | 0-None, 1-(-10V to+10V), 2-(-5V to+5V), 3-(4to20mA), 4-(0to20mA) | 1 | |
| OP2 ANA IN1 Invert | 1464 | 0-OFF, 1-ON | 0 | |
| OP2 ANA IN1 Gain | 1465 | 0.0% TO 300.0% | 100.0 | |
| OP2 ANA IN1 Offset | 1466 | -100.0% TO 100.0% | 0.0 | |
| OP2 ANA IN1 Deadband | 1467 | 0.0% TO 75.0% | 0.0 | |
| OP2 ANA IN1 Filter | 1468 | 0 (No Filter) TO 6 (Max Filter) | 0 | |
| OP2 ANA IN2 TYPE | 1469 | 0-None, 1-(-10V to+10V), 2-(-5V to+5V), 3-(4to20mA), 4-(0to20mA) | 1 | |
| OP2 ANA IN2 Invert | 1470 | 0-OFF, 1-ON | 0 | |
| OP2 ANA IN2 Gain | 1471 | 0.0% TO 300.0% | 100.0 | |
| OP2 ANA IN2 Offset | 1472 | -100.0% TO 100.0% | 0.0 | |
| OP2 ANA IN1 Deadband | 1473 | 0.0% TO 75.0% | 0.0 | |
| OP2 ANA IN1 Filter | 1474 | 0 (No Filter) TO 6 (Max Filter) | 0 | |

OP2 parameter selections (P#1463 to 1474) are available if the expansion board is installed in Slot2 of the Control.

Hi RES Parameters Continued

Level 1, Output Setup Block

| Parameter | P# | Adjustable Range | Factory | User Setting |
|---------------------|------|---|---------|--------------|
| ANA OUT1 Signal | 1511 | 18-CONTROL TEMP 19-ANALOG INPUT1 20-ANALOG INPUT2 21- OPT1 ANA IN1 22- OPT1 ANA IN2 23- OPT2 ANA IN1 24- OPT2 ANA IN2 | 29 | |
| ANA OUT2 Signal | 1514 | 18-CONTROL TEMP 19-ANALOG INPUT1 20-ANALOG INPUT2 21- OPT1 ANA IN1 22- OPT1 ANA IN2 23- OPT2 ANA IN1 24- OPT2 ANA IN2 | 3 | |
| OP1 ANAOUT1 Type | 1551 | 0-(0V to+10V), 1-(0V to+5V), 2-(-10V to+10V), 3-(-5V to+5V), 4-(4to20mA), 5-(0to20mA) | 2 | |
| OP1 ANAOUT2 Type | 1554 | | 2 | |
| OP1 ANAOUT1 Gain | 1553 | 0 - 200.0% | 100.0 | |
| OP1 ANAOUT2 Gain | 1556 | | 100.0 | |

Hi RES Parameters Continued

Level 1, Output Setup Block Continued

| Parameter | P# | Adjustable Range | Factory | User Setting |
|--------------------------|------|---|---------|--------------|
| OP1 ANAOUT1 Signal | 1552 | 0-SPEED REF 1-SPEED DEMAND 2-ACC/DEC 3-MOT OR CURRENT 4-MAG CURRENT 5-MAG CURRENT COMMAND 6-LOAD CURRENT 7-LOAD CURRENT COMMAND 8-POWER 9-PH1 CURRENT 10-PH2 CURRENT 11-PH3 CURRENT 12-MOT OR VOLTAGE 13-VD DEMAND 14-VQ DEMAND 15-BUS VOLTAGE | 29 | |
| OP1 ANAOUT2 Signal | 1555 | 16-ABS TORQUE 17-T ORQUE 18-CONTROL TEMP 19-ANALOG INPUT1 20-ANALOG INPUT2 21-OPT1 ANA IN1 22-OPT1 ANA IN2 23-OPT2 ANA IN1 24-OPT2 ANA IN2 25-PROC FEEDFORWARD 26-PROC FEEDBACK 27-PROC SETPOINT 28-ELECTRIC ANGLE 29-ABS SPEED 30-VELOCITY 31-NETWORK 32-CALIBRATE | 29 | |

OP1 parameter selections (P#1551 to 1556) are available if the expansion board is installed in Slot1 of the Control.

Hi RES Parameters Continued

Level 1, Output Setup Block Continued

| Parameter | P# | Adjustable Range | Factory | User Setting |
|------------------|-----------|--|----------------|---------------------|
| OP2 ANAOUT1 Type | 1557 | 0-(0V to+10V), 1-(0V to+5V), 2-(-10V to+10V), | 2 | |
| OP2 ANAOUT2 Type | 1560 | 3-(-5V to+5V), 4-(4to20mA), 5-(0to20mA) | 2 | |
| OP2 ANAOUT1 Gain | 1559 | 0 - 200.0% | 100.0 | |
| OP2 ANAOUT2 Gain | 1562 | | 100.0 | |

Hi RES Parameters Continued

Level 1, Output Setup Block Continued

| Parameter | P# | Adjustable Range | Factory | User Setting |
|--------------------------|------|---|---------|--------------|
| OP2 ANAOUT1 Signal | 1558 | 0-SPEED REF 1-SPEED DEMAND 2-ACC/DEC 3-MOT OR CURRENT 4-MAG CURRENT 5-MAG CURRENT COMMAND 6-LOAD CURRENT 7-LOAD CURRENT COMMAND 8-POWER 9-PH1 CURRENT 10-PH2 CURRENT 11-PH3 CURRENT 12-MOT OR VOLTAGE 13-VD DEMAND 14-VQ DEMAND 15-BUS VOLTAGE | 29 | |
| OP2 ANAOUT2 Signal | 1561 | 16-ABS TORQUE 17-T ORQUE 18-CONTROL TEMP 19-ANALOG INPUT1 20-ANALOG INPUT2 21-OPT1 ANA IN1 22-OPT1 ANA IN2 23-OPT2 ANA IN1 24-OPT2 ANA IN2 25-PROC FEEDFORWARD 26-PROC FEEDBACK 27-PROC SETPOINT 28-ELECTRIC ANGLE 29-ABS SPEED 30-VELOCITY 31-NETWORK 32-CALIBRATE | 29 | |

OP2 parameter selections (P#1557 to 1562) are available if the expansion board is installed in Slot2 of the Control.

Hi RES Parameters Continued

Level 2, Miscellaneous Block

| Parameter | P# | Adjustable Range | Factory | User Setting |
|------------------|-----------|--|----------------|---------------------|
| Filter Source | 2310 | 4-Analog IN2, 5-Opt1 ANA1, 6-Opt1 ANA2, 7-Opt2 ANA1, 8-Opt2 ANA2 | 0 | |

Level 2, Process Control Block Continued

| Parameter | P# | Adjustable Range | Factory | User Setting |
|------------------|-----------|---|----------------|---------------------|
| Process Feedback | 2603 | 5-Network, 6-Opt1 ANA1, 7-Opt1 ANA2, 8-Opt2 ANA1, 9-Opt2 ANA2 | 0 | |
| Setpoint Source | 2604 | 5-Network, 6-Opt1 ANA1, 7-Opt1 ANA2, 8-Opt2 ANA1, 9-Opt2 ANA2 | 0 | |

Section 5 Troubleshooting

Overview

The Main Menu “Diagnostic” option is used to view the diagnostic screen.

Diagnostic Screen

At the keypad, from the Main menu the Diagnostic screens are accessed and the Option Boards display shows what boards are installed and recognized by the software. If the installed board is not displayed on this screen, the connections and software versions should be checked.

If the board is installed in Slot 1, it will be shown as Option 1.

If the board is installed in Slot 2, it will be shown as Option 2.

Installed Option Boards

| | | | |
|---------------|------|-----------|---|
| DIAG | STOP | LOCAL | Press ► or ◀ to go to the next or previous Diagnostic screen. |
| OPTION BOARDS | | | |
| OPTION 1 | | Ana Input | |
| OPTION 2 | | None | |
| FEEDBACK | | None | |
| EV. LOG | 0r | MAIN | Press R to return to previous menu. |
| | | | Press A to go to Status screen. |

Displays Hi Resolution Analog EXB status: voltage present at each of the Analog Inputs and Outputs.

If the EXB is installed in Slot 1, OP1 is displayed (shown).

If the EXB is installed in Slot 2, OP2 is displayed.

| Display | Comments |
|--|--|
| DIAG STOP LOCAL HI RES INPUTS OP1 ANA IN1 0.0V OP1 ANA IN2 0.0V EV. LOG 0r MAIN | Press ► or ◀ to go to the next or previous Diagnostic screen. Press R to return to previous menu. Press A to go to Status screen. Note: This screen does not appear unless EXBHH005 is installed. |
| DIAG STOP LOCAL HI RES OUTPUTS OP1 ANA OUT1 0.0V OP1 ANA OUT2 0.0V EV. LOG 0r MAIN | Press ► or ◀ to go to the next or previous Diagnostic screen. Press R to return to previous menu. Press A to go to Status screen. Note: This screen does not appear unless EXBHH005 is installed. |



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DENVER, CO 80207
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FAX: 303-595-3772

9680 PARK MEADOWS DRIVE
SUITE 214
LONE TREE, CO 80134-6739
PHONE: 303-339-9629
FAX: 303-339-9633

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65 SOUTH TURNPIKE ROAD
WALLINGFORD, CT 06492
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FAX: 203-269-5485

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FAX: 812-378-2555

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FAX: 785-749-4217

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FAX: 508-854-0291

MICHIGAN

DETROIT
33782 STERLING PONDS BLVD.
STERLING HEIGHTS, MI 48312
PHONE: 586-979-9800
FAX: 586-979-9969

GRAND RAPIDS

668 THREE MILE ROAD NW
GRAND RAPIDS, MI 49504
PHONE: 616-785-1784
FAX: 616-785-1786

MINNESOTA

MINNEAPOLIS
21080 134TH AVE. NORTH
ROGERS, MN 55374
PHONE: 763-428-3633
FAX: 763-428-4551

MISSOURI

ST LOUIS
422 INDUSTRIAL DRIVE
MARYLAND HEIGHTS, MO 63043
PHONE: 314-298-1800
FAX: 314-298-1960

KANSAS CITY
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FAX: 816-587-3735

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AUBURN
ONE ELLIS DRIVE
AUBURN, NY 13021
PHONE: 315-265-3403
FAX: 315-263-9623

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1220 ROTHERWOOD ROAD
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2629 CRESCENTVILLE ROAD
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