

ACH580

E-Clipse bypass and packaged drive user manual

ACH580-BCR/BDR/VCR/VDR E-Clipse Bypass Drives 1...200 HP

ACH580-PCR/PDR Packaged Drives with Disconnect 1...200 HP



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ACH580 BCR/BDR/VCR/VDR E-Clipse Bypass Drives 1...200 HP

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Safety instructions

These are the safety instructions which you must obey when you install and operate the drive and do maintenance on the drive. If you ignore the safety instructions, injury, death or damage can occur.

Use of warnings and notes in this manual


Warnings tell you about conditions which can cause injury or death, or damage to the equipment. They also tell you how to prevent the danger. Notes draw attention to a particular condition or fact, or give information on a subject.

The manual uses these warning symbols:

| | |
|---|---|
|  | Electricity warning tells about hazards from electricity which can cause injury or death, or damage to the equipment. |
|  | General warning tells about conditions, other than those caused by electricity, which can cause injury or death, or damage to the equipment. |
|  | Electrostatic sensitive devices warning tells you about the risk of electrostatic discharge which can cause damage to the equipment. |

General safety in installation, start-up and maintenance

These instructions are for all personnel that install the drive and do maintenance work on it.

 **WARNING!** Obey these instructions. If you ignore them, injury or death, or damage to the equipment can occur.

- Use safety shoes with a metal toe cap to avoid foot injury. Wear protective gloves and long sleeves. Some parts have sharp edges.

- Handle the drive carefully.
 - Frames R5...R9: Lift the drive with a lifting device. Use the lifting eyes of the drive.
 - Frames R5...R9: Do not tip the drive over. The drive is heavy and its center of gravity is high. An overturning drive can cause physical injury.



- Beware of hot surfaces. Some parts, such as heatsinks of power semiconductors, remain hot for a while after disconnection of the electrical supply.
- Keep the drive in its package or protect it otherwise from dust and burr from drilling and grinding until you install it.
- Vacuum clean the area below the drive before the start-up to prevent the drive cooling fan from drawing the dust inside the drive.
- Do not cover the air inlet and outlet when the drive runs.
- Make sure that there is sufficient cooling. See the *ACH580 Hardware Manual* (3AXD50000044839) for more information.

- Before you connect voltage to the drive, make sure that the drive covers are on. Keep the covers on during the operation.
- Before you adjust the drive operation limits, make sure that the motor and all driven equipment can operate throughout the set operation limits.
- Before you activate the automatic fault reset or automatic restart functions of the drive control program, make sure that no dangerous situations can occur. These functions reset the drive automatically and continue operation after a fault or supply break. If these functions are activated, the installation must be clearly marked as defined in IEC/EN 61800-5-1, subclause 6.5.3, for example, "THIS MACHINE STARTS AUTOMATICALLY".
- The maximum number of drive power-ups is five in ten minutes. Too frequent power-ups can damage the charging circuit of the DC capacitors.
- If you have connected safety circuits to the drive (for example, emergency stop and Safe torque off), validate them at the start up. For the validation of the Safe torque off, see ACH580 HVAC control program firmware manual (3AXD50000027537 [English]). For the validation of other safety circuits, see the instructions provided with them.


Note:

- If you select an external source for start command and it is on, and the start command is level-triggered, the drive will start immediately after fault reset. See parameters 20.02 Ext1 start trigger type and 20.07 Ext2 start trigger type in ACH580 HVAC control program firmware manual (3AXD50000027537 [English]).
 - When the control location is not set to Local (text Hand is not shown on the top row of the panel and parameter 19.19 Off mode disable has value Off button disabled), the stop key on the control panel will not stop the drive.
- Frames R1...R5: Do not attempt to repair a malfunctioning drive; contact your local representative for replacement or repair by authorized persons.
 - Frames R6...R9: Can be repaired by authorized persons.

Electrical safety in installation, start-up and maintenance

Precautions before electrical work

These warnings are for all personnel who do work on the drive, motor cable or motor.

 **WARNING!** Frames R1 ... R9: Obey these instructions. If you ignore them, injury or death, or damage to the equipment can occur. If you are not a qualified electrical professional, do not do electrical installation or maintenance work. Go through these steps before you begin any installation or maintenance work.

1. Clearly identify the work location.
2. Disconnect all possible voltage sources. Lock and tag.
 - Open the main disconnect at the power supply of the drive.
 - Make sure that reconnection is not possible.
 - Disconnect any external power sources from the control circuits.
 - After you disconnect the drive, always wait for 5 minutes to let the intermediate circuit capacitors discharge before you continue.
3. Protect any other energized parts in the work location against contact.
4. Take special precautions when close to bare conductors.
5. Measure that the installation is de-energized.
 - Use a multimeter with an impedance of at least 1 Mohm.

- Make sure that the voltage between the drive input power terminals (L1, L2, L3) and the grounding terminal (PE) is close to 0 V.

Frames R1...R3: Measure the voltage between the drive UDC+ terminal and grounding terminal (PE) with one multimeter. As there is no UDC- terminal, measure the voltage between the drive T1/U terminal and grounding terminal (PE) with another multimeter. Make sure that the voltage difference between the multimeters is close to 0 V.

Frames R4...R9: Measure the voltage between the drive DC terminals (UDC+ and UDC-) and the grounding terminal (PE) and make sure that it is close to 0 V.

6. Install temporary grounding as required by the local regulations.
7. Ask for a permit to work from the person in control of the electrical installation work.

If the drive does not operate according to these steps, refer to the *ACH580-01 Hardware Manual* (3AXD50000044839).

Additional instructions and notes



WARNING! Obey these instructions. If you ignore them, injury or death, or damage to the equipment can occur.

- If the drive will be connected on an IT system (ungrounded or high-resistance-grounded [over 30 ohms]), make sure neither the EMC filter nor the ground-to-phase varistor are connected (metal screws should not be installed). Connections with metal screws in these systems can cause danger or damage. See section *Checking the compatibility with IT (ungrounded) and corner-grounded TN systems (North America)* in the *ACH580 Installation, Operation and Maintenance Manual* (3AXD50000049127).

Note: For other systems, connecting the internal EMC filter will reduce the conducted emission.

- If the drive will be connected on a corner-grounded TN system, make sure the EMC filter is not connected (metal screws should not be installed). Connections with metal screws in these systems can cause danger or damage. See section *Checking the compatibility with IT (ungrounded) and corner-grounded TN systems (North America)* in the *ACH580 Installation, Operation and Maintenance Manual* (3AXD50000049127).

Note: For other systems, connecting the internal EMC filter (using metal screws) will reduce the conducted emission.

- Use all ELV (extra low voltage) circuits connected to the drive only within a zone of equipotential bonding, that is, within a zone where all simultaneously accessible conductive parts are electrically connected to prevent hazardous voltages appearing between them. You can accomplish this by a proper factory grounding, that is, make sure that all simultaneously accessible conductive parts are grounded to the protective earth (PE) bus of the building.
- Do not do insulation or voltage withstand tests on the drive or drive modules.

Note:

- The motor cable terminals of the drive are at a dangerous voltage when the input power is on, regardless of whether the motor is running or not.
- The DC and brake resistor terminals (UDC+, UDC-, R+ and R-) are at a dangerous voltage.
- External wiring can supply dangerous voltages to the terminals of relay outputs (RO1, RO2 and RO3).
- The Safe torque off function does not remove the voltage from the main and auxiliary circuits. The function is not effective against deliberate sabotage or misuse.




WARNING! Use a grounding wrist band when you handle the printed circuit boards. Do not touch the boards unnecessarily.

The boards contain components sensitive to electrostatic discharge.

Grounding

These instructions are for all personnel who are responsible for the electrical installation, including the grounding of the drive.


 **WARNING!** Obey these instructions. If you ignore them, injury or death, or equipment malfunction can occur, and electromagnetic interference can increase.

- If you are not a qualified electrical professional, do not do grounding work.
 - Always ground the drive, the motor and adjoining equipment to the protective earth (PE) bus of the power supply. This is necessary for the personnel safety. Proper grounding also reduces electromagnetic emission and interference.
 - In a multiple-drive installation, connect each drive separately to the protective earth (PE) bus of the power supply.
 - Make sure that the conductivity of the protective earth (PE) conductors is sufficient. See section [Power cable terminal and lead-through data](#) in the *ACH580 Installation, Operation and Maintenance Manual* (3AXD50000049127). Obey the local regulations.
 - Connect the power cable shields to the protective earth (PE) terminals of the drive.
 - Standard IEC/EN & UL 61800-5-1 (section 4.3.5.5.2.) requires that as the normal touch current of the drive is higher than 3.5 mA AC or 10 mA DC, you must use a fixed protective earth (PE) connection. In addition,
 - install a second protective earth conductor of the same cross-sectional area as the original protective earthing conductor,
- or
- install a protective earth conductor with a cross-section of at least 7 AWG (10 mm²) Cu,

or

- install a device which automatically disconnects the supply if the protective earth conductor breaks.


Additional instructions for Safety Functions

 **WARNING!** Bypass configurations (ACH580-VxR & ACH580-BxR) do not support Safe Torque Off (STO) functionality in bypass mode.

Additional instructions for permanent magnet motor drives

Safety in installation, start-up and maintenance

These are additional warnings concerning permanent magnet motor drives. The other safety instructions in this chapter are also valid.

 **WARNING!** Obey these instructions. If you ignore them, injury or death and damage to the equipment can occur.

- Do not work on a drive when a rotating permanent magnet motor is connected to it. A rotating permanent magnet motor energizes the drive including its power terminals.

Before installation, start-up and maintenance work on the drive:

- Stop the motor.
- Disconnect the motor from the drive with a safety switch or by other means.
- If you cannot disconnect the motor, make sure that the motor cannot rotate during work. Make sure that no other system, like hydraulic crawling drives, can rotate the motor directly or through any mechanical connection like felt, nip, rope, etc.
- Measure that the installation is de-energized.
 - Use a multimeter with an impedance of at least 1 Mohm.
 - Make sure that the voltage between the drive output terminals (T1/U, T2/V, T3/W)

and the grounding (PE) busbar is close to 0 V.

- Make sure that the voltage between the drive input power terminals (L1, L2, L3) and the grounding (PE) busbar is close to 0 V.
- Make sure that the voltage between the drive DC terminals (UDC+, UDC-) and the grounding (PE) terminal is close to 0 V.
- Install temporary grounding to the drive output terminals (T1/U, T2/V, T3/W). Connect the output terminals together as well as to the PE.

Start-up and operation:

- Make sure the motor is not run over the rated speed with dynamic/positive displacement loads.

General safety in operation

These instructions are for all personnel that operate the drive.



WARNING! Obey these instructions. If you ignore them, injury or death, or damage to the equipment can occur.

- Do not control the motor with the line side disconnect at the drive power supply; instead, use the control panel start and stop keys or commands through the I/O terminals of the drive.
- Give a stop command to the drive before you reset a fault. If you have an external source for the start command and the start is on, the drive will start immediately after the fault reset, unless you configure the drive for pulse start. See the firmware manual.
- Before you activate automatic fault reset functions of the drive control program, make sure that no dangerous situations can occur. These functions reset the drive automatically and continue operation after a fault.

Note: When the drive is not in the Hand mode, the Off key on the control panel will not stop the drive.

Cybersecurity disclaimer

This product is designed to be connected to and to communicate information and data via a network interface. It is Customer's sole responsibility to provide and continuously ensure a secure connection between the product and Customer network or any other network (as the case may be). Customer shall establish and maintain any appropriate measures (such as but not limited to the installation of firewalls, application of authentication measures, encryption of data, installation of anti-virus programs, etc) to protect the product, the network, its system and the interface against any kind of security breaches, unauthorized access, interference, intrusion, leakage and/or theft of data or information. ABB and its affiliates are not liable for damages and/or losses related to such security breaches, any unauthorized access, interference, intrusion, leakage and/or theft of data or information.

ACH580 BCR/BDR/VCR/VDR
E-Clipse Bypass Drives
1...200 HP

Installation

Study these installation instructions carefully before proceeding. **Failure to observe the warnings and instructions may cause a malfunction or personal hazard.**



WARNING! Before you begin read [Safety instructions](#) on page [iv](#).



WARNING! When the ACH580 with E-Clipse Bypass is connected to the line power, the Motor Terminals T1, T2, and T3 are live even if the motor is not running. Do not make any connections when the ACH580 with E-Clipse Bypass is connected to the line. Disconnect and lock out power to the drive before servicing the drive. Failure to disconnect power may cause serious injury or death.

Application

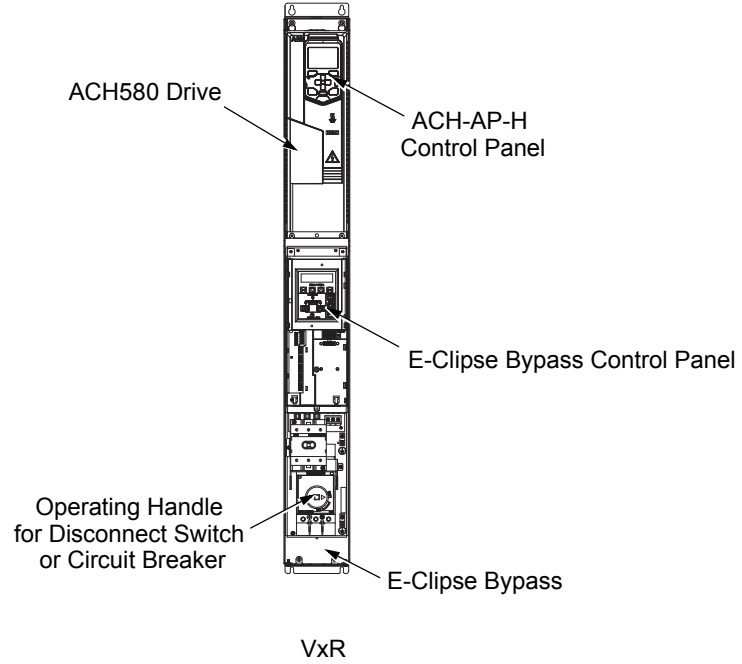
This manual is a supplement to the ACH580-01 User's Manual and documents E-Clipse Bypass configurations.

E-Clipse bypass features and functions

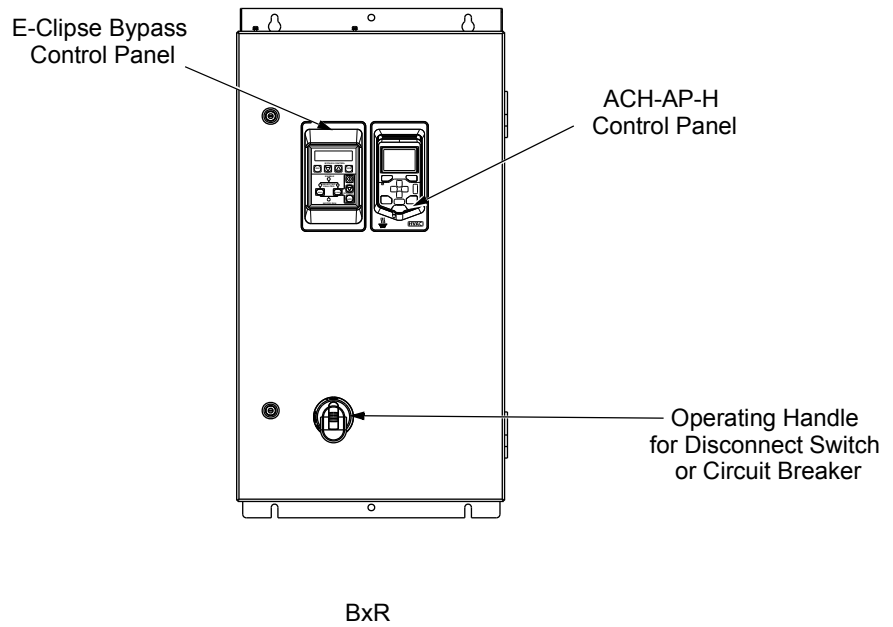
The ACH580 with E-Clipse Bypass is an ACH580 AC adjustable frequency drive in an integrated UL (NEMA) Type 1, UL (NEMA) Type 12, or UL (NEMA) Type 3R package with a bypass motor starter. The ACH580 with E-Clipse Bypass provides:

- Disconnect switch or circuit breaker with door mounted handle mechanism. The handle can be padlocked in the OFF position (padlock not supplied).
- Bypass starter.
- Motor overload protection.
- Local operator panel with indicating lights and multifunction display.
- Provisions for external control connections.
- Embedded communications for major BMS protocols including BACnet, Johnson Controls International N2 and Modbus.
- Optional field bus adapters for connection to additional BMS protocols including LonWorks, Ethernet/IP, DeviceNet, and PROFINET.
- Optional drive service switch (drive input disconnect), the functional equivalent of a three-contactor bypass arrangement.

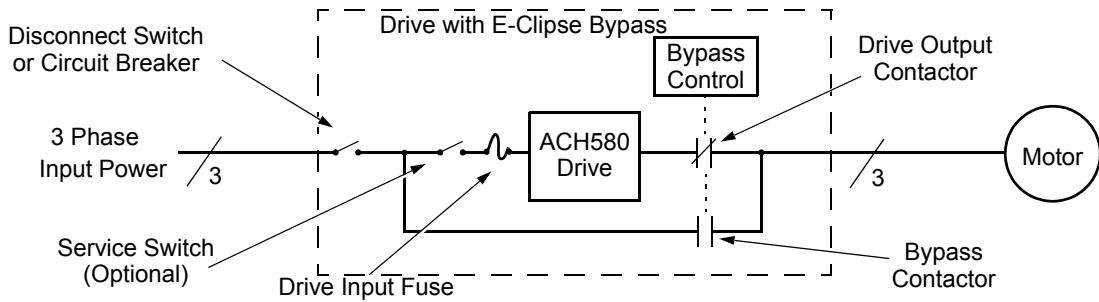
The following shows the front view of the ACH580 E-Clipse Bypass vertical configuration, and identifies the major components.



The following shows the front view of the ACH580 E-Clipse Bypass standard configurations, and identifies the major components.



The following is a typical power diagram.



Installation flow chart

The installation of E-Clipse Bypass Configurations for ACH580 drives follows the outline below. The steps must be carried out in the order shown. At the right of each step are references to the detailed information needed for the correct installation of the unit.

| Task | Reference in <i>ACH580-01 Hardware Manual (3AXD50000044839) Installation section</i> | Reference in this Manual |
|---|--|---|
| PREPARE for installation | <i>Preparing for installation in the ACH580-01 Hardware Manual (3AXD50000044839)</i> | Preparing for installation on page 6. Suitable mounting location on page 7 |
| PREPARE the mounting location | PREPARE the mounting location | — |
| MOUNT the unit | <i>MOUNT the drive</i> | — |
| REMOVE the covers from Vertical E-Clipse Bypass Unit | <i>REMOVE the front cover</i> | — |
| INSTALL wiring | <i>Wiring overview and Install the wiring</i> | Installing the wiring starting on page 7. |
| CHECK jumpers and switches | — | Check jumpers and switches on page 25. |
| CHECK installation | <i>Check installation</i> | Check installation – Bypass on page 19. |
| RE-INSTALL the covers | <i>Re-install cover</i> | — |
| APPLY power | <i>Apply power</i> | — |
| START-UP | <i>Start-up</i> | — |

For more details, refer to the *ACH580-01 Hardware Manual (3AXD50000044839)*.

Preparing for installation

Drive identification

Drive labels

To determine the type of drive you are installing, refer to either:

- Serial number label attached on upper part of the chokeplate between the mounting holes.
- Type code label attached on the heat sink – on the right side of the unit cover.



| | | | |
|---|---|--|---|
| VFD Rating Input 3PH 50...60 Hz Voltage(U1) 440...480 Vac Current(I1n) 240 A Short Circuit 100 kA E-Clipse Package Rating Power(Pn) 200 Hp | Output 3PH 0...500 Hz Voltage(U2) 0...U1 Vac Current(I2n) 240 A | ABB Inc. Made in the USA of foreign parts Mfg. Date: xx-xxxx-20xx | MTR OL INCL: SEE MANUAL Orig. Drive Firmware: V.2.05.0.0 Orig. Bypass Firmware: V.1.01B |
|---|---|--|---|

Schematic: 3AUA0000014954

S/N 2090501769

ACH580-BCR-240A-4

Type code

Use the following chart to interpret the type code found on either label.

ACH580-BCR-012A-4 +...+...

| | |
|--|-------|
| AC, HVAC Drive = 580 Product Series | _____ |
| Construction 01 = Base Drive BCR = E-Clipse Bypass with circuit breaker BDR = E-Clipse Bypass with disconnect switch PCR = Packaged Drive with circuit breaker PDR = Packaged Drive with disconnect switch VCR = Vertical bypass with circuit breaker VDR = Vertical bypass with disconnect switch | _____ |
| VFD output current rating (See ratings chart for details) | _____ |
| Voltage rating 2 = 208...240 VAC 4 = 440...480 VAC 6 = 575...600 VAC | _____ |
| Enclosure protection class No specification = UL (NEMA) Type 1 +B056 = UL (NEMA) Type 12 +B058 = UL (NEMA) Type 3R | _____ |
| Power options +E213 = Line reactor (PxR or BxR Configurations) +F267 = Service switch (VxR or BxR Configurations) | _____ |
| Input/Output option modules +L501 = Ext 24V DC/AC and digital I/O Extension +L512 = 115/230 V digital input interface +L523 = Ext 24V and isolated PTC Interface | _____ |
| Fieldbus adaptors +K451 = DeviceNet Adapter +K452 = LonWorks Adapter +K454 = Profibus Adapter +K462 = ControlNet Adapter +K465 = BACnet/IP (2-port) Adapter (PxR or -01 configurations) +K475 = Ethernet Adapter | _____ |
| Keypad +J429 = Control panel with Bluetooth® interface | _____ |

Ratings and frame size

For ratings and frame size information refer to the chart in the *Ratings* section of the *ACH580-01 Hardware Manual* (3AXD50000044839). This section lists technical specifications, and identifies the drive's frame size, which is significant, since some instructions in this document vary, depending on the drive's frame size. To read the Ratings table, you need the "Output current rating" entry from *Type code* on page 6. Also, when using the Ratings tables, note that there are three tables based on the drive's "Voltage rating".

Suitable mounting location

In selecting a suitable mounting location for E-Clipse Bypass configurations, refer to the *Technical data* on page 213 in this manual for the appropriate information on:

- Branch circuit protection
- Dimensions and weights
- UL (NEMA) Type 3R, Bx3R-1...Bx3R-4 enclosures are designed to be mounted on a wall.

Installing the wiring



WARNING!

- Metal shavings or debris in the enclosure can damage electrical equipment and create a hazardous condition. Where parts, such as conduit plates require cutting or drilling, first remove the part. If that is not practical, cover nearby electrical components to protect them from all shavings or debris.
- Do not connect or disconnect input or output power wiring, or control wires, when power is applied.
- Never connect line voltage to drive output Terminals T1, T2, and T3.
- Do not make any voltage tolerance tests (Hipot or Megger) on any part of the unit. Disconnect motor wires before taking any measurements in the motor or motor wires.
- Make sure that power factor correction capacitors are not connected between the drive and the motor.

Wiring requirements

Refer to the *Wiring requirements* in the *ACH580-01 Hardware Manual* (3AXD50000044839). The requirements apply to all ACH580 drives. In particular:

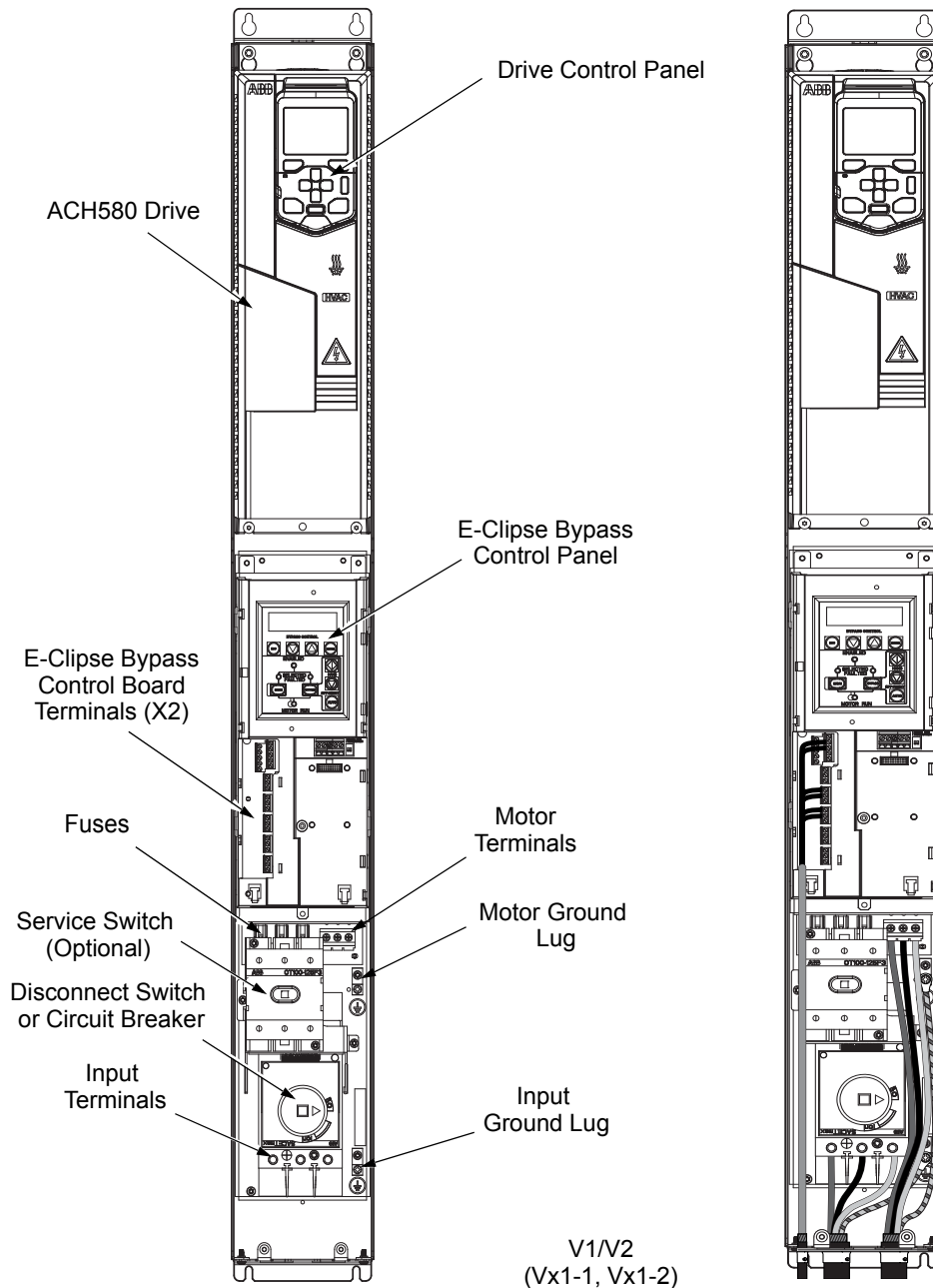
- Use separate, metal conduit runs to keep these three classes of wiring apart:
 - Input power wiring.
 - Motor wiring.
 - Control/communications wiring.
- Properly and individually ground the drive, the motor and cable shields.

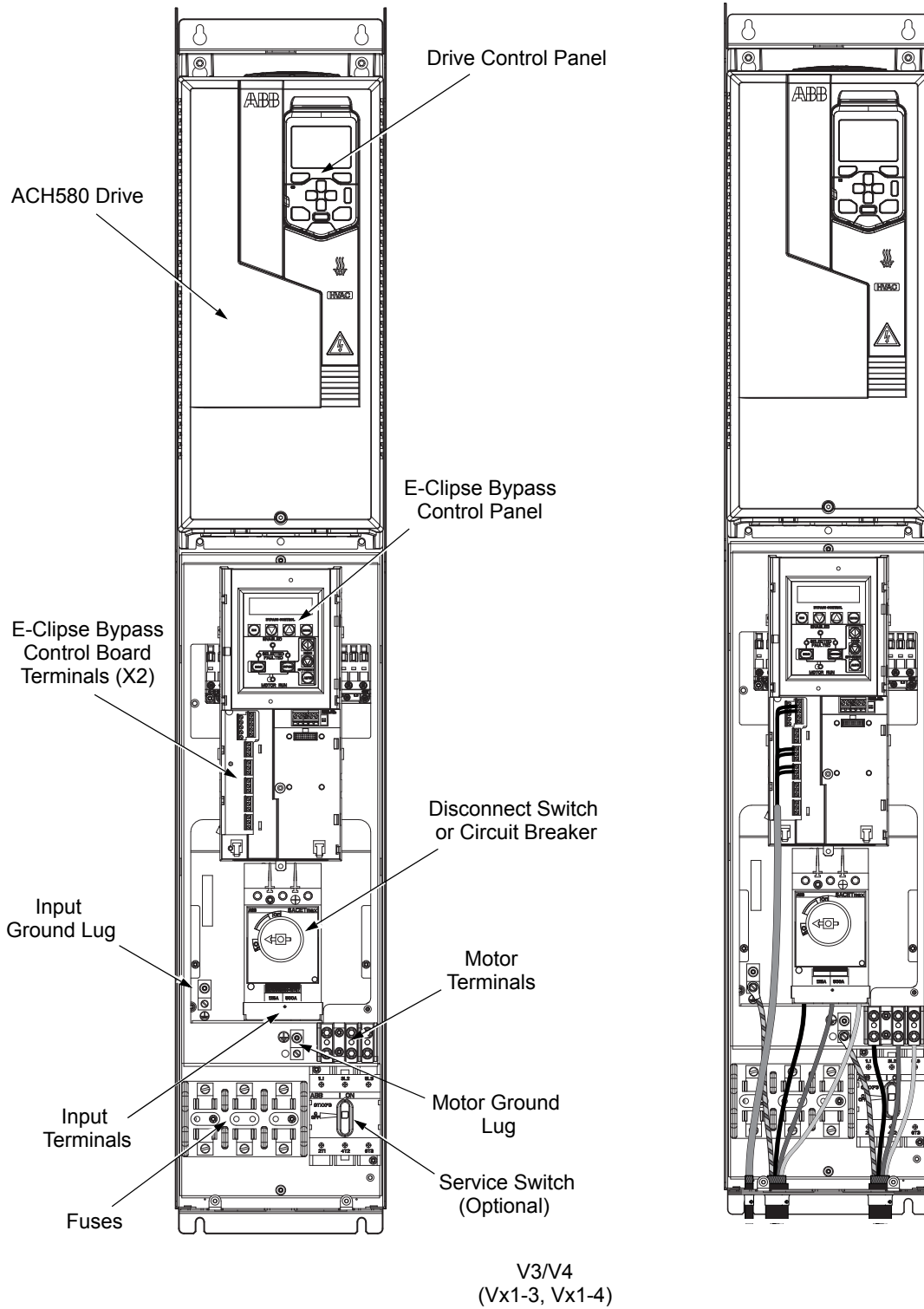
- Use wire ties to permanently affix control/communications wiring to the hooked wire race tie points provided maintaining a minimum 6 mm (1/4 in.) spacing from power wiring.
- Use a separate motor conduit run for each motor.

Wiring overview

Connection and wiring diagrams – Vertical E-Clipse Bypass

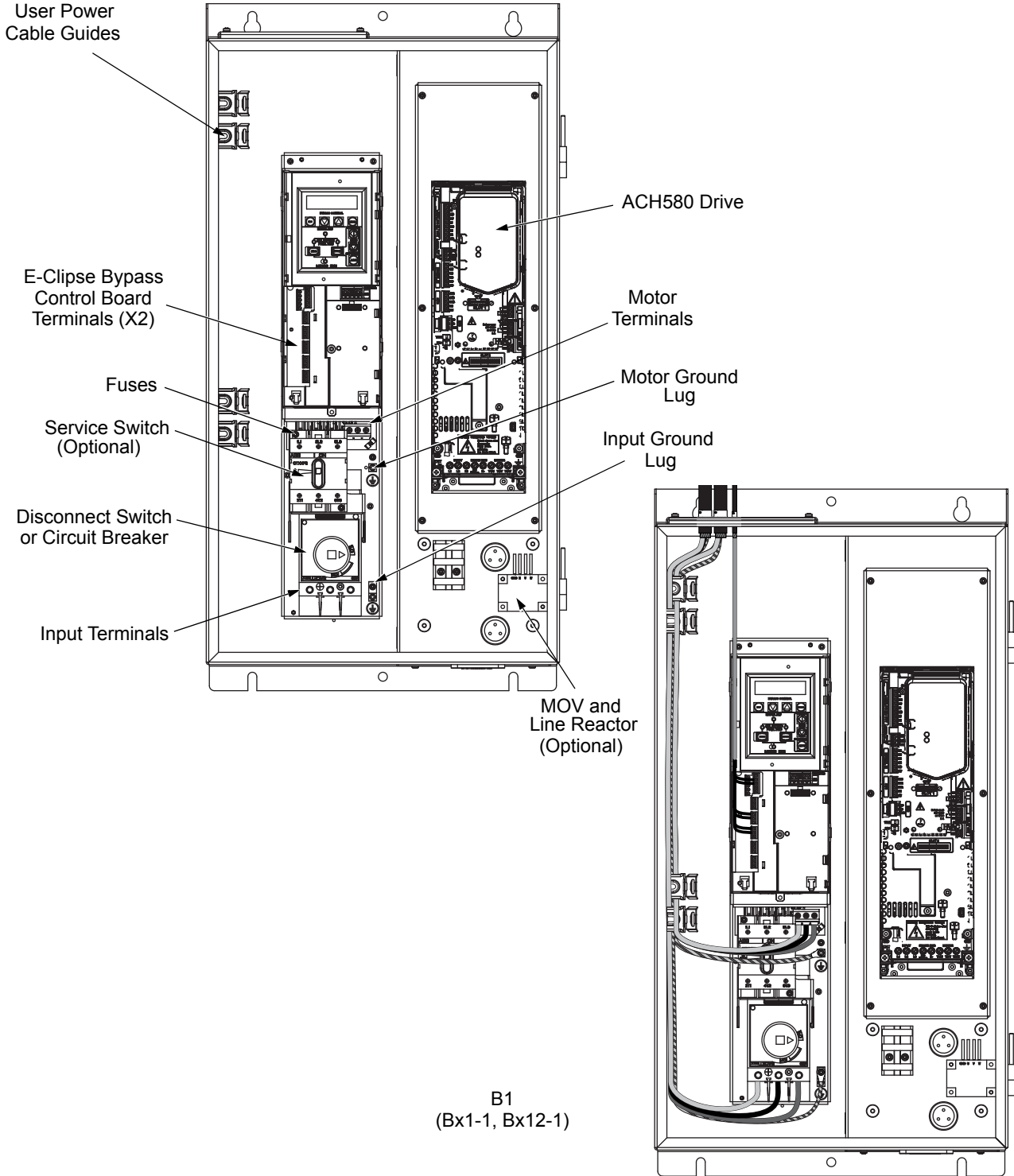
ACH580 Vertical E-Clipse Bypass units are configured for wiring access from the bottom only. The following figures show the layout and wiring connection points. For drive control wiring, see page 52. Maintain appropriate separation of control and power wires.

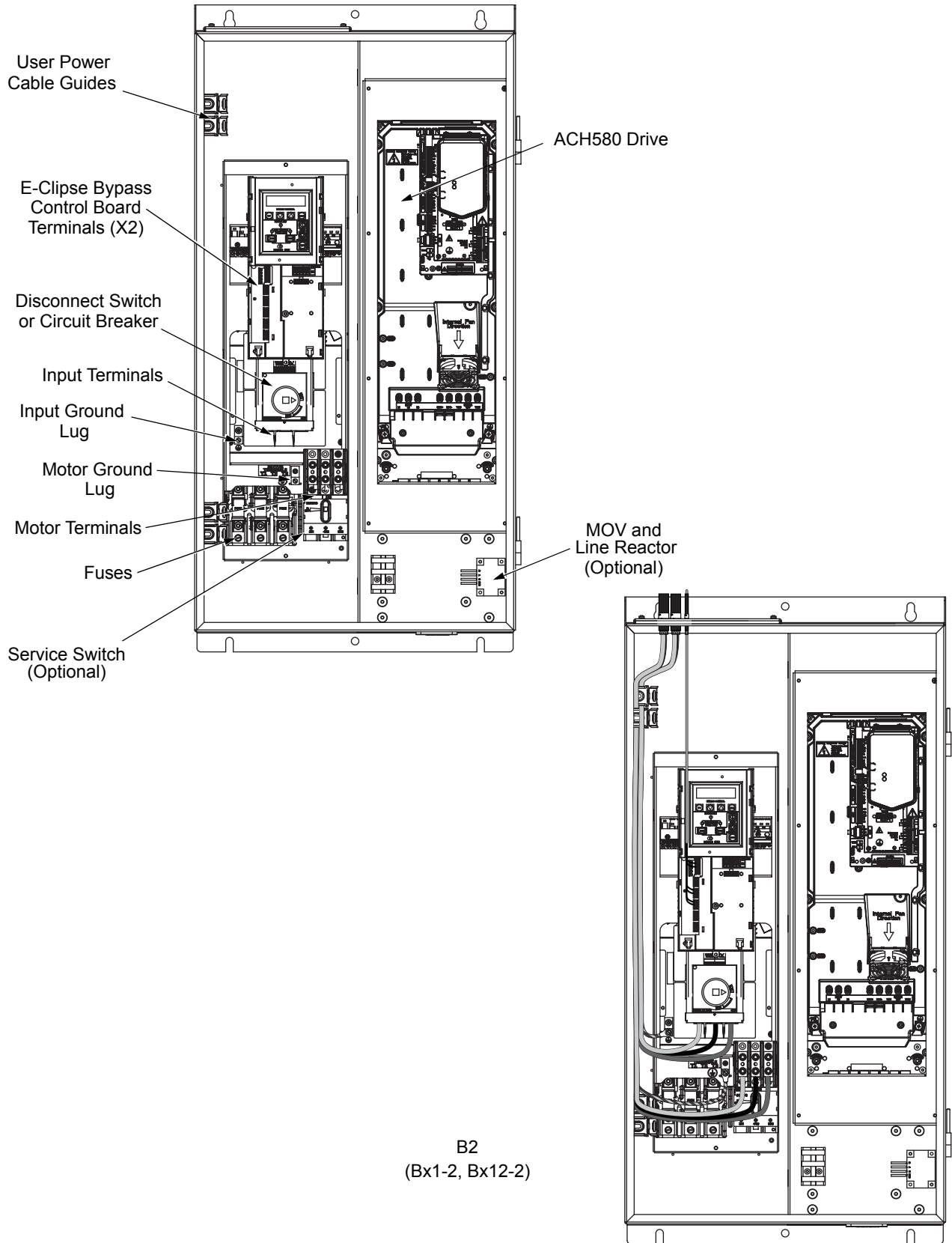


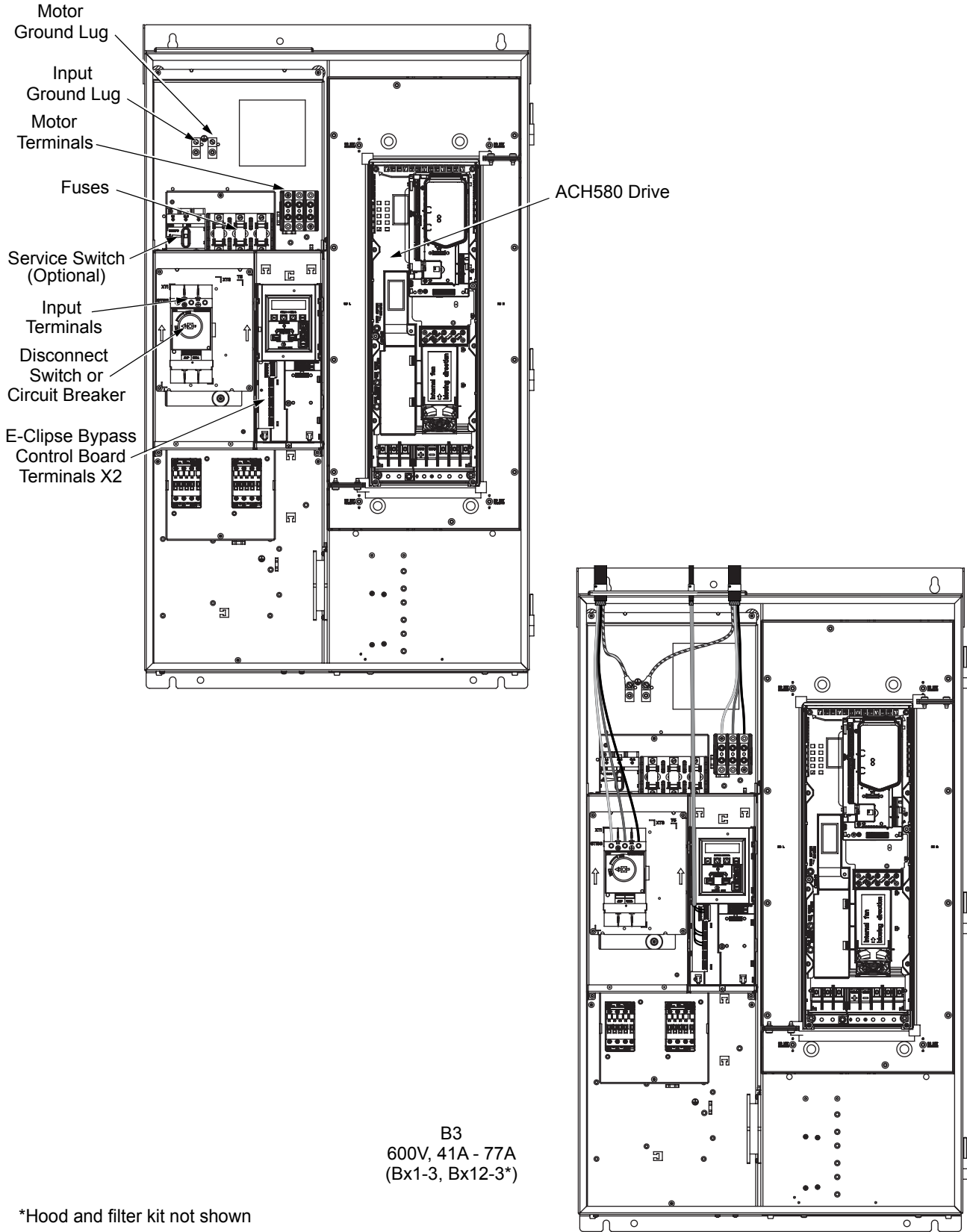


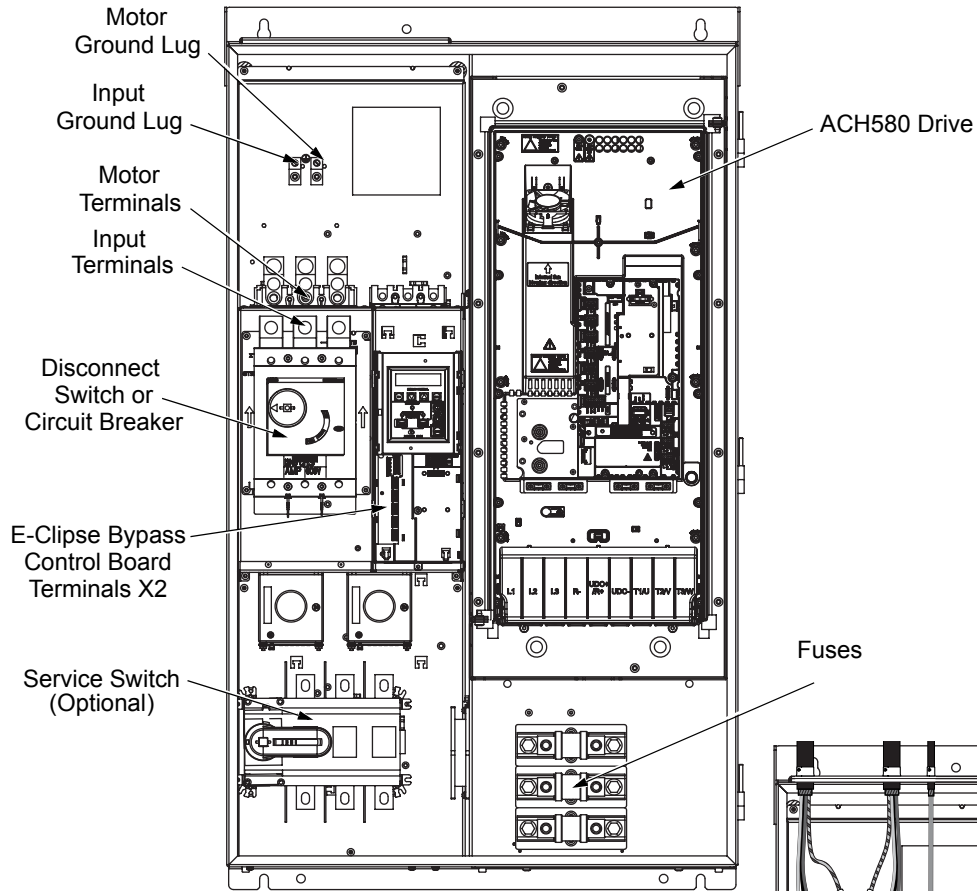
Connection and wiring diagrams – Box E-Clipse Bypass

ACH580 Box E-Clipse Bypass units are configured for wiring access from the top (for UL (NEMA) Type 1 and 12) and from the bottom (for UL (NEMA) Type 3R). The following figures show the layout and wiring connection points. For drive control wiring, see page 52. Maintain appropriate separation of control and power wires.



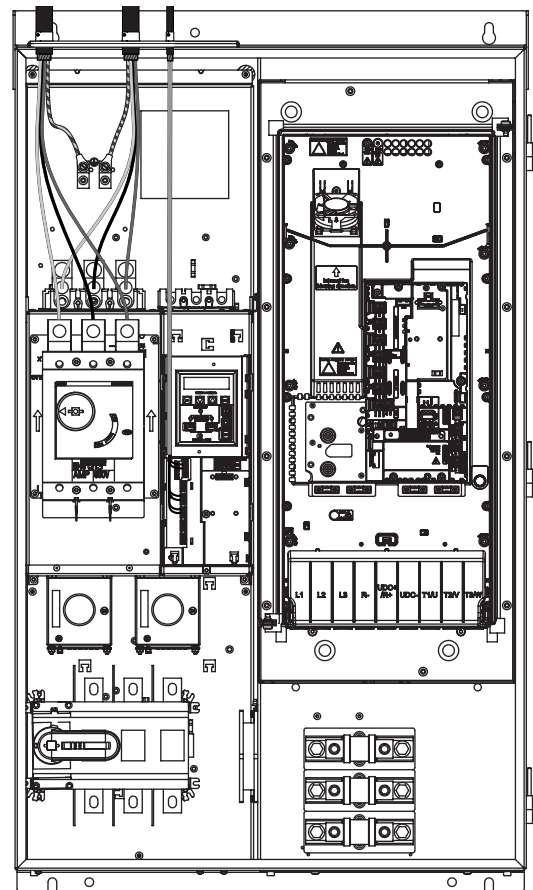


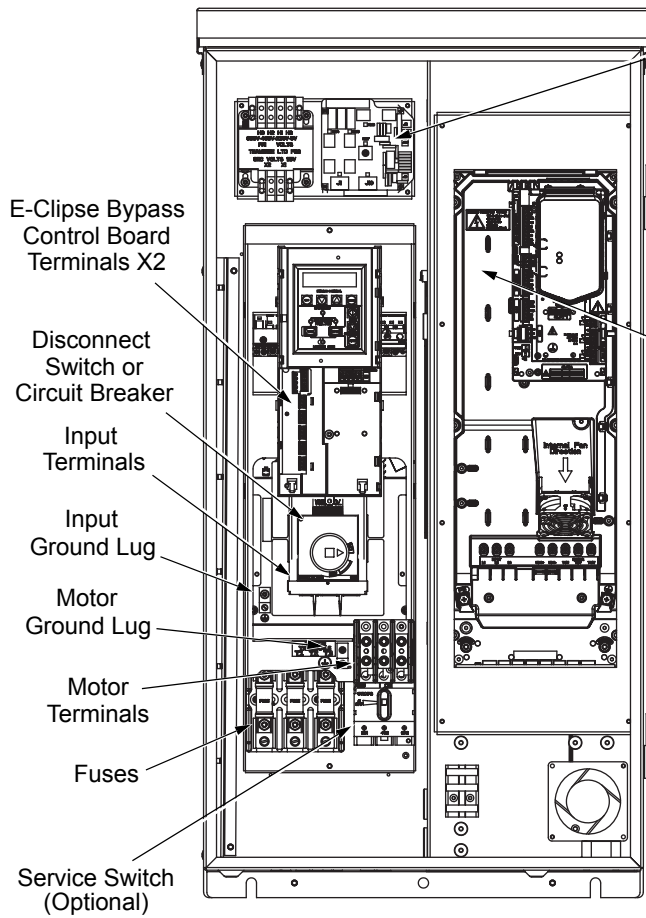




B3
Units above 77A
(Bx1-3, Bx12-3*)

*Hood and filter kit not shown

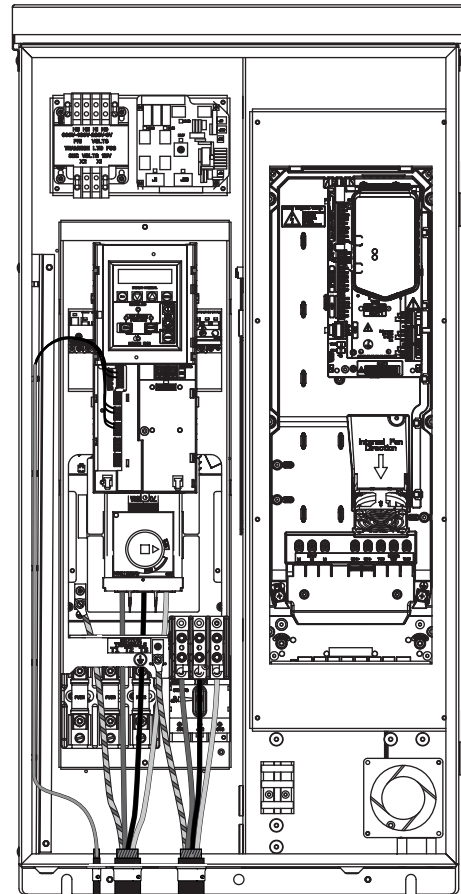




| RHTR Temperature HI/LO Jumper (X1) | Heater ON Temperature | Heater OFF Temperature |
|--|-----------------------|------------------------|
| Default Setting (X1 jumper in LO position) | 14.4 °C 58 °F | 21.4 °C 70.5 °F |
| Alternate Setting (X1 jumper in HI position) | 17.8 °C 64 °F | 24.4 °C 76.5 °F |

The alternate (HI) setting further reduces the likelihood of condensate in high humidity environments.

ACH580 Drive

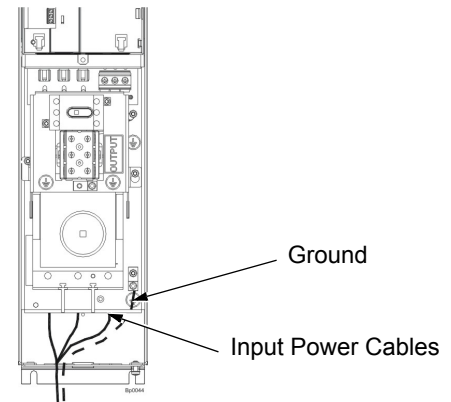


B2
(Bx3R-2)

Install the line input wiring

Line input connections – Vertical E-Clipse Bypass configurations

Connect the input power to the terminals at the bottom of the disconnect switch or circuit breaker as shown below. Also see [Connection and wiring diagrams – Vertical E-Clipse Bypass](#) on page 8. Connect the equipment grounding conductor to the ground lug near the input power connection point.



Line input connections – Standard E-Clipse Bypass configurations (wall mounted)

Connect input power to the terminals of the disconnect switch or circuit breaker. Connect the equipment grounding conductor to the ground lug at the top of the enclosure. For connection points for Standard E-Clipse Bypass configurations, refer to [Connection and wiring diagrams – Vertical E-Clipse Bypass](#) on page 8 and [Connection and wiring diagrams – Box E-Clipse Bypass](#) on page 10.

Note: Route cables through the cable guides on the left side of the enclosure. Use separate conduits for input power and motor cables. Follow the guides to separate the cables from each other.

Power connections – Vertical E-Clipse Bypass configurations

Line input connections

Connect the input power to the terminals at the bottom of the disconnect switch or circuit breaker. Also see [Connection and wiring diagrams – Vertical E-Clipse Bypass](#) on page 8. Connect the equipment grounding conductor to the ground lug near the input power connection point.

Motor connections

Connect the motor cables to the terminals at the bottom of the bypass section. Also see [Connection and wiring diagrams – Vertical E-Clipse Bypass](#) on page 8. Connect the motor grounding conductor to the ground lug near the motor cable terminal block connection point.

Power connections – Standard E-Clipse Bypass configurations (wall mounted)

Line input connections

Connect input power to the terminals of the disconnect switch or circuit breaker. Connect the equipment grounding conductor to the ground lug at the top of the enclosure. The figure below shows the connection points for Standard E-Clipse Bypass configurations. Also see [Connection and wiring diagrams – Box E-Clipse Bypass](#) on page 10.

Motor connections

Connect the motor cables to the output terminal block as shown on page 17. Also see [Connection and wiring diagrams – Box E-Clipse Bypass](#) on page 10. The motor grounding conductor can be connected to the ground lug near the terminal block.

Note: Route cables through the cable guides on the left side of the enclosure. Use separate conduits for input power and motor cables. Follow the guides to separate the cables from each other.



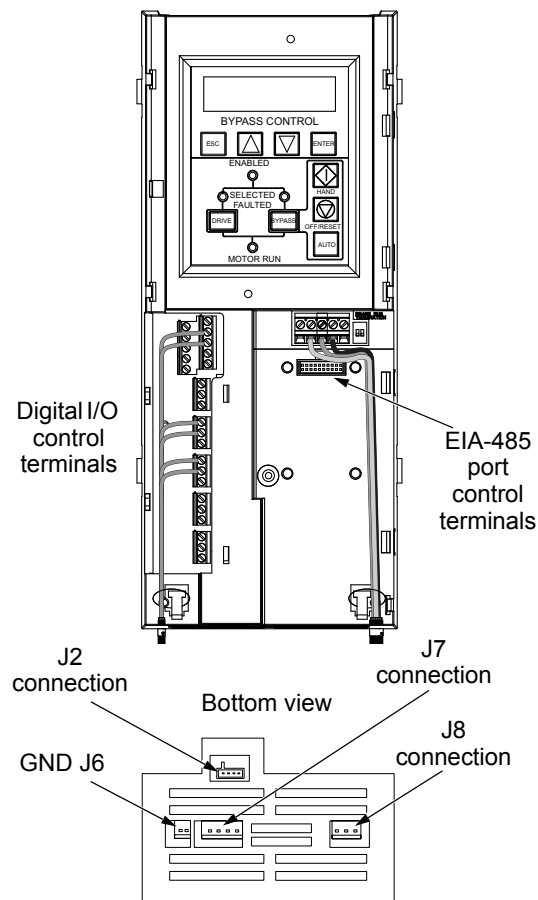
WARNING! Check the motor and motor wiring insulation before connecting the ACH580 to line power. Refer to the *ACH580-01 Hardware Manual* (3AXD50000044839). Before proceeding with the insulation resistance measurements, check that the ACH580 is disconnected from incoming line power. Failure to disconnect line power could result in death or serious injury.

Install the control wiring

Connect control wiring to terminal block X1 on the ACH580 control board and to terminal block X2 on the E-Clipse Bypass control board. For more information on these connections, refer to the following:

- X1 terminal block location and terminal data are defined in the [Installation](#) instructions for the drive on page 5.
- X2 terminal block location is illustrated in the figures starting with [Connection and wiring diagrams – Vertical E-Clipse Bypass](#) on page 8.
- X2 terminal data are provided in [Basic control connections for E-Clipse HVAC Default](#) on page 18.
- Basic connections are described in the following paragraphs. Alternate configurations using the E-Clipse Bypass macro are described in the *ACH580 HVAC control program firmware manual* (3AXD50000027537).
- On Terminal Block X1 inside the ACH580, analog inputs and outputs and additional digital input and relay output connections (AI1, AI2, AO1, AO2, DI1...DI6 and RO1...RO6) are available for use.

Note: The E-Clipse Bypass control circuitry uses serial communications connections (X1:29...X1:31) inside the ACH580. These connections are not available for any other purpose and must not be reconfigured.



Basic connections

The figure on page 17 shows the basic control connections for use with the E-Clipse Bypass HVAC Default macro. These connections are described in the following paragraphs.

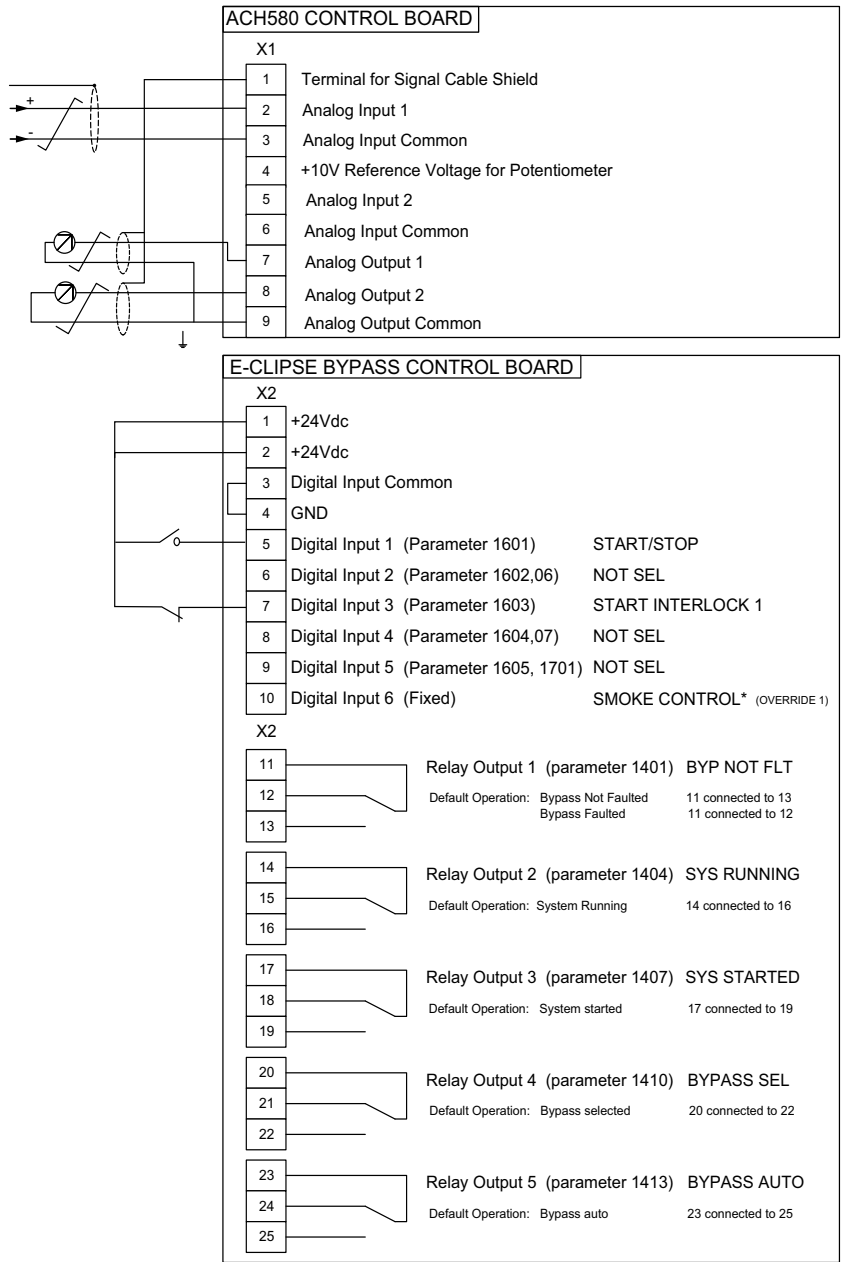
In typical installations, only analog input wires connect to the ACH580 terminal block, with other control connections made on the E-Clipse Bypass control board.

Use wire ties to permanently affix control/communications wiring to the hooked wire race tie points provided, maintaining a minimum 6 mm (1/4 in.) spacing from power wiring.

Drive's power connection terminals

Refer to the tables in the [Technical data](#) section from pages 201 – 208, which list the maximum power and motor cable terminal sizes for connections to an input circuit breaker or disconnect switch, a motor terminal block and ground lugs. The tables also list torque that should be applied when tightening the terminals.

Basic control connections for E-Clipse HVAC Default



Parameters Changed Relative to E-Clipse HVAC Default

| Parameter Number | Description | Setting |
|------------------|-------------|---------|
| | | |
| | | |
| | | |

- Smoke Control (Override1) is a fixed input. Closing Digital Input 6 **will** place the E-Clipse Bypass in Smoke Control mode which may reassign the function of the other Digital Inputs. Refer to the Smoke Control (Override1) documentation.

Check installation – Bypass

Control panel settings and checks

Apply power to the E-Clipse Bypass unit. The ACH580 Control Panel should show the operating status of the drive. If the E-Clipse Bypass Control Panel displays a PHASE SEQ (Phase Sequence) fault, remove power, wait at least 5 minutes and then swap any two input phase wires. If the motor is a standard 208/230 V, 60 Hz motor connected to a 240 V drive or a 460 V, 60 Hz motor connected to a 480 V drive, the default parameter settings should be suitable for the initial tests described below. If the motor's rating is not 208/230 V or 460 V, 60 Hz, the Motor Nominal Voltage and Motor Nominal Frequency parameters will need to be properly set before proceeding. Refer to the *ACH580 HVAC control program firmware manual* (3AXD50000027537) and set the parameters as required.

Note: The settings for ALL external communication between the ACH580 with E-Clipse Bypass and any Building Automation System are configured using the E-Clipse Bypass operator panel. DO NOT attempt to configure the external communication connection using the ACH580 operator panel!

The settings for internal communication between the ACH580 and the E-Clipse Bypass are configured at the factory and require no adjustment.

Drive Link recovery procedure

If the ACH580 Drive communication settings are unintentionally changed during setup a "Drive Link Fault", "Drive Link Error" or "Drive Setup" warning may be displayed. Should this occur, accomplish the following steps in order.

Using the ACH580 Drive Keypad, set Parameter 9521 bit 5 to "Bypass present". This will automatically set up the ACH580 to support the bypass.

System check: motor connected to ACH580 with E-Clipse Bypass

After performing the control panel checks and setting the ACH580 Drive Start-up Data parameters, check the operation of the ACH580 Drive with E-Clipse Bypass with the motor connected as follows:

1. In order to prevent the motor from starting, the system should be in the Drive mode and the drive should be OFF when the power is disconnected at the end of the previous series of control panel settings and checks.
2. Disconnect and lock out power to the E-Clipse Bypass unit, wait at least five minutes before disconnecting power.
3. Connect the motor to the output terminals.



CAUTION: Be aware of the state of the contacts before applying power.

If the Advanced Override (Override 2) input contact is closed, the motor will start across the line as soon as power is applied.

If the Start Interlock and Run Permissive input contacts are closed and the Smoke Control (Override 1) input contact is closed, the motor will start across the line as soon as power is applied.

If the Start/Stop, Start Interlock, and Run Permissive input contacts are closed and the system is in the Bypass mode and in either Hand or Auto, the motor will start across the line as soon as power is applied.

If the Start/Stop, Start Interlock, and Run Permissive input contacts are closed and the system is in the Drive mode with the drive in either Hand or Auto mode, the motor will start on the drive as soon as power is applied.

In order to prevent the motor from running without disconnecting the motor, open the Run Permissive and Start Interlock contacts on bypass control board terminals X2:2, X2:3 and X2:4 before applying power. Set the bypass to Drive mode and the drive to OFF.

4. Apply power to the E-Clipse Bypass unit. The ACH580 Control Panel display should be illuminated. On the bypass control panel, both the display and Enabled LED should be illuminated. If the Enabled LED is not illuminated solid green, check to see that closed contacts or jumpers connect terminal X2:3 to X2:4 and X2:2 to X2:7 on the bypass control board.
5. The Drive Selected LED should be illuminated. If not, press the Drive Select key to switch to Drive mode. Leave the system in the Drive mode when proceeding to the next step.
6. Press the Hand key on the ACH580 Control Panel. Press and hold the UP key until the motor just starts rotating.

Note: If the ACH580 Control Panel displays an Overcurrent, Short circuit or Earth leakage fault, disconnect and lock out power to the E-Clipse Bypass unit. Wait at least 5 minutes. Disconnect the motor leads from the E-Clipse Bypass unit and Megger each motor lead to ground to determine if the motor is good. Check the power leads from the Drive / Bypass to the motor for damaged or improper wiring. If the ACH580 Control Panel displays any other drive faults, correct the fault condition before proceeding to the next step.



CAUTION: Check motor rotation direction as soon as the motor begins to move. If motor does not rotate in the correct direction, shut down the drive, disconnect and lock out power to the drive and wait five minutes. Swap any two motor output wires (T1, T2, and T3). Incorrect motor rotation direction may cause equipment damage.

7. Increase the speed to the highest safe operating speed.
8. Press the OFF key on the drive control panel. The motor should stop.

If the drive does not operate according to these steps, refer to the *ACH580 HVAC control program firmware manual (3AXD50000027537)*.

If the drive operates according to these steps, your ACH580 with E-Clipse Bypass is ready to use with preset or modified macro settings.

Note: The settings for ALL external communication between the ACH580 with E-Clipse Bypass and any Building Automation System are configured using the E-Clipse Bypass operator panel. DO NOT attempt to configure the external communication connection using the ACH580 operator panel!

The settings for internal communication between the ACH580 and the E-Clipse Bypass are configured at the factory and require no adjustment.

Note: On the ACH580 drive, Parameter 9521, bit 5 must be set for proper operation with the E-Clipse Bypass. When this bit is set, the following ACH580 parameter values are set and write protected:

| Parameter | Value |
|---------------------------------|------------------------|
| 20.01 – Ext1 commands | 14 – Embedded fieldbus |
| 20.02 – Ext1 start trigger type | 1 – Level |
| 20.06 – Ext2 commands | 14 – Embedded fieldbus |
| 20.07 – Ext2 start trigger type | 1 – Level |
| 20.40 – Run permissive | 15 – Embedded fieldbus |
| 20.41 – Start interlock 1 | 15 – Embedded fieldbus |
| 20.42 – Start interlock 2 | 1 – Not used |
| 20.43 – Start interlock 3 | 1 – Not used |
| 20.44 – Start interlock 4 | 1 – Not used |
| 58.01 – Protocol | 1 – Modbus RTU |
| 58.04 – Baud rate | 6 – 76.8kbits/s |
| 58.05 – Parity | 2 – 8 EVEN 1 |
| 58.25 – Control profile | 5 – DCU profile |
| 58.34 – Word order | 0 – HI-LO |

Refer to the *ACH580-01 firmware manual* (3AXD50000027537) for programming instructions.

Note: Primary Settings not to be used to configure parameters above which include:

- Start/Stop
- Interlocks and Permissive
- Communications

Note: Run motor from drive before attempting bypass operation.

System check: motor disconnected from the ACH580 with E-Clipse Bypass

If you are familiar with the E-Clipse Bypass operation, you may skip the following section. Otherwise, after performing the system checks and setting the ACH580 Drive Start-up Data parameters, become familiar with the operation of the ACH580 Drive with E-Clipse Bypass without the motor connected as follows:

1. Disconnect and lock out power to the E-Clipse Bypass unit, wait at least five minutes after disconnecting power.
2. Disconnect the motor from the E-Clipse Bypass unit.
3. Apply power to the E-Clipse Bypass unit by turning on the branch circuit disconnect device and the bypass disconnect switch or circuit breaker.
4. The ACH580 Control Panel display should be illuminated. On the E-Clipse Bypass control panel, both the display and *Enabled* LED should be illuminated. If the

Enabled LED is not illuminated solid green, check to see that closed contacts or jumpers connect terminal X2:3 to X2:4 and X2:2 to X2:7 on the bypass control board.

5. On the E-Clipse Bypass control panel, either the *Drive Selected* or *Bypass Selected* LED should be illuminated. Pressing the *Drive Select* or *Bypass Select* key should switch the bypass back and forth between the *Drive* mode and the *Bypass* mode as indicated by the LEDs above each button. Check that the bypass control panel switches the system between modes. Leave the system in the *Bypass* mode when proceeding to the next step.
6. Check to see that pressing the:
 - *Auto* key on the bypass control panel causes the bottom line on the E-Clipse Bypass display to indicate "*Bypass in Auto*".
 - *Hand* key on the bypass control panel generates a Motor Phase Fault.
 - Under normal conditions (motor connected) pressing the *Hand* key on the bypass control panel causes the bottom line on the E-Clipse Bypass display to indicate "*Hand #A Run*".
 - *OFF* key on the bypass control panel causes the bottom line on the E-Clipse Bypass display to indicate "*Off Stop*".
7. For Steps 8 through 14, ACH580 Drive Parameter 99.04 must be set to "*Scalar*". After successful completion of Step 13, Parameter 99.04 may be set to "*Vector*" if very specific application requirements make it necessary to use this type of motor control. Operation using the "*Vector*" setting is unnecessary for control of almost all fan and pump applications. Refer to the *ACH580 firmware manual* (3AXD50000027537) for details on setting parameters.
8. Press the *Drive Select* key on the E-Clipse Bypass control panel. The *Drive Select* LED should be illuminated.
9. Check to see that pressing the:
 - *Auto* key on the bypass control panel causes the E-Clipse Bypass display to indicate "*Bypass in Auto*".
 - *Hand* key on the bypass control panel causes no change to the E-Clipse Bypass display.
 - *OFF* key on the bypass control panel causes the E-Clipse Bypass display to indicate "*Bypass in Off*".
10. Press the *HAND* key on the drive control panel. Note that the top line of the control panel display indicates "*HAND*" and run as a clockwise rotating arrow. The *Drive Run* LED on the E-Clipse Bypass control panel should be illuminated.
11. Press the *UP* arrow on the drive control panel. Note that the speed reference indication in the top line of the drive control panel display increases from "*0 HZ*".
12. In the middle line of the drive control panel display, the output current indication should indicate "*0.0 A.*"
13. Press the *DOWN* arrow on the drive control panel until the speed and frequency indications return to "*0.0.*"

14. Press the *OFF* key on the drive control panel. Note that the bottom line of the drive control panel display indicates “Off.”

If the ACH580 Drive and E-Clipse Bypass operate according to these steps, and you have familiarized yourself with their operation, disconnect and lock out power to prepare for the next test.

Refer to the [Safety instructions](#) section on page [v](#) for the warnings all personnel who do work on the drive, motor cable or motor need to follow.

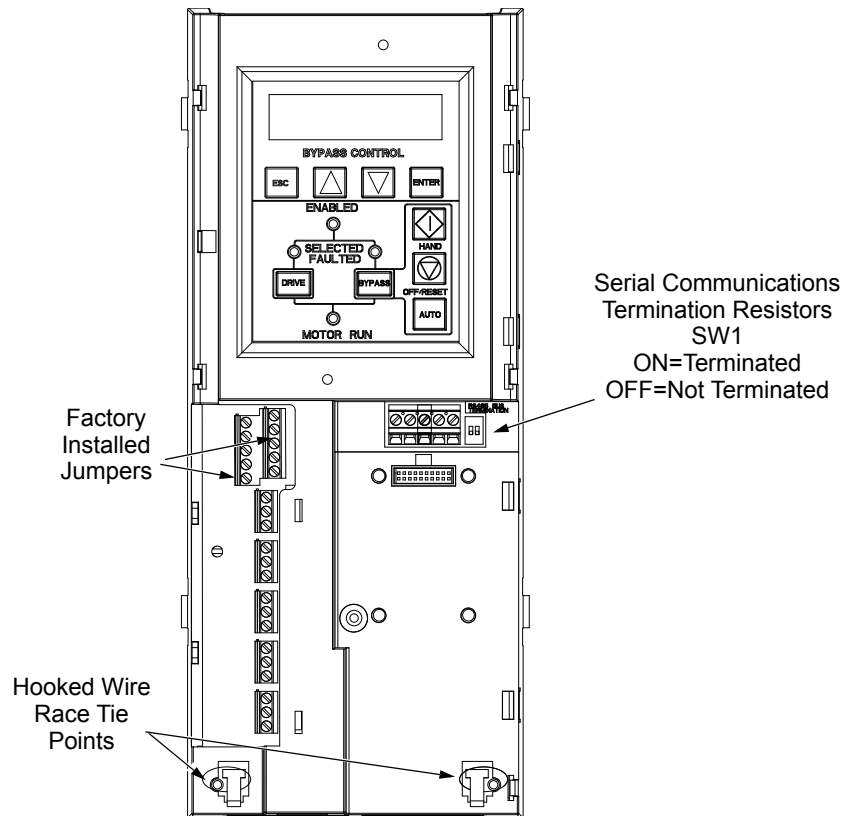
If the drive does not operate according to these steps, refer to the *ACH580-01 Hardware Manual* (3AXD50000044839).

Check jumpers and switches

The settings described in this section are factory set and, for most situations, do not require adjustment. However, it is a good practice to review these settings to confirm that they are appropriate for the configuration installed.

Jumper and switch locations

The figure below shows the locations of the SW1 DIP switch on the E-Clipse Bypass control board. The function and setting of this switch is explained in the following paragraph.



DIP switch settings

The DIP switch is used to configure the serial communications termination resistors.

To reduce noise on the serial communications network, terminate the EIA-485 network using 120 ohm resistors at both ends of the network. Use the DIP switches to connect or disconnect the on-board termination resistors. Both switches must be positioned in the ON or OFF position to correctly configure the termination resistors.

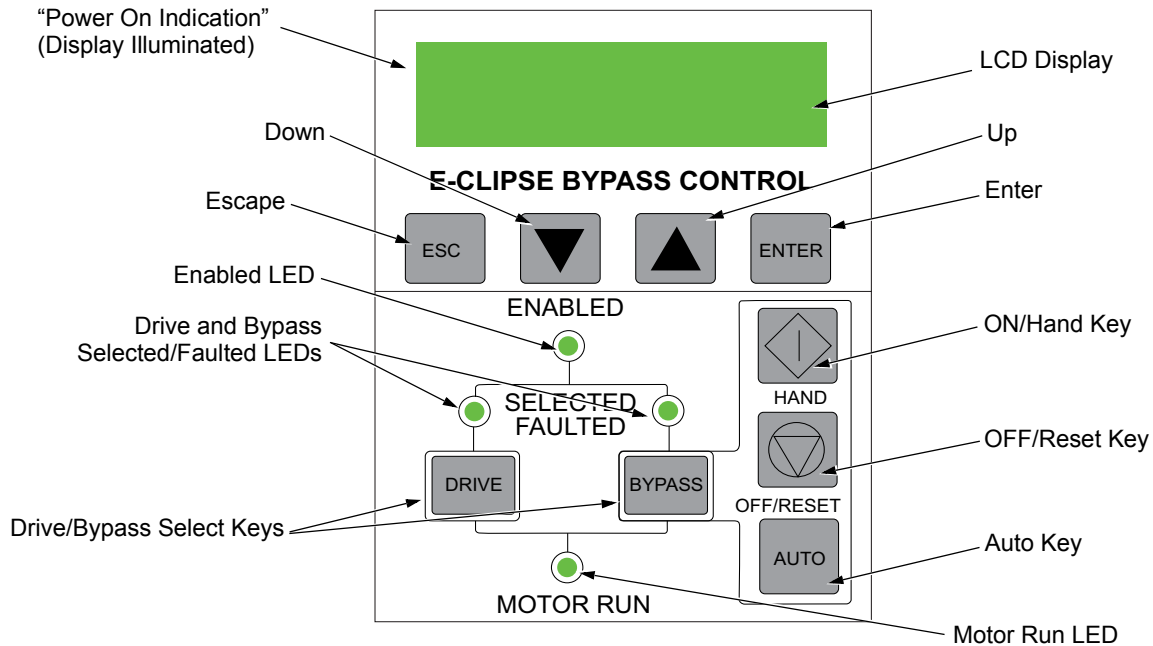
Circuit breaker settings

On some ACH580 E-Clipse Bypasses, the circuit breaker has adjustable settings for instantaneous current protection. The factory default settings are practical for most applications. Refer to the "ABB SACE Instruction Sheet" (supplied with these units) for additional information on the adjustment of these settings.

Control panel

Bypass control

The bypass control panel features:



Power On Indication

The *Ready (Power On) indication* is provided by the bypass control panel. The bypass control panel display will be illuminated and text will be displayed when the disconnect switch or circuit breaker is closed and control power is applied to the bypass.

Enabled LED

The *Enabled LED* is illuminated green under the following conditions:

- Both the Start Interlock(s) and Run Permissive contacts are closed.
- The Start Interlock contact(s) are closed with no Start command present.

The Enabled LED flashes green if the Run Permissive contact is open, the Start Interlock contact(s) are closed, and Start command is present.

The Enabled LED is illuminated red when the Start Interlock contact(s) are open.

Motor Run LED

The *Motor Run LED* is illuminated green when the motor is running in either bypass mode or in drive mode. The Motor Run LED flashes green to indicate the system has been placed in an Override condition.

Bypass Faulted LED

The *Bypass Faulted LED* is illuminated or flashes red when the motor or bypass protection functions have shut down the bypass. The specific nature of the fault is indicated on the bypass control display. Refer to the [Diagnostics](#) section on page [185](#) for more details.

Drive Selected LED

The *Drive Selected LED* is illuminated green when the drive has been selected as the power source for the motor and no drive fault is present.

Bypass Selected LED

The *Bypass Selected LED* is illuminated or flashes green when the bypass has been selected as the power source for the motor and no bypass fault is present.

Drive Faulted LED

The *Drive Faulted LED* is illuminated red when the bypass has lost its communications link with the drive or when the motor or drive protection functions have shut down the drive. The specific nature of the fault is indicated on the drive control panel display. Refer to the [Diagnostics](#) section on page [185](#) for more details.

Automatic Transfer

The *Automatic Transfer* indication is provided on the bypass control panel. The bypass control display will continuously flash an warning to indicate the system has automatically transferred to Bypass after a Drive fault. The Bypass Selected LED flashes green when the system has automatically transferred to bypass operation. The bypass event log will also record this event.

Auto Indication

The *Auto Indication* is provided on the bypass control panel default display when the bypass control panel Auto key is pressed. Normally this indicates that the Auto Start contact or communications has been selected as the means for starting and stopping the motor in the bypass mode.

Off Indication

The *Off Indication* is provided on the bypass control panel default display when bypass control panel Off key is pressed.

Hand Indication

The *Hand Indication* is provided on the bypass control panel default display when the motor has been started manually in the bypass mode.

Drive Select Key

The *Drive Select Key* selects the drive as the power source for the motor.

Bypass Select Key

The *Bypass Select Key* selects the bypass as the power source for the motor.

Off/Reset Key

The *Off/Reset Key* may be used to manually stop the motor if the motor has been running on bypass power. The Off/Reset key also resets most bypass faults. It may

take several minutes before the bypass can be reset after an overload trip. If a bypass fault condition is present the second press of this key places the bypass in the OFF mode.

Auto Key

The *Auto Key* selects the Auto Start contact or communications as the means for starting and stopping the motor in the bypass mode.

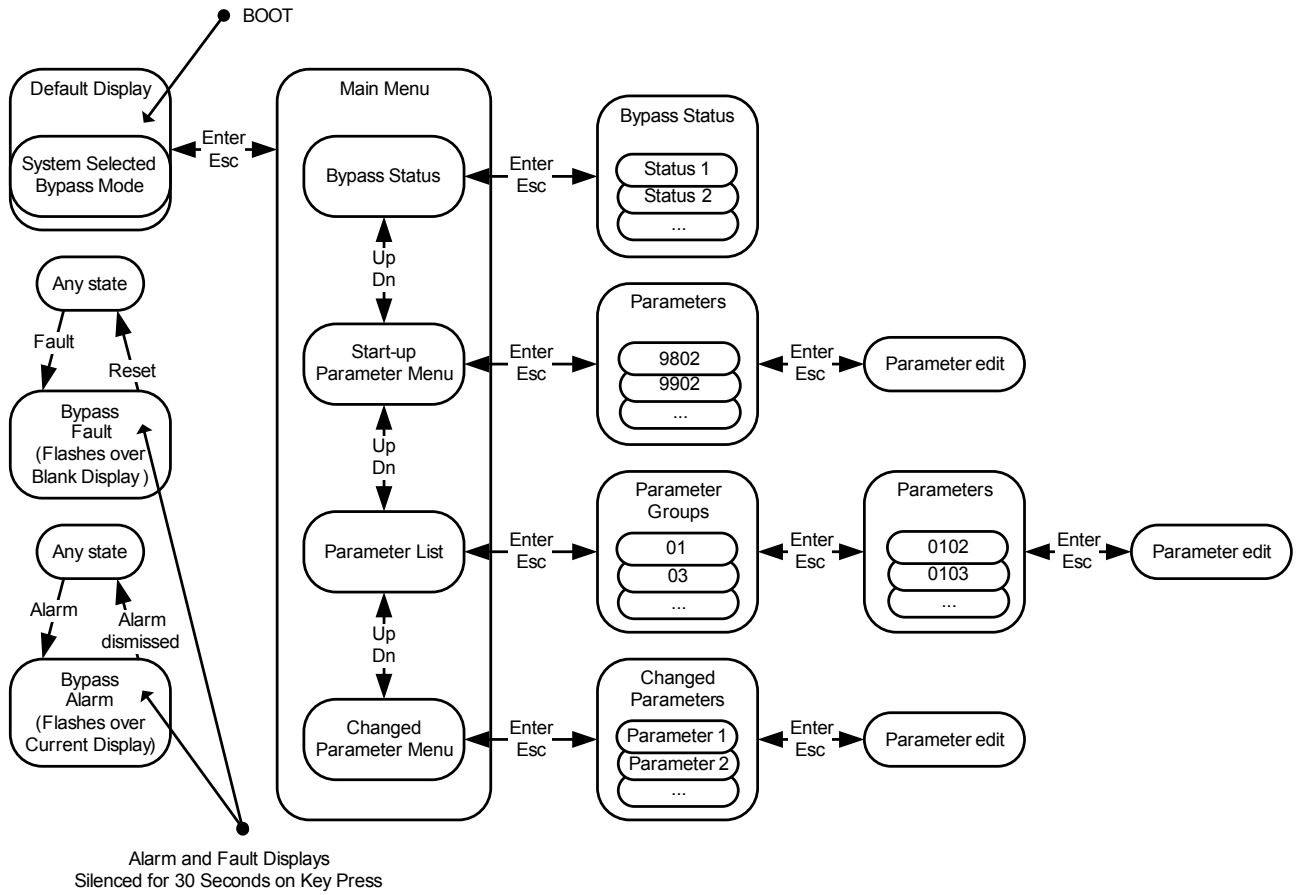
Hand Key

The *Hand Key* can be used to manually start the motor when the bypass has been selected as the power source for the motor.

Bypass control panel modes

The HVAC Bypass Control Panel has several different modes for configuring, operating and diagnosing the bypass. Select MENU and use the UP/DOWN buttons to select modes. The modes are:

- Default Display mode – Provides (HAND/OFF/AUTO) indication of the bypass operating control mode.
- Bypass Status mode – Provides status indications of the current system operating conditions.
- Start-Up Parameter Mode – Provides a list of parameters or operating conditions that may be configured or viewed during startup.
- Parameter List mode – Used to edit parameter values individually.
- Changed Parameter mode – Displays changed parameters.
- Bypass Fault Display mode – If there is an active bypass fault, the control panel will flash the fault number and fault diagnostic indication in English.
- Bypass Warning Display mode – If there is an active bypass warning, the control panel will flash the warning number and warning diagnostic indication in English.



Refer to the illustration for the Bypass Control Panel's Menu Structure.

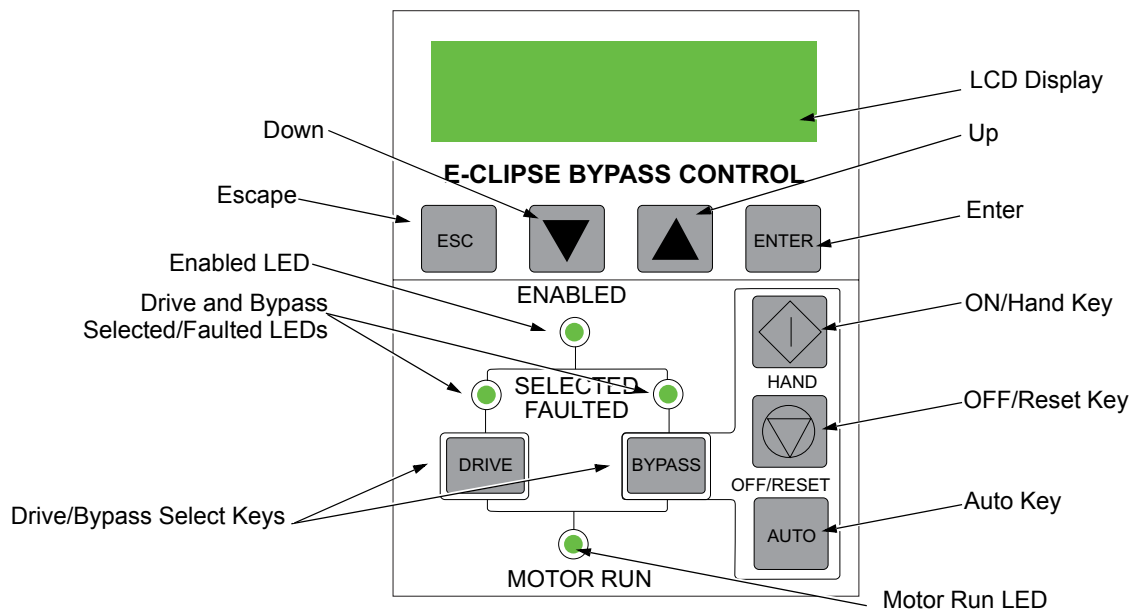
Start-up

Start-up

Start-Up can be performed in two ways:













- Using the Start-Up Parameter List
- Changing the parameters individually from the Full Parameter List.

Note: Run motor from drive before attempting bypass operation.













Start-up by changing the parameters from the start-up list



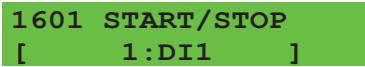







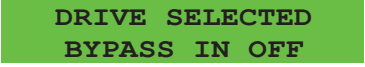
To change the parameters, follow these steps:

| | | | |
|---|---|--|---|
| 1 | The Default Display indicates the Bypass Control mode. | | DRIVE SELECTED BYPASS IN OFF |
| 2 | Press ENTER to enter the Main Menu . |  | *BYPASS STATUS STARTUP PARAMS |
| 3 | Select the Startup Params with the Up/Down arrows and press ENTER . |    | BYPASS STATUS *STARTUP PARAMS |
| 4 | Select the appropriate Parameter with the Up/Down arrows and press ENTER . |    | *1601 START/STOP 1613 BP DISABLE |
| 5 | Press the Up/Down arrows to change the Parameter Value . |   | *1601 START/STOP 1602 PERMISSIVE |
| 6 | Press ENTER to store the modified value or press ESC to leave the Parameter Edit mode. |  or  | *1601 START/STOP 1613 BP DISABLE |
| 7 | Press ESC to return to the Main Menu , and again to return to the Default Display . |  | *1601 START/STOP 1613 BP DISABLE |

Start-up by changing the parameters individually from the parameter list

To change the parameters, follow these steps:

| | | | |
|---|--|--|---|
| 1 | The Default Display indicates the Bypass Control mode. | | DRIVE SELECTED BYPASS IN OFF |
| 2 | Press ENTER to enter the Main Menu . |  | *BYPASS STATUS STARTUP PARAMS |
| 3 | Select the Parameter List with the Up/Down arrows and press ENTER . |    | STARTUP PARAMS *PARAMETER LIST |
| 4 | Select the appropriate Parameter Group with the Up/Down arrows and press ENTER . |    | 14 RELAY OUT *16 SYSTEM CTRL |
| 5 | Select the appropriate Parameter in a group with the Up/Down arrows and press ENTER . |    | *1601 START/STOP 1602 PERMISSIVE |

| | | | |
|---|--|---|---|
| 6 | Press the Up/Down arrows to change the Parameter Value . |   |  |
| 7 | Press ENTER to store the modified value or press ESC to leave the Parameter Edit mode. |  or  |  |
| 8 | Press ESC to return to the listing of Parameter Groups , and again to return to the Main Menu . |   |  |
| 9 | Press ESC to return to the Default Display from the Main Menu . |  |  |

Note: In the Parameter Edit mode the current parameter value appears below the parameter name.

Note: To view the default parameter value, press the Up/Down arrows simultaneously. Press Enter to restore the default parameter value or press ESC to leave the Parameter Edit mode.

E-Clipse bypass functions overview

Operating modes

Note: For normal operation with the bypass, place the drive control panel in the Auto mode. Place the E-Clipse bypass control panel to *Drive* (selected) and ensure the *Hand-off* auto selection is set to OFF.

Drive Mode

Under normal conditions the system is in the *Drive* mode. The drive provides power to the motor and controls its speed. The source of the drive's start/stop and speed commands is determined by the *Auto* or *Hand* mode selection of the drive's control panel. Commands come from the bypass control terminals (or communication) when the *Auto* mode has been selected or directly from the drive control panel when the *Hand* mode has been selected. The user can normally switch to the *Drive* mode by pressing the *Drive* key on the bypass control panel.

Reverse Drive Mode

Reverse Drive mode is a subset of Drive mode; as such the drive provides power to the motor and controls its speed and direction. The source of the drive's start/stop, speed and direction commands is the Reverse Drive input (DI2 - if programmed).

In this mode the system acknowledges all of the same permissives and interlocks as Drive mode. When the Reverse Drive input contact is closed with the drive running, the drive ramps down to zero speed then reverses motor direction and continues running; with the drive stopped, the drive starts and runs in the reverse direction. In either case the motor operates at the constant speed programmed on the drive. No other start command is required. See parameter 1630 on page 66 for a description of drive programming and wiring requirements.

Bypass Mode

In the Bypass mode, the motor is powered by AC line power through the bypass contactor. The drive contactor opens to isolate the drive output. The source of the bypass start/stop commands is determined by the *Auto* or *Hand* mode selection of the bypass' control panel. Commands come from the bypass control terminals (or communication) when the Auto mode has been selected or directly from the bypass control panel when the Hand mode has been selected. The user can normally switch to the Bypass mode by pressing the *Bypass* key on the bypass control panel. Alternative methods of bypass control called Overrides are also available. Refer to the following descriptions of the Override modes.

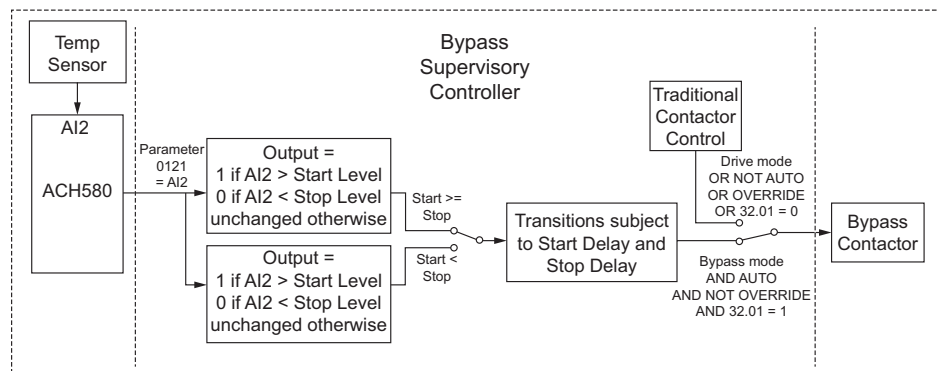
Smoke Control Mode (Override 1)

In the Smoke Control (Override 1) mode, the motor is powered by AC line power through the bypass contactor. The source of the start command is internal and unaffected by external stop commands. The system also ignores all commands from either the drive or bypass control panels, or over communications, when in this mode. The user can switch to the Smoke Control mode by closing the Smoke Control input contact (DI6). When the Smoke Control input contact is closed, the system is forced to bypass and runs the motor (refer to the Note on page 55). The Motor Run LED flashes green when the system is in Override. While in Smoke Control mode, the system does not respond to some inputs and does respond to other inputs, i.e., the system will ignore low priority safeties such as low temp or FreezeStats and return duct smoke detectors. While in Smoke Control mode, the system will respond to high priority safeties such as high static pressure and damper end-switch proofs. The system will always respond to the electronic motor overload protection included in the bypass controller. See the diagrams on page 56 for suggested wiring of typical customer inputs.

Normally when the Smoke Control input contact is switched from closed to open, the system returns to the operating mode that existed prior to entering Override and can again be controlled using the Drive and Bypass keys. The exception to this is when the Advanced Override (Override 2) input contact is closed, in which case the system switches to Advanced Override mode.

Supervisory Mode

In the Bypass Supervisory mode, the bypass has the ability to control a process by cycling the bypass contactor on and off with a hysteresis control. In this mode the motor is powered by AC line power through the bypass contactor. The source of the bypass start/stop commands is determined by the *Auto* or *Hand* mode selection of the bypass' control panel. Commands come from the analog input level (AI2) on the ACH580 drive when the Auto mode has been selected or directly from the bypass control panel when the Hand mode has been selected (manual). Bypass supervisory control is enabled and configured in parameter Group 32. Once enabled, the user can switch to the Supervisory Bypass mode by pressing the *Bypass* key on the bypass control panel. Alternative methods of bypass control called Overrides are also available. Refer to the following descriptions of the Override modes. The Supervisory control only operates in Bypass / Auto mode. If the user presses the *Hand* or *Off* buttons, operation is the same as normal bypass operation. If the user selects Drive mode, the Supervisory operation is also stopped. Returning to Bypass / Auto mode will put the bypass back to Supervisory mode.



Advanced Override Mode (Override 2)

In the Advanced Override (Override 2) mode, the motor is powered either by the drive through the drive or by AC line power through the bypass contactor. Depending on the E-Clipse bypass parameter 1708 setting, the user can switch to the Advanced Override mode by closing the Advanced Override input contact (DI5 - if programmed) or as a command through communications.

When Advanced Override is active, the system does not respond to the inputs on the Drive and E-Clipse Bypass control panel keys.

The Motor Run LED flashes green on the drive and bypass keypads when the system is in override.

While in Advanced Override, the system responds to bypass overloads and programmed faults. The system can be custom programmed to acknowledge or disregard certain faults, safeties and enables. The unit default is programmed to ignore all external safeties and run enables. See Group 17 for programmability of the digital input and fault functions.

Normally when the Advanced Override is deactivated, the system returns to the previous operating mode and can be controlled using the Drive and Bypass keypads. If the system was previously in *Hand* mode, the system reverts to *Off* mode. The exception to this is when the Smoke Control (Override 1) input contact is closed, in which case the system remains in Smoke Control mode.

The tables on pages [38-40](#) provide information on how to set up the E-Clipse bypass and the ACH580 drive for Override 2 mode. The table on page [38](#) describes the key Override 2 parameters in the E-Clipse bypass. The table on page [39](#) describes the key Override parameters that would be programmed in the ACH580 drive.

The table on page [40](#) describes how to configure Override in the ACH580 drive using Primary Settings, instead of using parameters. In most Override 2 applications the Primary Settings (page [40](#)) will be used to program Override 2 applications.

Note that programming ACH580 drive Override parameters / Primary Settings is not necessary if E-Clipse bypass parameter 1708 is set to [1] Bypass or [4] Stop. The tables on pages [39](#) and [40](#) assume the ACH580 drive is in Scalar mode.

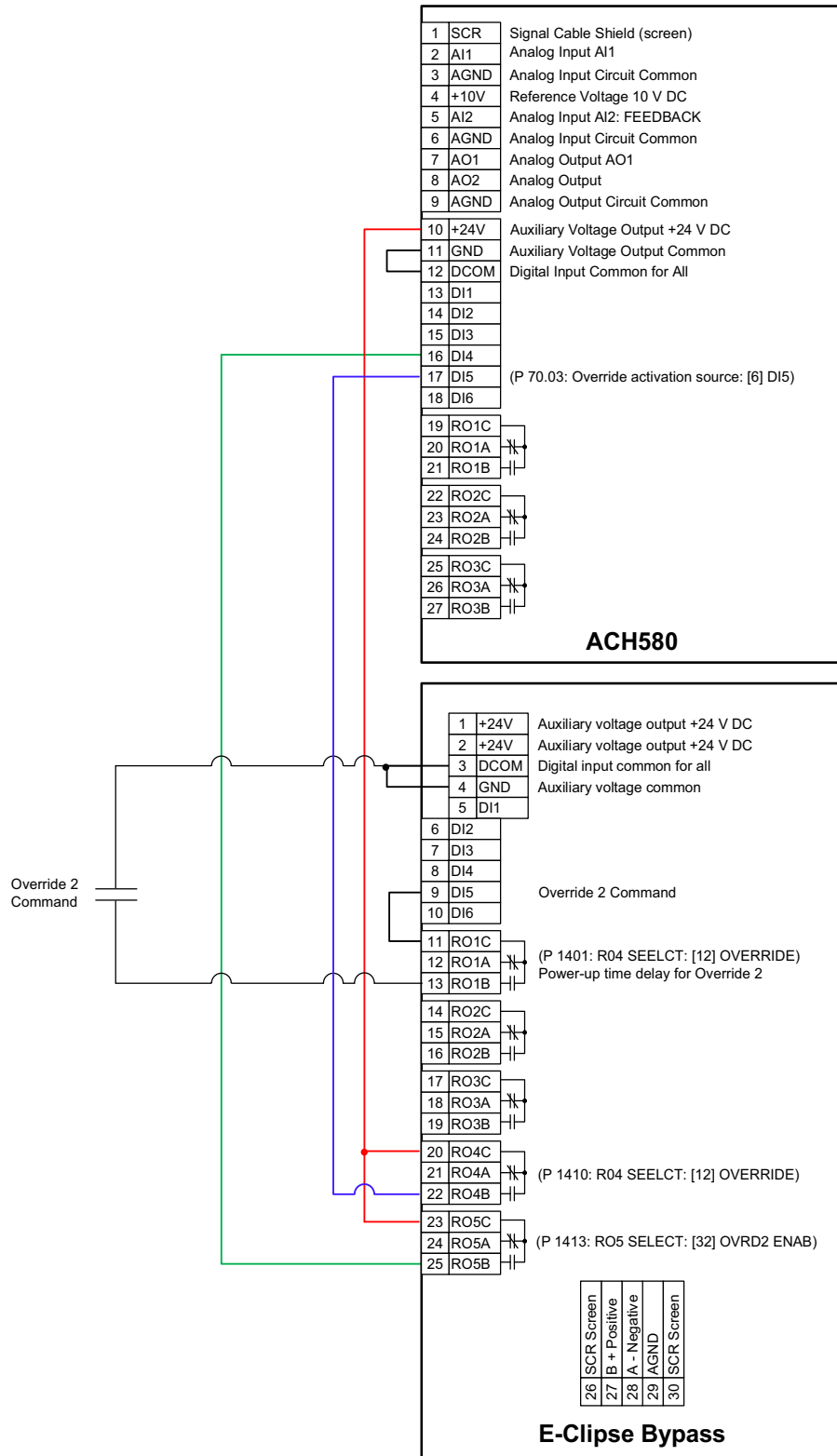
Programming Advanced Override (Override 2)

| Parameter Number | Parameter Name | Parameter Value | Comments |
|--|------------------------------------|-------------------------|---|
| Programming the E-Clipse Bypass for Advanced Override Operation | | | |
| 1701 | OVERRIDE 2 | [1] DI5 | Digital Input 5 of the E-Clipse Bypass is used to activate Override operation for both the VFD and the E-Clipse Bypass. |
| 1702 | Permissive Override PERMIS OVR | <i>as required</i> | Determines whether the E-Clipse's Run Permissive input can interrupt Override operation. (The default value does not allow Run Permissive to interrupt Override operation. If the damper control interlock function is desired during Override operation, this interlock must be ACKNOWLEDGED.) |
| 1703 | Interlock 1 Override INTLK1 OVR | <i>as required</i> | Determines whether the Eclipse's Interlock 1 input can interrupt Override operation. (The default value does not allow Interlock 1 to interrupt Override operation.) |
| 1704 | Interlock 2 Override INTLK2 OVR | <i>as required</i> | Determines whether the Eclipse's Interlock 2 input can interrupt Override operation. (The default value does not allow Interlock 2 to interrupt Override operation.) |
| 1706 | Interlock 4 Override INTLK4 OVR | <i>as required</i> | Determines whether the Eclipse's Interlock 4 input can interrupt Override operation. (The default value does not allow Interlock 4 to interrupt Override operation.) |
| 1707 | FAULTS OVR | <i>as required</i> | Determines whether certain Eclipse Faults can interrupt Override operation. |
| 1708 | OVR2 MODE | <i>as required</i> | |
| | | [1] BYPASS | During Override 2 operation, the motor will only run at full speed in bypass mode. |
| | | [2] VFD | During Override 2 operation, the motor will only run at a controlled speed from the ACH580 VFD. Parameter Group 70 in the ACH580 VFD is used to program its operation. If the VFD cannot run the motor, the motor will stop. Requires additional control wiring between E-Clipse and ACH580 VFD. |
| | | [3] VFD/BYPASS | During Override 2 operation, the system will first attempt to run the motor from the ACH580 VFD, as programmed in Parameter Group 70 of the ACH580 VFD. If the VFD loses power or is in a fault condition, the system will use the E-Clipse Bypass to run the motor at full speed in bypass mode. Requires additional control wiring between E-Clipse and ACH580 VFD. See the diagram on page 41. |
| | | [4] STOP | During Override 2 operation, the motor will stop. |
| 1401 | RO1 SELECT | [7] BYP NOT FLT | Relay 1 is used to delay the Override 2 command for the E-Clipse Bypass during power-up of the system. This is to ensure that the ACH580 VFD has had enough time to boot up before the system goes into Override 2 Mode. (the value of parameter 1402 can be adjusted as needed.) |
| 1402 | R1 ON DLY | 10.0 s (or as required) | |
| 1403 | R1 OFF DLY | 2.0 s | |
| 1410 | RO4 SELECT | [12] OVERRIDE | When the E-Clipse Bypass is in the Override 1 or Override 2 mode, this relay will activate. Its normally open contacts are wired to activate the Override function in the ACH580 VFD. This will cause the VFD to display WARNING 2020, Override. It will also lock out the ability to change the VFD's parameters or control it externally. |
| 1411 ¹ | R4 ON DLY | 0.0 s | |
| 1412 ¹ | R4 OFF DLY | 0.0 s | |
| 1413 | RO5 SELECT | [32] OVRD2 ENAB | Enables Override 2 operation for the VFD based on the programming of E-Clipse parameters 1701 through 1708. The normally open contact of this relay is wired to apply control voltage to Digital Input 4 of the ACH580 VFD. This enables the VFD to run in Override mode. The E-Clipse Bypass can stop the VFD during Override 2 operation by opening this contact. |
| 1414 ¹ | R5 ON DLY | 0.0 s | |
| 1415 ¹ | R5 OFF DLY | 0.0 s | |

1) Indicates a parameter that is unchanged from its default value.

| Initial Programming for Override function using OVRD2, via parameters | | | | |
|---|--|--|---|--|
| | Only required for E-Clipse parameter selections: 1708, OVRD2 MODE [2] VFD or [3] VFD/BYPASS | The drive should first be set up and operating correctly with the E-Clipse Bypass. | | |
| ACH580 Parameters | The parameters in this section program the ACH580 VFDs operation during Override Mode. | | | |
| | Parameter | Parameter Name | Parameter Value | Comments |
| | 95.21 | HW option word 2 | Bit 5: Bypass present Bit 8: Legacy bypass present | Verify that the Drive is set up for E-Clipse bypass. Word value for 95.21 = [1] E-Clipse bypass is = 0010 0000. |
| | 70.02 | Override enable | [0] Off [1] On [2] On, critical | Default is [0] Off <ul style="list-style-type: none"> Off: Override is not being used, On: Uses programmed number of fault resets, On, Critical: infinite number of fault resets. |
| | 70.03 | Override activation source | [5] DI5 high | Contacts closing against the drive's DI5 will activate Override Mode in the ACH580 VFD. |
| | 70.04 | Override reference source | [0] Constant speed/freq [1] AI1 [2] AI2 [3] Override speed/freq [4] Motor potentiometer [5] Stop [6] Process PID set1 | Defaults to [3] <i>Override speed/freq</i> The drive will use the Hz value programmed in 70.06 Note that [0] <i>Constant speed/freq</i> is similar |
| | 70.05 | Override direction | [0] Forward [1] Reverse [2] to [7], DI1 to DI6 [8] to [13], -DI1 to -DI6 [9] Other | Defaults to [0] <i>Forward</i> |
| | 70.06 | Override frequency | -500 Hz to 500 Hz | Defaults to 0.0 Hz. Set the value the drive will control to in Override when 70.04 is [3]. |
| | 70.20 | Override fault handling | [0] Fault on high priority [1] Autoreset | Defaults to [1] <i>Fault on high priority</i> . |
| | 70.21 | Override Auto reset trials | Integer value: 1 to 5 | Defaults to 5 times. |
| | 70.22 | Override Auto reset time | Value from 5.0 to 120.0 secs | Defaults to 5.0 seconds. |

| Initial Programming for Override function using OVRD2, via parameters | | |
|---|---|--|
| | Only required for E-Clipse parameter selections: 1708, OVRD2 MODE [2] VFD or [3] VFD/BYPASS | The drive should first be set up and operating correctly with the E-Clipse Bypass. |
| Primary Settings > Override > Example for using a single Override frequency | | |
| The Primary Settings in this section program the ACH580 OED's operation during Override mode. | | |
| Path > Selection | Options | Selected option/Description |
| Override mode: | Disabled; Normal; Critical | Normal: programmed number of fault resets, or Critical: infinite number of fault resets. |
| Activate override from: | DI1 to DI6, high DI1 to DI6, low | Select: <i>DI5 high</i> See wiring diagram on page 42. |
| Reference from: | [0] Constant speed/freq [1] AI1 [2] AI2 [3] Override speed/freq [4] Motor potentiometer [5] Stop [6] Process PID set1 | Confirm: [3] <i>Override speed/freq</i> (default) |
| Override frequency: | -500 Hz to 500 Hz | Set the appropriate value required by the engineer and air balancer. |
| Direction selection: | [0] Forward [1] Reverse [2] to [7], DI1 to DI6 [8] to [13], -DI1 to -DI6 [9] Other | Confirm: Default of [0] <i>Forward</i> Design may require Reverse or a changeable direction. |
| Override safeties: | Not used | Wire and Configure the Safeties at the E-Clipse bypass. ACH580 drive safeties are not used with an E-Clipse bypass. |
| <input checked="" type="checkbox"/> Use autoreset for critical faults: | | Default is the checkbox is <i>unselected</i> . Critical faults are the faults that would require restarting the inverter in normal operation. |



Recommended control wiring between ACH580 and E-Clipse Bypass to enable Advanced Override 2. Required for E-Clipse parameter 1708 selections [2] VFD and [3] VFD/BYPASS.

Hand Mode

When the system is in the Bypass mode, the operator can manually start the motor by pressing the Hand key on the bypass control panel. The motor will run and *Hand* is indicated on the bypass control display. In order to run the motor, the Start Interlock(s) and Run Permissive contacts must be closed (green Enabled LED) and any bypass fault must be reset.

Auto Mode

In the Auto mode the bypass start/stop command comes from the Start/Stop input terminal on the bypass control board (or communication). The Auto mode is selected by pressing the Auto key on the bypass control panel. *Auto* is indicated on the bypass control display when the bypass is in the Auto mode. If the system is in the Bypass mode, the motor will run across the line if the Auto mode is selected, the Start/Stop, Start Interlock(s) and Run Permissive contacts are closed and any bypass fault is reset.

Off Mode

If the motor is running in the Bypass mode, the operator can manually stop the motor by pressing the Off/Reset key on the bypass control panel. The Hand or Auto indication on the bypass control display will change to Off. The motor can be restarted by pressing the Hand key or the bypass can be returned to the Auto mode by pressing the Auto key. If the system is in the Drive mode, pressing the Off/Reset key will take the bypass out of the Auto mode, but will not affect motor operation from the drive. If the system is switched to the Bypass mode, a motor that is running will stop.

Bypass/Drive Mode transfers

If the drive is in the Auto mode and the motor is running in the Drive mode, the motor will transfer to bypass operation and continue running if the system is switched to the Bypass mode and the bypass is in the Auto mode with the Start/Stop Input contact closed. If the motor is running in the Bypass mode, the motor will transfer to drive operation and continue running if the system is switched to the Drive mode and the drive is in the Auto mode with the Start/Stop Input contact closed.

Starting the motor on application of power

If the Start Interlock(s) and Run Permissive Input contacts are closed (Start command must also be present in Auto) and the system is in the Bypass mode and in either the Hand or Auto mode, the motor will start across the line as soon as power is applied. If the system is in the Drive mode with the drive in the Auto mode, the motor will start on the drive as soon as power is applied.

Automatic transfer feature

When the Automatic Transfer feature is selected, the system switches to Bypass mode and the motor is automatically transferred to line power if the drive trips out on a protective trip. If automatic restart has been enabled in the drive, the drive will attempt to automatically restart before the motor is transferred to line power. The Automatic Transfer function can be enabled through the bypass control panel. The *Automatic Transfer* indication is provided on the bypass control panel. The control panel display will continuously flash a warning to indicate the system has automatically transferred to Bypass. The bypass event log will also record this event.

Bypass control board inputs and outputs

The bypass control board has five programmable and one fixed relay contact (digital) inputs and five programmable relay outputs that are available for connection to external control circuits. The internal 24VDC supply is normally used in conjunction with the relay contact inputs. The input and output functions are described below. Refer to the [Installation](#) section on page 3 for additional information and connection instructions.

Relay contact (digital) inputs

All Relay Contact (Digital) Inputs with the exception of the Override 1 “Smoke Control” and “Reverse Drive” Inputs can be configured to any one of three (3) conditions.

1. “Digital Input” (DI), in which case the bypass system will react to the defined input function during normal operation.
2. “Not Selected”, in which case the bypass system will ignore the defined input function as bypass control, but will continue to pass the operating state of the digital input through communications to the building automation system.
3. “Comms”, in which case the bypass system will react to the defined input function over communications during normal operation. The bypass system will ignore the digital input as a defined input function, but will continue to pass the operating state of the digital input over communications to the building automation system.

Start/Stop (DI1)

The Start/Stop input is connected to a normally open contact that starts and stops the system. When the bypass is in the Drive mode and the drive is in the Auto mode, the Start/Stop input contact controls the motor by starting and stopping the drive. When the bypass is in the Bypass mode and Auto is indicated on the bypass control display, the Start/Stop input contact controls the motor by controlling the bypass contactor.

Permissive (DI2)

The Run Permissive input is connected to the series combination of any external normally closed permissive contacts, such as damper end switches, that must be closed to allow the motor to run. If any of these external contacts are open while a Start command is present, the Enabled LED will flash green and the motor is prevented from running.

Reverse Drive (DI2)

The Reverse Drive input can be connected to an external contact that is closed to select the Reverse Drive mode. See [Reverse Drive Mode](#) on page 35 for a description of this mode.

Safety Interlock (DI2...DI5)

The Safety Interlock input(s) are connected to the series combination of any external normally closed interlock contacts, such as Firestat, Freezestat, and high static pressure switches – switches that must be closed to allow the motor to run. If any of these external contacts are open, the Enabled LED is illuminated red, the drive

output contactor, bypass contactor, and System Started relay are de-energized preventing the motor from running.

Bypass Fault Reset (DI4)

The Bypass Fault Reset input can be connected to an external contact that is closed to reset a bypass fault. It may take several minutes before the bypass can be reset after an overload trip.

Advanced Override (DI5) (Override 2)

The Advanced Override (Override 2) input can be connected to an external contact that is closed to select the Advanced Override mode. See [Advanced Override Mode \(Override 2\)](#) on page 37 for a description of this mode.

Smoke Control (DI6) (Override 1)

The Smoke Control (Override 1) input can be connected to an external contact that is closed to select the Fireman's Override mode. See [Smoke Control Mode \(Override 1\)](#) on page 36 for a description of this mode.

Relay contact outputs

System Ready (1) [SYS READY]

If configured for *System Ready*, the relay is energized when the Drive/Bypass System is ready to be started. Two conditions must be met in order for the *System Ready* relay to energize.

- The *Safety Interlock* input contact(s) must be closed and
- There can be no fault present in the selected mode (Drive or Bypass) of the system.

System Running (2) [SYS RUNNING]

If configured for *System Running*, the relay is energized when the Drive/Bypass system is running. The *System Running* relay provides an output when the motor is running whether powered by the drive or the bypass.

System Started (3) [SYS STARTED]

If configured for *System Started*, the relay is energized when the Drive/Bypass system is started. Three conditions must be met in order for the relay to energize.

- A *Start* command must be present,
- The *Safety Interlock* input contact(s) must be closed and
- There can be no fault present in the system. The Start command can come from the bypass control board terminal block, the drive control panel, the bypass control panel, or communications, depending on the operational mode selected.

The System Started relay is ideal for use in damper actuator circuits, opening the dampers only under those conditions where the system is preparing to run the motor. Closing the dampers if the safeties open, the system faults, or when a Stop command is issued.

Bypass Selected (4) [BYPASS MODE]

If configured for *Bypass Selected*, the relay is energized when Bypass Mode has been selected as the method of motor control. The *Bypass Selected* relay is de-energized when Drive Mode has been selected as the method of motor control.

Bypass Run (5) [BYPASS RUN]

If configured for *Bypass Run*, the relay is energized when the bypass is running. The *Bypass Run* relay provides an output only when the motor is running and powered by the bypass. The *Bypass Run* relay is de-energized when the motor is not being run in bypass.

Bypass Fault (6) [BYPASS FLT]

If configured for *Bypass Fault*, the relay is energized when a bypass fault has occurred or when the bypass motor overload/underload protection has tripped. The specific nature of the fault is indicated on the bypass control panel display. The *Bypass Fault* relay is de-energized during normal operation.

Bypass Not Fault (7) [BYP NOT FLT]

If configured for *Bypass Not Fault*, the relay is energized during normal operation. The *Bypass Not Fault* relay is de-energized when power is removed from the system, a bypass fault has occurred or when the bypass motor overload/underload protection has tripped. The specific nature of the fault is indicated on the bypass control panel display.

Bypass Warning (8) [BYPASS WRNG]

If configured for *Bypass Warning*, the relay is energized when a bypass warning is present. The specific nature of the warning is indicated on the bypass control panel display. The *Bypass Warning* relay is de-energized during normal operation.

Drive Fault (9) [DRIVE FAULT]

If configured for *Drive Fault*, the relay is energized when a drive fault has occurred. The specific nature of the fault is indicated on the drive control panel display. The *Drive Fault* relay is de-energized during normal control panel.

Drive Not Fault (10) [DRV NOT FLT]

If configured for *Drive Not Fault*, the relay is energized during normal operation. The *Drive Not Fault* relay is de-energized when power is removed from the system, or when a drive fault has occurred. The specific nature of the fault is indicated on the drive control panel display.

Drive Warning (11) [DRIVE WARNING]

If configured for *Drive Warning*, the relay is energized when a drive warning is present. The specific nature of the warning is indicated on the drive control panel display. The *Drive Warning* relay is de-energized during normal operation.

Override (12) [OVERRIDE]

If configured for *Override*, the relay is energized when Smoke Control Override or Advanced Override mode is selected and de-energized in all other modes. The *Override* relay is de-energized during normal operation.

Bypass Hand (13) [BYPASS HAND]

If configured for *Bypass Hand*, the relay is energized when the motor is running in Bypass Mode and Hand (manual operation) is selected. The *Bypass Hand* relay is de-energized when Bypass Auto or Bypass Off are selected.

Bypass Off (14) [BYPASS OFF]

If configured for *Bypass Off*, the relay is energized when the bypass control mode *Off* is selected. The *Bypass Off* relay is de-energized when either Bypass Auto or Bypass Hand are selected.

Bypass Auto (15) [BYPASS AUTO]

If configured for *Bypass Auto*, the relay is energized when the bypass control mode *Auto* is selected. The *Bypass Auto* relay is de-energized when either Bypass Off or Bypass Hand are selected.

Communications Control (16) [COMM CTRL]

If configured for *Communications Control*, the relay is energized when the appropriate ON command is provided over the communications connection. The relay is de-energized when the appropriate OFF command is provided over the communications connection.

System Warning (17) [SYS WARNING]

If configured for *System Warning*, the relay is energized when a drive/bypass warning is present. The specific nature of the warning is indicated on either the drive control panel display or the bypass control panel display, depending upon the origination of the warning. The *System Warning* relay is de-energized during normal operation.

Bypass Fault/Warning (18) [BYP FLT/WRN]

If configured for *Bypass Fault/Warning*, the relay is energized when either a bypass fault has occurred, the bypass motor overload/underload protection has tripped or when a bypass warning condition is present. The *Bypass Fault/Warning* relay is de-energized during normal operation.

Bypass Overload (19) [BYP OVERLD]

If configured for *Bypass Overload*, the relay is energized when the bypass motor overload level has exceeded the programmed protection setting. The *Bypass Overload* relay is de-energized during normal operation.

Bypass Underload (20) [BYP UNDERLD]

If configured for *Bypass Underload*, the relay is energized when the bypass motor underload level has fallen below the programmed protection setting. This output is often used for broken belt indication. The *Bypass Underload* relay is de-energized during normal operation.

PCB Overtemperature (21) [PCB OVERTMP]

If configured for *PCB Overtemperature*, the relay is energized when the temperature of the bypass control, printed circuit board has exceeded the fixed protection setting. The *PCB Overtemperature* relay is de-energized during normal operation.

System Underload (22) [SYS UNDERLD]

If configured for *System Underload*, the relay is energized when either the drive or bypass motor underload level has fallen below the programmed protection setting. This output is often used for broken belt indication. The *System Underload* relay is de-energized during normal operation.

System Fault (23) [SYSTEM FLT]

If configured for *System Fault*, the relay is energized when either a drive/bypass fault has occurred or the bypass motor overload/underload protection has tripped. The *System Fault* relay is de-energized during normal operation.

System Fault/Warning (24) [SYS FLT/WRN]

If configured for *System Fault/Warning*, the relay is energized when either a drive/bypass fault has occurred, the bypass motor overload/underload protection has

tripped or when a drive/bypass warning condition is present. The *System Fault/Warning* relay is de-energized during normal operation.

System External Control (25) [SYS EXT CTL]

If configured for System External Control, the relay is energized when Auto is selected as the control mode for the selected power source (Drive or Bypass). The System External Control relay is de-energized when either Hand or Off is selected as the control mode for the selected power source.

System Overload (26) [SYS OVERLD]

If configured for System Overload, the relay is energized when either the drive or bypass motor overload level has risen above the programmed protection setting. This output is often used for motor overload indication. The System Overload relay is de-energized during normal operation.

Contactor Fault (27) [CONTACT FLT]

If configured for Contactor Fault, the relay is energized when either a drive contactor/ bypass contactor fault has occurred. The Contactor Fault relay is de-energized during normal operation.

System No Fault (28) [SYS NOT FLT]

If configured for System No Fault, the relay is energized during normal operation. The System No Fault relay is de-energized when power is removed from the system, a system fault has occurred or when the active motor overload/underload protection has tripped. The specific nature of the fault is indicated on the control panel display (Drive or Bypass).

Drive Link Error (29) [DRV LNK ERR]

If configured for Drive Link Error, the relay is energized when the communications link between the drive and bypass has been interrupted. The Drive Link Error relay is de-energized during normal operation.

External Comm Loss (30) [EXT COMM LS]

If configured for External Comm Loss, the relay is energized when the communications link between the system (Drive/Bypass) and the external communications network (building automation system) has been interrupted. The External Comm Loss relay is de-energized during normal operation.

Override 2 Stop (31) [OVRD2 STOP]

If configured for Override 2 Stop, the relay is energized when the motor is expected to stop during Override 2. For this relay to energize, Override 2 must be active and parameter 1708 programmed for STOP. The Override 2 Stop relay is de-energized during normal operation.

Override 2 Enable (32) [OVRD2 ENAB]

If configured for Override 2 Enable, the relay is energized when the drive is expected to control the motor during Override 2. For this relay to energize, the drive output contactor must be closed and any interlocks programmed as acknowledge in parameters 1702...1707 must be present. The Override 2 Enable relay is de-energized during normal operation.

Energy Savings Estimator

The ABB E-Clipse Bypass is capable of displaying the estimated energy savings provided by variable frequency drive operation. Additional displays provide estimated dollar savings based upon a user provided cost per kilowatt hour and estimated CO₂ avoidance in tons.

The Energy Savings Estimator feature is activated by enabling the Learn Mode in Parameter 1628 (LEARN MODE). Learn Mode should be activated on a day with typical ambient conditions for best accuracy. Once the Learn Mode is enabled, the E-Clipse Bypass will keep a running tally of the energy used to run the application for the length of time defined in Parameter 1629. This energy usage becomes the base line for energy savings calculations on this application.

The user can adjust the default Learn Time (48 hours) by adjusting Parameter 1629 (LEARN TIME). The minimum Learn Time setting is 6 minutes (0.1 hour) and the maximum Learn Time setting is 200 hours. It is recommended that the E-Clipse Bypass run in Learn Mode for at least 24 hours for increased accuracy.

The MWh Saved estimation is displayed in megawatt hours in Parameter 0114 (MWH).

The Cost Saved calculation is simply the user provided cost per kilowatt hour in cents per kilowatt hour from Parameter 1627 (COST/KWH), times the energy saved. The Cost Saved estimate is displayed in thousands of dollars (K\$) in Parameter 0115 (COST SAVED).

The CO₂ Saved calculation is a constant (0.5 tons per megawatt-hour) times the energy saved. The CO₂ Saved estimate is displayed in tons of CO₂ (tn) in Parameter 0116 (CO₂ SAVED). Since the application uses less energy in drive mode, less CO₂ is generated by the power plant supplying power to the site.

Energy Saving Estimator setup

Verify the connected equipment is ready for operation. Set the following Parameters:

- Parameter 1627 – set to local cost of energy in cents per kilowatt hours
- Parameter 1629 – set to desired hours of initial bypass operation to establish energy usage baseline
- Select Bypass Mode on E-Clipse Keypad
- Parameter 1628 – set to ENABLED
- Start Bypass
- Run Bypass for at least the LEARN TIME set in Parameter 1629
- Select Drive Mode on E-Clipse Keypad
- Operate System normally

Note: The Learn Mode is terminated by any of the following conditions:

- User clears the Learn Mode request (Parameter 1628 = NOT SEL)
- The running time in Learn Mode equals the time set by Parameter 1629
- The user enters Drive Mode.

At the end of Learn Mode, the average bypass power is calculated.

From that point on, whenever the system is operated in Drive Mode, it keeps a running total of the energy savings.

The energy savings is measured from a certain point in time. This starting point is triggered by any of the following events:

- Learn Mode is terminated
 - 01.57 Inverter kWh counter (resettable)
 - **Drive** parameter 01.15 (KWH COUNTER) is reset
 - **Bypass** parameter 0114 (KWH SAVED) is reset
-

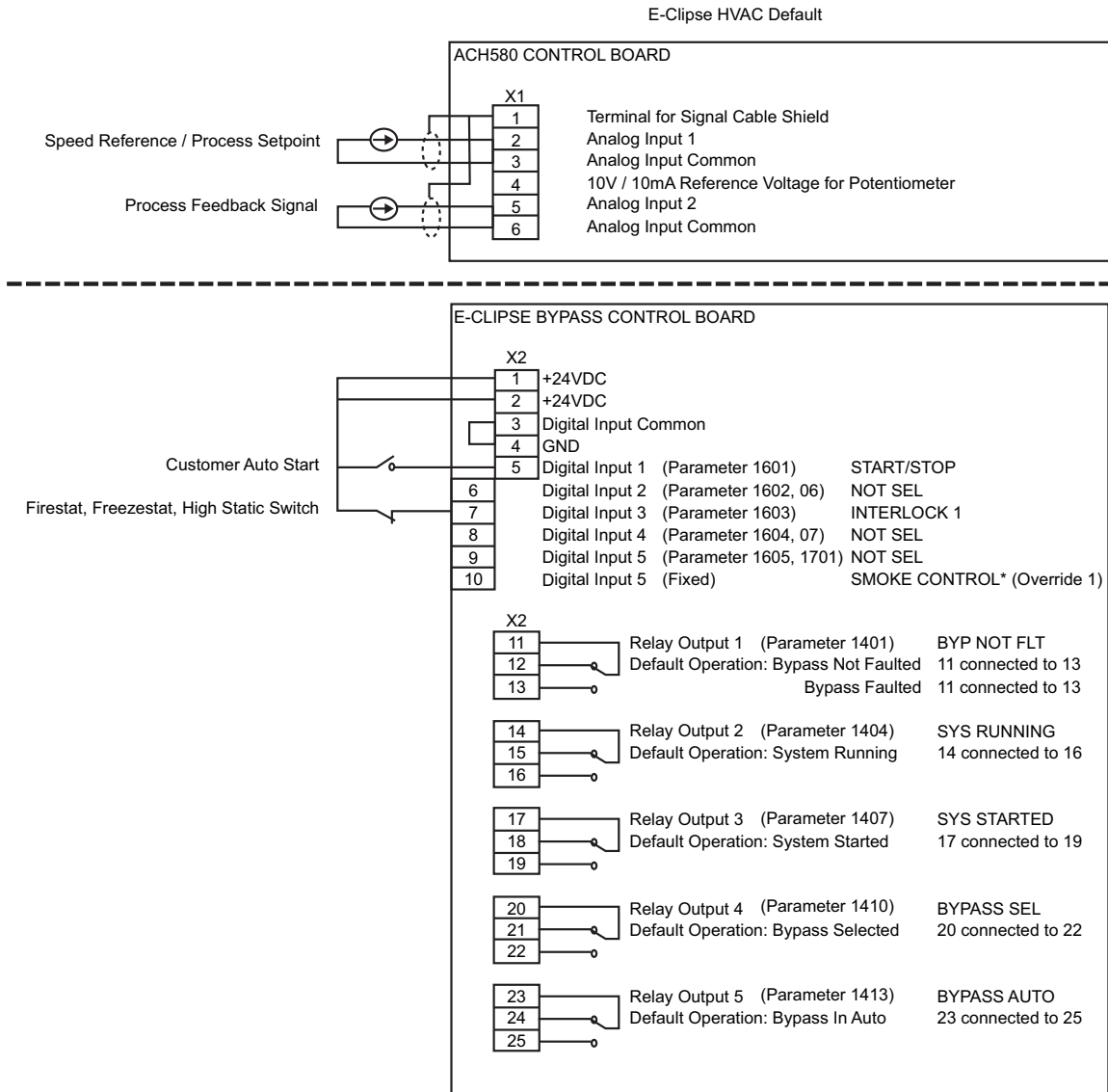
Application macros

The following figures show a variety of configurations and connections using the available E-Clipse Bypass Macros. E-Clipse Bypass macros are selected and configured using the E-Clipse Bypass Control Panel.

E-Clipse Bypass macros provide a simple, easy method of configuring the E-Clipse Bypass unit to the most commonly used HVAC applications.

The availability of up to four separate safety inputs (START INTERLOCKS) and a Run Permissive, along with override and automatic transfer capabilities, provide unparalleled integration into real world HVAC applications and building automation systems.

E-Clipse HVAC Default macro

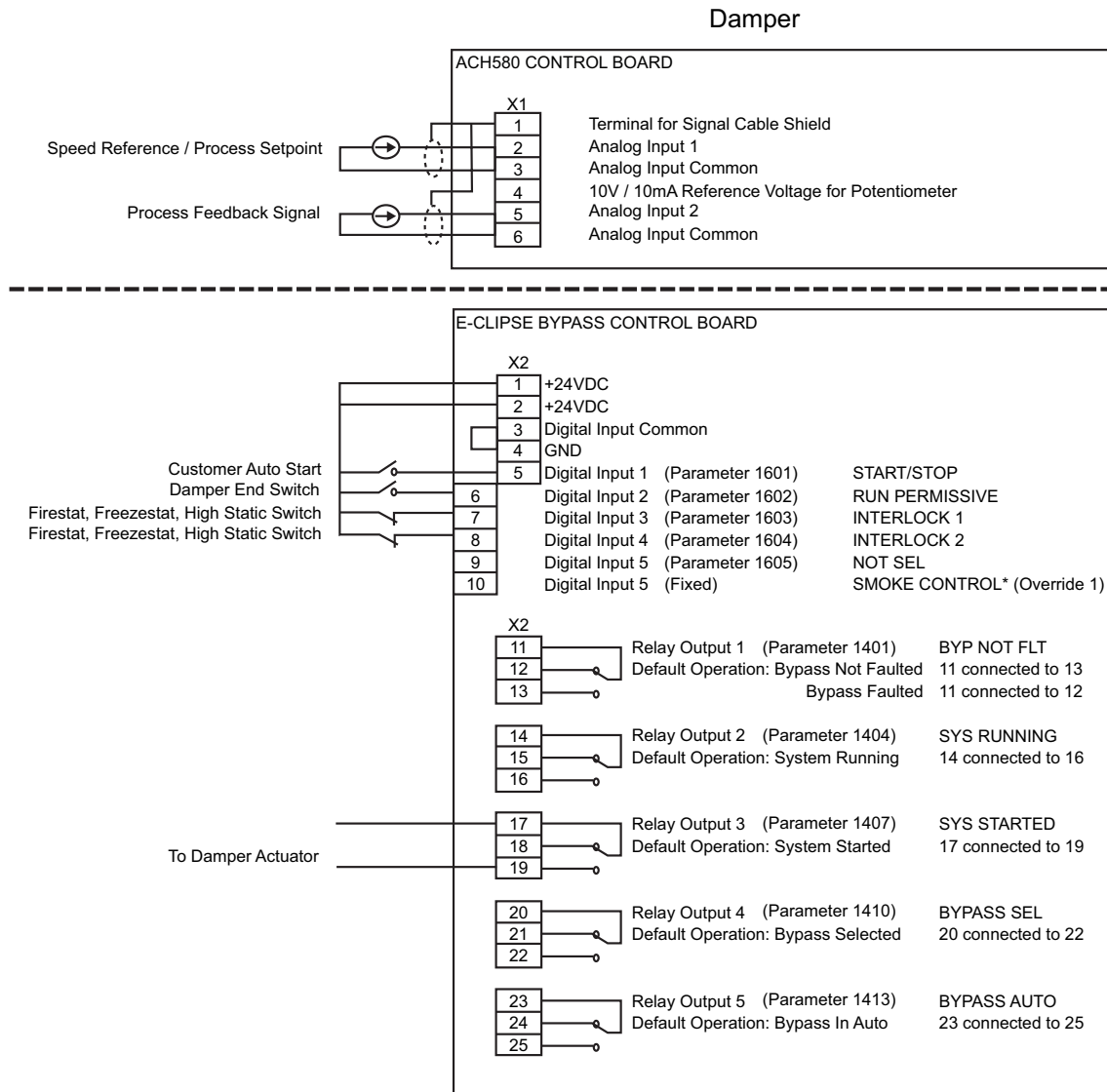


Parameters Changed Relative to E-Clipse HVAC Default

| Parameter Number | Description | Setting |
|------------------|-------------|---------|
| | | |
| | | |
| | | |
| | | |

* Smoke Control (Override1) is a fixed input. Closing Digital Input 6 will place the E-Clipse Bypass in Smoke Control mode which may reassign the function of the other Digital Inputs. Refer to the Smoke Control (Override1) documentation.

Damper macro



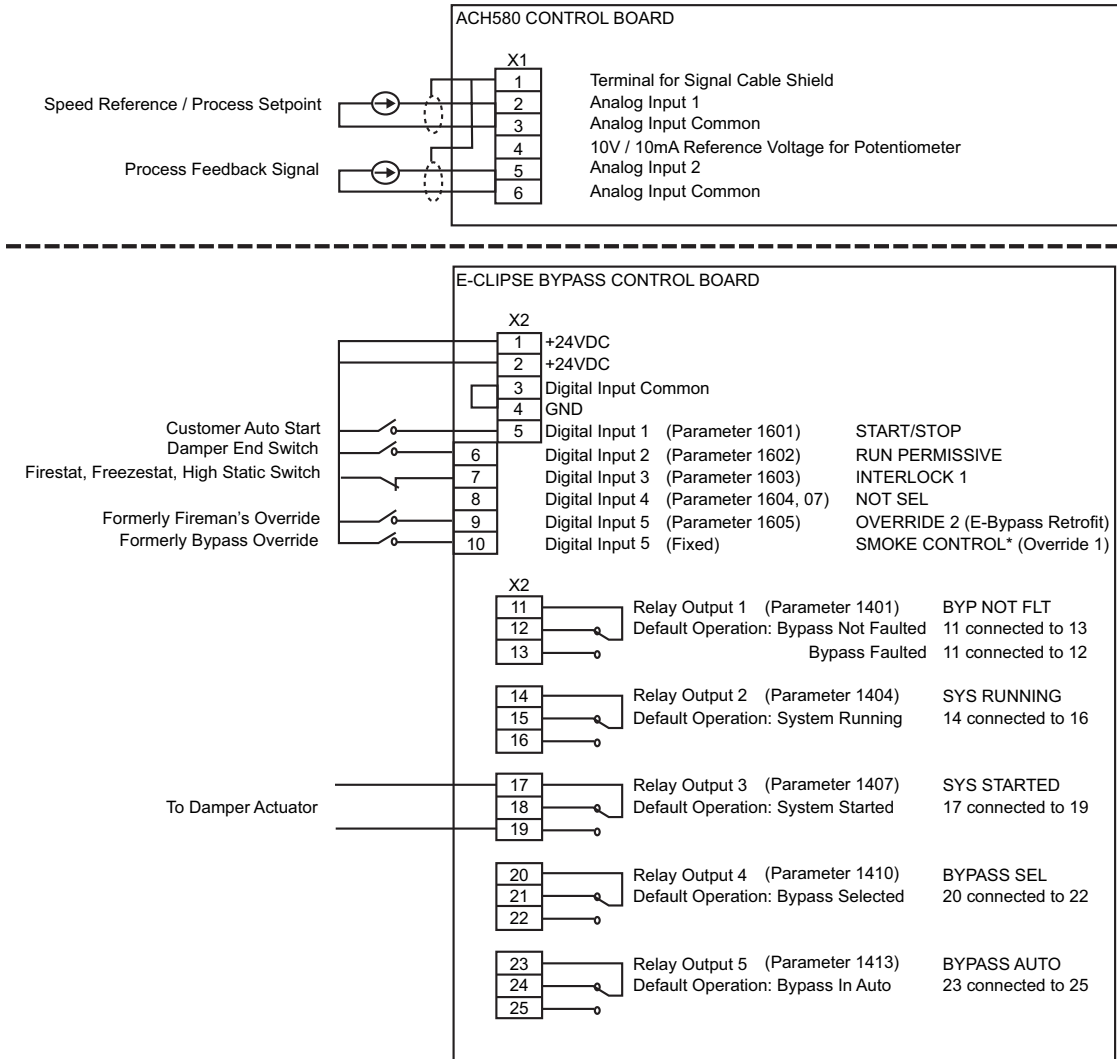
Parameters Changed Relative to HVAC Default

| Parameter Number | Description | Setting |
|------------------|--|---------|
| 1602 | Damper End Switch PERMISSIVE | DI2 |
| 1604 | Firestat, Freezestat, High Static Switch INTERLOCK 2 | DI4 |
| | | |
| | | |

* Smoke Control (Override1) is a fixed input. Closing Digital Input 6 **will** place the E-Clipse Bypass in Smoke Control mode which may reassign the function of the other Digital Inputs. Refer to the Smoke Control (Override1) documentation.

Retrofit macro

Retrofit

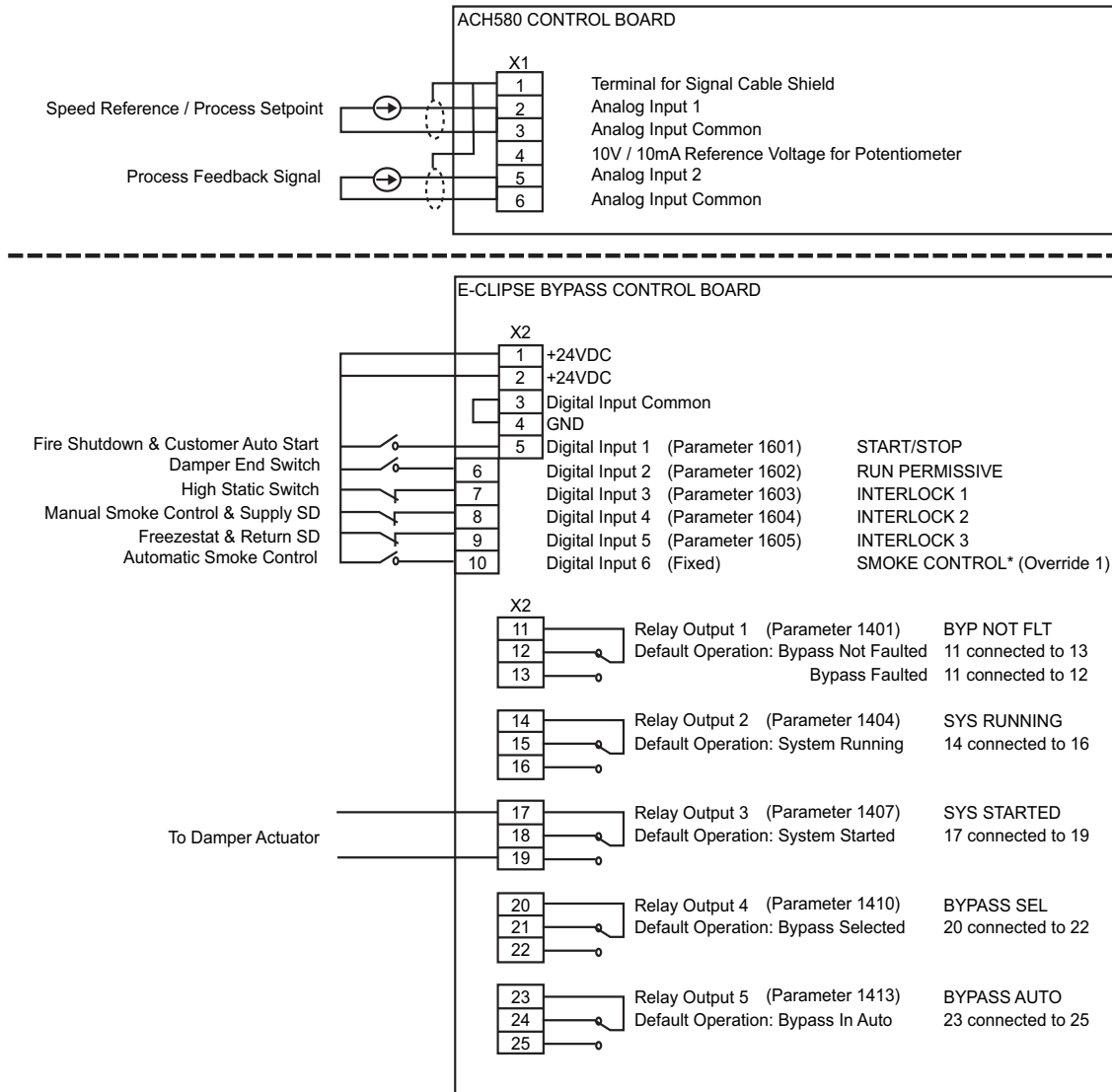


Parameters Changed Relative to HVAC Default

| Parameter Number | Description | Setting |
|------------------|--|---------|
| 1602 | Damper End Switch PERMISSIVE | DI2 |
| 1701 | Refer to page 37 VERRIDE 2 (Advanced Override) | DI5 |
| | | |
| | | |

* Smoke Control (Override1) is a fixed input. Closing Digital Input 6 will place the E-Clipse Bypass in Smoke Control mode which may reassign the function of the other Digital Inputs. Refer to the Smoke Control (Override1) documentation.

Smoke Control (Override1) macro



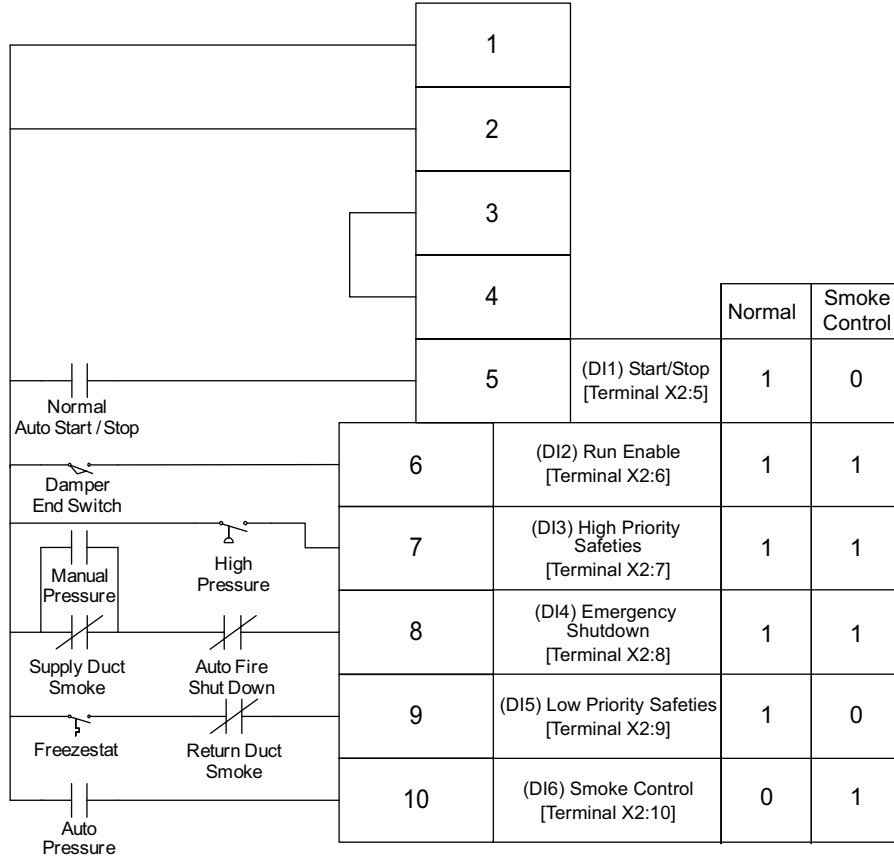
| Parameter Number | Description | Setting |
|------------------|--|---------|
| 1602 | Damper End Switch PERMISSIVE | DI2 |
| 1603 | High Pressure Switch, High Priority Safeties INTERLOCK 1 | DI3 |
| 1604 | Supply Smoke Detector, Emergency Shutdown INTERLOCK 2 | DI4 |
| 1605 | Freezestat, Low Priority Safeties INTERLOCK 3 | DI5 |

* Smoke Control (Override1) is a fixed input. Closing Digital Input 6 **will** place the E-Clipse Bypass in Automatic Smoke Control mode. The Macro change will be implemented when DI6 closes. All Interlock and Permissives are required before the motor runs. Refer to the Smoke Control (Override1) documentation.

Typical wiring diagram showing a conventional wiring and use of the E-Clipse Bypass using Override 1 macro.

Typical system wiring with use of E-Clipse Bypass:

X2 E-Clipse Bypass Controller Input



Normal Operation:

- Close Start/Stop (X2:5)
- Fan starts, assuming that X2: 6, 7, 8, and 9 are all closed

Emergency Shutdown:

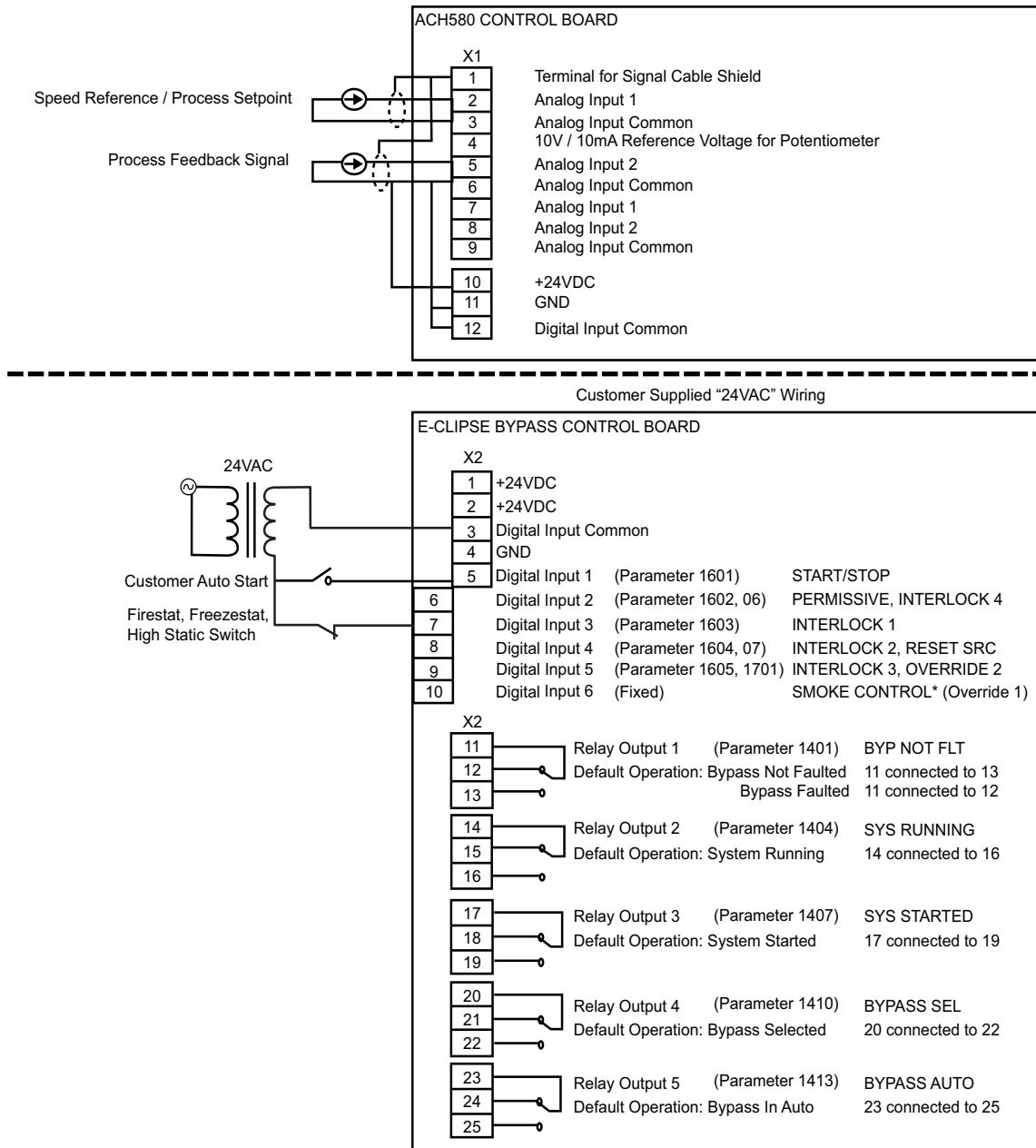
- Open auto fire shutdown, unit stops

Smoke Control Mode:

- Close contact on X2:10
- Fan starts regardless of position of internal HOA switch and inputs X2:5 and X2:9
- Inputs X2:6, 7 and 8 followed
- Internal overloads followed

Alternate wiring examples

Alternate wiring examples showing analog input connections for using PID control in ACH580. Also, these examples show how 24VAC can be connected to digital input on E-Clipse Bypass Control Board.



Parameters

Parameter list and descriptions

Parameter data is specific to bypass firmware version.

Group 01: Actual Data

| Group 01: Actual Data | | | | | |
|-----------------------|---------------|-------------------|-----------------------|---------|--|
| Code | Name | Resolution | Range | Default | Description |
| 0101 | MOTOR CURR | 0.1 A | | — | Display motor current in any mode. |
| 0102 | INPUT VOLT | 1 V | | — | Average of line-line input voltages |
| 0103 | DI STATUS | 1 | 000000 - 111111 | — | DI1-> 110010 <- DI6 |
| 0104 | RO STATUS | 1 | 00000 - 11111 | — | RO1-> 11001 <- RO5 |
| 0105 | PCB TEMP | 0.1 °C | | — | Temperature of bypass board |
| 0106 | KW HOURS (R) | 1 kWh | 0 - 65535 | 0 | Bypass-mode kilowatt hours (resettable). |
| 0107 | COMM RO | 1 | 0-FFFFh | — | Serial link control word that can be linked to relay output control (see group 14) |
| 0108 | RUN TIME(R) | 1 hr | 0 - 65535 hr | 0 | Bypass-mode run time (resettable). |
| 0109 | ON TIME 1(R) | 1 day | 0 - 65535 days | 0 | Total power on time of bypass, days (resettable) |
| 0110 | ON TIME 2(R) | 2sec | 00:00:00 - 23:59:58 | 0 | Total power on time of bypass, hr:min:sec (resettable) |
| 0111 | A-B VOLT | 1 V | | — | Phase A - Phase B voltage |
| 0112 | B-C VOLT | 1 V | | — | Phase B - Phase C voltage |
| 0113 | C-A VOLT | 1 V | | — | Phase C - Phase A voltage |
| 0114 | MWH(R) SAVED | 0.001 MWH - 1 MWH | 0.001 MWH - 65535 MWH | 0 | Drive kWh savings over bypass operation (resettable) |
| 0115 | COST SAVED(R) | 0.001 K\$ - 1 K\$ | 0.001 K\$ - 65535 K\$ | 0 | Drive cost savings over bypass operation (reset by parameter 0114) |
| 0116 | CO2 SAVED(R) | 0.1 tn | 0.1 - 6553.5 tn | 0 | Drive CO2 savings over bypass operation (reset by parameter 0114) |
| 0117 | KWH SAVE L | 1 | 0 - 65535 | 0 | Calculated drive savings (kWh) = (65536 × [parameter 0017 + parameter 0018])/256 |
| 0118 | KWH SAVE H | 1 | 0 - 65535 | 0 | Calculated drive savings (kWh) = (65536 × [parameter 0017 + parameter 0018])/256 |

(R) Can be reset by pressing UP and DOWN buttons simultaneously when in parameter set mode.

Group 03: Status

| Group 03: Status | | | | | |
|------------------|------------|------------|--|---------|-------------------------------|
| Code | Name | Resolution | Range | Default | Description |
| 0301 | FBUS CW 1 | — | b0: 1 = Start b1: 1 = Fault reset b2: 1 = Run disable b3: 1 = Field bus local b4: 1 = Start disable 1 b5: 1 = Start disable 2 b6: 1 = Start disable 3 b7: 1 = Start disable 4 b8: 1 = Override 2 b9: 1 = Link On b10 - b15: not used | 0 | Control word 1 from field bus |
| 0303 | FBUS SW 1 | — | b0: 1 = Ready b1: 1 = Enabled b2: 1 = Started b3: 1 = Running b4: 1 = Field bus local b5: 1 = Fault b6: 1 = Warning b7: 1 = Notice b8: 1 = Request control b9: 1 = Override b10: 1 = Powered up b11: 1 = Bypass mode b12: 1 = Panel local mode b13 - b15: not used | 0 | Status word 1 to field bus |
| 0305 | FLT WORD 1 | — | b0: 1 = Coil current measurement b1: 1 = Bypass contact stuck b2: 1 = Drive contact stuck b3: 1 = Bypass coil open b4: 1 = Drive coil open b5: 1 = Undervoltage b6: not used b7: 1 = Drive AI2 fault b8: 1 = Motor overload b9: 1 = Input phase A loss b10: 1 = Input phase B loss b11: 1 = Input phase C loss b12: 1 = Drive 1st start fault b13: 1 = coil power supply fault b14: not used b15: 1 = Earth fault | 0 | Bypass fault status, word 1 |
| 0306 | FLT WORD 2 | — | b0: 1 = Motor Underload b1: 1 = Max cycling fault b2: 1 = Drive link fault b3: 1 = Reverse rotation b4: 1 = Phase A current measurement b5: 1 = Phase C current measurement b6: 1 = Bypass coil shorted b7: 1 = Drive coil shorted b8: not used b9: not used b10: 1 = Invalid sub-assembly b11: 1 = Serial 1 Err b12: 1 = EFB Config File b13: 1 = Force Trip b14: 1 = EFB 1 b15: 1 = EFB 2 | 0 | Bypass fault status, word 2 |

| Group 03: Status | | | | | |
|------------------|------------|------------|---|---------|-------------------------------|
| Code | Name | Resolution | Range | Default | Description |
| 0307 | FLT WORD 3 | — | b0: 1 = EFB 3 b1: 1 = Open motor phase b2: not used b3: not used b4: 1 = Control board temperature b5: not used b6: not used b7: not used b8: 1 = RBIO ID error b9: 1 = Stack overflow b10: 1 = Timed scan overflow b11: 1 = Serial flash corrupt b12: 1 = Unknown drive b13: 1 = Unknown bypass b14 - b15: not used | 0 | Bypass fault status, word 3 |
| 0308 | WRN WORD 1 | — | b0: 1 = Input phase A loss b1: 1 = Input phase B loss b2: 1 = Input phase C loss b3: 1 = Auto transfer active b4: 1 = External Comm Error b5: 1 = Permissive b6: 1 = PCB Temp b7: 1 = Drive Setup b8: 1 = Bypass run delay b9: 1 = Motor Temp b10: 1 = Underload b11: 1 = Bypass disabled b12: 1 = Drive link error b13: 1 = Drive test b14: 1 = Drive 1st start needed b15: 1 = Low input voltage | 0 | Bypass warning status, word 1 |
| 0309 | WRN WORD 2 | — | b0: not used b1: not used b2: Override 1 b3: Override 2 b4: 1 = Interlock 1 b5: 1 = Interlock 2 b6: 1 = Interlock 3 b7: 1 = Interlock 4 b8: 1 = Mode auto lock b9: 1 = Mode local lock b10: 1 = Comm config error b11: 1 = FIG parameter configuration b12: 1 = Drive faulted b13 - b15: not used | 0 | Bypass warning status, word 2 |

Group 04: Fault Log

| Group 04: Fault Log | | | | | |
|---------------------|------------|----------------|----------------------------------|---------|--|
| Code | Name | Resolution | Range | Default | Description |
| 0401 | LAST FAULT | 1 | 3001 - 3999 See 'Faults' page | 0 | Last fault declared |
| 0402 | F1 TIME 1 | 1, days ago | 0 - 65535 | 0 | Time since last fault, days |
| 0403 | F1 TIME 2 | 2, ago | 00:00:00 - 23:59:58 | 0 | Time since last fault, hr:min:sec |
| 0404 | F1 VOLTAGE | 1V | 0 - 1200V | 0 | Input voltage at last fault |
| 0405 | F1 CURRENT | 0.1A | 0.0 - 6553.5A | 0 | Motor current at last fault |
| 0406 | F1 EVENT 1 | — | See parameter 501 | 0 | Last event status before last fault |
| 0407 | F1 E1 TIME | 2, before | 00:00:00 - 23:59:58 | 0 | Time before last fault of last event: hr:min:sec if time < 1 day |
| | | 1, days before | 0 - 9999 | | days if time >= 1 day |
| 0408 | F1 EVENT 2 | — | See parameter 501 | 0 | 2nd to last event status before last fault |

| Group 04: Fault Log | | | | | |
|---------------------|------------|----------------|----------------------------------|---------|--|
| Code | Name | Resolution | Range | Default | Description |
| 0409 | F1 E2 TIME | 2, before | 00:00:00 - 23:59:58 | 0 | Time before last fault of 2nd last event: hr:min:sec if time < 1 day |
| | | 1, days before | 0 - 9999 | | days if time >= 1 day |
| 0410 | FAULT 2 | 1 | 3001 - 3999 See 'Faults' page | 0 | 2nd to last fault |
| 0411 | F2 TIME 1 | 1, days ago | 0 - 65535 | 0 | Time since 2nd to last fault, days |
| 0412 | F2 TIME 2 | 2, ago | 00:00:00 - 23:59:58 | 0 | Time since 2nd to last fault, hr:min:sec |
| 0413 | F2 VOLTAGE | 1V | 0 - 1200V | 0 | Input voltage at 2nd to last fault |
| 0414 | F2 CURRENT | 0.1A | 0.0 - 6553.5A | 0 | Motor current at 2nd to last fault |
| 0415 | F2 EVENT 1 | — | See parameter 501 | 0 | Last event status before 2nd to last fault |
| 0416 | F2 E1 TIME | 2, before | 00:00:00 - 23:59:58 | 0 | Time before 2nd last fault of last event: hr:min:sec if time < 1 day |
| | | 1, days before | 0 - 9999 | | days if time >= 1 day |
| 0417 | F2 EVENT 2 | — | See parameter 501 | 0 | 2nd to last event before 2nd to last fault |
| 0418 | F2 E2 TIME | 2, before | 00:00:00 - 23:59:58 | 0 | Time before 2nd last fault of 2nd last event: hr:min:sec if time < 1 day |
| | | 1, days before | 0 - 9999 | | days if time >= 1 day |
| 0419 | FAULT 3 | 1 | 3001 - 3999 See 'Faults' page | 0 | 3rd to last fault |
| 0420 | FAULT 4 | 1 | 3001 - 3999 See 'Faults' page | 0 | 4th to last fault |
| 0421 | FAULT 5 | 1 | 3001 - 3999 See 'Faults' page | 0 | 5th to last fault |

Group 05: Event Log

| Group 05: Event Log | | | | | |
|---------------------|------------|-------------|--|---------|---------------------------------------|
| Code | Name | Resolution | Range | Default | Description |
| 0501 | LAST EVENT | — | b0: 1 = Bypass mode b1: 1 = Safeties In b2: 1 = Permissive b3: 1 = Start b4: 1 = In Auto Transfer b5: 1 = Override 2 b6: 1 = Override 1 b7: 1 = Drive Fault b8: 1 = Bypass Fault b9: 1 = System Started b10: 1 = System Running b11: 1 = Drive First Start Completed b12: not used b13: not used b15,b14: 0,0 = Off; 0,1 = Hand, 1,0 = Auto; 1,1 = not valid | 0 | Status at last event |
| 0502 | E1 TIME 1 | 1, days ago | 0 - 65535 | 0 | Time since last event, days |
| 0503 | E1 TIME 2 | 2, ago | 00:00:00 - 23:59:58 | 0 | Time since last event, hr:min:sec |
| 0504 | EVENT 2 | — | See parameter 501 | 0 | Status of 2nd to last event |
| 0505 | E2 TIME 1 | 1, days ago | 0 - 65535 | 0 | Time since 2nd last event, days |
| 0506 | E2 TIME 2 | 2, ago | 00:00:00 - 23:59:58 | 0 | Time since 2nd last event, hr:min:sec |
| 0507 | EVENT 3 | — | See parameter 501 | 0 | Status of 3rd to last event |

| Group 05: Event Log | | | | | |
|---------------------|-----------|-------------|---------------------|---------|---------------------------------------|
| Code | Name | Resolution | Range | Default | Description |
| 0508 | E3 TIME 1 | 1, days ago | 0 - 65535 | 0 | Time since 3rd last event, days |
| 0509 | E3 TIME 2 | 2, ago | 00:00:00 - 23:59:58 | 0 | Time since 3rd last event, hr:min:sec |
| 0510 | EVENT 4 | — | See parameter 501 | 0 | Status of 4th to last event |
| 0511 | E4 TIME 1 | 1, days ago | 0 - 65535 | 0 | Time since 4th last event, days |
| 0512 | E4 TIME 2 | 2, ago | 00:00:00 - 23:59:58 | 0 | Time since 4th last event, hr:min:sec |

Group 14: Relay Outputs

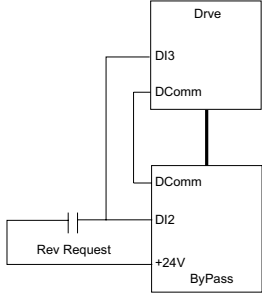
| Group 14: Relay Outputs | | | | | |
|-------------------------|------------|------------|--|-----------------------|--|
| Code | Name | Resolution | Range | Default | Description |
| 1401 | RO1 SELECT | 1 | 0 = NOT SEL 1 = SYS READY 2 = SYS RUNNING 3 = SYS STARTED 4 = BYPASS SEL 5 = BYPASS RUN 6 = BYPASS FLT 7 = BYP NOT FLT 8 = BYPASS WRNG 9 = DRIVE FAULT 10 = DRV NOT FLT 11 = DRIVE WARNING 12 = OVERRIDE 13 = BYPASS HAND 14 = BYPASS OFF 15 = BYPASS AUTO 16 = COMM CTRL 17 = SYS WARNING 18 = BYP FLT/WRN 19 = BYP OVERLD 20 = BYP UNDERLD 21 = PCB OVERTMP 22 = SYS UNDERLD 23 = SYSTEM FLT 24 = SYS FLT/WRN 25 = SYS EXT CTL 26 = SYS OVERLD 27 = CONTACT FLT 28 = SYS NOT FLT 29 = DRV LNK ERR 30 = EXT COMM LS 31 = OVRD2 STOP 32 = OVRD2 ENAB | BYP NOT FLT (7) | Selects function for digital output. Define the event or condition that activates relay 1. |
| 1402 | R1 ON DLY | 0.1 sec | 0-3600.0s | 0s | Delay from active state to active output. |
| 1403 | R1 OFF DLY | 0.1 sec | 0-3600.0s | 0s | Delay from inactive state to inactive output. |
| 1404 | RO2 SELECT | 1 | See RO 1 Select. | SYS RUNNING (2) | |
| 1405 | R2 ON DLY | 0.1 sec | 0-3600.0s | 0s | Delay from active state to active output. |
| 1406 | R2 OFF DLY | 0.1 sec | 0-3600.0s | 0s | Delay from inactive state to inactive output. |
| 1407 | RO3 SELECT | 1 | See RO 1 Select. | SYS STARTED (3) | |
| 1408 | R3 ON DLY | 0.1 sec | 0-3600.0s | 0s | Delay from active state to active output. |
| 1409 | R3 OFF DLY | 0.1 sec | 0-3600.0s | 0s | Delay from inactive state to inactive output. |
| 1410 | RO4 SELECT | 1 | See RO 1 Select. | BYPASS SEL (4) | |

| Group 14: Relay Outputs | | | | | |
|-------------------------|------------|------------|------------------|------------------------|---|
| Code | Name | Resolution | Range | Default | Description |
| 1411 | R4 ON DLY | 0.1 sec | 0-3600.0s | 0s | Delay from active state to active output. |
| 1412 | R4 OFF DLY | 0.1 sec | 0-3600.0s | 0s | Delay from inactive state to inactive output. |
| 1413 | RO5 SELECT | 1 | See RO 1 Select. | BYPASS AUTO (13) | |
| 1414 | R5 ON DLY | 0.1 sec | 0-3600.0s | 0s | Delay from active state to active output. |
| 1415 | R5 OFF DLY | 0.1 sec | 0-3600.0s | 0s | Delay from inactive state to inactive output. |

Group 16: System Control

| Group 16: System Control | | | | | |
|--------------------------|-------------|------------|------------------------------------|----------------|--|
| Code | Name | Resolution | Range | Default | Description |
| 1601 | START/STOP | 1 | 0 = NOT SEL 1 = DI1 2 = COMM | DI 1 (1) | Selects source for system start command. |
| 1602 | PERMISSIVE | 1 | 0 = NOT SEL 1 = DI2 2 = COMM | NOT SEL (0) | Selects source for the permissive command. |
| 1603 | INTERLOCK 1 | 1 | 0 = NOT SEL 1 = DI3 2 = COMM | DI 3 (1) | Selects source for the interlock 1 command. |
| 1604 | INTERLOCK 2 | 1 | 0 = NOT SEL 1 = DI4 2 = COMM | NOT SEL (0) | Selects source for the interlock 2 command. |
| 1605 | INTERLOCK 3 | 1 | 0 = NOT SEL 1 = DI5 2 = COMM | NOT SEL (0) | Selects source for the interlock 3 command. |
| 1606 | INTERLOCK 4 | 1 | 0 = NOT SEL 1 = DI2 2 = COMM | NOT SEL (0) | Selects source for the interlock 4 command. |
| 1607 | RESET SRC | 1 | 0 = NOT SEL 1 = DI4 2 = COMM | NOT SEL (0) | Selects source for fault reset command (rising edge). |
| 1608 | AUTO XFR | 1 | 0 = NOT SEL 1 = ENABLE | NOT SEL (0) | Enabled allows auto transfer to bypass on all drive faults except the conditional faults which require an additional enable. NOT SEL prevents auto transfer to bypass for all drive faults including the conditional faults. |
| 1609 | OC TRANSFR | 1 | 0 = NOT SEL 1 = ENABLE | NOT SEL (0) | Drive over current causes auto transfer. Requires global auto transfer enable also. |
| 1610 | OV TRANSFR | 1 | 0 = NOT SEL 1 = ENABLE | NOT SEL (0) | Drive over voltage causes auto transfer. Requires global auto transfer enable also. |
| 1611 | UV TRANSFR | 1 | 0 = NOT SEL 1 = ENABLE | NOT SEL (0) | Drive under voltage causes auto transfer. Requires global auto transfer enable also. |
| 1612 | AI TRANSFR | 1 | 0 = NOT SEL 1 = ENABLE | NOT SEL (0) | Drive AI loss causes auto transfer. Requires global auto transfer enable also. |
| 1613 | BP DISABLE | 1 | 0 = NOT SEL 1 = DISABLE | NOT SEL (0) | Disables bypass mode. |
| 1614 | BP RUN DLY | 1 sec | 0 - 300 secs | 0s | Bypass contactor pick-up delay when starting bypass or transferring from Drive mode. |
| 1615 | SAVE PARAM | 1 | 0 = DONE 1 = SAVE | 0 | Save User Settings (SaveImm + SavePwr). |

| Group 16: System Control | | | | | |
|--------------------------|------------|------------|--|--------------------|--|
| Code | Name | Resolution | Range | Default | Description |
| 1616 | DISP WRNGS | 1 | 0 = DISABLE 1 = ENABLE | ENABLE (1) | Enables warnings to be displayed: INP PHASE A LOSS, INP PHASE B LOSS, INP PHASE C LOSS, MTR OVERLOAD, BYPASS DISABLED, DRIVE SETUP, PCB TEMP DRIVE LINK ERROR DRIVE FAULTED |
| 1617 | DRIVE TEST | 1 | 0 = DISABLE 1 = ENABLE | DISABLE (0) | Enables drive test mode. Drive contactor is opened. |
| 1618 | PASS CODE | 1 | 0 - 65535 | 123 | Pass code entry to edit panel lock parameter and view/edit security lock parameters. The security parameters are 1640 – 1644. Default: 123 |
| 1619 | PAR LOCK | 1 | 0 = LOCKED 1 = OPEN | OPEN (1) | When switched to "LOCKED" prevents parameter changes from panel. Does not affect to Field Bus writes, expect changing the lock value itself; correct password must always be set first, even in case of Field Bus. |
| 1620 | PERMSV TXT | 1 | 0 = PERMISSIVE 1 = DAMPER END SWTCH 2 = VALVE OPENING 3 = PRE-LUBE CYCLE | PERMISSIVE (0) | Alternative text choices for warning 4006. |
| 1621 | INTLK1 TXT | 1 | 0 = INTERLOCK 1 1 = VIBRATION SWITCH 2 = FIRESTAT 3 = FREEZESTAT 4 = OVERPRESSUR E 5 = VIBRATION TRIP 6 = SMOKE WARNING 7 = SAFETY OPEN 8 = LOW SUCTION | INTERLOCK 1 (0) | Alternative text choices for warning 4021. |
| 1622 | INTLK2 TXT | 1 | 0 = INTERLOCK 2 ... | INTERLOCK 2 (0) | Alternative text choices for warning 4022. See parameter 1621 for range. |
| 1623 | INTLK3 TXT | 1 | 0 = INTERLOCK 3 ... | INTERLOCK 3 (0) | Alternative text choices for warning 4023. See parameter 1621 for range. |
| 1624 | INTLK4 TXT | 1 | 0 = INTERLOCK 4 ... | INTERLOCK 4 (0) | Alternative text choices for warning 4024. See parameter 1621 for range. |
| 1625 | COMM CTRL | 1 | 0 = DRIVE ONLY 1 = SYSTEM | DRIVE ONLY (0) | Selects comm control mode. In drive only mode, control of drive is made through drive points, and control of bypass over comms is not possible. In system mode, control of system (bypass or drive) is made through bypass points. |

| Group 16: System Control | | | | | |
|--------------------------|------------|------------|--|----------------|--|
| Code | Name | Resolution | Range | Default | Description |
| 1626 | MODE LOCK | 1 | 0 = NOT SEL 1 = AUTO MODE 2 = LOCAL MODE | NOT SEL (0) | When Mode Lock is AUTO MODE, the control panel will not allow switching to Hand or Off. When Mode Lock is LOCAL MODE, the control panel will not allow switching to Auto. |
| 1627 | COST/KWH | 0.1 c/kWh | 0.0 - 100.00 c/kWh | 7.0 c/kWh | Cost of energy: cents/kWh |
| 1628 | LEARN MODE | 1 | 0 = NOT SEL 1 = ENABLED | NOT SEL (0) | When enabled, bypass learns average power consumption while operating in bypass mode |
| 1629 | LEARN TIME | 0.1 Hr | 0.0 - 200.0 Hr | 48.0 Hr | Time that learn mode will be active after it is enabled |
| 1630 | START REV | | 0 = NOT SEL 1 = DI2 | NOT SEL (0) |  <ul style="list-style-type: none"> • Selects source for drive start reverse command for a constant frequency for wiring diagram above and programming below. • Reverse request can only be selected for DI2 on the E-Clipse • Drive Param 20.21 (Direction) needs to be set for REQUEST. • Drive Param 28.22 (Constant Frequency Sel 1) needs to be set to DI3. • Drive Param 28.26 (Constant Frequency 1) needs to be set for frequency required. Use positive value. • Drive Param 28.21 bit 1 (Direction enable) set to 1. • When E-Clipse input DI2 is energized the bypass sets drive's reverse run request over the communication link. • The same signal input for bypass DI2 goes to Drive DI3 and sets constant frequency. • The Reverse request has priority over normal Run input, this means that if both DI1 and DI2 are closed at the same time motor will run reverse at the constant frequency. |

| Group 16: System Control | | | | | |
|--------------------------|------------|------------|------------------------|---------------|---|
| Code | Name | Resolution | Range | Default | Description |
| 1631 | DRV/BYPASS | 1 | 0 = KEYPAD 1 = DI5 | KEYPAD (0) | Selects source for drive/bypass mode command. (0) Keypad – The drive/bypass mode selection is made from the bypass keypad (DRIVE or BYPASS select keys). (1) DI5 – The drive/bypass mode selection from the bypass keypad is disabled and selection is made from the digital input. When DI5 is energized the system is set to bypass mode. |
| 1640 | PASS SET | | 0 – 65535 | 0 | Sets the passcode that is compared against parameter 1618- PASS CODE. Passcode required to open. |
| 1641 | PASS CNFRM | | 0 – 65535 | 0 | Confirms the setting of parameter 1640 - PASS SET. |
| 1642 | ABB ACCESS | | 0 = LOCKED 1 = OPEN | LOCKED (0) | Locks access to factory only parameters and factory debug tool. Passcode required to open. |
| 1643 | FB LOCK | | 0 = LOCKED 1 = OPEN | OPEN (1) | <ul style="list-style-type: none"> Allows Fieldbus writing of parameters. Applies to embedded and FBA. Does not affect control of the bypass over the fieldbus. Does not affect bypass parameters in group 53- FBA DATA OUT. Does not affect writing of parameters to the drive. Passcode required to open. |
| 1644 | DNLD LOCK | | 0 = LOCKED 1 = OPEN | OPEN (1) | Allows locking of program and serial flash downloads. Passcode required to open. |

Group 17: Override 2

| Group 17: Override 2 | | | | | |
|----------------------|------------|------------|---|------------------|--|
| Code | Name | Resolution | Range | Default | Description |
| 1701 | OVERRIDE 2 | 1 | 0 = NOT SEL 1 = DI5 2 = COMM | NOT SEL (0) | Selects source for override 2 command. |
| 1702 | PERMSV OVR | 1 | 0 = ACKNOWLEDGE 1 = DISREGARD | DISREGARD (1) | Acknowledge or disregard permissive during override 2. |
| 1703 | INTLK1 OVR | 1 | 0 = ACKNOWLEDGE 1 = DISREGARD | DISREGARD (1) | Acknowledge or disregard interlock 1 during override 2. |
| 1704 | INTLK2 OVR | 1 | 0 = ACKNOWLEDGE 1 = DISREGARD | DISREGARD (1) | Acknowledge or disregard interlock 2 during override 2. |
| 1706 | INTLK4 OVR | 1 | 0 = ACKNOWLEDGE 1 = DISREGARD | DISREGARD (1) | Acknowledge or disregard interlock 4 during override 2. |
| 1707 | FAULTS OVR | 1 | 0 = ACKNOWLEDGE 1 = DISREGARD | DISREGARD (1) | Acknowledge or disregard overrideable bypass faults during override 2. All faults can be overridden except: 3009, 3021, 3022, 3023, 3024, 3027, 3034, 3101, 3202, 3203, 3204, 3205, 3206 |
| 1708 | OVRD2 MODE | 1 | 1 = BYPASS 2 = VFD 3 = VFD/BYPASS 4 = STOP | BYPASS (1) | 1 = Use bypass contactor only 2 = Use drive only 3 = Use drive, switch to bypass on drive fault 4 = Both contactors open |

Note: For wiring requirements and additional configuration detail refer to [Advanced Override Mode \(Override 2\)](#) on page 37.

Group 30: Fault Function

| Group 30: Fault Function | | | | | |
|--------------------------|------------|------------|---|----------------|---|
| Code | Name | Resolution | Range | Default | Description |
| 3001 | UL ACTION | 1 | 0 = NOT SEL 1 = FAULT 2 = WARNING | NOT SEL (0) | Selects action to be taken if underload occurs. |
| 3002 | UL TIME | 1 sec | 10 - 400 sec | 20 sec | Time below underload level before fault is declared. |
| 3003 | UL TRIP % | 1% | 0 - 100% | 20% | Sets power level at which underload is declared. |
| 3004 | COMM LOSS | 1 | 0 = NOT SEL 1 = FAULT 2 = CONST SP7 3 = LAST SPEED | NOT SEL (0) | This parameter serves similar purpose as parameter 58.14 in drive which specifies behavior if communication link goes down. |
| 3005 | COMM TIME | 0.1s | 0.0 - 600.0s | 0 | Sets the communication fault time used with COMM LOSS parameter. A value of "0" disables the timer. |
| 3006 | PHASE LOSS | 1 | 0 = DISABLE 1 = ENABLE | 1 | Provides input phase loss detection for bypass mode. |
| 3007 | PHASE SEQ | 1 | 0 = DISABLE 1 = ENABLE | 1 | Indicates if drive and bypass would run the motor in the same direction. |

Group 32: Supervisory Control

| Group 32: Supervisory Control | | | | | |
|-------------------------------|------------|------------|-------------------------------|------------------|---|
| Code | Name | Resolution | Range | Default | Description |
| 3201 | SUPER CTRL | 1 | 0 = DISABLE 1 = ENABLE | DISABLE (0) | Enable supervisory control in bypass mode. |
| 3202 | START LVL | 1% | 0 - 100% | 70% | Value of drive's AI2 that causes bypass contactor closure. Applies only in supervisory mode. |
| 3203 | STOP LEVEL | 1% | 0 - 100% | 30% | Value of drive's AI2 that causes bypass contactor opening. Applies only in supervisory mode. |
| 3204 | START DLY | 1s | 20 - 3600s | 40s | Time that close condition must be present before contactor is closed. Applies only in supervisory mode. |
| 3205 | STOP DLY | 1s | 20 - 3600s | 60s | Time that open condition must be present before contactor is opened. Applies only in supervisory mode. |
| 3206 | FBK LOSS | 1 | 0 = BYP STOP 1 = BYP START | BYP START (1) | Bypass contactor operation if drive link fault, drive AI2 loss or excessive cycling. |

Group 33: Information

| Group 33: Information | | | | | |
|-----------------------|------------|------------|-------|---------|--|
| Code | Name | Resolution | Range | Default | Description |
| 3301 | FW VERSION | hex | | — | Revision of main application firmware. |
| 3302 | PT VERSION | hex | | — | Revision of panel text file. |
| 3303 | LP VERSION | — | | — | Loading package version. |
| 3304 | CB VERSION | — | | — | Control board version. |
| 3305 | TEST DATE | — | | — | |

| Group 33: Information | | | | | |
|-----------------------|------------|------------|---------------|---------|---|
| Code | Name | Resolution | Range | Default | Description |
| 3306 | DRIVE TYPE | — | | — | Drive Type - copy of drive's parameter 07.03. |
| 3307 | SUB ASMBLY | — | | — | Bypass Sub assembly type. |
| 3308 | PLANT CODE | 1 | 0-9 | 0 | Part of bypass serial number: Shows 1 digit plant code. Identifies the factory where the device was made |
| 3309 | MFG DATE | 1 | 0107 - 5299 | 0 | Part of bypass serial number: Shows 4 digit manufacturing date. WWYY. (2 digits for the week number 01-52 and 2 digits for the year) |
| 3310 | UNIT NUM | 1 | 00001 - 65535 | 0 | Part of bypass serial number: Shows 5 digit unit number here. Tells order number of a unit manufactured during a certain week. Maximum number is 65525. |

Group 50: Bypass EFB

| Group 50: Bypass EFB | | | | | |
|----------------------|------------|------------|-----------|---------|---|
| Code | Name | Resolution | Range | Default | Description |
| 5003 | BP MAC ID | 1 | 0 - 65535 | 256 | Bypass station ID (NODE ADDRESS) |
| 5008 | BP OK MSG | 1 | 0 - 65535 | 0 | Contains a count of valid messages received by the bypass. During normal operation, this counter is increasing constantly. |
| 5013 | TOKEN CNT | 1 | 0 - 65535 | 0 | Contains a count of the number of times the bypass has received the token. |
| 5040 | BP OB ID L | 1 | 0 - 65535 | 0 | BACnet Device object ID lower word. The Bypass's Device object ID must be unique across all BACnet devices in the building network. Valid values are 0...4194303. The Device Object ID is formed as a combination of parameter 5040 and 5099. To set an ID from 1 to 65535 set this parameter = to the desired ID and set 5099 = 0. To set an ID greater than 65535, set this parameter to the lower 4 digits of the ID and set 5099 to the remaining upper digits. For example, to set the ID to 71234, set the 5040 = 1234 and 5099 = 7. The default values of 5040 = 0 and 5099 = 0 are handled specially. This case uses parameter 5003, the MAC ID as the value for the device object ID. |
| 5099 | BP OB ID H | 1 | 0 - 419 | 0 | BACnet Device object ID upper word. See parameter 5040 for description of how to use this parameter. |

Group 51: External Comm Mode

| Group 51: External Comm Mode | | | | | |
|------------------------------|--------------------------------|------------|--|---------|---|
| Code | Name | Resolution | Range | Default | Description |
| 5101 | FBA TYPE | 1 | 0 = NOT DEFINED 1 = Profibus 15 = LonWorks 37 = DeviceNet 502 = Modbus TCP 2222 Ethernet/IP | — | Displays type of attached fieldbus adapter module. |
| 5102 ... 5126 | FBA PAR 2 ... FBA PAR 26 | 1 | 0 - 65535 | 0 | Fieldbus specific - consult FBA User's Manual. |
| 5127 | REFRESH | 1 | 0 = DONE 1 = REFRESH | 0 | Validates any changed adapter module configuration parameters. After refreshing, value reverts automatically to DONE. |
| 5128 | FBA PAR 28 | 1 | 0 - 0xFFFF | 0 | Parameter table version |
| 5129 | FBA PAR 29 | 1 | 0 - 0xFFFF | 0 | Bypass type code |
| 5130 | FBA PAR 30 | 1 | 0 - 0xFFFF | 0 | Mapping file version |
| 5131 | FBA PAR 31 | 1 | 0 - 6 | 0 | Fieldbus adapter status |
| 5132 | FBA PAR 32 | 1 | 0 - 0xFFFF | 0 | Module common software version |
| 5133 | FBA PAR 33 | | 0 - 0xFFFF | 0 | Module application software version |

Group 52: FBA Data In

| Group 52: FBA Data In | | | | | |
|-----------------------|--------------------------------|------------|---|---------|--|
| Code | Name | Resolution | Range | Default | Description |
| 5201 ... 5210 | DATA IN 1 ... DATA IN 10 | 1 | 0 = Not In Use 1 = Control Word (ABBDP) 2 = Ref 1 (ABBDP) 3 = Ref 2 (ABBDP) 4 = Status Word (ABBDP) 5 = Actual Value 1 (ABBDP) 6 = Actual Value 2 (ABBDP) 0101h - 063FFh = Drive parameters 8101h - E3FFh = Bypass parameters + 8000h | 0 | Specifies information to be read from the drive (into the network). Only for modules that support the cyclic low scanner function (such as FMBT-12). For specifying values 1-6, select ABB drive's profile information, like status word or actual values. To specify drive parameters, use the format gg _h .pp _h where gg _h is the parameter group in hexadecimal and pp _h is the parameter in hexadecimal. For instance, drive parameter 30.14 is encoded as 1E0Eh. Bypass parameter is specified as 8000h + gg _h .pp _h . For instance, bypass parameter 0114 is encoded as 810Eh. |

Group 53: FBA Data Out

| Group 53: FBA Data Out | | | | | |
|------------------------|---------------------------------|------------|--|---------|---|
| Code | Name | Resolution | Range | Default | Description |
| 5301 ... 5310 | DATA OUT 1 ... DATA OUT10 | 1 | 0 = Not In Use 1 = Control Word (ABBDP) 2 = Ref 1 (ABBDP) 3 = Ref 2 (ABBDP) 4 = Status Word (ABBDP) 5 = Actual Value 1 (ABBDP) 6 = Actual Value 2 (ABBDP) 0101h -063FFh = Drive parameters 8101h - E3FFh = Bypass parameters + 8000h | — | Specifies information to be written to the drive (out of the network). Only for modules that support the cyclic low scanner function (such as FMBT-12). For specifying values 1-6, select ABB drive's profile information, like control word of reference. To specify drive parameters, use the format ggh.pph where gg _h is the parameter group in hexadecimal and pp _h is the parameter in hexadecimal. For instance, drive parameter 30.14 is encoded as 1E0Eh. Bypass parameter is specified as 8000h + gg _h .pp _h . For instance, bypass parameter 0114 is encoded as 810Eh. |

Group 58: Drive EFB

The drive's Group 58 must be replicated on bypass, since the EFB link on the drive is reserved for internal communication with the bypass. All Group 58 functionality associated with selection by 98.02 is hosted on the bypass controller for drive. Group 58 parameters on the bypass are a subset of the Group 58 parameters on the drive.

| Group 58: Drive EFB | | | | | |
|---------------------|------------|------------|--|---------|---|
| Code | Name | Resolution | Range | Default | Description |
| 5802 | DV PROT ID | hex | 0x0000 - 0xFFFF | 0x0000 | Protocol ID and revision: Format: XXYY where XX = protocolID and YY = program revision |
| 5803 | DV MAC ID | 1 | 0 - 65535 | 256 | Default value is protocol-dependent: Modbus and N2 is 1, BACnet is 128. Drive station ID (NODE ADDRESS) Refer to Communication setup – EFB on page 79 for more information. |
| 5804 | BAUD RATE | 0.1 kbit/s | 1.2, 2.4, 4.8, 9.6, 19.2, 38.4, 57.6, 76.8 | 9.6 | Default value is protocol-dependent: Modbus and N2 is 9.6, BACnet is 38.4. Defines the communication speed of the RS485 link in kbits per second (kb/s). Refer to Communication setup – EFB on page 79 for more information. |
| 5805 | EFB PARITY | 1 | 0=8 NONE 1, 1=8 NONE 2, 2=8 EVEN 1, 3=8 ODD 1 | 0 | Defines the data length, parity and stop bits to be used with the RS485 link communication. Default value is protocol-dependent: Modbus is 1, N2 and BACnet is 0. Refer to Communication setup – EFB on page 79 for more information. |

| Group 58: Drive EFB | | | | | |
|---------------------|------------|------------|---|---------|--|
| Code | Name | Resolution | Range | Default | Description |
| 5807 | DV STATUS | 1 | 0=IDLE, 1=EXECUT INIT, 2=TIME OUT, 3=CONFIG ERR, 4=OFF-LINE, 5=ON-LINE, 6=RESET, 7=LISTEN ONLY | 0 | Contains the status of the drive EFB protocol. |
| 5808 | DV OK MSG | 1 | 0 - 65535 | 0 | Contains a count of valid messages received by the drive. <ul style="list-style-type: none"> During normal operation, this counter is increasing constantly. |
| 5811 | UART ERROR | 1 | 0 - 65535 | 0 | Contains a count of the messages with a character error received by the drive. |
| 5812 | DV CRC ERR | 1 | 0 - 65535 | 0 | Contains a count of the messages with a CRC error received by the drive. |
| 5813 | TOKEN CNT | 1 | 0 - 65535 | 0 | Contains a count of the number of times the drive has received the token. |
| 5817 | TX DELAY | 1 | 0 - 65535 | 0 | Defines the drive minimum response delay in addition to any fixed delay imposed by the protocol. |
| 5818 | EFB CNTRL | 1 | 0 - 0xFFFF | 0 | Displays the raw (unmodified) control word sent by the Modbus controller to the drive. This parameter is read-only. |
| 5819 | EFB STAT | 1 | 0 - 0xFFFF | 0 | Status word sent by the drive to the Modbus controller. this parameter is read-only. |
| 5825 | PROFILE | 1 | 0=ABB DRV LIM, 1=DCU PROFILE, 2=ABB DRV FULL | 0 | Selects the communications profile used by the EFB protocol. |
| 5840 | DV OB ID L | 1 | 0 - 65535 | 4303 | BACnet Device object ID lower word. The Drive's Device object ID must be unique across all BACnet devices in the building network. Valid values are 0...4194303. The Device Object ID is formed as a combination of parameter 5840 and 5899. To set an ID from 1 to 65535 set this parameter = to the desired ID and set 5899 = 0. To set an ID greater than 65535, set this parameter to the lower 4 digits of the ID and set 5899 to the remaining upper digits. For example, to set the ID to 71234, set the 5840 = 1234 and 5899 = 7. The default values of 5840 = 0 and 5899 = 0 are handled specially. This case uses parameter 5803, the MAC ID as the value for the device object ID. |
| 5841 | MAX MASTER | 1 | 0 - 127 | 127 | The Drive's highest master address for devices on the BACnet MS/TP bus. |
| 5842 | MAX INF FR | 1 | 0 - 10 | 1 | The maximum number of information frames the drive may transmit before it must pass the token. |
| 5899 | DV OB ID H | 1 | 0 - 419 | 419 | BACnet Device object ID upper word. See parameter 58.40 for description of how to use this parameter. |
| 58100 | DB REV | 1 | 0 - 65535 | 0 | BACnet Database Revision |

| Group 58: Drive EFB | | | | | |
|---------------------|----------|------------|--|---------|---|
| Code | Name | Resolution | Range | Default | Description |
| 58105 | DV IO 5 | 1 | 0 – FFFFh (values less than 0101h are ignored) | 0 | Defines the address in the drive which the Modbus master accesses when it reads from or writes to register address 40005. Drive parameter is specified as gg _h .pp _h . For instance, drive parameter 30.14 is encoded as 1E0Eh. |
| 58106 | DV IO 6 | 1 | 0 – FFFFh (values less than 0101h are ignored) | 0 | Defines the address in the drive which the Modbus master accesses when it reads from or writes to register address 40006. Drive parameter is specified as gg _h .pp _h . For instance, drive parameter 30.14 is encoded as 1E0Eh. |
| 58107 | DV IO 7 | 1 | 0 – FFFFh (values less than 0101h are ignored) | 0 | Defines the address in the drive which the Modbus master accesses when it reads from or writes to register address 40007. Drive parameter is specified as gg _h .pp _h . For instance, drive parameter 30.14 is encoded as 1E0Eh. |
| 58108 | DV IO 8 | 1 | 0 – FFFFh (values less than 0101h are ignored) | 0 | Defines the address in the drive which the Modbus master accesses when it reads from or writes to register address 40008. Drive parameter is specified as gg _h .pp _h . For instance, drive parameter 30.14 is encoded as 1E0Eh. |
| 58109 | DV IO 9 | 1 | 0 – FFFFh (values less than 0101h are ignored) | 0 | Defines the address in the drive which the Modbus master accesses when it reads from or writes to register address 40009. Drive parameter is specified as gg _h .pp _h . For instance, drive parameter 30.14 is encoded as 1E0Eh. |
| 58110 | DV IO 10 | 1 | 0 – FFFFh (values less than 0101h are ignored) | 0 | Defines the address in the drive which the Modbus master accesses when it reads from or writes to register address 40010. Drive parameter is specified as gg _h .pp _h . For instance, drive parameter 30.14 is encoded as 1E0Eh. |
| 58111 | DV IO 11 | 1 | 0 – FFFFh (values less than 0101h are ignored) | 0 | Defines the address in the drive which the Modbus master accesses when it reads from or writes to register address 40011. Drive parameter is specified as gg _h .pp _h . For instance, drive parameter 30.14 is encoded as 1E0Eh. |
| 58112 | DV IO 12 | 1 | 0 – FFFFh (values less than 0101h are ignored) | 0 | Defines the address in the drive which the Modbus master accesses when it reads from or writes to register address 40012. Drive parameter is specified as gg _h .pp _h . For instance, drive parameter 30.14 is encoded as 1E0Eh. |

Group 98: Options

| Group 98: Options | | | | | |
|-------------------|-----------|------------|--|---------|---|
| Code | Name | Resolution | Range | Default | Description |
| 9802 | COMM PROT | 1 | 0=NOT SEL 1=STD MODBUS 2=N2 4=EXT FBA 5=BACNET | 0 | This parameter sets the communication protocol that the package will communicate to the building automation system. |

Group 99: Startup Data

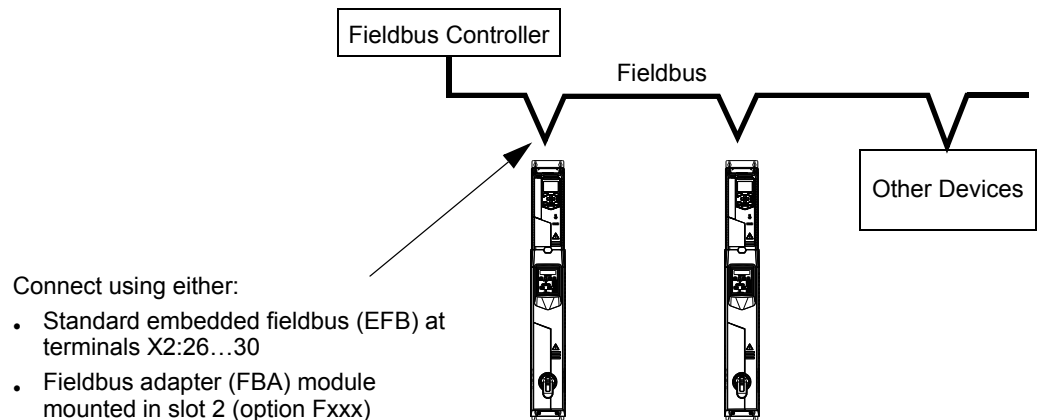
| Group 99: Startup Data | | | | | |
|------------------------|------------|------------|---|---------|---|
| Code | Name | Resolution | Range | Default | Description |
| 9902 | B.P. MACRO | 1 | 1 = HVAC DEFAULT 2 = DAMPER 3 = RETROFIT 4 = SMOKE CONTROL | 1 | Select bypass macro. Predefined set of parameter values for certain application is loaded in use. |

Embedded fieldbus

Overview

The ABB E-Clipse bypass can be set up to accept control for the ACH580 drive and/or the E-Clipse Bypass from an external system using standard communication protocols. When using communication, the ABB E-Clipse bypass can:

- Receive system control information from the fieldbus,
- Receive drive only control information from the fieldbus, or
- Be controlled from some combination of fieldbus control and other available control locations, such as digital or analog inputs, and the control panel.



Two basic fieldbus communications configurations are available:

- Embedded fieldbus (EFB) – Using the EIA 485 interface at terminals X2:26...30 on the control board, a control system can communicate with the system using:
 - Modbus® - RTU EIA 485
 - Metasys® N2 EIA 485
 - BACnet® MS/TP EIA 485
- Fieldbus adapter (FBA) – See [Fieldbus adapter](#) on page 161.

NOTE: Throughout this manual, references to parameters pertain to parameters and adjustments in the ABB E-Clipse Bypass.

Unless specifically called-out as drive parameters, all parameter adjustments are in the ABB E-Clipse bypass.

In this document any references to “system” refers to ABB E-Clipse Bypass and ACH580 drive.

Control interface

In general, the basic control interface between the fieldbus system and the drive consists of:

| Protocol | Control Interface | Reference for more information |
|----------|--|---|
| Modbus | <ul style="list-style-type: none"> • Output Words <ul style="list-style-type: none"> – Control word – Reference1 – Reference2 • Input Words <ul style="list-style-type: none"> – Status word – Actual value 1 – Actual value 2 – Actual value 3 – Actual value 4 – Actual value 5 – Actual value 6 – Actual value 7 – Actual value 8 | The content of these words is defined by profiles. For details on the profiles used, see Modbus protocol technical data – Drive only starting on page 138 |
| N2 | <ul style="list-style-type: none"> • Binary output objects • Analog output objects • Binary input objects • Analog input objects | N2 protocol technical data – system on page 100 and Bypass overview on page 109 |
| BACnet | <ul style="list-style-type: none"> • Device management • Binary output objects • Analog output objects • Binary input objects • Analog input objects | BACnet protocol technical data – system on page 114 |

Note: The words “output” and “input” are used as seen from the fieldbus controller point of view. For example an output describes data flow from the fieldbus controller to the bypass.

Mechanical and electrical installation – Embedded Fieldbus (EFB)



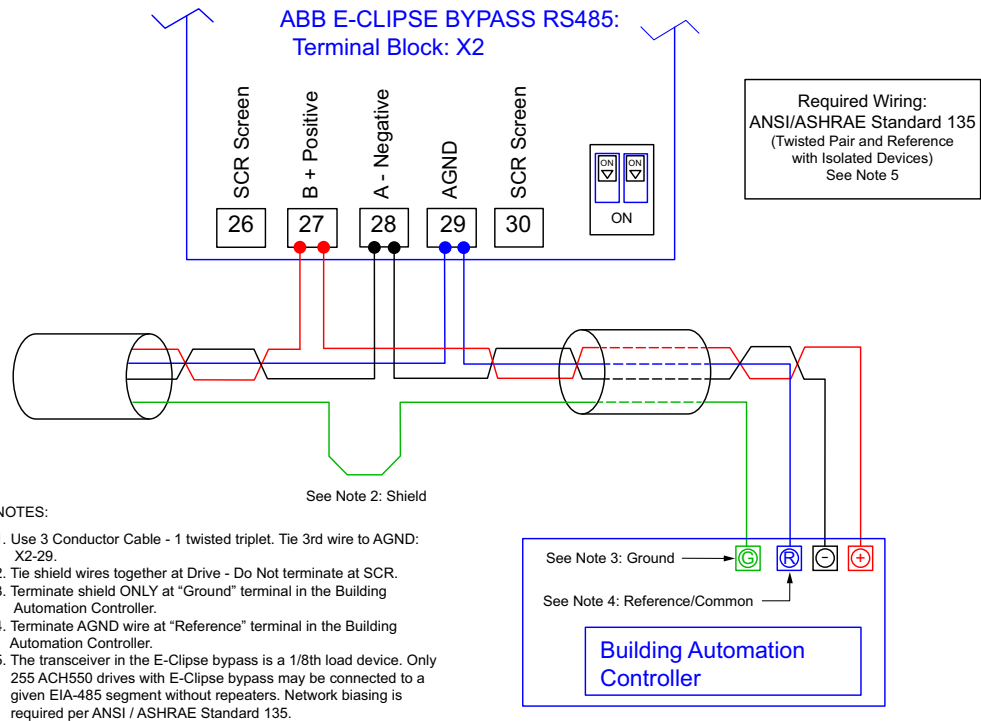
Warning! Connections should be made only while the bypass is disconnected from the power source.

Bypass terminals 26...30 are for EIA 485 communications.

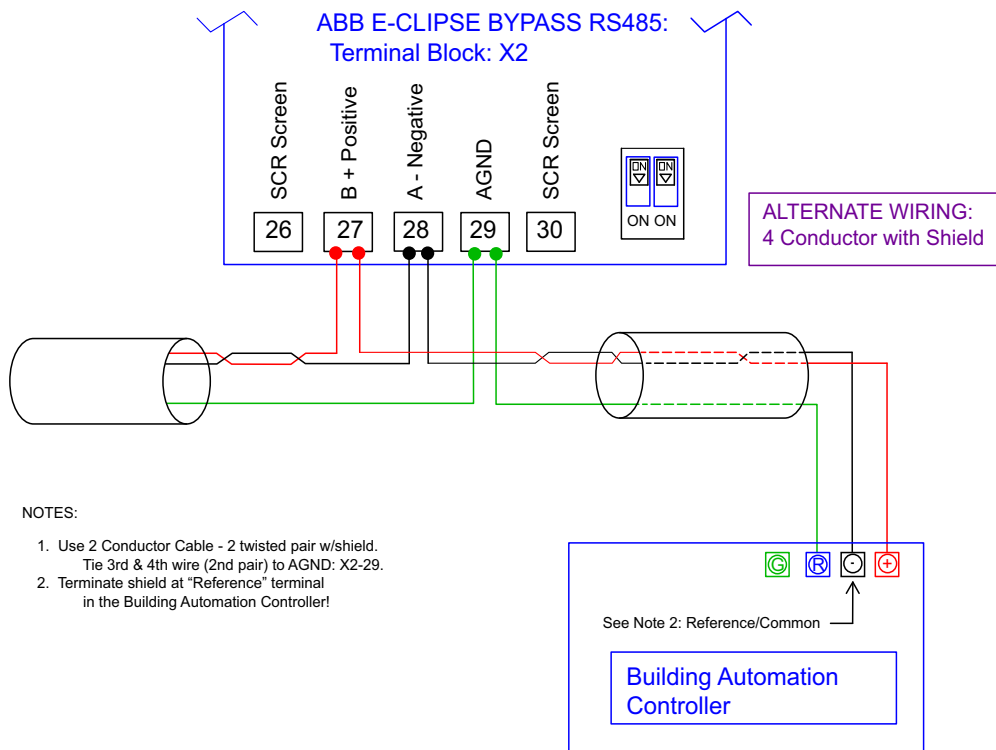
- Use Belden 9842 or equivalent. Belden 9842 is a dual twisted, shielded pair cable with a wave impedance of 120 Ω .
- Use one of these twisted shielded pairs for the EIA 485 link. Use this pair to connect all A (-) terminals together and all B (+) terminals together.
- Use both of the other wires in the other pair for the reference/common (terminal 29).

- Do not directly ground the EIA 485 network at any point. Ground all devices on the network using their corresponding earthing terminals.
- As always, the grounding wires should not form any closed loops, and all the devices should be earthed to a common ground.
- Connect the EIA 485 link in a daisy-chained bus, without dropout lines.
- Do not connect the shield at the bypass. Tie the shields together at the bypass. Only load the shield connection at the EIA 485 master.
- For configuration information see the following:
 - [Communication setup – EFB](#) section.
 - [Activate drive control functions – EFB](#) section.
 - The appropriate EFB protocol specific technical data.
 - To reduce noise on the network, terminate the EIA 485 network using 120 Ω resistors at both ends of the network. Use the DIP switch to connect or disconnect the termination resistors. Refer to page [78](#) for the diagram and table.

Preferred wiring diagram



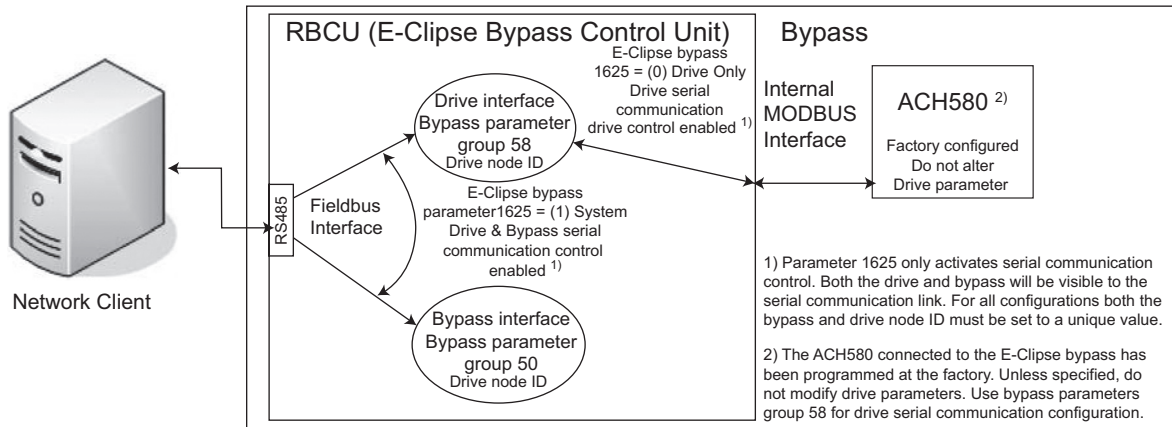
Alternate wiring diagram



Communication setup – EFB

The addition of serial communications to the ABB E-Clipse bypass system is done by bringing the network connection to the bypass and using the bypass software to direct messages either to the drive or to the bypass control software. The user makes no connection to the drive fieldbus terminals since this channel is reserved for the bypass control interface to the drive.

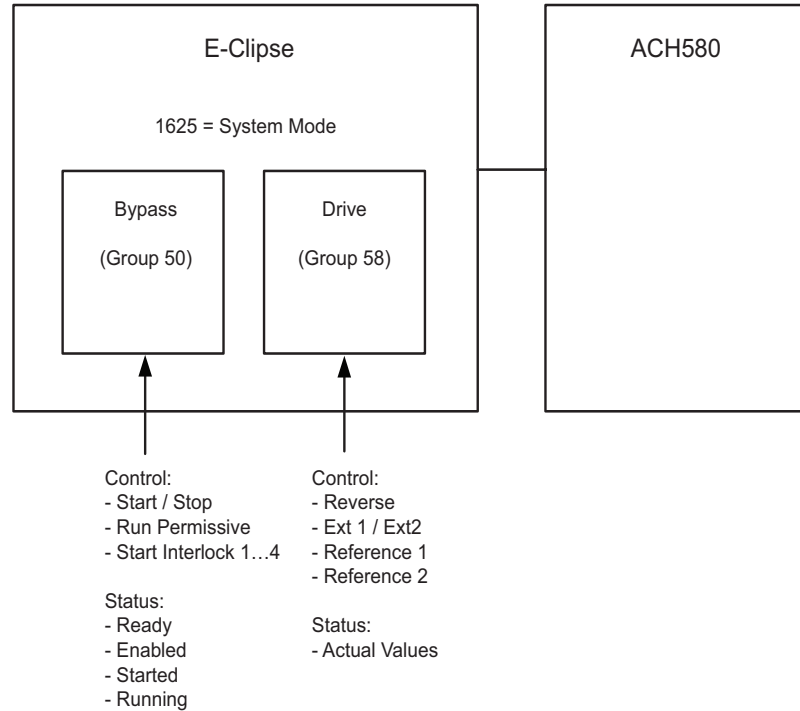
For all EFB Protocols, the drive is viewed as one node and the bypass is viewed as a separate node. This node and bypass, along with the physical and logical connections for communications are illustrated in the following figure.



Setup of the drive logical connection is done in parameter Group 58 on the bypass keypad. This group contains, among other things, the Drive MAC ID and Device Object Instance ID. Group 58 on the drive must not be modified from the settings defined by drive parameter 95.21, HW options word2; bit 5, Bypass present.

Selection of the EFB protocol is done in bypass parameter 9802. Setup of the bypass logical connection is done in parameter Group 50 on the bypass keypad.

The user can use bypass parameter 1625, COMM CTRL to determine if control signals (start and enables) go to the drive or to the system. Parameter 1625 = 0 (DRIVE ONLY) is intended for legacy applications where the network was only able to control the drive. Parameter 1625 = 1 (SYSTEM) provides new functionality where control signals control both the drive and bypass depending on the drive/bypass mode selected on the bypass keypad. In both cases, non-control related points are visible on the bypass. Parameter 1625 should be left as DRIVE ONLY when the Building Automation System is only monitoring, and not controlling, the drive package over communications.



Refer to the figure for the System mode diagram.

Fieldbus communication selection

To activate the fieldbus communication, set parameter 9802 COMM PROT =

- 1 (STD MODBUS).
- 2 (N2)
- 4 (EXT FBA) - See [Fieldbus adapter](#) on page 161
- 5 (BACNET)

Note: In System mode, the Building Automation System writes to either the bypass or the drive, through two logical nodes. A common physical port supports both nodes. Group 58 is used to configure (i.e., baud rate) and diagnose the common physical port. Group 58 is also used to configure (i.e., MAC ID and Device Object Instance ID) and diagnose the drive logical node. Group 50 is used to configure (i.e., MAC ID and Device Object Instance ID) and diagnose the bypass logical node.

Serial communication configuration – Drive

Setting 9802 automatically sets the appropriate default values in parameters that define the communication process. These parameters and descriptions are defined below. In particular, note that the station ID may require adjustment.

| Bypass Parameter | Description | EFB Protocol Reference | | |
|------------------|---|---|---|--------|
| | | Modbus | N2 | BACnet |
| 1625 | COMM CONTROL | 1625 = 0 (Drive Only) for control signals (Start/Stop and enables) to go to drive only. 1625 = 1 (System) for control signals to go to the system (drive or bypass, depending on keypad mode selection) | | |
| 5802 | DV PROT ID Contains the identification and program revision of the protocol. | Do not edit. Any non-zero value entered for parameter 9802 COMM PROT SEL, sets this parameter automatically. The format is: XYY, where xx = protocol ID, and YY = program revision. | | |
| 5803 | DV MAC ID Defines the drives node address of the EIA 485 link. | Set each bypass on the network with a unique value for this parameter. Default: 1 Note: For a new address to take affect, the system power must be cycled OR 5302 must first be set to 0 before selecting a new address. Leaving 5302 = 0 places the EIA 485 channel in reset, disabling communication. | Sets MS/TP MAC ID. A temporary value of 0 places the protocol channel in reset. Default: 128 | |
| 5804 | EFB BAUD RATE Defines the communication speed of the EIA 485 link in kbits per second (kbits/s). 1.2 kbits/s 2.4 kbits/s 4.8 kbits/s 9.6 kbits/s 19.2 kbits/s 38.4 kbits/s 57.6 kbits/s 76.8 kbits/s | Default: 9.6 kbits/s Do not edit for N2 | Default: 38.4 kbits/s | |

| Bypass Parameter | Description | EFB Protocol Reference | | |
|------------------|---|------------------------|------------|--------|
| | | Modbus | N2 | BACnet |
| 5805 | <p>EFB PARITY</p> <p>Defines the data length, parity and stop bits to be used with the EIA 485 link communication.</p> <ul style="list-style-type: none"> The same settings must be used in all on-line stations. <p>0=8 NONE 1 – 8 data bits, No parity, one stop bit. 1=8 NONE 2 – 8 data bits, No parity, two stop bits. 2=8 EVEN 1 – 8 data bits, Even parity, one stop bit. 3=8 ODD 1 – 8 data bits, Odd parity, one stop bit.</p> | Default: 1 | Default: 0 | |
| 5825 | <p>PROFILE</p> <p>Selects the communication profile used by the EFB protocol.</p> <p>0 = ABB DRV LIM – Operation of Control/Status Words conform to limited ABB Drives Profile, as used in ACH550/580. 1 = DCU PROFILE – Operation of Control/Status Words conform to 32-bit DCU Profile. 2 = ABB DRV FULL – Operation of Control/Status Words conform to ABB Bypass Profile, as used in ACH550.</p> | Default: 0 | Default: 0 | |

| Bypass Parameter | Description | EFB Protocol Reference | | |
|------------------|---|------------------------|-----|---|
| | | Modbus | N2 | BACnet |
| 5840 | DV OB ID L BACnet Device object ID lower word. The Drive's Device object ID must be unique across all BACnet devices in the building network. Valid values are 0...4194302. The Device Object ID is formed as a combination of parameter 5840 and 5899. To set an ID from 1 to 65535 set this parameter = to the desired ID and set 5899 = 0. To set an ID greater than 65535, set this parameter to the lower 4 digits of the ID and set 58.99 to the remaining upper digits. For example, to set the ID to 71234, set the 5840 = 1234 and 5899 = 7. The default values of 5840 = 0 and 5899 = 0 are handled specially. This case uses parameter 5803, the MAC ID as the value for the device object ID. | N/A | N/A | Resolution: 1 Range: 0-65535 Default: 0 |
| 5841 | MAX MASTER The Drive's highest master address for devices on the BACnet MS/TP bus. | | | Resolution: 1 Range: 0-127 Default: 127 |
| 5842 | MAX INF FR The maximum number of information frames the drive may transmit before it must pass the token. | | | Resolution: 1 Range: 0-10 Default: 1 |
| 5899 | DV OB ID H BACnet Device object ID upper word. See parameter 5840 for description of how to use this parameter. | | | Resolution: 1 Range: 0-419 Default: 0 |
| 58100 | DB REV BACnet Database Revision | | | Resolution: 1 Range: 0-65535 Default: 0 |

Note: After any changes to the communication settings, the communication channel must be reset by either cycling the system power, or by clearing (set to 0 and enter) and then restoring the station ID (5803) to desired station ID.

Serial communication configuration – Bypass

Setting 9802 automatically sets the appropriate default values in parameters that define the communication process. These parameters and descriptions are defined below. In particular, note that the station ID may require adjustment.

| Bypass Parameter | Description | EFB Protocol Reference | | |
|------------------|--|--|-----|---|
| | | Modbus | N2 | BACnet |
| 1625 | COMM CONTROL | 1625 = 0 (Drive Only) for control signals (Start/Stop and enables) to go to drive only. 1625 = 1 (System) for control signals to go to the system (drive or bypass, depending on keypad mode selection) | | |
| 5003 | BP STATION ID Defines the drives node address of the EIA 485 link. | Set each bypass on the network with a unique value for this parameter. When this protocol is selected, the default value for this parameter is: 256 Note: For a new address to take affect, the system power must be cycled OR 5003 must first be set to 0 before selecting a new address. Leaving 5003 = 0 places the EIA 485 channel in reset, disabling communication. The default value fro Modbus and N2 is 1. | | Sets MS/TP MAC ID. A temporary value of 0 places the protocol channel in reset. Default: 256 |
| 5040 | BY OB ID L BACnet Device object ID lower word. The Drive's Device object ID must be unique across all BACnet devices in the building network. Valid values are 0...4194303. The Device Object ID is formed as a combination of parameter 50.40 and 50.99. To set an ID from 1 to 65535 set this parameter = to the desired ID and set 58.99 = 0. To set an ID greater than 65535, set this parameter to the lower 4 digits of the ID and set 58.99 to the remaining upper digits. For example, to set the ID to 71234, set the 5040 = 1234 and 5099 = 7. The default values of 5840 = 0 and 5899 = 0 are handled specially. This case uses parameter 5003, the MAC ID as the value for the device object ID. | N/A | N/A | Resolution: 1 Range: 0-65535 Default: 0 |

| Bypass Parameter | Description | EFB Protocol Reference | | |
|------------------|--|------------------------|-----|---|
| | | Modbus | N2 | BACnet |
| 5099 | BY OB ID H BACnet Device object ID upper word. See parameter 5040 for description of how to use this parameter. | N/A | N/A | Resolution: 1 Range: 0-419 Default: 0 |

Note: After any changes to the communication settings, the communication channel must be reset by either cycling the system power, or by clearing (set to 0 and enter) and then restoring the station ID (5002) to desired station ID.

Activate drive control functions – EFB

Controlling the drive

Fieldbus control of various drive functions requires configuration to:

- Tell the drive (via the bypass) to accept fieldbus control of the function.
- Define as a fieldbus input, any drive data required for control.
- Define as a fieldbus output, any control data required by the drive.

The following sections describe, at a general level, the configuration required for each control function. For the protocol-specific details, see the specific protocol technical data section in this manual.

Start/stop control (Drive only)

Using the fieldbus for start/stop control of the drive only requires:

- Bypass parameter values set as defined below.
- Fieldbus controller supplied command(s) in the appropriate location. (The location is defined by the Protocol Reference, which is protocol dependent.)
- Control commands must be addressed to the Drive node with parameter 1625 set to 0 (DRIVE ONLY). For SYSTEM control refer to [Start/stop control \(System\)](#) on page 91.

| Bypass Parameter | | Value | Description | Protocol Reference | | | |
|------------------|------------|----------------|--|---------------------------------|--------------------------------|-----|--------|
| | | | | Modbus ¹ | | N2 | BACnet |
| | | | | ABB DRV | DCU PROFILE | | |
| 1601 | START/STOP | 2 (COMM) | Start/Stop by fieldbus with Ext1 or Ext2 selected. | 40001 bits 0...3 (see page 150) | 40031 bits 0, 1 (see page 151) | BO1 | BV10 |
| 1625 | COMM CTRL | 0 (DRIVE ONLY) | Enable drive only control. | N/A | | | |

1) For Modbus, the protocol reference can depend on the profile used, hence two columns in these tables. One column refers to the ABB Drives profile, selected when parameter 5825 = 0 (ABB DRV LIM) or 5825 = 2 (ABB DRV FULL). The other column refers to the DCU profile selected when parameter 5825 = 1 (DCU PROFILE). See [ABB control profiles technical data – Drive](#) section on page 146.

Input reference select

Using the fieldbus to provide input references to the drive requires:

- Drive parameter values set with the drive keypad as defined below.
- Fieldbus controller supplied reference word(s) in the appropriate location. (The location is defined by the Protocol Reference, which is protocol dependent.)

| | | Scalar Control (Group 28) | Vector Control (Group 22) | Value |
|-------------------------|------|------------------------------|------------------------------|--|
| Ext1/Ext2 Select | | 19.11 | | 32, EFB MCW bit 11 |
| Ext1 | Ref1 | 28.11 | 22.11 | Flexibility to write to 3.09 (EFBRef1) or 3.10 (EFBRef2) |
| | Ref2 | 28.12 | 22.12 | |
| Ext2 | Ref1 | 28.15 | 22.15 | |
| | Ref2 | 28.16 | 22.16 | |

EFB Ref1/Ref2

| Drive Parameter | Modbus | | N2 | BACnet |
|---------------------------|---------|-------------|-----|--------|
| | ABB DRV | DCU Profile | | |
| 19.11 Ext1/Ext2 Selection | 40001 | 40031 | BO5 | BV13 |
| | bit11 | bit5 | | |
| 3.09 EFB Ref1 | 40002 | | AO1 | AV16 |
| 3.10 EFB Ref2 | 40003 | | AO2 | AV17 |

Reference

As described earlier in [Control interface](#), the REFERENCE word is a speed or frequency reference.

Reference scaling

Where required, REFERENCES can be scaled. See the following, as appropriate:

- Modbus Register 40002 in the [Modbus protocol technical data – Drive only](#) section.
- [N2 analog output objects – Drive](#) in the [N2 protocol technical data – system](#) section.
- The slope of points 60 and 61 in the [BACnet protocol technical data – system](#) section.

The following table describes REFERENCE scaling for the ABB Drives profile.

| ABB Drives Profile (EFB) | | | | |
|--------------------------|---------------------|----------------|---|--|
| Reference | Range | Reference Type | Scalar | Remarks |
| REF1 | -32767... +32767 | Frequency | -20000 = -(par 46.02) +20000 = (par 46.02) | Final reference limited by 30.13/30.14 |
| | | Speed | -20000 = -(par 46.01) +20000 = (par 46.01) | Final reference limited by 30.11/30.12 |
| REF2 | -32767... +32767 | Frequency | -20000 = -(par 46.02) +20000 = (par 46.02) | Final reference limited by 30.13/30.14 |
| | | Speed | -20000 = -(par 46.01) +20000 = (par 46.01) | Final reference limited by 30.11/30.12 |

Drive relay output control

Using the fieldbus for relay output control requires:

- Drive parameter values set as defined below.
- Fieldbus controller supplied reference word(s) in the appropriate location. (The location is defined by the Protocol Reference, which is protocol dependent.)

| Drive Parameter | | Value | Setting | Protocol Reference | | | |
|-----------------------------------|------------------|-------------------------|--|-----------------------|-------------|------|--------|
| | | | | Modbus | | N2 | BACnet |
| | | | | ABB DRV | DCU PROFILE | | |
| 10.24 RO1 Source | RELAY OUTPUT 1 | 62, RO/DIO control word | Relay Output 1 controlled by fieldbus. | 402659 bit 0 or 00033 | | BO7 | BO0 |
| 10.27 | RELAY OUTPUT 2 | 62, RO/DIO control word | Relay Output 2 controlled by fieldbus. | 402659 bit 1 or 00034 | | BO8 | BO1 |
| 10.30 | RELAY OUTPUT 3 | 62, RO/DIO control word | Relay Output 3 controlled by fieldbus. | 402659 bit 2 or 00035 | | BO9 | BO2 |
| 15.07 ¹⁾ | RELAY OUTPUT 4 | 62, RO/DIO control word | Relay Output 4 controlled by fieldbus. | 402659 bit 3 or 00036 | | BO10 | BO3 |
| 15.10 ¹⁾ | RELAY OUTPUT 5 | 62, RO/DIO control word | Relay Output 5 controlled by fieldbus. | 402659 bit 4 or 00037 | | BO11 | BO4 |
| 15.23 ¹⁾ DO1 Source | DIGITAL OUTPUT 1 | 62, RO/DIO control word | Digital Output 1 controlled by fieldbus. | 402659 bit 8 or 00038 | | BO12 | BO5 |

1) More than 3 relays requires the addition of a relay extension module.

For example: To control relays 1 and 2 using serial communication:
Set parameters 10.24 RO1 Source = 62, RO/DIO control word.

Then, for example using N2:

- To turn Relay 1 On: Force object BO7 to On.
- To turn Relay 2 On: Force object BO8 to On.
- To turn both Relay 1 and 2 On: Force objects BO7 and BO8 On.

Note: Relay status feedback occurs without configuration as defined below.

| Drive Parameter | | Value | Setting | Protocol Reference | | | |
|--------------------|---------------|---------------------|---------|----------------------|-------------|-----------|-----------|
| | | | | Modbus | | N2 | BACnet |
| | | | | ABB DRV | DCU PROFILE | | |
| 10.21 RO Status | RO 1-3 STATUS | Relay 1...3 status. | N/A | 402581 or 00033...35 | | BI4...BI6 | BI0...BI2 |
| 15.04 RO/DO Status | RO 4-5 STATUS | Relay 4...6 status. | N/A | 403844 or 00036...37 | | BI7...BI8 | BI3...BI4 |
| | DOI STATUS | | N/A | 403844 or 00038 | | BI9 | BI5 |

Analog output control

Using the fieldbus for analog output control requires:

- Drive parameter values set as defined below.
- Fieldbus controller supplied reference word(s) in the appropriate location. (The location is defined by the Protocol Reference, which is protocol dependent.)

| Drive Parameter | | Value | Setting | Protocol Reference | | | |
|-----------------|------------------|----------------------|---|--------------------|----------------|-----|--------|
| | | | | Modbus | | N2 | BACnet |
| | | | | ABB DRV | DCU PROFILE | | |
| 13.12 | AO1 Source | 37, AO1 Data Storage | Analog Output 1 controlled by writing to parameter 13.91. | – | – | – | |
| 13.91 | AO1 Data Storage | – | | 403419 | AO14 | AO0 | |
| 13.22 | AO2 Content Sel | 38, AO2 Data Storage | Analog Output 2 controlled by writing to parameter 13.92. | – | – | – | |
| 13.92 | AO2 Data Storage | – | | 403420 | AO15 | AO1 | |

PID control setpoint source

Using the fieldbus for the PID control setpoint requires:

- Drive parameter values set as defined below.
- Fieldbus controller supplied setpoint value in the appropriate location. (As defined in [Analog output control](#))

| Drive Parameter | | Value | Description | Protocol Reference |
|-----------------|-------------------------|---------------------------------------|--|--------------------|
| 40.16 | Set 1 setpoint 1 source | 24 (Setpoint data storage) | Communication channel setpoint source | – |
| 40.17 | Set 1 setpoint 2 source | 3 (AI1 scaled) | Optional analog input value. Needed if combining communication reference with analog input value | – |
| 40.18 | Set 1 setpoint function | 0 (In1) 1 (In1+In2) 3 (In1*In2) | Setpoint is 40.92 value itself/+AI1/*AI1 | – |

NOTE: For 41.16 – 41.18, PID set 2 can be used. Setpoint data storage still uses 40.92, even when PID set 2 is used.

Feedback from the drive – EFB

Pre-defined feedback

Inputs to the controller (drive outputs) have pre-defined meanings established by the protocol. This feedback does not require drive configuration. The following table lists a sample of feedback data. For a complete listing, see input word/point/object listings in the technical data for the appropriate protocol starting on page [100](#).

| Drive Parameter | | Protocol Reference | | |
|-----------------|-----------------------------------|--------------------|---------------|--------|
| | | Modbus | N2 | BACnet |
| 01.01 | Motor Speed Used | 400257 | AI3 | AV0 |
| 01.06 | Output Frequency | 400262 | AI1 | AV1 |
| 01.07 | Motor Current | 400263 | AI4 | AV4 |
| 01.10 | Motor Torque | 400266 | AI5 | AV5 |
| 01.14 | Output Power | 400270 | AI6 | AV6 |
| 01.11 | DC Voltage | 400267 | AI11 | AV2 |
| 01.13 | Output Voltage | 400269 | AI12 | AV3 |
| 01.57 | Inverter KWH Counter (resettable) | 400313 | AI8 | AV8 |
| 10.02 | DI Delayed Status | 402562 | BI12 | BI6 |
| 10.21 | RO Status | 402581 | BI4, BI5, BI6 | BI0 |
| 58.19 | EFB Status Word – bit 0 (STOP) | 414867 bit 0 | BI1 | BV0 |
| 58.19 | EFB Status Word – bit 2 (REV) | 414867 bit 2 | BI2 | BV1 |

Note: With Modbus, any parameter can be accessed using the format: 4 followed by the parameter number. Example: 400000 + (group #) * 256 + parameter#

Mailbox read/write

The ACH580 provides a “Mailbox” function to access parameters that have not been pre-defined by the protocol. Using mailbox, any drive parameter can be identified and read. Mailbox can also be used to adjust parameter settings by writing a value to any parameter identified. The following table describes the use of this function.

| Name | Description | Protocol Reference | | |
|-------------------|---|----------------------|------|--------|
| | | Modbus ¹⁾ | N2 | BACnet |
| Mailbox Parameter | Enter the number of the drive group and parameter number using the format: (group #) * 256 + parameter #. Example: drive parameter 28.01 is entered as $(28 * 256) + 1 = 7169$ | Does not apply. | AO19 | AV25 |
| Mailbox Data | Contains the parameter value after a read, or enter the desired parameter value for a write. | | AO20 | AV26 |
| Mailbox Read | A binary value triggers a read – the value of the “Mailbox Parameter” appears in “Mailbox data”. | | BO19 | BV15 |
| Mailbox Write | A binary value triggers a write – the drive value for the “Mailbox Parameter” changes to the value in “Mailbox data”. | | BO20 | BV16 |

1) Modbus provides direct access to all parameters using the format: $40000 + (\text{group \#}) * 256 + \text{parameter \#}$.

Example: drive parameter 28.01 is mapped as $40000 + 28 * 256 + 1 = 407169$.

Actual value scaling

When using Modbus, the scaling of actual values is set by the parameter resolution. (Refer to the *Parameter list and descriptions* section in the *ACH580 HVAC control program firmware manual (3AXD50000027537)* for parameter resolutions.) For example:

| Feedback Integer | Scaling | (Feedback Integer) / (Scaling) = Scaled Value |
|--|---------------|---|
| 100 (example: 12.11 AI1 actual feedback) | 1000 = 1 unit | $100 / 1000 = 0.1 \text{ mA}$ |
| 10 | 10 = 1% | $10 / 10 = 1\%$ |

Activate bypass control functions – EFB

Controlling the bypass

Fieldbus control of various bypass functions requires configuration to:

- Tell the system to accept fieldbus control of the function.
- Define as a fieldbus input, any bypass data required for control.
- Define as a fieldbus output, any control data required by the drive/bypass.

The following sections describe, at a general level, the configuration required for each control function.

Start/stop control (System)

Using the fieldbus for start/stop control of the system requires:

- Bypass parameter values set as defined below.
- Fieldbus controller supplied command(s) in the appropriate location. (The location is defined by the Protocol Reference, which is protocol dependent.)
- Control commands must be addressed to the Bypass node with parameter 1625 set to 1 (SYSTEM). For DRIVE ONLY control refer to [Start/stop control \(Drive only\)](#) on page 85.

| Bypass Parameter | | Value | Description | Protocol Reference | | |
|------------------|----------------|------------|--|--------------------|-----|--------|
| | | | | Modbus | N2 | BACnet |
| 1601 | START/ STOP | 2 (COMM) | Start/Stop by fieldbus with Ext1 or Ext2 selected. | 400001 bit 0 | BO1 | BV10 |
| 1625 | COMM CTRL | 1 (SYSTEM) | Enable system control. | N/A | | |

Miscellaneous system control

Note: Control of system commands is dependent upon the setting of bypass parameter 1625.

Using the fieldbus miscellaneous system control requires:

- Bypass parameter values set as defined below.
- Fieldbus controller supplied reference word(s) in the appropriate location. (The location is defined by the Protocol Reference, which is protocol dependent.)

| Bypass Parameter | | Value | Setting | Protocol Reference | | |
|------------------|-------------------|-------------------------------|--|--------------------|------|--------|
| | | | | Modbus | N2 | BACnet |
| 1602 | RUN PERMISSIVE | 2 (COMM) (Not Recommended) | Run permissive by fieldbus. | 400001 bit 2 | BO2 | BV12 |
| 1603 | START INTERLOCK 1 | 2 (COMM) (Not Recommended) | Source for Start Interlock 1 is the fieldbus Command word. | 400001 bit 4 | BO10 | BV15 |
| 1604 | START INTERLOCK 2 | 2 (COMM) (Not Recommended) | Source for Start Interlock 2 is the fieldbus Command word. | 400001 bit 5 | BO11 | BV16 |
| 1605 | START INTERLOCK 3 | 2 (COMM) (Not Recommended) | | 400001 bit 6 | BO12 | BV17 |
| 1606 | START INTERLOCK 4 | 2 (COMM) (Not Recommended) | | 400001 bit 7 | BO13 | BV18 |
| 1607 | RESET SRC | 2 (COMM) | Fault reset by fieldbus | 400001 bit 1 | BO3 | BV14 |
| 1625 | COMM CTRL | 1 (SYSTEM) | Enable System Control. | N/A | | |

Bypass relay output control

Using the fieldbus for relay output control requires:

- Bypass parameter values set as defined below.
- Fieldbus controller supplied reference word(s) in the appropriate location. (The location is defined by the Protocol Reference, which is protocol dependent.)

| Bypass Parameter | | Value | Setting | Protocol Reference | | | |
|------------------|----------------|-------------------|--|---------------------------------|--|-----|--------|
| | | | | Modbus | | N2 | BACnet |
| | | | | 1625 = "SYSTEM" ¹ | 1625 = "DRIVE ONLY" ² | | |
| 1401 | RELAY OUTPUT 1 | 16 (Comm Ctrl) | Relay Output 1 controlled by fieldbus. | 400263 bit 0 | 433031 bit 0 | BO5 | BO0 |
| 1404 | RELAY OUTPUT 2 | 16 (Comm Ctrl) | Relay Output 2 controlled by fieldbus. | 400263 bit 1 | 433031 bit 1 | BO6 | BO1 |
| 1407 | RELAY OUTPUT 3 | 16 (Comm Ctrl) | Relay Output 3 controlled by fieldbus. | 400263 bit 2 | 433031 bit 2 | BO7 | BO2 |
| 1410 | RELAY OUTPUT 4 | 16 (Comm Ctrl) | Relay Output 4 controlled by fieldbus. | 400263 bit 3 | 433031 bit 3 | BO8 | BO3 |
| 1413 | RELAY OUTPUT 5 | 16 (Comm Ctrl) | Relay Output 5 controlled by fieldbus. | 400263 bit 4 | 433031 bit 4 | BO9 | BO4 |

1) Written via Bypass node.

2) Written via Drive node.

For example: To control relays 1 and 2 using serial communication:

From the bypass keypad, set parameters 1401 RELAY OUTPUT 1 and 1402 RELAY OUTPUT 2 = 16 (COMM CTRL).

Then, for example using N2:

- To turn Relay 1 On: Force object BO5 to On.
- To turn Relay 2 On: Force object BO6 to On.
- To turn both Relay 1 and 2 On: Force objects BO5 and BO6 On.

Note: Relay status feedback occurs without configuraton as defined below

| Bypass Parameter | | Value | N2 | BACnet |
|------------------|---------------|---------------------|-----------|-----------|
| 0104 RO Status | RO 1-5 STATUS | Relay 1...5 status. | B10...B14 | B10...B14 |

Communications fault

When using fieldbus control, specify the bypass' action if external serial communication is lost.

| Bypass Parameter | | Value | Setting |
|------------------|-----------------|---|--|
| 3004 | COMM LOSS | 0 (Not Sel) 1 (Fault) 2 (Const Sp7) 3 (Last Speed) | Set for appropriate drive/bypass response. NOTE: If the system is in bypass mode when communication is lost, choices 2 and 3 will cause the bypass contactor to remain in its present state. |
| 3005 | COMM FAULT TIME | Set time delay before acting on a communication loss. | |

Feedback from the ABB E-Clipse Bypass – EFB

Pre-defined feedback

Inputs to the controller (bypass outputs) have pre-defined meanings established by the protocol. This feedback does not require bypass configuration. The following table lists a sample of feedback data. For a complete listing, see input word/point/object listings in the technical data for the appropriate protocol.

| Bypass Parameter | | Protocol Reference | | |
|------------------|------------|--------------------|-----|--------|
| | | Modbus | N2 | BACnet |
| 0101 | MOTOR CURR | 400257 | A11 | AV0 |

Note: As noted above, Modbus provides direct access to all parameters using the format: 400000 + (group #) * 256 + parameter #.

Example: drive parameter 28.01 is mapped as $40000 + 28 * 256 + 1 = 407169$.

| Type | Name | Description | N2 | BACnet |
|------|----------------|---|------|--------|
| DI | System Ready | System is ready to accept start command (either mode). | BI1 | BV7 |
| DI | System Enabled | System is enabled to start motor (either mode). | BI2 | BV9 |
| DI | System Started | System start interlocks are made and start command has been received (either mode). Motor runs if run permissive is active. | BI3 | BV1 |
| DI | System Running | Motor is running (either mode). | BI4 | BV0 |
| DI | Fieldbus Local | System is under fieldbus local control (either mode). | BI5 | N/A |
| DI | Bypass Fault | Bypass is faulted. | BI6 | BV2 |
| DI | Bypass Warning | Bypass is alarming. | BI7 | BV5 |
| DI | Comm Control | System is configured for control in the comm channel | BI8 | N/A |
| DI | Override | Override status | BI9 | BV13 |
| DI | DI1 Status | Bypass digital input 1 status | BI10 | BI5 |

| Type | Name | Description | N2 | BACnet |
|------|------------------|---|------|--------|
| DI | DI2 Status | Bypass digital input 2 status | BI11 | BI6 |
| DI | DI3 Status | Bypass digital input 3 status | BI12 | BI7 |
| DI | DI4 Status | Bypass digital input 4 status | BI13 | BI8 |
| DI | DI5 Status | Bypass digital input 5 status | BI14 | BI9 |
| DI | DI6 Status | Bypass digital input 6 status | BI15 | BI10 |
| DI | RO1 Status | Bypass relay output 1 status | BI16 | BI0 |
| DI | RO2 Status | Bypass relay output 2 status | BI17 | BI1 |
| DI | RO3 Status | Bypass relay output 3 status | BI18 | BI2 |
| DI | RO4 Status | Bypass relay output 4 status | BI19 | BI3 |
| DI | RO5 Status | Bypass relay output 5 status | BI20 | BI4 |
| DI | Bypass Select | 1=Bypass mode, 0=Drive mode | BI21 | BV4 |
| DI | System Underload | Reports system underload status (either mode) | BI22 | BV8 |
| DI | System Fault | Reports system fault status (either mode) | BI23 | BV3 |
| DI | Bypass Run | Reports motor running status in bypass mode | BI24 | BV6 |

Diagnostics – EFB

Fault queue for drive diagnostics (read via Drive node)

For general ACH580 diagnostics information, see the [Diagnostics](#) section on page [185](#). For specific ACH580 fault codes, refer to the *ACH580 Hardware Manual* (3AXD50000044839).

| Type | Name | Description | Modbus | N2 | BACnet |
|------|----------------|--------------------------------|--------|------|--------|
| AI | Last Fault | Reports last drive fault | 401025 | AI17 | AV18 |
| AI | Previous Fault | Reports fault previous to last | 401026 | AI18 | AV19 |
| AI | Oldest Fault | Reports third-oldest fault | 401027 | AI19 | AV20 |

Fault queue for bypass diagnostics (read via Bypass node)

For general E-Clipse Bypass diagnostics information, see [Diagnostics](#) section on page [185](#). For specific E-Clipse bypass fault codes, see [Fault listing](#) on page [186](#).

| Type | Name | Description | Modbus | N2 | BACnet |
|------|----------------|--------------------------|--------|-----|--------|
| AI | Last Fault | Reports last drive fault | 401025 | AI2 | AV3 |
| AI | Warning Word 1 | Reports warning word 1 | 400776 | AI3 | AV4 |
| AI | Warning Word 2 | Reports warning word 2 | 400777 | AI4 | AV5 |

Serial communication diagnostics

Network problems can be caused by multiple sources. Some of these sources are:

- Loose connections
- Incorrect wiring (including swapped wires)
- Bad grounding
- Duplicate station numbers
- Incorrect setup of bypass or other devices on the network

The major diagnostic features for fault tracing on an EFB network include Group 58 EFB Protocol parameters 5808...5819. The [Parameters](#) section on page 59 describes these parameters in detail. Group 58 applies to the drive external communications. Group 50 applies to the bypass external communications.

Diagnostic situations

The sub-sections below describe various diagnostic situations – the problem symptoms and corrective actions.

Normal operation

During normal network operation, 5808...5819 bypass parameter values act as follows at each bypass:

- 5808 DV OK MESSAGES advances (advances for each application message properly received and addressed to this drive).
- 5812 DV CRC ERRORS does not advance at all (advances when an invalid message CRC is received).
- 5811 UART ERRORS does not advance at all (advances when character format errors are detected, such as parity or framing errors).
- 5819 DV status value varies depending on network traffic.
- BACnet protocol: 5813 TOKEN CNT (MS/TP token counter) advances for each token passed to this drive. (Does not apply for other protocols.)

Loss of communication

The action taken by the ABB E-Clipse Bypass, if communication is lost, is configured in [Communications fault](#). The parameters are 3004 COMM LOSS and 3005 COMM TIME. The [Parameters](#) section describes these parameters in detail.

No master station on line

If no master station is on line: Neither the EFB OK MESSAGES nor the errors (5812 EFB CRC ERRORS and 5811 EFB UART ERRORS) increase on any of the stations.

To correct:

- Check that a network master is connected and properly programmed on the network.
- Verify that the cable is connected, and is not cut or short circuited.

Duplicate stations

If two or more stations have duplicate numbers:

- Two or more drives cannot be addressed.
- Every time there is a read or write to one particular station, the value for 5812 EFB CRC ERRORS or 5811 EFB UART ERRORS advances.

To correct: Check all station numbers and edit conflicting values.

Swapped wires

If the communication wires are swapped (terminal A on one drive is connected to terminal B on another):

- The value of 5808 EFB OK MESSAGES does not advance.
- The values of 5812 EFB CRC ERRORS and 5811 EFB UART ERRORS are advancing.

To correct: Check that the EIA-485 lines are not swapped.

Fault 3028 – EXT COMM LOSS

If the bypass' control panel shows fault code 3028 "EXT COMM LOSS", check for either of the following:

- The master system is down. To correct, resolve problem with master system.
- The communication connection is bad. To correct, check communication connection at the bypass.
- The time-out selection for the bypass is too short for the given installation. The master is not polling the bypass within the specified time-out delay. To correct, increase the time set by parameter 3005 COMM TIME.

Troubleshooting

The troubleshooting table below should be followed in order from top to bottom by parameter number. Begin the troubleshooting process by displaying the first parameter in the table (58.11) and determining if the display on the panel exhibits the symptom. If it does, review the possible cause(s) and take the necessary corrective action(s). Once the symptom for this parameter is eliminated, continue to the next parameter and repeat the process until you have reached the end.

The parameters in the list refer to Drive EFB 58xx and E-Clipse Bypass EFB 58xx. The factory default setting for E-Clipse Bypass EFB parameter 5003 prevents the network from seeing the E-Clipse Bypass. Change this setting **ONLY** if the bypass will be seen as a node on the network. Troubleshoot the E-Clipse Bypass EFB (50xx) portion **ONLY** if the bypass will be seen as a node on the network.

| Parameter Number | Display on Panel (Symptom) | Possible Cause | Corrective Action |
|------------------------|---|--|--|
| 5811 UART ERRORS | Rapidly Increasing Numeric Value ¹ | <ol style="list-style-type: none"> 1. Duplicate Addresses 2. Swapped Wires 3. Incorrect Baud Rate 4. Incorrect Parity 5. Too many devices on wire 6. Noise on EIA-485 wire 7. Blown EIA-485 transceiver | <ol style="list-style-type: none"> 1. Ensure Drive EFB parameters 5803 [also 5840 and 5899 when using BACnet] and Bypass EFB parameters 5003 [also 5040 and 5099 when using BACnet] are unique. 5803 and 5003 must be unique addresses on the segment. [5840, 5899 and 5040, 5099 must be unique addresses on the network when using BACnet]. 2. Swap wires B(+) and A(-). 3. Adjust parameter 5804 and Cycle power. 4. Change parity using parameter 5805 and cycle power. 5. Limit to 31 unit loads on 1 segment. 6. Install EIA-485 (3 conductor shielded) data grade cable communications wire. See drawings on page 78. 7. Find and correct ground loop or high voltage problems before replacing any component assemblies. Perform the following steps to determine if the EIA-485 transceiver is damaged. <ol style="list-style-type: none"> a. Power unit down. b. Remove bus wires and re-tighten connections. c. Turn bus termination ON. d. Measure impedance between B(+) and A(-) <ul style="list-style-type: none"> ACH580 121 ohms +/- 5% E-Clipse 140 ohms +/- 5% If measurements are not within the specified range the EIA-485 transceiver is bad, replace the assembly containing the EIA-485 port. |

| Parameter Number | Display on Panel (Symptom) | Possible Cause | Corrective Action |
|---|---|--|--|
| 5812 DV CRC ERR | Rapidly Increasing Numeric Value ¹ | <ol style="list-style-type: none"> 1. Duplicate Addresses 2. Too many devices on wire 3. Noise on EIA-485 wire | <ol style="list-style-type: none"> 1. See Corrective Action 1. Parameter Number 5811 2. Limit to 31 unit loads on 1 segment (Bypass = 1 unit load) 3. See Corrective Action 6. Parameter Number 5811 |
| 5819 DV STATUS | IDLE | <ol style="list-style-type: none"> 1. No network connection 2. Blown EIA-485 transceiver | <ol style="list-style-type: none"> 1. Land communication wires as shown in drawings on page 78. Check Repeater (if installed onsite) 2. See Corrective Action 7. Parameter Number 5811 3. Change application number in the Siemens field panel. |
| 5813 5013 TOKEN CNT (BACnet Only) | Not Increasing Numeric Value | <ol style="list-style-type: none"> 1. Drive device address parameter 5803 is set to 128 or greater. 2. E-Clipse Bypass device address parameter 5003 is set to 128 or greater. 3. Max Masters is set too low on all drives. | <ol style="list-style-type: none"> 1. Change parameter 5803 to a unique value below 128. 2. Change parameter 5003 to a unique value below 128. Note: The default value for parameter 5003 is 256. This setting prevents the network from seeing the bypass. Change this setting ONLY if the bypass will be seen as a node on the network. 3. Change Max Masters property at all devices on bus to 127. |
| 5808 DV OK MSG | OK Message Counter not increasing ¹ | <ol style="list-style-type: none"> 1. Master/Client not communicating with drive. 2. Failed router | <ol style="list-style-type: none"> 1. Add device and points to the building control system. 2. Replace router. |

1) Reset by pressing UP and DOWN arrows simultaneously in edit mode. Save change by pressing ENTER.

N2 protocol technical data – system

System overview

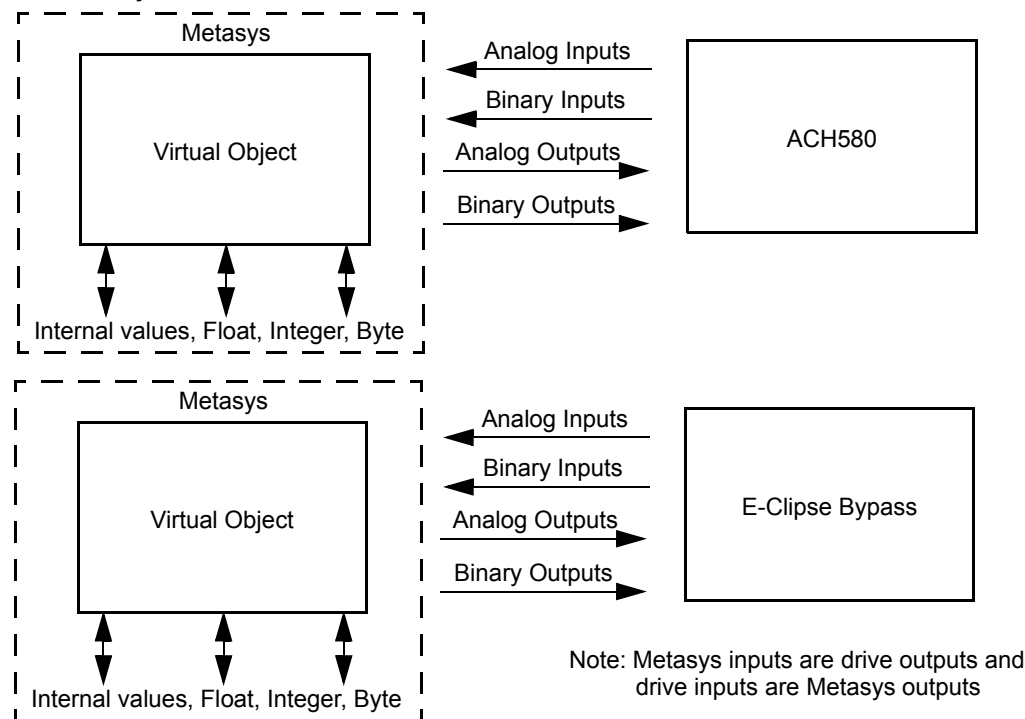
The N2 Fieldbus connection to the system is based on an industry standard RS-485 physical interface. The N2 Fieldbus protocol is a master-slave type, serial communication protocol, used by the Johnson Controls Metasys® system. In the Metasys architecture the N2 Fieldbus connects object interfaces and remote controllers to Network Control Units (NCUs).

The N2 Fieldbus can also be used to connect the system to the Metasys Companion product line.

This section describes the use of the N2 Fieldbus with the E-Clipse Bypass connection.

Supported features

In the N2 Fieldbus protocol the ACH580 and E-Clipse Bypass may appear as a “virtual object”.

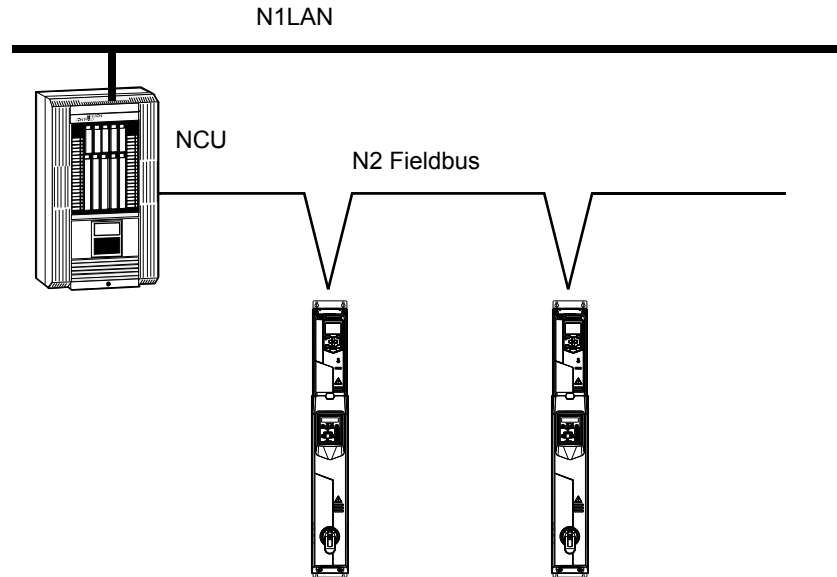


A virtual object is made up of:

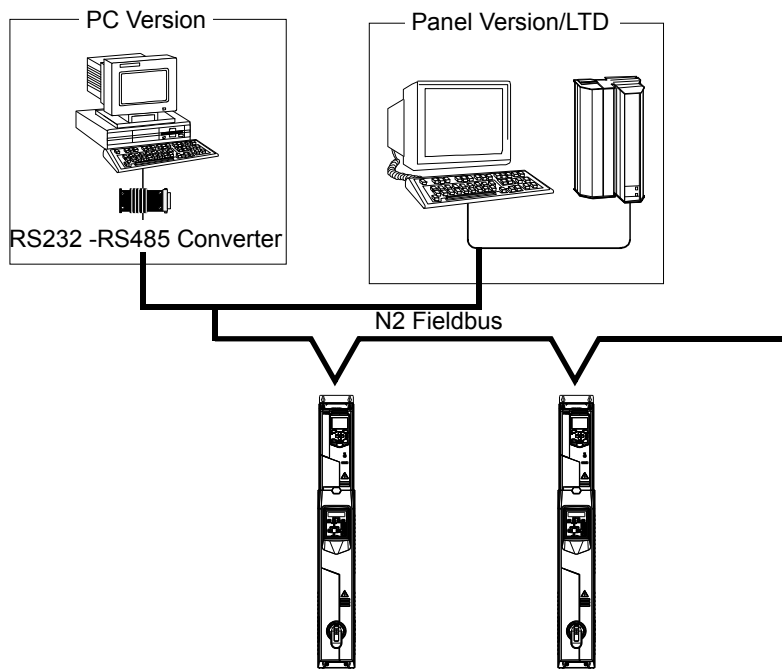
- Analog Inputs
- Binary Inputs
- Analog Outputs
- Binary Outputs
- Internal values for Floating point, Integer, and Byte values.

Metasys integration

The following diagram shows the drives' integration to the Johnson Controls Metasys system.



The following diagram shows the drives' integration to the Johnson Controls Metasys Companion system.



On the N2 Fieldbus each system can be accessed by the full complement of Metasys FMS features, including Change-of-State (COS) monitoring, warning notification, scheduling, trend, and totalization.

On one N2 Fieldbus segment there can be up to 32 nodes while integrating the E-Clipse Bypass system with Johnson Controls Metasys. Each E-Clipse bypass may

consume two nodes on a N2 fieldbus segment, if both the drive and bypass objects are being polled by the system.

Drive device type

For the Metasys and Metasys Companion products, the device type for the ACH580 drive is VND.

When bypass parameter 1625 COMM CTL= (0) DRIVE ONLY, drive's N2 objects are all supported using the drive's device address. The bypass's N2 objects related to the control word are no longer valid. For further information on the functional implications of the setting of parameter 1625, see [Communication setup – EFB](#) on page 79.

Bypass N2 Objects Not Valid

| Number | Object | Bypass Parameter |
|--------|-------------------|------------------|
| BO1 | SYSTEM START | Command Word |
| BO2 | SYSTEM DISABLE | Command Word |
| BO3 | SYSTEM RESET | Command Word |
| BO4 | OVERRIDE | Command Word |
| B10 | START INTERLOCK 1 | Command Word |
| B11 | START INTERLOCK 2 | Command Word |
| B12 | START INTERLOCK 3 | Command Word |
| B13 | START INTERLOCK 4 | Command Word |

When bypass parameter 1625 COMM CTL= (1) SYSTEM, drive's N2 following objects related to control are no longer available when using the drive's device address.

Drive N2 Objects Not Valid

| Number | Object | Bypass Parameter |
|--------|----------------|------------------|
| BO1 | START/STOP | Command Word |
| BO2 | RUN PERMISSIVE | Command Word |
| BO3 | N2 LOCAL CTL | Command Word |

Drive Overview

The ACH580 drive does not support N2 Fieldbus communication "internal values".

All of the Analog and Binary I/O objects are listed below.

Analog Input – The analog input objects support the following features:

- Analog Input actual value in engineering units
- Low Warning limit
- Low Warning limit
- High Warning limit
- High Warning limit
- Differential value for the hysteresis of the Alarms and Warnings

- Change of State (COS) enabled
- Warning Enabled
- Warning Enabled
- Override value is received, but there is no action taken.

Binary Input – The binary input objects support the following features:

- Binary Input actual value
- Normal / Warning state specification
- Warning Enabled
- Change of State (COS) enabled
- Override value is received, but there is no action taken.

Analog Output – The analog output objects support the following features:

- Analog Output value in engineering units
- Override value is used to change the Analog Output value. It is not possible to return to the previous value by removing the override. The override feature is used only to change the value.

Binary Output – The binary output objects support the following features:

- Binary Output value
- Override value is used to change the Binary Output value. It is not possible to return to the previous value by removing the override. The override feature is used only to change the value.

N2 analog input objects – Drive

The following table lists the N2 Analog Input objects defined for the ACH580 drive.

| N2 Analog Inputs: | | | | | |
|-------------------|-------------------|-----------------|------------|-------|------------|
| Number | Object | Drive Parameter | Resolution | Units | Range |
| AI1 | OUTPUT FREQUENCY | 01.06 | 0.1 | Hz | 0...250 |
| AI2 | RATED SPEED | 01.62 | 0.1 | % | 0...100 |
| AI3 | SPEED | 01.01 | 1 | rpm | 0...9999 |
| AI4 | CURRENT | 01.07 | 0.1 | A | 0...9999 |
| AI5 | TORQUE | 01.10 | 0.1 | % | -200...200 |
| AI6 | POWER | 01.17 | 0.1 | kW | 0...65535 |
| AI7 | DRIVE TEMPERATURE | 05.11 | 0.1 | % | -40...160 |
| AI8 | KILOWATT HOURS | 01.58 | 1 | kWh | 0...65535 |
| AI9 | MEGAWATT HOURS | Derived value | 1 | MWh | 0...65535 |
| AI10 | RUN TIME | 05.03 | 1 | H | 0...65535 |
| AI11 | DC BUS VOLTAGE | 01.11 | 1 | V | 0...999 |
| AI12 | OUTPUT VOLTAGE | 01.13 | 1 | V | 0...999 |
| AI13 | PRC PID FEEDBACK | 40.97 | 0.1 | % | 0...100 |

| N2 Analog Inputs: | | | | | |
|-------------------|-------------------|-----------------|------------|-------|------------|
| Number | Object | Drive Parameter | Resolution | Units | Range |
| AI14 | PRC PID DEVIATION | 40.99 | 0.1 | % | 0...100 |
| AI15 | EXT PID FEEDBACK | Derived value | 0.1 | % | 0...100 |
| AI16 | EXT PID DEVIATION | Derived value | 0.1 | % | 0...100 |
| AI17 | LAST FAULT | Derived value | 1 | | fault code |
| AI18 | PREV FAULT | Derived value | 1 | | fault code |
| AI19 | OLDEST FAULT | Derived value | 1 | | fault code |
| AI20 | AI 1 ACTUAL | 12.101 | 0.1 | % | 0...100 |
| AI21 | AI 2 ACTUAL | 12.102 | 0.1 | % | 0...100 |
| AI22 | AO 1 ACTUAL | 13.11 | 0.1 | mA | 0...20 |
| AI23 | AO 2 ACTUAL | 13.21 | 0.1 | mA | 0...20 |
| AI24 | MOTOR TEMP | Derived value | 1 | °C | 0...200 |

1) Rated Speed Is A Percent Of Maximum Frequency (Parameter 2008) If The Drive Is In Scalar Mode, And Is A Percent Of Maximum Speed (Parameter 2002) In Speed Mode.

N2 binary input objects – Drive

The following table lists the N2 Binary Input objects defined for the ACH580 drive.

| N2 Binary Inputs: | | | |
|-------------------|----------------------|------------------------|-----------------------------|
| Number | Object | Drive Parameter | Range |
| BI1 | STOP/RUN | Status Word, BIT2 | 0 = Stop, 1 = Drive Running |
| BI2 | FORWARD/REVERSE | Status Word, BIT11 | 0 = Forward, 1 = Reverse |
| BI3 | FAULT STATUS | Status Word, BIT15 | 0 = OK, 1 = Drive Fault |
| BI4 | RELAY 1 STATUS | 10.21, BIT0 | 0 = Off, 1 = On |
| BI5 | RELAY 2 STATUS | 10.21, BIT1 | 0 = Off, 1 = On |
| BI6 | RELAY 3 STATUS | 10.21, BIT2 | 0 = Off, 1 = On |
| BI7 | RELAY 4 STATUS | 15.04, BIT0 | 0 = Off, 1 = On |
| BI8 | RELAY 5 STATUS | 15.04, BIT1 | 0 = Off, 1 = On |
| BI9 | DIGITAL OUT 1 STATUS | 15.04, BIT5 | 0 = Off, 1 = On |
| BI10 | INPUT 1 STATUS | 10.02, BIT0 | 0 = Off, 1 = On |
| BI11 | INPUT 2 STATUS | 10.02, BIT1 | 0 = Off, 1 = On |
| BI12 | INPUT 3 STATUS | 10.02, BIT2 | 0 = Off, 1 = On |
| BI13 | INPUT 4 STATUS | 10.02, BIT3 | 0 = Off, 1 = On |
| BI14 | INPUT 5 STATUS | 0119 (bit mask 02) | 0 = Off, 1 = On |
| BI15 | INPUT 6 STATUS | 10.02, BIT5 | 0 = Off, 1 = On |
| BI16 | EXTERNAL 2 SELECT | DCU status word, BIT14 | 0 = EXT1 = EXT2 |
| BI17 | HAND/AUTO | DCU status word, BIT12 | 0 = AUTO, 1 = HAND |
| BI18 | WARNING | DCU status word, BIT16 | 0 = OK, 1 = WARNING |
| BI20 | DRIVE READY | DCU status word, BIT0 | 0 = Not Ready, 1 = Ready |
| BI21 | AT SETPOINT | DCU status word, BIT7 | 0 = No, 1 = At Setpoint |

| N2 Binary Inputs: | | | |
|--------------------------|-----------------|------------------------|------------------------------|
| Number | Object | Drive Parameter | Range |
| BI22 | RUN PERMISSIVES | DCU status word, BIT1 | 0 = Not Enabled, 1 = Enabled |
| BI23 | N2 LOCAL MODE | DCU status word, BIT13 | 0 = Auto, 1 = N2 Local |
| BI24 | N2 CONTROL SRC | DCU status word, BIT26 | 0 = No, 1 = Yes |
| BI25 | N2 REF1 SRC | DCU status word, BIT27 | 0 = No, 1 = Yes |
| BI26 | N2 REF2 SRC | DCU status word, BIT28 | 0 = No, 1 = Yes |

N2 analog output objects – Drive

The following table lists the N2 Analog Output objects defined for the ACH580 drive.

| N2 Analog Outputs: | | | | | |
|---------------------------|--------------------|------------------------|-------------------|--------------|-------------------------|
| Number | Object | Drive Parameter | Resolution | Units | Range |
| AO1 | REFERENCE 1 | Reference 1 | 0.1 | % | 0...100 |
| AO2 | REFERENCE 2 | Reference 2 | 0.1 | % | 0...100 |
| AO3 | ACCEL TIME 1 | Derived value | 0.1 | s | 0.1...1800 |
| AO4 | DECEL TIME 1 | Derived value | 0.1 | s | 0.1...1800 |
| AO5 | CURRENT LIMIT | 30.17 | 0.1 | A | 0...1.3·I _{2n} |
| AO6 | PID1-CONT GAIN | 40.32 | 0.1 | % | 0.1...100 |
| AO7 | PID1-CONT I-TIME | 40.33 | 0.1 | s | 0.1...600 |
| AO8 | PID1-CONT D-TIME | 40.34 | 0.1 | s | 0...10 |
| AO9 | PID1-CONT D FILTER | 40.35 | 0.1 | s | 0...10 |
| AO10 | PID2-CONT GAIN | 41.32 | 0.1 | % | 0.1...100 |
| AO11 | PID2-CONT I-TIME | 41.33 | 0.1 | s | 0.1...600 |
| AO12 | PID2-CONT D-TIME | 41.34 | 0.1 | s | 0...10 |
| AO13 | PID2-CONT D FILTER | 41.35 | 0.1 | s | 0...10 |
| AO14 | COMMAND AO 1 | 13.91 | 0.1 | % | 0...100 |
| AO15 | COMMAND AO 2 | 13.92 | 0.1 | % | 0...100 |
| AO16 | EXT PID SETPOINT | 71.21 | 0.1 | % | 0...100 |
| AO17 | SPD OUT MIN | Derived value | 0.1 | % | 0...200 |
| AO18 | SPD OUT MAX | Derived value | 0.1 | % | 0...200 |
| AO19 | MB PARAM | N/A | 1 | None | 0...65535 |
| AO20 | MB DATA | N/A | 1 | None | 0...65535 |

N2 binary output objects – Drive

The following table lists the N2 Binary Output objects defined for the ACH580 drive.

| N2 Binary Outputs: | | | |
|--------------------|-----------------------|-------------------------|-----------------------------------|
| Number | Object | Drive Parameter | Range |
| BO1 | STOP/START | Command Word | 0 = Stop, 1 = Start to Speed |
| BO2 | FORWARD/REVERSE | Command Word | 0 = Forward, 1 = Reverse |
| BO3 | PANEL LOCK | Command Word | 0 = Open, 1 = Locked |
| BO4 | RUN PERMISSIVE | Command Word | 0 = Enable, 1 = Disable |
| BO5 | REF1/REF2 SELECT | Command Word | 0 = Ref1, 1 = Ref2 |
| BO6 | FAULT RESET | Command Word | Change 0 -> 1 Resets |
| BO7 | COMMAND RO 1 | 10.99, bit0 | 0 = Off, 1 = On |
| BO8 | COMMAND RO 2 | 10.99, bit1 | 0 = Off, 1 = On |
| BO9 | COMMAND RO 3 | 10.99, bit2 | 0 = Off, 1 = On |
| BO10 | COMMAND RO 4 | 10.99, bit3 | 0 = Off, 1 = On |
| BO11 | COMMAND RO 5 | 10.99, bit4 | 0 = Off, 1 = On |
| BO12 | COMMAND RO 6 | 10.99, bit5 | 0 = Off, 1 = On |
| BO13 | RESET RUN TIME | Indirectly mapping | 0 = N/A, 1 = On (Reset Run Time) |
| BO14 | RESET KWH COUNT | Indirectly mapping | 0 = N/A, 1 = On (Reset kWh Count) |
| BO15 | PRC PID SELECT | 40.57 (indirectly) | 0 = SET2, 1 = SET2 |
| BO16 | N2 LOCAL CTL (Note 1) | DCU Control Word, BIT16 | 0 = Auto, 1 = N2 |
| BO17 | N2 LOCAL REF (Note 1) | DCU Control Word, BIT17 | 0 = Auto, 1 = N2 |
| BO18 | SAVE PARAMETERS | 96.07 (indirectly) | 0 = N/A, 1 = On (Save Parameters) |
| BO19 | READ MB | N/A | 0 = NO, 1 = READ |
| BO20 | WRITE MB | N/A | 0 = NO, 1 = WRITE |

1) N2 LOCAL CTL and N2 LOCAL REF have priority over drive input terminals. Use these binary outputs for temporary N2 control of the drive when COMM is not the selected control source.

DDL file for NCU – Drive

The listing below is the Data Definition Language (DDL) file for ACH580 drives used with the Network Control Units.

This listing is useful when defining drive I/O objects to the Network Controller Units.

Below is the ACH580.DDL file listing.

```
*****
* ABB Drives, ACH 580 Variable Frequency Drive
*****
CSMODEL "ACH_580", "VND"

AITITLE "Analog_Inputs"
BITITLE "Binary_Inputs"
AOTITLE "Analog_Outputs"
BOTITLE "Binary_Outputs"

CSAI "AI1",N,N,"FREQ_ACT","Hz"
CSAI "AI2",N,N,"PCT_ACT","%"
CSAI "AI3",N,N,"SPEED","RPM"
CSAI "AI4",N,N,"CURRENT","A"
CSAI "AI5",N,N,"TORQUE","%"
CSAI "AI6",N,N,"POWER","kW"
CSAI "AI7",N,N,"DRV_TEMP_PCT","%"
CSAI "AI8",N,N,"ENERGY_k","kWh"
CSAI "AI9",N,N,"ENERGY_M","MWh"
CSAI "AI10",N,N,"RUN_TIME","H"
CSAI "AI11",N,N,"DC_VOLT","V"
CSAI "AI12",N,N,"VOLT_ACT","V"
CSAI "AI13",N,N,"PID1_ACT","%"
CSAI "AI14",N,N,"PID2_DEV","%"
CSAI "AI15",N,N,"PID2_ACT","%"
CSAI "AI16",N,N,"PID2_DEV","%"
CSAI "AI17",N,N,"LAST_FLT","Code"
CSAI "AI18",N,N,"PREV_FLT","Code"
CSAI "AI19",N,N,"1ST_FLT","Code"
CSAI "AI20",N,N,"AI_1_ACT","%"
CSAI "AI21",N,N,"AI_2_ACT","%"
CSAI "AI22",N,N,"AO_1_ACT","mA"
CSAI "AI23",N,N,"AO_2_ACT","mA"
CSAI "AI24",N,N,"MTR_TEMP","°C"

CSBI "BI1",N,N,"STOP/RUN","STOP","RUN"
CSBI "BI2",N,N,"FWD/REV","FWD","REV"
CSBI "BI3",N,N,"FAULT","OK","FLT"
CSBI "BI4",N,N,"RELAY_1","OFF","ON"
CSBI "BI5",N,N,"RELAY_2","OFF","ON"
CSBI "BI6",N,N,"RELAY_3","OFF","ON"
CSBI "BI7",N,N,"RELAY_4","OFF","ON"
CSBI "BI8",N,N,"RELAY_5","OFF","ON"
```

```

CSBI "BI9",N,N,"DO_1","OFF","ON"
CSBI "BI10",N,N,"INPUT_1","OFF","ON"
CSBI "BI11",N,N,"INPUT_2","OFF","ON"
CSBI "BI12",N,N,"INPUT_3","OFF","ON"
CSBI "BI13",N,N,"INPUT_4","OFF","ON"
CSBI "BI14",N,N,"INPUT_5","OFF","ON"
CSBI "BI15",N,N,"INPUT_6","OFF","ON"
CSBI "BI16",N,N,"EXT1/2","EXT1","EXT2"
CSBI "BI17",N,N,"HND/AUTO","AUTO","HAND"
CSBI "BI18",N,N,"WARNING","OFF","ON"
CSBI "BI20",N,N,"DRV_REDY","NO","YES"
CSBI "BI21",N,N,"AT_SETPT","NO","YES"
CSBI "BI22",N,N,"RUN_PERMISSIVE","DISABLED","ENABLED"
CSBI "BI23",N,N,"N2_LOC_M","AUTO","N2_L"
CSBI "BI24",N,N,"N2_CTRL","NO","YES"

CSBI "BI25",N,N,"N2_R1SRC","NO","YES"
CSBI "BI26",N,N,"N2_R2SRC","NO","YES"
CSAO "AO1",Y,Y,"REF_1","%"
CSAO "AO2",Y,Y,"REF_2","%"
CSAO "AO3",Y,Y,"ACCEL_1","s"
CSAO "AO4",Y,Y,"DECEL_1","s"
CSAO "AO5",Y,Y,"CURR_LIM","A"
CSAO "AO6",Y,Y,"PID1_GN","%"
CSAO "AO7",Y,Y,"PID1_I","s"
CSAO "AO8",Y,Y,"PID1_D","s"
CSAO "AO9",Y,Y,"PID1_FLT","s"
CSAO "AO10",Y,Y,"PID2_GN","%"
CSAO "AO11",Y,Y,"PID2_I","s"
CSAO "AO12",Y,Y,"PID2_D","s"
CSAO "AO13",Y,Y,"PID2_FLT","s"
CSAO "AO14",Y,Y,"CMD_AO_1","%"
CSAO "AO15",Y,Y,"CMD_AO_2","%"
CSAO "AO16",Y,Y,"PI2_STPT","%"
CSAO "AO17",Y,Y,"MIN_SPD","%"
CSAO "AO18",Y,Y,"MAX_SPD","%"
CSAO "AO19",Y,Y,"MB_PARAM",""
CSAO "AO20",Y,Y,"MB_DATA",""
CSBO "BO1",Y,Y,"START","STOP","START"
CSBO "BO2",Y,Y,"REVERSE","FWD","REV"
CSBO "BO3",Y,Y,"PAN_LOCK","OPEN","LOCKED"
CSBO "BO4",Y,Y,"RUN_ENAB","ENABLE","DISABLE"
CSBO "BO5",Y,Y,"R1/2_SEL","EXT_1","EXT_2"
CSBO "BO6",Y,Y,"FLT_RSET","-","RESET"
CSBO "BO7",Y,Y,"CMD_RO_1","OFF","ON"
CSBO "BO8",Y,Y,"CMD_RO_2","OFF","ON"
CSBO "BO9",Y,Y,"CMD_RO_3","OFF","ON"
CSBO "BO10",Y,Y,"CMD_RO_4","OFF","ON"
CSBO "BO11",Y,Y,"CMD_RO_5","OFF","ON"
CSBO "BO12",Y,Y,"CMD_RO_6","OFF","ON"

```

```

CSBO "BO13",Y,Y,"RST_RTIM","OFF","RESET"
CSBO "BO14",Y,Y,"RST_KWH","OFF","RESET"
CSBO "BO15",Y,Y,"PID_SEL","SET1","SET2"
CSBO "BO16",Y,Y,"N2_LOC_C","AUTO","N2"
CSBO "BO17",Y,Y,"N2_LOC_R","AUTO","N2"
CSBO "BO18",Y,Y,"SAV_PRMS","OFF","SAVE"
CSBO "BO19",Y,Y,"READ_MB","NO","READ"
CSBO "BO20",Y,Y,"WRITE_MB","NO","WRITE"

```

Bypass overview

The ABB E-Clipse bypass does not support N2 Fieldbus communication “internal values”.

All of the Binary I/O objects are listed below.

Binary Input – The binary input objects support the following features:

- Binary Input actual value
- Normal / Warning state specification
- Warning Enabled
- Change of State (COS) enabled
- Override value is received, but there is no action taken.

Binary Output – The binary output objects support the following features:

- Binary Output value
- Override value is used to change the Binary Output value. It is not possible to return to the previous value by removing the override. The override feature is used only to change the value.

N2 analog input objects – Bypass

The following table lists the N2 Analog Input objects defined for the ABB E-Clipse bypass.

| N2 Analog Inputs: | | | | | |
|-------------------|----------------|------------------|------------|-------|--|
| Number | Object | Bypass Parameter | Resolution | Units | Range |
| AI1 | CURRENT | 0101 | 0.1 | A | 0...9999 |
| AI2 | LAST FAULT | 0401 | 1 | | fault code |
| AI3 | WARNING WORD 1 | 0308 | 1 | | Warning mask (see bypass manual description of parameter 0308) |
| AI4 | WARNING WORD 2 | 0309 | 1 | | Warning mask (see bypass manual description of parameter 0309) |
| AI5 | HAND OFF AUTO | | | | 0=Off, 1=Hand, 2=Auto |
| AI6 | INPUT VOLT | 0102 | 1 | V | Average of line-line input voltage |

| N2 Analog Inputs: | | | | | |
|-------------------|----------|------------------|------------|-------|-----------------------------|
| Number | Object | Bypass Parameter | Resolution | Units | Range |
| AI7 | PCB TEMP | 0105 | 0.1 | °C | Temperature of bypass board |
| AI8 | KW HOURS | 0106 | 1 | kWh | Bypass-mode kilowatt hours |
| AI9 | RUN TIME | 0108 | 1 | HR | 0...65535 |
| AI10 | A-B VOLT | 0111 | 1 | V | Phase A - Phase B voltage |
| AI11 | B-C VOLT | 0112 | 1 | V | Phase B - Phase C voltage |
| AI12 | C-B VOLT | 0113 | 1 | V | Phase C - Phase A voltage |

N2 analog output objects – Bypass

The following table lists the N2 Analog Input objects defined for the ABB E-Clipse bypass.

| N2 Analog Inputs: | | | | | |
|-------------------|------------|------------------|------------|-------|-----------|
| Number | Object | Bypass Parameter | Resolution | Units | Range |
| AO1 | BYP RUNDLY | 1614 | 1 | s | 0...300 |
| AO2 | MB PARAM | N/A | 1 | None | 0...65535 |
| AO3 | MB DATA | N/A | 1 | None | 0...65535 |

N2 binary input objects – Bypass

The following table lists the N2 Binary Input objects defined for the ABB E-Clipse bypass.

| N2 Binary Inputs: | | | |
|-------------------|----------------|---------------------|--------------------|
| Number | Object | Drive Parameter | Range |
| BI1 | SYSTEM READY | Status Word | 1 = Ready |
| BI2 | SYSTEM ENABLED | Status Word | 1 = Enabled |
| BI3 | SYSTEM STARTED | Status Word | 1 = System Started |
| BI4 | SYSTEM RUNNING | Status Word | 1 = System Running |
| BI5 | N2 LOCAL MODE | Status Word | 1 = N2 Local |
| BI6 | FAULT | Status Word | 1 = Bypass Fault |
| BI7 | WARNING | Status Word | 1 = Bypass Warning |
| BI8 | N2 CONTROL SCR | Status Word | 1 = Yes |
| BI9 | OVERRIDE | Status Word | 1 = Override |
| BI10 | INPUT 1 STATUS | 0103 (bit mask 1) | 1 = On |
| BI11 | INPUT 2 STATUS | 0103 (bit mask 2) | 1 = On |
| BI12 | INPUT 3 STATUS | 0103 (bit mask 4) | 1 = On |
| BI13 | INPUT 4 STATUS | 0103 (bit mask 8) | 1 = On |
| BI14 | INPUT 5 STATUS | 0103 (bit mask 10h) | 1 = On |
| BI15 | INPUT 6 STATUS | 0103 (bit mask 20h) | 1 = On |

| N2 Binary Inputs: | | | |
|--------------------------|----------------|------------------------|---------------------------------|
| Number | Object | Drive Parameter | Range |
| BI16 | RELAY 1 STATUS | 0104 (bit mask 1) | 1 = On |
| BI17 | RELAY 2 STATUS | 0104 (bit mask 2) | 1 = On |
| BI18 | RELAY 3 STATUS | 0104 (bit mask 4) | 1 = On |
| BI19 | RELAY 4 STATUS | 0104 (bit mask 8) | 1 = On |
| BI20 | RELAY 5 STATUS | 0104 (bit mask 10h) | 1 = On |
| BI21 | BYPASS MODE | Status Word | 0 = Drive mode, 1 = Bypass mode |
| BI22 | SYS UNDERLOAD | Status Word | 1 = System Underload |
| BI23 | SYS FAULT | Status Word | 1 = System Fault |
| BI24 | BYPASS RUNNING | Status Word | 1 = Bypass Running |

N2 binary output objects – Bypass

The following table lists the N2 Binary Output objects defined for the ABB E-Clipse bypass.

| N2 Binary Outputs: | | | |
|---------------------------|--------------------|------------------------|------------------------------------|
| Number | Object | Drive Parameter | Range |
| BO1 | SYSTEM START | Command Word | 1 = Started |
| BO2 | SYS RUN PERMISSIVE | Command Word | 1 = Enable |
| BO3 | SYSTEM RESET | Command Word | Change 0 -> 1 Resets |
| BO4 | OVERRIDE | Command Word | 1 = Override |
| BO5 | COMMAND RO 1 | 107 (bit mask 1) | 1 = On |
| BO6 | COMMAND RO 2 | 107 (bit mask 2) | 1 = On |
| BO7 | COMMAND RO 3 | 107 (bit mask 4) | 1 = On |
| BO8 | COMMAND RO 4 | 107 (bit mask 8) | 1 = On |
| BO9 | COMMAND RO 5 | 107 (bit mask 10h) | 1 = On |
| BO10 | SYS INTERLOCK 1 | Command Word | 1 = Enable |
| BO11 | SYS INTERLOCK 2 | Command Word | 1 = Enable |
| BO12 | SYS INTERLOCK 3 | Command Word | 1 = Enable |
| BO13 | SYS INTERLOCK 4 | Command Word | 1 = Enable |
| BO14 | RESET KW HOURS | 0106 | Bypass-mode kilowatt hours - RESET |
| BO15 | RESET RUN TIME | 0108 | 0...65535 - RESET |
| BO16 | PAR LOCK | 1619 | 0 = LOCKED, 1 = OPEN |
| BO17 | N2 LOCAL MODE | Command Word | 0 = AUTO, 1 = N2 LOCAL |
| BO18 | READ MB | N/A | 0 = NO, 1 = READ |
| BO19 | WRITE MB | N/A | 0 = NO, 1 = WRITE |

DDL file for NCU – Bypass

The listing below is the Data Definition Language (DDL) file for ABB E-Clipse bypass used with the Network Control Units.

This listing is useful when defining bypass I/O objects to the Network Controller Units.

```
*****
*   ABB Drives, E-Clipse Bypass
*****
CSMODEL "E-Clipse_Bypass", "VND"

AITITLE "Analog Inputs"
BITITLE "Binary Inputs"
AOTITLE "Analog Outputs"
BOTITLE "Binary Outputs"

CSAI "AI1",N,N,"CURRENT","A"
CSAI "AI2",N,N,"LAST FLT","Code"
CSAI "AI3",N,N,"ALM WD 1","Code"
CSAI "AI4",N,N,"ALM WD 2","Code"
CSAI "AI5",N,N,"HOA","Code"
CSAI "AI6",N,N,"INP VOLT","V"
CSAI "AI7",N,N,"PCB TEMP","?C"
CSAI "AI8",N,N,"KW HOURS","kWh"
CSAI "AI9",N,N,"RUN TIME","H"
CSAI "AI10",N,N,"A-B VOLT","V"
CSAI "AI11",N,N,"B-C VOLT","V"
CSAI "AI12",N,N,"C-A VOLT","V"

CSBI "BI1",N,N,"SYS RDY","NO","YES"
CSBI "BI2",N,N,"SYS ENAB","DISABLED","ENABLED"
CSBI "BI3",N,N,"SYS STRT","NO","YES"
CSBI "BI4",N,N,"SYS RUN","NO","YES"
CSBI "BI5",N,N,"N2 LOC M","AUTO","N2 L"
CSBI "BI6",N,N,"FAULT","OK","FLT"
CSBI "BI7",N,N,"WARNING","NO","YES"
CSBI "BI8",N,N,"N2 CTRL","NO","YES"
CSBI "BI9",N,N,"OVERRIDE","NO","YES"
CSBI "BI10",N,N,"INPUT 1","OFF","ON"
CSBI "BI11",N,N,"INPUT 2","OFF","ON"
CSBI "BI12",N,N,"INPUT 3","OFF","ON"
CSBI "BI13",N,N,"INPUT 4","OFF","ON"
CSBI "BI14",N,N,"INPUT 5","OFF","ON"
CSBI "BI15",N,N,"INPUT 6","OFF","ON"
CSBI "BI16",N,N,"RELAY 1","OFF","ON"
CSBI "BI17",N,N,"RELAY 2","OFF","ON"
CSBI "BI18",N,N,"RELAY 3","OFF","ON"
CSBI "BI19",N,N,"RELAY 4","OFF","ON"
CSBI "BI20",N,N,"RELAY 5","OFF","ON"
```

```
CSBI "BI21",N,N,"BP MODE","DRIVE","BYPASS"  
CSBI "BI22",N,N,"SYS UNLD","NO","YES"  
CSBI "BI23",N,N,"SYS FLT","NO","YES"  
CSBI "BI24",N,N,"BP RUN","NO","YES"  
  
CSAO "AO1",Y,Y,"BP R DLY","s"  
CSAO "AO2",Y,Y,"MB PARAM",""  
CSAO "AO3",Y,Y,"MB DATA",""  
  
CSBO "BO1",Y,Y,"SYS STRT","STOP","START"  
CSBO "BO2",Y,Y,"SYS RUN PERMISSIVE","DISABLE","ENABLE"  
CSBO "BO3",Y,Y,"SYS RSET","OFF","RESET"  
CSBO "BO4",Y,Y,"OVERRIDE","OFF","OVERRIDE"  
CSBO "BO5",Y,Y,"CMD RO 1","OFF","ON"  
CSBO "BO6",Y,Y,"CMD RO 2","OFF","ON"  
CSBO "BO7",Y,Y,"CMD RO 3","OFF","ON"  
CSBO "BO8",Y,Y,"CMD RO 4","OFF","ON"  
CSBO "BO9",Y,Y,"CMD RO 5","OFF","ON"  
CSBO "BO10",Y,Y,"SYS INTERLOCK 1","DISABLE","ENABLE"  
CSBO "BO11",Y,Y,"SYS INTERLOCK 2","DISABLE","ENABLE"  
CSBO "BO12",Y,Y,"SYS INTERLOCK 3","DISABLE","ENABLE"  
CSBO "BO13",Y,Y,"SYS INTERLOCK 4","DISABLE","ENABLE"  
CSBO "BO14",Y,Y,"RST KWH","OFF","RESET"  
CSBO "BO15",Y,Y,"RST RTIM","OFF","RESET"  
CSBO "BO16",Y,Y,"PAR LOCK","OPEN","LOCKED"  
CSBO "BO17",Y,Y,"N2 LOC C","AUTO","N2"  
CSBO "BO18",Y,Y,"READ MB","NO","READ"  
CSBO "BO19",Y,Y,"WRITE MB","NO","WRITE"
```

BACnet protocol technical data – system

System overview -

When bypass parameter 1625 COMM CTL = (0) DRIVE ONLY, the drive's BACnet objects are supported using the drive's device address. The bypass's BACnet objects related to the control word are no longer valid See [Communication setup – EFB](#) on page 79.

Bypass BACnet objects not valid

| Point # | Name |
|---------|--------------------|
| BV10 | RUN/STOP CMD |
| BV11 | OVERRIDE CMD |
| BV12 | RUN PERMISSIVE CMD |
| BV14 | FAULT RESET |
| BV15 | START INTERLOCK 1 |
| BV16 | START INTERLOCK 2 |
| BV17 | START INTERLOCK 3 |
| BV18 | START INTERLOCK 4 |

When bypass parameter 1625 COMM CTL = (1) SYSTEM, the drive's BACnet following objects related to control are no longer available when using the drive's device address.

Drive BACnet objects not valid

| Point # | Name |
|---------|--------------------|
| BV10 | RUN/STOP CMD |
| BV12 | RUN PERMISSIVE CMD |
| BV20 | START INTERLOCK 1 |
| BV21 | START INTERLOCK 2 |

Drive overview

Bypass parameter Group 58 defines features used by all Embedded Fieldbus (EFB) protocols.

Note: The system will function as a master with MAC IDs in the range of 1-127. With MAC ID settings of 128-254, the drive is in slave only mode.

Changes made to drive parameter Group 58, EFB Protocol, do not take affect until you perform one of the following:

- Cycle the bypass power OFF and ON, or
- Set bypass parameter 5803 to 0, and then back to a unique MAC ID, or
- Use the ReinitializeDevice service.

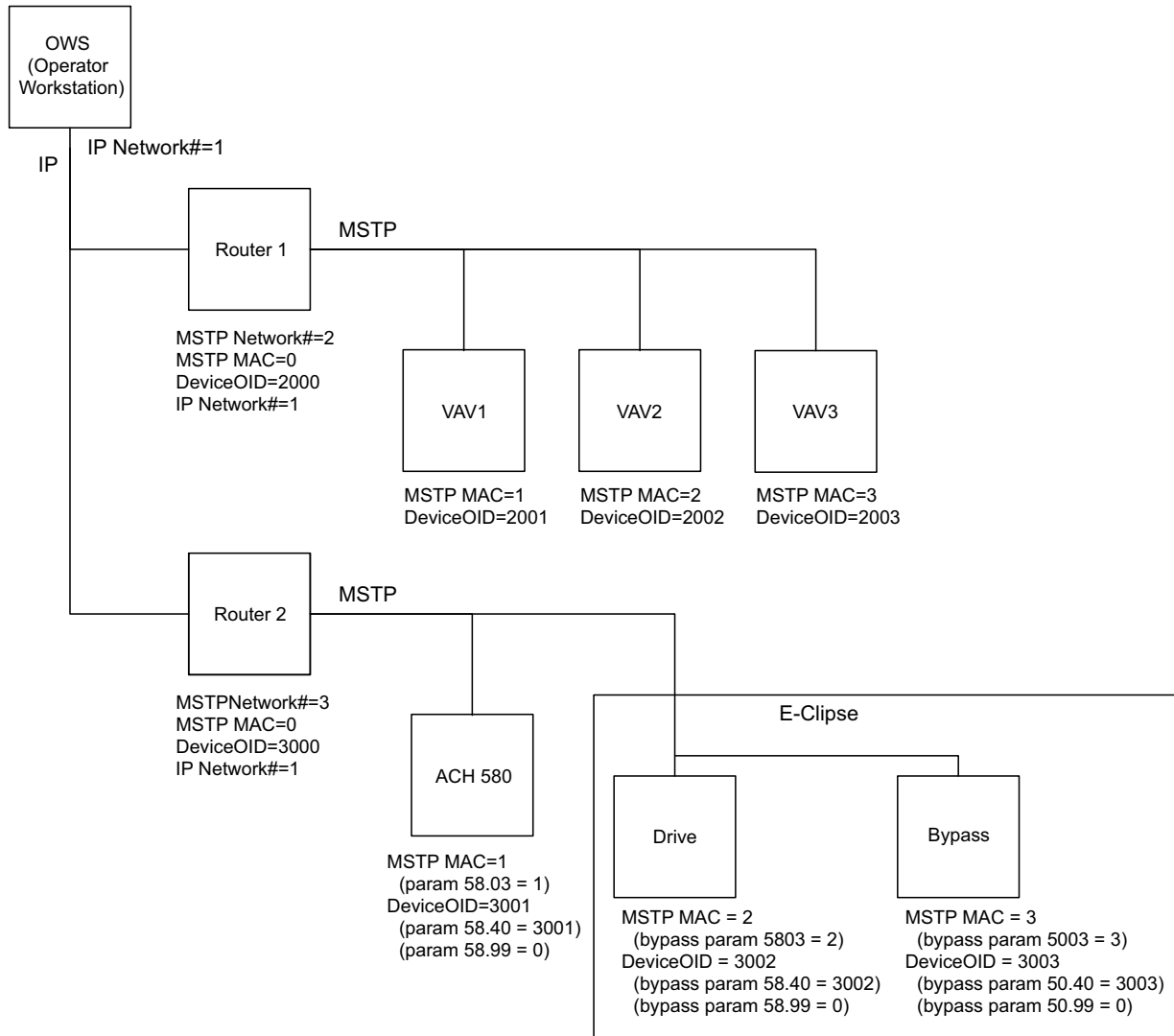
Quick-start sequence - drive communications

The following steps summarize the process for enabling and configuring BACnet on the ABB E-Clipse Bypass:

1. Enable BACnet protocol: Set bypass parameter 9802, COMM PROTOCOL SEL BACNET (5).
 - To confirm this selection, read bypass parameter 5803, EFB PROTOCOL ID. It should read x5xx (where “x” is any value).
2. Place the BACnet channel in “reset”: Set bypass parameter 5803, EFB STATION ID = 0.
 - This setting holds the BACnet communication channel in reset while remaining settings are completed.
3. Define the MS/TP baud rate.
 - Set bypass parameter 5803, EFB BAUD RATE = appropriate value
4. Define the Device Object instance.
 - To define a specific device object instance value, use bypass parameters 5840 and 5899 (object instance values must be unique and in the range 0 to 4,194,302).
 - To use the bypass’ MS/TP MAC ID as the device object instance value, set bypass parameter 5840 and 5899 = 0.
 - BACnet requires a unique Device Object ID for each device on the BACnet network.
5. Define a unique MS/TP MAC ID. Set bypass parameter 5802, EFB STATION ID = appropriate value.
 - Once this parameter is set to a non-zero value, current BACnet settings are “latched” and used for communication until the channel is reset.
 - In order to participate in MS/TP token passing, the MAC ID used must be within the limits defined by other masters’ “Max Master” property.
6. Confirm proper BACnet communication.
 - When BACnet communication is operating properly, bypass parameter 5813, EFB PAR 16 (the MS/TP token counter), should be continually increasing.
 - Bypass parameter 5811, UART ERRORS, should be stable.
7. Configure the Device Object Name.
 - BACnet requires a unique name for each device on the BACnet network. Write the Object Name of the Device Object of the drive to a unique text string using the operator workstation or software tool capable of writing BACnet properties. The Object Name cannot be modified with the ABB display panel and only the Device object name is writable in this product. The E-Clipse bypass does not support writing of Device Description.

BACnet Device Address Rules

- MSTP MAC Addresses must be unique for all devices connected to the same RS485 network.
- MSTP MAC Address is configurable via parameter 5003 in the bypass.
 - 1..127 = range of supported Master addresses for the bypass
- Network Number must be unique for each network (IP and MSTP)
- Network Number of 0 is reserved for broadcasts
- Device Object IDs must be unique across the entire BACnet network, all IP and MSTP subnetworks.
- Device Object IDs are 22 bits, configurable via parameters 5840 and 5899 in the bypass.
- The example Network Numbers and DeviceOIDs show a good way to maintain unique DeviceOIDs across the network.



Activate drive control functions

Controlling the drive

Fieldbus control of various drive functions requires configuration to:

- Tell the drive to accept fieldbus control of the function.
- Define as a fieldbus input, any system data required for control (drive only or system)
- Define as a fieldbus output, any control data required by the drive.

The following sections describe the configuration required for each control function.

Note: The user should change only the parameters for the functions you wish to control via BACnet. All other parameters should typically remain at factory default.

Start/stop direction control – Drive

Using the fieldbus for start/stop/direction control of the drive requires:

- Drive parameter values set as defined below.
- Fieldbus controller supplied command(s) in the appropriate location.

| Bypass Parameter | | Value | Description | BACnet Access Point |
|------------------|------------|------------------------------|---|---------------------|
| 1601 | START/STOP | 2 (COMM) | Start/Stop by fieldbus with Ext1 or Ext2 ¹ selected | BV10 |
| 1625 | COMM CTRL | 0 (Drive Only) 1 (System) | 1625 = 0 for control signals (Start/Stop and enables) to go to drive only 1625 = 1 for control signals to go to the system (drive or bypass, depending on keypad mode selection) | N/A |

1) Ext1 = Ref 1

Ext 2 = Ref 2; Ref 2 normally used for PID setpoint commands.

Input reference select

Using the fieldbus for start/stop/direction control of the drive requires:

- Drive parameter values set as defined below.
- Fieldbus controller supplied command(s) in the appropriate location.)

| | | Scalar Control (Group 28) | Vector Control (Group 22) | Value |
|-------------------------|------|---------------------------|---------------------------|--|
| Ext1/Ext2 Select | | 19.11 | | 32, EFB MCW bit 11 |
| Ext1 | Ref1 | 28.11 | 22.11 | Flexibility to write to 3.09 (EFBRef1) or 3.10 (EFBRef2) |
| | Ref2 | 28.12 | 22.12 | |
| Ext2 | Ref1 | 28.15 | 22.15 | |
| | Ref2 | 28.16 | 22.16 | |

EFB Ref1/Ref2

| Drive Parameter | BACnet Access Point |
|---------------------------|---------------------|
| 19.11 Ext1/Ext2 Selection | BV13 |
| 3.09 EFB Ref1 | AV16 |
| 3.10 EFB Ref2 | AV17 |

Drive relay output control

Using the fieldbus for relay output control requires:

- Drive parameter values set as defined below.
- Only make these drive programming changes if you require control via BACnet.
- Fieldbus controller supplied, binary coded, relay command(s) in the appropriate location.

| Drive Parameter | | Value | Setting | BACnet Access Point |
|--------------------------------|------------------|-------------------------|--|---------------------|
| 10.24 RO1 Source | RELAY OUTPUT 1 | 62, RO/DIO control word | Relay Output 1 controlled by fieldbus. | BO0 |
| 10.27 | RELAY OUTPUT 2 | 62, RO/DIO control word | Relay Output 2 controlled by fieldbus. | BO1 |
| 10.30 | RELAY OUTPUT 3 | 62, RO/DIO control word | Relay Output 3 controlled by fieldbus. | BO2 |
| 15.07 ¹⁾ | RELAY OUTPUT 4 | 62, RO/DIO control word | Relay Output 4 controlled by fieldbus. | BO3 |
| 15.10 ¹⁾ | RELAY OUTPUT 5 | 62, RO/DIO control word | Relay Output 5 controlled by fieldbus. | BO4 |
| 15.23 ¹⁾ DO1 Source | DIGITAL OUTPUT 1 | 62, RO/DIO control word | Digital Output 1 controlled by fieldbus. | BO5 |

1) More than 3 relays requires the addition of a relay extension module.

Analog output control

Using the fieldbus for analog output control requires:

- Drive parameter values set as defined below.
- Fieldbus controller supplied analog value(s) in the appropriate location.

| Drive Parameter | | Value | Setting | BACnet Access Point |
|-----------------|------------------|----------------------|---|---------------------|
| 13.12 | AO1 Source | 37, AO1 Data Storage | Analog Output 1 controlled by writing to parameter 13.91. | – |
| 13.91 | AO1 Data Storage | – | | AO0 |
| 13.22 | AO2 Content Sel | 38, AO2 Data Storage | Analog Output 2 controlled by writing to parameter 13.92. | – |
| 13.92 | AO2 Data Storage | – | | AO1 |

Feedback from the drive

Pre-defined feedback

Inputs to the controller (drive outputs) have pre-defined meanings established by the protocol. This feedback does not require drive configuration. The following table lists a sample of feedback data.

| Drive Parameter | | BACnet |
|-----------------|-----------------------------------|--------|
| 01.01 | Motor Speed Used | AV0 |
| 01.06 | Output Frequency | AV1 |
| 01.07 | Motor Current | AV4 |
| 01.10 | Motor Torque | AV5 |
| 01.14 | Output Power | AV6 |
| 01.11 | DC Voltage | AV2 |
| 01.13 | Output Voltage | AV3 |
| 01.57 | Inverter KWH Counter (resettable) | AV8 |
| 10.02 | DI Delayed Status | BI6 |
| 10.21 | RO Status | BI0 |
| 58.19 | EFB Status Word – bit 0 (STOP) | BV0 |
| 58.19 | EFB Status Word – bit 2 (REV) | BV1 |

Mailbox read/write

The E-Clipse bypass provides a “Mailbox” function to access parameters that have not been pre-defined by the protocol. Using mailbox, any drive parameter can be identified and read. Mailbox can also be used to adjust parameter settings by writing a value to any drive or bypass parameter identified. The following table describes the use of this function.

| Name | Description | BACnet Access Point | |
|-------------------|---|---------------------|---------------------|
| | | Drive node objects | Bypass node objects |
| Mailbox Parameter | Enter the number of the drive group and parameter number using the format: (group #) * 256 + parameter #. Example: drive parameter 28.01 is entered as (28 * 256) + 1 = 7169 | AV25 | AV13 |
| Mailbox Data | Contains the parameter value after a read, or enter the desired parameter value for a write. | AV26 | AV14 |
| Mailbox Read | A binary value triggers a read – the value of the “Mailbox Parameter” appears in “Mailbox data”. | BV15 | BV21 |
| Mailbox Write | A binary value triggers a write – the drive value for the “Mailbox Parameter” changes to the value in “Mailbox data”. | BV16 | BV22 |

Note: You must read and write mailbox values using the drive's internal scaling. For example, the parameter 28.72 Freq acceleration time 1, has a resolution of 0.1 sec., which means that, in the drive (and in the mailbox), the value 1 = 0.1 seconds. So, a mailbox value of 10 translates to 1.0 second, a mailbox value of 300 translates to 30.0 seconds, etc. Refer to the [Parameter list and descriptions](#) section for each parameter's resolution and units of measure.

Note: Relay status feedback occurs without configuration as defined below.

| Drive Parameter | | Value | Setting | BACnet |
|--------------------|---------------|---------------------|---------|-----------|
| 10.21 RO Status | RO 1-3 STATUS | Relay 1...3 status. | N/A | B10...B12 |
| 15.04 RO/DO Status | RO 4-5 STATUS | Relay 4...6 status. | N/A | B13...B14 |
| | DOI STATUS | | N/A | B15 |

Protocol Implementation Conformance Statement (PICS) - Drive

PICS summary

BACnet Standard Device Profile. This version of the bypass BACnet fully conforms to the 'Application-Specific Controller' standard device profile (B-ASC).

Services Supported. The following services are supported by the bypass:

- I-Am (Response to Who-Is, also broadcast on power-up and other reset)
- I-Have (Response to Who-Has)
- ReadProperty
- WriteProperty
- DeviceCommunicationControl
- ReinitializeDevice

Data Link Layer. The ACH580 implements MS/TP (Master) Data Link Layer. All standard MS/TP baud rates are supported (9600, 19200, 38400 and 76800).

MAC ID / Device Object Instance. The bypass supports separate MAC ID and Device Object Instance parameters:

- Set the MAC ID using bypass parameter 5803. Default: 5803 = 1.
- Set the Device Object Instance using drive parameters 5840 and 53.17. Default: Both 5840 and 5899 = 0, which causes the MAC ID to "double" as the Device Object Instance. For Device Object Instance values not linked to the MAC ID, set ID values using 5840 and 5899 = a value other than 0.
 - For IDs in the range of 1 to 65,535: Parameter 5840 sets the ID directly (5317 must be 0). For example, the following values set the ID to 49134: 5840 = 49134 and 5899 = 0.
 - For IDs > 65,535: The ID equals 5311's value plus 10,000 times 5317's value. For example, the following values set the ID to 71,234: 5840 = 1234 and 5899 = 7.

Max Info Frames Property. Configure the Device Object Max Info Frames property using bypass parameter 5842. Default: 5312 = 1.

Max Master Property. Configure the Device Object Max Master property using drive parameter 5313. Default: 5841 = 127.

MS/TP token counter

Parameter 5813 stores the count of MS/TP tokens passed to this drive.

Object definitions – Drive

Object/property support matrix

The following table summarizes the Object Types/Properties Supported:

| Property | Object Type | | | | | | | | |
|------------------------|-------------|--------------|---------------|----------------|--------------|---------------|----------------|-----------------------------|-----------------|
| | Device | Binary Input | Binary Output | Binary Value | Analog Input | Analog Output | Analog Value | Multistate Value Properties | Loop Properties |
| Object Identifier | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Object Name | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Object Type | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| System Status | ✓ | | | | | | | | |
| Vendor Name | ✓ | | | | | | | | |
| Vendor Identifier | ✓ | | | | | | | | |
| Model Name | ✓ | | | | | | | | |
| Firmware Revision | ✓ | | | | | | | | |
| Appl Software Revision | ✓ | | | | | | | | |
| Protocol Version | ✓ | | | | | | | | |
| Protocol Revision | ✓ | | | | | | | | |
| Services Supported | ✓ | | | | | | | | |
| Object Types Supported | ✓ | | | | | | | | |
| Object List | ✓ | | | | | | | | |
| Max APDU Length | ✓ | | | | | | | | |
| Segmentation Support | ✓ | | | | | | | | |
| APDU Timeout | ✓ | | | | | | | | |
| Number APDU Retries | ✓ | | | | | | | | |
| Max Master | ✓ | | | | | | | | |
| Max Info Frames | ✓ | | | | | | | | |
| Device Address Binding | ✓ | | | | | | | | |
| Database Revision | ✓ | | | | | | | | |
| Present Value | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Status Flags | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Event State | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Out-of-Service | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Units | | | | | ✓ | ✓ | ✓ | | |
| Priority Array | | | ✓ | ✓ ¹ | | ✓ | ✓ ¹ | | |
| Relinquish Default | | | ✓ | ✓ ¹ | | ✓ | ✓ ¹ | | |
| Polarity | | ✓ | ✓ | | | | | | |
| Active Text | | ✓ | ✓ | ✓ | | | | | |
| Inactive Text | | ✓ | ✓ | ✓ | | | | | |
| Property List | ✓ | ✓ | ✓ | | | ✓ | ✓ | ✓ | ✓ |

| Property | Object Type | | | | | | | | |
|---------------------------------------|-------------|--------------|---------------|--------------|--------------|---------------|--------------|-----------------------------|-----------------|
| | Device | Binary Input | Binary Output | Binary Value | Analog Input | Analog Output | Analog Value | Multistate Value Properties | Loop Properties |
| Local Date | ✓ | | | | | | | | |
| Local Time | ✓ | | | | | | | | |
| Active COV Subscriptions ² | ✓ | | | | | | | | |
| COV Increment ² | | | | | | ✓ | ✓ | | |
| Number of States | | | | | | | | ✓ | |
| State Text | | | | | | | | ✓ | |
| Output Units | | | | | | | | | ✓ |
| Manipulated Variable Reference | | | | | | | | | ✓ |
| Controlled Variable Reference | | | | | | | | | ✓ |
| Controlled Variable Value | | | | | | | | | ✓ |
| Controlled Variable Units | | | | | | | | | ✓ |
| Setpoint Reference | | | | | | | | | ✓ |
| Action | | | | | | | | | ✓ |
| Proportional Constant | | | | | | | | | ✓ |
| Proportional Constant Units | | | | | | | | | ✓ |
| Integral Constant | | | | | | | | | ✓ |
| Integral Constant Units | | | | | | | | | ✓ |
| Derivative Constant | | | | | | | | | ✓ |
| Derivative Constant Units | | | | | | | | | ✓ |
| Derivative Filter Time | | | | | | | | | ✓ |
| Priority for Writing | | | | | | | | | ✓ |
| Object Name ID | | | | | | | | | ✓ |

1) For commandable values only.

2) If COV supported.

Binary input object instance summary – Drive

The following table summarizes the Binary Input Objects supported:

| Instance ID | Object Name | Description | Active/ Inactive Text | Present Value Access Type |
|-------------|-------------|---|--------------------------|------------------------------|
| BI0 | RO 1 ACT | This object indicates the status of Relay Output 1. | ON/OFF | R |
| BI1 | RO 2 ACT | This object indicates the status of Relay Output 2. | ON/OFF | R |
| BI2 | RO 3 ACT | This object indicates the status of Relay Output 3. | ON/OFF | R |
| BI3 | RO 4 ACT | This object indicates the status of Relay Output 4 (requires CMOD-01 or CHD-01 option). | ON/OFF | R |

| Instance ID | Object Name | Description | Active/ Inactive Text | Present Value Access Type |
|-------------|-------------|---|-----------------------|---------------------------|
| BI4 | RO 5 ACT | This object indicates the status of Relay Output 5 (requires CMOD-01 or CHD-01 option). | ON/OFF | R |
| BI5 | DO 1 ACT | This object indicates the status of Relay Output 6 (requires CMOD-01 option). | ON/OFF | R |
| BI6 | DI 1 ACT | This object indicates the status of Digital Input 1. | ON/OFF | R |
| BI7 | DI 2 ACT | This object indicates the status of Digital Input 2. | ON/OFF | R |
| BI8 | DI 3 ACT | This object indicates the status of Digital Input 3. | ON/OFF | R |
| BI9 | DI 4 ACT | This object indicates the status of Digital Input 4. | ON/OFF | R |
| BI10 | DI 5 ACT | This object indicates the status of Digital Input 5. | ON/OFF | R |
| BI11 | DI 6 ACT | This object indicates the status of Digital Input 6. | ON/OFF | R |

Note: For Present Value Access Types, R = Read-only, W = Writeable, C = Commandable. Commandable values support priority arrays and relinquish defaults.

Binary output object instance summary – Drive

The following table summarizes the Binary Output Objects supported:

| Instance ID | Object Name | Description | Active/ Inactive Text | Present Value Access Type |
|-------------|-------------|--|-----------------------|---------------------------|
| BO0 | RO1 CMD | This object controls the output state of Relay 1. This control requires that drive parameter 10.24 value = 62 (RO/DIO CONTROL WORD). | ON/OFF | C |
| BO1 | RO2 CMD | This object controls the output state of Relay 1. This control requires that drive parameter 10.27 value = 62 (RO/DIO control word). | ON/OFF | C |
| BO2 | RO3 CMD | This object controls the output state of Relay 1. This control requires that drive parameter 10.30 value = 62 (RO/DIO control word). | ON/OFF | C |
| BO3 | RO4 CMD | This object controls the output state of Relay 1. This control requires that drive parameter 15.07 value = 62 (RO/DIO control word). Also requires CMOD-01 option. | ON/OFF | C |

| Instance ID | Object Name | Description | Active/Inactive Text | Present Value Access Type |
|-------------|-------------|---|----------------------|---------------------------|
| BO4 | RO5 CMD | This object controls the output state of Relay 1. This control requires that drive parameter 15.10 value = 62 (RO/DIO control word). Also requires CMOD-01 option. | ON/OFF | C |
| BO5 | RO6 CMD | This object controls the output state of Digital Output 1. This control requires that drive parameter 15.23 value = 62 (RO/DIO control word). Also requires CMOD-01 option. | ON/OFF | C |

Note: For Present Value Access Types, R = Read-only, W = Writeable, C = Commandable. Commandable values support priority arrays and relinquish defaults.

Binary value object instance summary – Drive

The following table summarizes the Binary Value Objects supported:

| Instance ID | Object Name | Description | Active/Inactive Text | Present Value Access Type |
|-------------|---------------|---|----------------------|---------------------------|
| BV0 | RUN/STOP ACT | This object indicates the drive Run Status, regardless of the control source. | RUN/STOP | R |
| BV1 | FWD/REV ACT | This object indicates the motor's rotation direction, regardless of the control source. | REV/FWD | R |
| BV2 | FAULT ACT | this object indicates the drive's fault status. | FAULT/OK | R |
| BV3 | EXT 1/2 ACT | This object indicates which control source is active: External 1 or External 2. | EXT2/EXT1 | R |
| BV4 | HAND/AUTO ACT | This object indicates whether the drive is under Hand or Auto control. | HAND/AUTO | R |
| BV5 | WARNING ACT | This object indicates the drive's warning status. | WARNING/OK | R |
| BV7 | DRIVE READY | This object indicates whether the drive is ready to accept a run command. | READY/NOT READY | R |
| BV8 | AT SETPOINT | This object indicates whether the drive is at the commanded setpoint. | YES/NO | R |
| BV9 | ENABLE ACT | This object indicates the System Enable command status (the combination of all Run and Start Interlocks), regardless of the control source. | ENABLE/DISABLE | R |

| Instance ID | Object Name | Description | Active/Inactive Text | Present Value Access Type |
|-------------|--------------------|---|----------------------|---------------------------|
| BV10 | RUN/STOP CMD | This object commands a drive start. Control requires bypass parameter 1601 value = comm. | RUN/STOP | C |
| BV11 | FWD/REV CMD | This object commands a motor rotation direction change. Control requires 20.11 = request (0) and drive configured to receive the reference over the fieldbus. | REV/FWD | C |
| BV12 | RUN PERMISSIVE CMD | This object commands Run Permissive. Control requires parameter 1601 value = COMM. | ENABLE/DISABLE | C |
| BV13 | EXT 1/2 CMD | This object selects EXT1 or EXT2 as the active control source. Control requires parameter 19.11 value = EFB MCW bit 11 (32). | EXT2/EXT1 | C |
| BV14 | FAULT RESET | This object resets a faulted drive. The command is rising-edge triggered. | RESET/NO | C |
| BV15 | MBOX READ | This object reads a parameter (defined by AV25 MBOX PARAM) and returns it in AV26 MBOX DATA. | READ/RESET | W |
| BV16 | MBOX WRITE | This object writes the data value specified by AV26, MBOX DATA, to a parameter (defined by AV25, MBOX PARAM). | WRITE/RESET | W |
| BV17 | LOCK PANEL | This object locks the panel and prevents parameter changes. The corresponding drive parameter is 96.02. | LOCK/UNLOCK | W |
| BV18 | CTL OVERRIDE CMD | This object commands the drive into BACnet Control Override. In this mode, BACnet takes drive control from the normal source. However, the control panel's HAND mode has priority over BACnet Control Override. | ON/OFF | C |
| BV19 | CTL OVERRIDE ACT | This object indicates whether the drive is in BACnet Control Override. (See BV18.) | ON/OFF | R |
| BV20 | START INTERLOCK 1 | This object commands start interlock1. Control requires bypass parameter 1603 value = COMM. | ENABLE/DISABLE | C |
| BV21 | START INTERLOCK 2 | This object commands start interlock1. Control requires bypass parameter 1604 value = COMM. | ENABLE/DISABLE | C |
| BV24 | STARTED MON | This object indicates the drive's started status. | START/NO START | R |

| Instance ID | Object Name | Description | Active/Inactive Text | Present Value Access Type |
|-------------|--------------|---|----------------------|---------------------------|
| BV25 | STO MON | This object indicates the drive's Safe Torque Off status. | ON/OFF | R |
| BV26 | UL MON | This object indicates the drive's underload status. | ON/OFF | R |
| BV27 | OL MON | This object indicates the drive's overload status. | ON/OFF | R |
| BV28 | MTR HTG CMD | This object activates the drive's motor pre-heating function. | ON/OFF | W |
| BV29 | MTR HG MON | This object indicates the drive's motor pre-heating status. | ON/OFF | R |
| BV30 | USER0 MON | This object indicates the drive's User Bit0 status. | ON/OFF | R |
| BV31 | USER1 MON | This object indicates the drive's User Bit1 status. | ON/OFF | R |
| BV32 | USER2 MON | This object indicates the drive's User Bit2 status. | ON/OFF | R |
| BV33 | USER3 MON | This object indicates the drive's User Bit3 status. | ON/OFF | R |
| BV34 | USER0 CMD | This object activates the drive's User Bit0. | ON/OFF | C |
| BV35 | USER1 CMD | This object activates the drive's User Bit1. | ON/OFF | C |
| BV36 | USER2 CMD | This object activates the drive's User Bit2. | ON/OFF | C |
| BV37 | USER3 CMD | This object activates the drive's User Bit3. | ON/OFF | C |
| BV39 | PAR SAV CMD | This object triggers the drive to save parameters to non-volatile memory. | SAVE/DONE | W |
| BV40 | PID SET2 SEL | This object selects which PID gain set is active. | SET2/SET1 | W |

Note: For Present Value Access Types, R = Read-only, W = Writeable, C = Commandable. Commandable values support priority arrays and relinquish defaults.

Analog input object instance summary – Drive

The following table summarizes the Analog Input Objects supported:

| Instance ID | Object Name | Description | Units | Present Value Access Type |
|-------------|----------------|---|---------|---------------------------|
| AI0 | ANALOG INPUT 1 | This object indicates the value of Analog Input 1. The corresponding drive parameter is 12.101. | Percent | R |
| AI1 | ANALOG INPUT 2 | This object indicates the value of Analog Input 2. The corresponding drive parameter is 12.102. | Percent | R |

Note: For Present Value Access Types, R = Read-only, W = Writeable, C = Commandable. Commandable values support priority arrays and relinquish defaults.

Analog output object instance summary – Drive

The following table summarizes the Analog Output Objects supported:

| Name | Description | BACnet Access Point |
|-------------------|---|---------------------|
| Mailbox Parameter | Enter the number of the drive group and parameter number using the format: (group #) * 256 + parameter #. Example: drive parameter 28.01 is entered as (28 * 256) + 1 = 7169 | AV25 |
| Mailbox Data | Contains the parameter value after a read, or enter the desired parameter value for a write. | AV26 |
| Mailbox Read | A binary value triggers a read – the value of the “Mailbox Parameter” appears in “Mailbox data”. | BV15 |
| Mailbox Write | A binary value triggers a write – the drive value for the “Mailbox Parameter” changes to the value in “Mailbox data”. | BV16 |

Note: For Present Value Access Types, R = Read-only, W = Writeable, C = Commandable. Commandable values support priority arrays and relinquish defaults.

Analog value object instance summary – Drive

The following table summarizes the Analog Value Objects supported:

| Instance ID | Object Name | Description | Units | Present Value Access Type |
|-------------|--------------|--|-----------|---------------------------|
| AV0 | OUTPUT SPEED | This object indicates the calculated motor speed in RPM. The corresponding drive parameter is 01.01. | RPM | R |
| AV1 | OUTPUT FREQ | This object indicates the output frequency applied to the motor in Hz. The corresponding drive parameter is 01.06. | Hertz | R |
| AV2 | DC BUS VOLT | This object indicates the drive's DC bus voltage level. The corresponding drive parameter is 01.11. | Volts | R |
| AV3 | OUTPUT VOLT | This object indicates the AC output voltage applied to the motor. The corresponding drive parameter is 01.13. | Volts | R |
| AV4 | CURRENT | This object indicates the measured output current. The corresponding drive parameter is 01.07. | Amps | R |
| AV5 | TORQUE | This object indicates the calculated motor output torque as a percentage of nominal torque. The corresponding drive parameter is 01.10. | Percent | R |
| AV6 | POWER | This object indicates the measured output power in kW. The corresponding drive parameter is 01.14. | Kilowatts | R |
| AV7 | DRIVE TEMP | This object indicates the measured heatsink temperature expressed as percent where: 0% = 0°C (32°F) 100% = Fault limit The corresponding drive parameter is 05.11 | Percent | R |
| AV8 | KWH (R) | This object indicates, in kW hours, the drive's accumulated energy usage since the last reset. The value can be reset to zero. The corresponding drive parameter is 01.58. | kWh | W |
| AV9 | KWH (NR) | This object indicates the drive's accumulated energy usage in MW hours. The value cannot be reset. | MWh | R |
| AV10 | PRC PID FBCK | This object is the Process PID feedback signal. The corresponding drive parameter is 40.97. | Percent | R |
| AV11 | PRC PID DEV | This object is the Process PID output signal's deviation from its setpoint. The corresponding drive parameter is 40.99. | Percent | R |
| AV12 | EXT PID FBCK | This object is the External PID feedback signal. Calculated as (drive parameter 71.02) / drive parameter 71.14). | Percent | R |

| Instance ID | Object Name | Description | Units | Present Value Access Type |
|-------------|--------------|---|---------|---------------------------|
| AV13 | EXT PID DEV | This object is the External PID output signal's deviation from its setpoint. Calculated as (drive parameter 71.04) / drive parameter 71.14). | Percent | R |
| AV14 | RUN TIME (R) | This object indicates, in hours, the drive's accumulated run time since the last reset. The value can be reset to zero. The corresponding drive parameter is 05.03. | Hours | W |
| AV15 | MOTOR TEMP | This object indicates the drive's motor temperature, as set up in parameter Group 35. The corresponding drive parameter is 35.02 or 35.03 if either enabled or 35.01. | °C | R |
| AV16 | INPUT REF 1 | This object sets 03.09. Group 22 must be configured to make use of EFB ref 1. | Percent | C |
| AV17 | INPUT REF 2 | <ul style="list-style-type: none"> This object sets 03.10. Group 22 must be configured to make use of EFB ref 2. | Percent | C |
| AV18 | LAST FLT | This object indicates the most recent fault entered in the drive's fault log. | None | R |
| AV19 | PREV FLT 1 | This object indicates the second most recent fault entered in the drive's fault log. | None | R |
| AV20 | PREV FLT 2 | This object indicates the third most recent fault entered in the drive's fault log. | None | R |
| AV21 | AO 1 ACT | This object indicates Analog Output 1's level. The corresponding drive parameter is 12.11. Units depend on drive parameter 12.15. | mA or V | R |
| AV22 | AO 2 ACT | This object indicates Analog Output 2's level. The corresponding drive parameter is 12.22. Units depend on drive parameter 12.25. | mA or V | R |
| AV23 | ACCEL1 TIME | This object sets the Ramp1 acceleration time. The corresponding drive parameter is 28.72 if 99.04 value = Scalar; 23.12 if 99.04 value = Vector. | Seconds | W |
| AV24 | DECEL1 TIME | This object sets the Ramp1 deceleration time. The corresponding drive parameter is 28.73 if 99.04 value = Scalar; 23.13 if 99.04 value = Vector. | Seconds | W |
| AV25 | MBOX PARAM | This object defines the parameter to be read or written to by the mailbox function. See BV15 and BV16. | None | W |
| AV26 | MBOX DATA | This object holds the mailbox function's parameter value – a value that was read, or is to be written. See BV15 and BV16. | None | W |
| AV29 | FRQ OUT MIN | This object indicates the drive's minimum output frequency. | Amps | R |
| AV30 | FRQ OUT MAX | This object indicates the drive's maximum output frequency. | Percent | R |

| Instance ID | Object Name | Description | Units | Present Value Access Type |
|-------------|-----------------|---|---------|---------------------------|
| AV31 | SPD OUT PCT | This object indicates the drive's output speed, as a percentage of rated. | Percent | R |
| AV32 | CUR OUT PCT | This object indicates the drive's output current, as a percentage of rated. | Percent | R |
| AV33 | MAX CURRENT | This object indicates the drive's maximum output current. | Percent | R |
| AV40 | PRC PID FBK RD | This object indicates the drive's process PID feedback. | Percent | R |
| AV41 | PRC PID STPT RD | This object indicates the drive's process PID setpoint. | Percent | R |
| AV42 | PRC PID STPT WR | This object sets the drive's process PID setpoint. | Percent | C |
| AV43 | PRC PID FBK WR | This object sets the drive's process PID feedback. | Percent | C |
| AV44 | PRC PID OUT | This object indicates the drive's process PID output. | Percent | R |
| AV45 | PID SET1 GAIN | This object sets the drive's process PID set1 proportional gain. | None | W |
| AV46 | PID SET1 ITIME | This object sets the drive's process PID set1 integration time. | Seconds | W |
| AV49 | PRC PID DEV MON | This object indicates the drive's process PID deviation. | Percent | R |
| AV53 | PID SET2 GAIN | This object sets the drive's process PID set2 proportional gain. | None | W |
| AV54 | PID SET2 ITIME | This object sets the drive's process PID set2 integration time. | Seconds | W |
| AV55 | EXT PID FBK RD | This object indicates the drive's external PID feedback. | Percent | R |
| AV56 | EXT PID STPT RD | This object indicates the drive's external PID setpoint. | Percent | R |
| AV59 | EXT PID OUT | This object indicates the drive's external PID output. | Percent | R |
| AV60 | EXT PID PGAIN | This object sets the drive's external PID proportional gain. | None | W |
| AV61 | EXT PID ITIME | This object sets the drive's external PID integration time. | Seconds | W |
| AV64 | EXT PID DEV MON | This object indicates the drive's external PID deviation. | Percent | R |
| AV130 | KWH CUR HR | This object indicates the drive's energy usage for the current hour. | kWh | R |
| AV131 | KWH PRV HR | This object indicates the drive's energy usage for the previous hour. | kWh | R |
| AV132 | KWH CUR DAY | This object indicates the drive's energy usage for the current day. | kWh | R |
| AV133 | KWH PRV DAY | This object indicates the drive's energy usage for the previous day. | kWh | R |

Multistate Value Objects

The following table summarizes the Multistate Value Objects supported

| Instance ID | Object Name | Description |
|-------------|------------------|---|
| MSV0 | HAND AUTO REF | This object indicates the drive's Hand/Off/Auto status. |
| MSV1 | ACTIVE FAULT 1 | This object indicates the drive's most recent fault. |
| MSV2 | ACTIVE FAULT 2 | This object indicates the drive's second most recent fault. |
| MSV3 | ACTIVE FAULT 3 | This object indicates the drive's third most recent fault. |
| MSV4 | ACTIVE WARNING 1 | This object indicates the drive's most recent warning. |
| MSV5 | ACTIVE WARNING 2 | This object indicates the drive's second most recent warning. |
| MSV6 | ACTIVE WARNING 3 | This object indicates the drive's third most recent warning. |

Loop Objects

The following table summarizes the Multistate Value Objects supported

| Instance ID | Object Name | Description |
|-------------|-------------|--|
| LOOP0 | LOOP SET 1 | This object controls the drive's first loop object. |
| LOOP1 | LOOP SET 2 | This object controls the drive's second loop object. |

BACnet Protocol Implementation Conformance Statement

For the BACnet Protocol Implementation Conformance Statement, please see ABB document 3AXD10000768421.

Object definitions – Bypass

Object/property support matrix – Bypass

The following table summarizes the Object Types/Properties Supported:

| Property | Object Type | | | | | | |
|------------------------|-------------|--------------|---------------|--------------|--------------|---------------|--------------|
| | Device | Binary Input | Binary Output | Binary Value | Analog Input | Analog Output | Analog Value |
| Object Identifier | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Object Name | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Object Type | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Description | ✓ | | | | | | |
| System Status | ✓ | | | | | | |
| Vendor Name | ✓ | | | | | | |
| Vendor Identifier | ✓ | | | | | | |
| Model Name | ✓ | | | | | | |
| Firmware Revision | ✓ | | | | | | |
| Appl Software Revision | ✓ | | | | | | |
| Protocol Version | ✓ | | | | | | |
| Protocol Revision | ✓ | | | | | | |
| Services Supported | ✓ | | | | | | |
| Object Types Supported | ✓ | | | | | | |
| Object List | ✓ | | | | | | |
| Max APDU Length | ✓ | | | | | | |
| Segmentation Support | ✓ | | | | | | |
| APDU Timeout | ✓ | | | | | | |
| Number APDU Retries | ✓ | | | | | | |
| Max Master | ✓ | | | | | | |
| Max Info Frames | ✓ | | | | | | |
| Device Address Binding | ✓ | | | | | | |
| Database Revision | ✓ | | | | | | |
| Present Value | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Status Flags | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Event State | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Out-of-Service | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Units | | | | | ✓ | ✓ | ✓ |
| Priority Array | | | ✓ | ✓* | | ✓ | ✓* |
| Relinquish Default | | | ✓ | ✓* | | ✓ | ✓* |
| Polarity | | ✓ | ✓ | | | | |
| Active Text | | ✓ | ✓ | ✓ | | | |
| Inactive Text | | ✓ | ✓ | ✓ | | | |

1) For commandable values only.

BACnet input object instance summary – Bypass

The following table summarizes the Binary Input Objects supported:

| Instance ID | Object Name | Description | Active/ Inactive Text | Present Value Access Type |
|-------------|-------------|---|--------------------------|------------------------------|
| BI0 | RO 1 ACT | This object indicates the status of bypass Relay Output 1. | ON/OFF | R |
| BI1 | RO 2 ACT | This object indicates the status of bypass Relay Output 2. | ON/OFF | R |
| BI2 | RO 3 ACT | This object indicates the status of bypass Relay Output 3. | ON/OFF | R |
| BI3 | RO 4 ACT | This object indicates the status of bypass Relay Output 4. | ON/OFF | R |
| BI4 | RO 5 ACT | This object indicates the status of bypass Relay Output 5. | ON/OFF | R |
| BI5 | DI 1 ACT | This object indicates the status of bypass Digital Input 1. | ON/OFF | R |
| BI6 | DI 2 ACT | This object indicates the status of bypass Digital Input 2. | ON/OFF | R |
| BI7 | DI 3 ACT | This object indicates the status of bypass Digital Input 3. | ON/OFF | R |
| BI8 | DI 4 ACT | This object indicates the status of bypass Digital Input 4. | ON/OFF | R |
| BI9 | DI 5 ACT | This object indicates the status of bypass Digital Input 5. | ON/OFF | R |
| BI10 | DI 6 ACT | This object indicates the status of bypass Digital Input 6. | ON/OFF | R |

Note: For Present Value Access Types, R = Read-only, W = Writeable, C = Commandable. Commandable values support priority arrays and relinquish defaults.

BACnet output object instance summary – Bypass

The following table summarizes the Binary Output Objects supported:

| Instance ID | Object Name | Description | Active/ Inactive Text | Present Value Access Type |
|-------------|-------------|---|--------------------------|------------------------------|
| BO0 | RO1 COMMAND | This object controls the output state of bypass Relay Output 1. This control requires that parameter 1401 value = COMM. | ON/OFF | C |
| BO1 | RO2 COMMAND | This object controls the output state of bypass Relay Output 2. This control requires that parameter 1404 value = COMM. | ON/OFF | C |
| BO2 | RO3 COMMAND | This object controls the output state of bypass Relay Output 3. This control requires that parameter 1407 value = COMM. | ON/OFF | C |

| Instance ID | Object Name | Description | Active/ Inactive Text | Present Value Access Type |
|-------------|-------------|--|-----------------------|---------------------------|
| BO3 | RO4 COMMAND | This object controls the output state of bypass Relay Output 4. This control requires that parameter 1410 value = COMM (also requires OREL-01 option). | ON/OFF | C |
| BO4 | RO5 COMMAND | This object controls the output state of bypass Relay Output 5. This control requires that parameter 1413 value = COMM (also requires OREL-01 option). | ON/OFF | C |

Note: For Present Value Access Types, R = Read-only, W = Writeable, C = Commandable. Commandable values support priority arrays and relinquish defaults.

BACnet value object instance summary – Bypass

The following table summarizes the Binary Value Objects supported:

| Instance ID | Object Name | Description | Active/ Inactive Text | Present Value Access Type |
|-------------|----------------|---|-----------------------|---------------------------|
| BV0 | SYS RUN ACT | This Object indicates the system run status regardless of the control source. | RUN/STOP | R |
| BV1 | SYST START ACT | This Object indicates the system started status regardless of the control source. | START/NO START | R |
| BV2 | BYP FLT ACT | This Object indicates the bypass fault status. | FAULT/OK | R |
| BV3 | SYS FLT ACT | This Object indicates the system fault status. | FAULT/OK | R |
| BV4 | SYSTEM MODE | This Object indicates if the bypass or the drive is controlling the motor. | BYPASS/ DRIVE | R |
| BV5 | WARNING ACT | This Object indicates the bypass warning status. | WARNING/OK | R |
| BV6 | BYP RUN ACT | This Object indicates the bypass run status regardless of the control source. | RUN/STOP | R |
| BV7 | READY TO RUN | This Object indicates whether the system is ready to receive a run command. | READY/NO READY | R |
| BV8 | UNDERLOAD | This Object indicates whether the system is in an underload condition. | YES/NO | R |
| BV9 | ENABLE ACT | This Object indicates the System Enable command status (the combination of all Run and Start Interlocks), regardless of the control source. | ENABLE/ DISABLE | R |

| Instance ID | Object Name | Description | Active/ Inactive Text | Present Value Access Type |
|-------------|--------------------|--|-----------------------|---------------------------|
| BV10 | RUN/STOP CMD | This Object commands a system start. This requires bypass parameter 1601 value = COMM for BACnet to control. | RUN/ STOP | C |
| BV11 | OVERRIDE CMD | This Object commands the system to an override 2 condition. This requires bypass parameter 1701 value = COMM for BACnet to control. | YES/NO | C |
| BV12 | RUN PERMISSIVE CMD | This Object commands the system Run Permissive. This requires bypass parameter 1602 value = COMM for BACnet to control. | ENABLE/ DISABLE | C |
| BV13 | OVERRIDE ACT | This Object indicates if override 1 or override 2 is active regardless of the control source. | YES/NO | R |
| BV14 | FAULT RESET | This Object resets a faulted bypass. This requires bypass parameter 1607 value = COMM for BACnet to control. | RESET/ NO | C |
| BV15 | START INTERLOCK 1 | This Object commands the system Start Interlock 1. This requires bypass parameter 1603 value = COMM for BACnet to control. | ENABLE/ DISABLE | C |
| BV16 | START INTERLOCK 2 | This Object commands the system Start Interlock 2. This requires bypass parameter 1604 value = COMM for BACnet to control. | ENABLE/ DISABLE | C |
| BV17 | START INTERLOCK 3 | This Object commands the system Start Interlock 3. This requires bypass parameter 1605 value = COMM for BACnet to control. | ENABLE/ DISABLE | C |
| BV18 | START INTERLOCK 4 | This Object commands the system Start Interlock 4. This requires bypass parameter 1606 value = COMM for BACnet to control. | ENABLE/ DISABLE | C |
| BV19 | PAR LOCK | When switched to locked prevents parameter changes from the panel. | LOCK / UNLOCK | W |
| BV20 | CTL OVERRIDE CMD | Commands the bypass into BACnet Control Override. In this mode, BACnet takes the bypass control from the normal source. However, the panel's HAND mode still has priority. | ON / OFF | C |
| BV21 | MBOX READ | This object reads a parameter (defined by AV13 MBOX PARAM) and returns it in AV14 MBOX DATA | READ / RESET | W |

| Instance ID | Object Name | Description | Active/ Inactive Text | Present Value Access Type |
|-------------|-------------|---|-----------------------|---------------------------|
| BV22 | MBOX WRITE | This object writes the data value specified by AV14, MBOX DATA, to a parameter (defined by AV13, MBOX PARAM). | WRITE / RESET | W |

Note: For Present Value Access Types, R = Read-only, W = Writeable, C = Commandable. Commandable values support priority arrays and relinquish defaults.

BACnet analog value object instance summary – Bypass

The following table summarizes the Analog Value Objects supported:

| Instance ID | Object Name | Description | Units | Present Value Access Type |
|-------------|----------------|---|-------|---------------------------|
| AV0 | CURRENT | This Object indicates the measured output current. The corresponding bypass parameter is 0101. | Amps | R |
| AV1 | BYPASS MODE | This Object indicates the Hand/Off/Auto status of the bypass. 0=OFF; 1=HAND; 2=AUTO. | None | R |
| AV2 | BYP RUN DLY | This Object sets the bypass Run delay. The corresponding bypass parameter is 1614 | Secs | W |
| AV3 | LAST FLT | This Object indicates the last fault recorded by the bypass. The corresponding bypass parameter is 0401 | None | R |
| AV4 | WARNING WORD 1 | This Object indicates the first warning status word of the bypass. The corresponding bypass parameter is 0308 | None | R |
| AV5 | WARNING WORD 2 | This Object indicates the first warning status word of the bypass. The corresponding bypass parameter is 0309 | None | R |
| AV6 | INPUT VOLT | Average of line-line input voltage | Volts | R |
| AV7 | PCB TEMP | DEG C of bypass board | DEG C | R |
| AV8 | KW HOURS | Bypass mode kilowatt hours | kWh | W |
| AV9 | RUN TIME | Bypass mode run hours | Hrs | W |
| AV10 | A-B VOLT | Phase A - Phase B voltage | Volts | R |
| AV11 | B-C VOLT | Phase B - Phase C voltage | Volts | R |
| AV12 | C-B VOLT | Phase C - Phase A voltage | Volts | R |
| AV13 | MBOX PARAM | This object defines the parameter to be read or written to by the mailbox function. See BV21 and BV22. | None | W |
| AV14 | MBOX DATA | This object holds the mailbox function's parameter value - a value that was read, or is to be written. See BV21 and BV22. | None | W |

Modbus protocol technical data – Drive only

System overview

The Modbus® protocol was introduced by Modicon, Inc. for use in control environments featuring Modicon programmable controllers. Due to its ease of use and implementation, this common PLC language was quickly adopted as a de-facto standard for integration of a wide variety of master controllers and slave devices.

Modbus is a serial, asynchronous protocol. Transactions are half-duplex, featuring a single Master controlling one or more Slaves. While RS232 can be used for point-to-point communication between a single Master and a single Slave, a more common implementation features a multi-drop EIA 485 network with a single Master controlling multiple Slaves. The ABB E-Clipse bypass features EIA 485 for its Modbus physical interface.

RTU

The Modbus specification defines two distinct transmission modes: ASCII and RTU. The ABB E-Clipse Bypass supports RTU only.

Feature summary

The following Modbus function codes are supported by the system.

| Function | Code (Hex) | Description |
|---------------------------------------|------------|--|
| Read Coil Status | 0x01 | Read discrete output status. For the system, the individual bits of the control word are mapped to Coils 1...16. Relay outputs are mapped sequentially beginning with Coil 33 (e.g. RO1=Coil 33). |
| Read Discrete Input Status | 0x02 | Read discrete inputs status. For the system, the individual bits of the status word are mapped to Inputs 1...16 or 1...32, depending on the active profile. Terminal inputs are mapped sequentially beginning with Input 33 (e.g. DI1=Input 33). |
| Read Multiple Holding Registers | 0x03 | Read multiple holding registers. For the system, the entire parameter set is mapped as holding registers, as well as command, status and reference values. |
| Read Multiple Input Registers | 0x04 | Read multiple input registers. For the system, the 2 analog input channels are mapped as input registers 1 and 2. |
| Force Single Coil | 0x05 | Write a single discrete output. For the system, the individual bits of the control word are mapped to Coils 1...16. Relay outputs are mapped sequentially beginning with Coil 33 (e.g. RO1=Coil 33). |
| Write Single Holding Register | 0x06 | Write single holding register. For the system, the entire parameter set is mapped as holding registers, as well as command, status and reference values. |
| Diagnostics | 0x08 | Perform Modbus diagnostics. Subcodes for Query (0x00), Restart (0x01) and Listen Only (0x04) are supported. |
| Force Multiple Coils | 0x0F | Write multiple discrete outputs. For the system, the individual bits of the control word are mapped to Coils 1...16. Relay outputs are mapped sequentially beginning with Coil 33 (e.g. RO1=Coil 33). |
| Write Multiple Holding Registers | 0x10 | Write multiple holding registers. For the system, the entire parameter set is mapped as holding registers, as well as command, status and reference values. |
| Read/Write Multiple Holding Registers | 0x17 | This function combines functions 0x03 and 0x10 into a single command. |

Mapping summary

The following table summarizes the mapping between the system (parameters and I/O) and Modbus reference space. For details, see [Modbus addressing](#) below.

| ACH580 | Modbus Reference | Supported Function Codes |
|--|--------------------------|---|
| <ul style="list-style-type: none"> Control Bits Relay Outputs | Coils(0xxxx) | <ul style="list-style-type: none"> 01 – Read Coil Status 05 – Force Single Coil 15 – Force Multiple Coils |
| <ul style="list-style-type: none"> Status Bits Discrete Inputs | Discrete Inputs(1xxxx) | <ul style="list-style-type: none"> 02 – Read Input Status |
| <ul style="list-style-type: none"> Analog Inputs | Input Registers(3xxxxx) | <ul style="list-style-type: none"> 04 – Read Input Registers |
| <ul style="list-style-type: none"> Parameters Control/Status Words References | Holding Registers(4xxxx) | <ul style="list-style-type: none"> 03 – Read 4X Registers 06 – Preset Single 4X Register 16 – Preset Multiple 4X Registers 23 – Read/Write 4X Registers |

Communication profiles

When communicating by Modbus, the drive supports multiple profiles for control and status information. Bypass parameter 5825 (EFB CTRL PROFILE) selects the profile used. If bypass parameter 1625 = (1) SYSTEM then the drive and bypass profile are fixed ABB BYPASS PROFILE. See section Bypass Overview for ABB BYPASS PROFILE

- ABB DRV LIM – The primary (and default) profile is the ABB DRV LIM profile, which standardizes the control interface with ACH580 and ACH550 drive products. This profile is based on the PROFIBUS interface, and is discussed in detail in the following sections.
- DCU PROFILE – Another profile is called the DCU PROFILE. It extends the control and status interface to 32 bits.
- ABB DRV FULL – This profile standardizes the control interface with the ACH580 and ACH550 drive products. This profile is also based on the PROFIBUS interface, and supports two control word bits not supported by the ABB DRV LIM profile.

Modbus addressing

With Modbus, each function code implies access to a specific Modbus reference set. Thus, the leading digit is not included in the address field of a Modbus message.

Note: The drive supports the zero-based addressing of the Modbus specification. Holding register 400002 is addressed as 0001 in a Modbus message. Similarly, coil 33 is addressed as 0032 in a Modbus message.

Refer again to the [Mapping summary](#) above. The following sections describe, in detail, the mapping to each Modbus reference set.

0xxxx Mapping – Modbus Coils. The drive maps the following information to the 0xxxx Modbus set called Modbus Coils:

- Bit-wise map of the CONTROL WORD (selected using bypass parameter 5825 EFB CTRL PROFILE). The first 32 coils are reserved for this purpose.
- Relay output states, numbered sequentially beginning with coil 00033.

The following table summarizes the 0xxxx reference set:

| Modbus Ref. | Internal Location (All Profiles) | ABB DRV LIM BP Param (5825 = 0) | DCU PROFILE BP Param (5825 = 1) | ABB DRV FULL BP Param (5825 = 2) |
|-------------------|----------------------------------|---------------------------------|---------------------------------|----------------------------------|
| 00001 | CONTROL WORD – Bit 0 | OFF1 ¹ | STOP | OFF1* |
| 00002 | CONTROL WORD – Bit 1 | OFF2 ¹ | START | OFF2* |
| 00003 | CONTROL WORD – Bit 2 | OFF3 ¹ | REVERSE | OFF3* |
| 00004 | CONTROL WORD – Bit 3 | START | N/A | START |
| 00005 | CONTROL WORD – Bit 4 | N/A | RESET | RAMP_OUT_ZERO* |
| 00006 | CONTROL WORD – Bit 5 | RAMP_HOLD* | EXT2 | RAMP_HOLD* |
| 00007 | CONTROL WORD – Bit 6 | RAMP_IN_ZERO* | RUN_DISABLE | RAMP_IN_ZERO* |
| 00008 | CONTROL WORD – Bit 7 | RESET | STPMODE_R | RESET |
| 00009 | CONTROL WORD – Bit 8 | N/A | STPMODE_EM | N/A |
| 00010 | CONTROL WORD – Bit 9 | N/A | STPMODE_C | N/A |
| 00011 | CONTROL WORD – Bit 10 | N/A | RAMP_2 | REMOTE_CMD* |
| 00012 | CONTROL WORD – Bit 11 | EXT2 | RAMP_OUT_0 | EXT2 |
| 00013 | CONTROL WORD – Bit 12 | N/A | RAMP_HOLD | N/A |
| 00014 | CONTROL WORD – Bit 13 | N/A | RAMP_IN_0 | N/A |
| 00015 | CONTROL WORD – Bit 14 | N/A | REQ_LOCALLOCK | N/A |
| 00016 | CONTROL WORD – Bit 15 | N/A | TORQLIM2 | N/A |
| 00017 | CONTROL WORD – Bit 16 | Does not apply | FBLOCAL_CTL | Does not apply |
| 00018 | CONTROL WORD – Bit 17 | | FBLOCAL_REF | |
| 00019 | CONTROL WORD – Bit 18 | | START_DISABLE1 | |
| 00020 | CONTROL WORD – Bit 19 | | START_DISABLE2 | |
| 00021... 00032 | Reserved | Reserved | Reserved | Reserved |
| 00033 | RELAY OUTPUT 1 | Relay Output 1 | Relay Output 1 | Relay Output 1 |
| 00034 | RELAY OUTPUT 2 | Relay Output 2 | Relay Output 2 | Relay Output 2 |
| 00035 | RELAY OUTPUT 3 | Relay Output 3 | Relay Output 3 | Relay Output 3 |
| 00036 | RELAY OUTPUT 4 | Relay Output 4 | Relay Output 4 | Relay Output 4 |
| 00037 | RELAY OUTPUT 5 | Relay Output 5 | Relay Output 5 | Relay Output 5 |
| 00038 | RELAY OUTPUT 6 | Relay Output 6 | Relay Output 6 | Relay Output 6 |

1) = Active low

For the 0xxxx registers:

- Status is always readable.
- Forcing is allowed by user configuration of the drive for fieldbus control.
- Additional relay outputs are added sequentially.

The system supports the following Modbus function codes for coils:

| Function Code | Description |
|---------------|----------------------|
| 01 | Read coil status |
| 05 | Force single coil |
| 15 (0x0F Hex) | Force multiple coils |

1xxxx Mapping – Modbus Discrete Inputs. The drive maps the following information to the 1xxxx Modbus set called Modbus Discrete Inputs:

- Bit-wise map of the STATUS WORD (selected using bypass parameter 5825 EFB CTRL PROFILE). The first 32 inputs are reserved for this purpose.
- Discrete hardware inputs, numbered sequentially beginning with input 33.

The following table summarizes the 1xxxx reference set:

| Modbus Ref. | Internal Location (All Profiles) | ABB DRV BP Param (5825 = 0 or 2) | DCU PROFILE BP Param (5825 = 1) |
|-------------|----------------------------------|----------------------------------|---------------------------------|
| 10001 | STATUS WORD – Bit 0 | RDY_ON | READY |
| 10002 | STATUS WORD – Bit 1 | RDY_RUN | ENABLED |
| 10003 | STATUS WORD – Bit 2 | RDY_REF | STARTED |
| 10004 | STATUS WORD – Bit 3 | TRIPPED | RUNNING |
| 10005 | STATUS WORD – Bit 4 | OFF_2_STA ¹ | ZERO_SPEED |
| 10006 | STATUS WORD – Bit 5 | OFF_3_STA ¹ | ACCELERATE |
| 10007 | STATUS WORD – Bit 6 | SWC_ON_INHIB | DECELERATE |
| 10008 | STATUS WORD – Bit 7 | WARNING | AT_SETPOINT |
| 10009 | STATUS WORD – Bit 8 | AT_SETPOINT | LIMIT |
| 10010 | STATUS WORD – Bit 9 | REMOTE | SUPERVISION |
| 10011 | STATUS WORD – Bit 10 | ABOVE_LIMIT | REV_REF |
| 10012 | STATUS WORD – Bit 11 | EXT2 | REV_ACT |
| 10013 | STATUS WORD – Bit 12 | RUN_ENABLE | PANEL_LOCAL |
| 10014 | STATUS WORD – Bit 13 | N/A | FIELD BUS_LOCAL |
| 10015 | STATUS WORD – Bit 14 | N/A | EXT2_ACT |
| 10016 | STATUS WORD – Bit 15 | N/A | FAULT |
| 10017 | STATUS WORD – Bit 16 | Reserved | WARNING |
| 10018 | STATUS WORD – Bit 17 | Reserved | REQ_MAINT |
| 10019 | STATUS WORD – Bit 18 | Reserved | DIRLOCK |
| 10020 | STATUS WORD – Bit 19 | Reserved | LOCALLOCK |
| 10021 | STATUS WORD – Bit 20 | Reserved | CTL_MODE |
| 10022 | STATUS WORD – Bit 21 | Reserved | Reserved |
| 10023 | STATUS WORD – Bit 22 | Reserved | Reserved |
| 10024 | STATUS WORD – Bit 23 | Reserved | Reserved |
| 10025 | STATUS WORD – Bit 24 | Reserved | Reserved |
| 10026 | STATUS WORD – Bit 25 | Reserved | Reserved |

| Modbus Ref. | Internal Location (All Profiles) | ABB DRV BP Param (5825 = 0 or 2) | DCU PROFILE BP Param (5825 = 1) |
|-------------|----------------------------------|----------------------------------|---------------------------------|
| 10027 | STATUS WORD – Bit 26 | Reserved | REQ_CTL |
| 10028 | STATUS WORD – Bit 27 | Reserved | REQ_REF1 |
| 10029 | STATUS WORD – Bit 28 | Reserved | REQ_REF2 |
| 10030 | STATUS WORD – Bit 29 | Reserved | REQ_REF2EXT |
| 10031 | STATUS WORD – Bit 30 | Reserved | ACK_STARTINH |
| 10032 | STATUS WORD – Bit 31 | Reserved | ACK_OFF_ILCK |
| 10033 | DI1 | DI1 | DI1 |
| 10034 | DI2 | DI2 | DI2 |
| 10035 | DI3 | DI3 | DI3 |
| 10036 | DI4 | DI4 | DI4 |
| 10037 | DI5 | DI5 | DI5 |
| 10038 | DI6 | DI6 | DI6 |

1) = Active low

For the 1xxxx registers:

- Additional discrete inputs are added sequentially.

The system supports the following Modbus function codes for discrete inputs:

| Function Code | Description |
|---------------|-------------------|
| 02 | Read input status |

3xxxx Mapping – Modbus Inputs. The drive maps the following information to the 3xxxx Modbus addresses called Modbus input registers:

- Any user defined analog inputs.

The following table summarizes the input registers:

| Modbus Reference | Internal Location (All Profiles) | Remarks |
|------------------|----------------------------------|--|
| 30001 | AI1 | This register shall report the level of Analog Input 1 (0...100%). |
| 30002 | AI2 | This register shall report the level of Analog Input 2 (0...100%). |

The ACH580 supports the following Modbus function codes for 3xxxx registers:

| Function Code | Description |
|---------------|-------------------------|
| 04 | Read 3xxxx input status |

4xxxxx Register Mapping. The drive maps its parameters and other data to the 4xxxxx holding registers as follows:

- 400001...400099 map to drive control and actual values. These registers are described in the table below.
- 400101...465535 map to drive parameters or bypass parameters. Register addresses that do not correspond to drive parameters are invalid. If there is an

attempt to read or write outside the parameter addresses, the Modbus interface returns an exception code to the controller.

- Register addressing is done as follows:
 - For drive parameters use: $400000 + 256 * \text{parameter group} + \text{parameter index}$.
For example: parameter 22.80 would be mapped to register $400000 + 256 * 22 + 80 = 405712$.
 - For bypass parameters use: $400000 + 256 * (\text{parameter group} + 128) + \text{parameter index}$.
For example: bypass parameter 01.11 would be mapped to register $400000 + 256 * (1 + 128) + 11 = 433035$.

The following table summarizes the 4xxxxx drive control registers 400001...400099 (for 4xxxxx registers above 400099, see the drive parameter list, e.g. 400258 is parameter 0102):

| Modbus Register | | Access | Remarks |
|---------------------|--|--------|--|
| 400001 | ABB DRIVES PROFILE CONTROL WORD | R/W | Maps directly to the profile's Control Word. Supported only if bypass parameter 5825 = 0 or 2 (ABB drive profile). Bypass parameter 5318 holds a copy in hex format. |
| 400002 | Reference 1 | R/W | Range = 0...+20000 (scaled to +maximum reference), or -20000...0 (scaled to -maximum reference). Where: maximum reference is drive parameter 46.01, Speed scaling if control mode is vector or parameter 46.02, Frequency scaling if control mode is scalar. |
| 400003 | Reference 2 | R/W | Range = 0...+10000 (scaled to +maximum reference), or -10000...0 (scaled to -maximum reference). Where: maximum reference is drive parameter 46.01, Speed scaling if control mode is vector or parameter 46.02, Frequency scaling if control mode is scalar. |
| 400004 | ABB DRIVES PROFILE STATUS WORD | R | Maps directly to the profile's STATUS WORD. Supported only if bypass parameter 5825 = 0 or 2 (ABB bypass profile). Bypass parameter 5819 holds a copy in hex format. |
| 400005 ¹ | Actual 1. (select using drive parameter 58.28, EFB act1 type) | R | By default, stores a copy of speed or frequency. Use drive parameter 58.28 to select a different value. |
| 400006 ² | Actual 2. (select using drive parameter 58.29, EFB act2 type) | R | By default, stores nothing. Use drive parameter 58.29 to select a value. |
| 400007 | Actual 3. (select using bypass parameter 58107) | R | By default, stores nothing. Use bypass parameter 5312 to select an actual value for this register. |
| 400008 | Actual 4. (select using bypass parameter 58108) | R | By default, stores nothing. Use bypass parameter 5313 to select an actual value for this register. |
| 400009 | Actual 5. (select using bypass parameter 58109) | R | By default, stores nothing. Use bypass parameter 5314 to select an actual value for this register. |
| 400010 | Actual 6. (select using bypass parameter 58110) | R | By default, stores nothing. Use bypass parameter 5315 to select an actual value for this register. |

| Modbus Register | | Access | Remarks |
|-----------------|--|--------|---|
| 400011 | Actual 7. (select using bypass parameter 58111) | R | By default, stores nothing. Use bypass parameter 5316 to select an actual value for this register. |
| 400012 | Actual 8. (select using bypass parameter 58112) | R | By default, stores nothing. Use bypass parameter 5317 to select an actual value for this register. |
| 400031 | DCU CONTROL WORD LSW | R/W | Maps directly to the Least Significant Word of the DCU profile's CONTROL WORD. Supported only if BP Param 5825 = 1. See bypass parameter 0301. |
| 400032 | DCU CONTROL WORD MSW | R | Maps directly to the Most Significant Word of the DCU profile's CONTROL WORD. Supported only if BP Param 5825 = 1. See bypass parameter 0302. |
| 400033 | DCU STATUS WORD LSW | R | Maps directly to the Least Significant Word of the DCU profile's CONTROL WORD. Supported only if BP Param 5825 = 1. See bypass parameter 0303. |
| 400034 | DCU STATUS WORD MSW | R | Maps directly to the Most Significant Word of the DCU profile's CONTROL WORD. Supported only if BP Param 5825 = 1. See bypass parameter 0304. |
| 400045 | ACH580 REF1 LSW | R/W | Maps directly to the Least Significant Word of the DCU profile's REF1. Supported only if BP Parameter 5825 = 1. See drive parameter 03.09, EFB reference 1. |
| 400046 | ACH580 REF1 MSW | R/W | Maps directly to the Most Significant Word of the DCU profile's REF1. Supported only if BP Parameter 5825 = 1. See drive parameter 03.09, EFB reference 1. |
| 400047 | ACH580 REF2 LSW | R/W | Maps directly to the Least Significant Word of the DCU profile's REF2. Supported only if BP Parameter 5825 = 1. See drive parameter 03.10, EFB reference 2. |
| 400048 | ACH580 REF2 MSW | R/W | Maps directly to the Most Significant Word of the DCU profile's REF2. Supported only if BP Parameter 5825 = 1. See drive parameter 03.10, EFB reference 2. |

- 1) These Modbus Register numbers are selected using drive parameters 58.28 and 58.29.
- 2) These Modbus Register numbers are selected using drive parameters 58.28 and 58.29.

For the Modbus protocol, drive parameters in group 58 report the parameter mapping to 4xxxx Registers.

| BP Param | Description |
|----------|---|
| 58107 | DV IO 7 Specifies the parameter mapped to Modbus register 400007. |
| 58108 | DV IO 8 Specifies the parameter mapped to Modbus register 400008. |
| 58109 | DV IO 9 Specifies the parameter mapped to Modbus register 400009. |
| 58110 | DV IO 10 Specifies the parameter mapped to Modbus register 400010. |
| 58111 | DV IO 11 Specifies the parameter mapped to Modbus register 400011. |
| 58112 | DV IO 12 Specifies the parameter mapped to Modbus register 400012. |
| 5318 | Reserved. |

Except where restricted by the system, all parameters are available for both reading and writing. The parameter writes are verified for the correct value, and for a valid register addresses.

Note: Parameter writes through standard Modbus are always volatile i.e. modified values are not automatically stored to permanent memory. Use bypass parameter 1615 PARAM. SAVE to save all altered values.

The system supports the following Modbus function codes for 4xxxxx registers:

| Function Code | Description |
|---------------|----------------------------------|
| 03 | Read holding 4xxxxx registers |
| 06 | Preset single 4xxxxx register |
| 16 (0x10 Hex) | Preset multiple 4xxxxx registers |
| 23 (0x17 Hex) | Read/write 4xxxxx registers |

Actual values

The contents of the register addresses 400005...400012 are ACTUAL VALUES and are:

- 400005 and 400006 are specified using drive parameters 58.28...58.29
- 400007...400012 are specified using bypass parameters 58107...58112.
- Read-only values containing information on the operation of the drive.
- 16-bit words containing a sign bit and a 15-bit integer.
- When negative values, written as the two's complement of the corresponding positive value.
- Scaled as described earlier in [Actual value scaling](#).

Exception codes

Exception codes are serial communication responses from the drive. The drive supports the standard Modbus exception codes defined below.

| Exception Code | Name | Meaning |
|----------------|----------------------|--|
| 01 | ILLEGAL FUNCTION | Unsupported Command |
| 02 | ILLEGAL DATA ADDRESS | The data address received in the query is not allowable. It is not a defined parameter/group. |
| 03 | ILLEGAL DATA VALUE | A value contained in the query data field is not an allowable value for the ACH580, because it is one of the following: <ul style="list-style-type: none"> • Outside minimum or maximum. limits. • Parameter is read-only. • Message is too long. • Parameter write not allowed when start is active. • Parameter write not allowed when factory macro is selected. |

ABB control profiles technical data – Drive

Overview

ABB drives profile

The ABB Drives profile provides a standard profile that can be used with embedded Modbus. Two implementations of the ABB drives profile are available:

- ABB DRV LIM – The primary (and default) profile is the ABB DRV LIM profile, which standardizes the control interface with ACH580 and ACH550 drive products.
- ABB DRV FULL – This profile standardizes the control interface with the ACH580 and ACH550 drive products.

Except as noted, the following *ABB drives profile* descriptions apply to both implementations.

DCU profile

The DCU profile extends the control and status interface to 32 bits.

Control Word

The CONTROL WORD is the principal means for controlling the bypass from a fieldbus system. The fieldbus master station sends the CONTROL WORD to the system. The drive switches between states according to the bit-coded instructions in the CONTROL WORD. Using the CONTROL WORD (ABB drives profile version) requires that:

- The drive is in remote (REM) control.
- The serial communication channel used is configured to use an ABB control profile. For example, to use the control profile ABB DRV FULL, requires both bypass parameter 9802 COMM PROT SEL = 1 (STD MODBUS), and bypass parameter 5825 EFB CTRL PROFILE = 2 (ABB DRV FULL).

ABB drives profile

The following table and the state diagram later in this sub-section describe the CONTROL WORD content for the ABB Drives Profile.

| ABB Drives Profile (EFB) CONTROL WORD | | | | |
|---------------------------------------|--------------|-------|------------------|---|
| Bit | Name | Value | Commanded State | Comments |
| 0 | OFF1 CONTROL | 1 | READY TO OPERATE | Enter READY TO OPERATE |
| | | 0 | EMERGENCY OFF | Drive ramps to stop according to currently active deceleration ramp (22.13 or 22.15 if control mode is vector. 28.73 or 28.75 if control mode is scalar) Normal command sequence: <ul style="list-style-type: none"> • Enter OFF1 ACTIVE • Proceed to READY TO SWITCH ON, unless other interlocks (OFF2, OFF3) are active. |

| ABB Drives Profile (EFB) CONTROL WORD | | | | |
|---------------------------------------|-------------------------------|-------|---------------------|---|
| Bit | Name | Value | Commanded State | Comments |
| 1 | OFF2 CONTROL | 1 | OPERATING | Continue operation (OFF2 inactive) |
| | | 0 | EMERGENCY OFF | Drive coasts to stop. Normal command sequence: <ul style="list-style-type: none"> • Enter OFF2 ACTIVE • Proceed to SWITCHON INHIBITED |
| 2 | OFF3 CONTROL | 1 | OPERATING | Continue operation (OFF3 inactive) |
| | | 0 | EMERGENCY STOP | Drive stops within in time specified by drive parameter 23.23. Normal command sequence: <ul style="list-style-type: none"> • Enter OFF3 ACTIVE • Proceed to SWITCH ON INHIBITED WARNING! Be sure motor and bypass equipment can be stopped using this mode. |
| 3 | INHIBIT OPERATION | 1 | OPERATION ENABLED | Enter OPERATION ENABLED (Note the Run Permissive signal must be active. See bypass parameter 1601. If 1601 is set to COMM, this bit also actives the Run Permissive signal.) |
| | | 0 | OPERATION INHIBITED | Inhibit operation. Enter OPERATION INHIBITED |
| 4 | Unused (ABB DRV LIM) | | | |
| | RAMP_OUT_ZERO (ABB DRV FULL) | 1 | NORMAL OPERATION | Enter RAMP FUNCTION GENERATOR: ACCELERATION ENABLED |
| | | 0 | RFG OUT ZERO | Force ramp function generator output to Zero. Drive ramps to stop (current and DC voltage limits in force). |
| 5 | RAMP_HOLD | 1 | RFG OUT ENABLED | Enable ramp function. Enter RAMP FUNCTION GENERATOR: ACCELERATOR ENABLED |
| | | 0 | RFG OUT HOLD | Halt ramping (Ramp Function Generator output held) |
| 6 | RAMP_IN_ZERO | 1 | RFG INPUT ENABLED | Normal operation. Enter OPERATING |
| | | 0 | RFG INPUT ZERO | Force Ramp Function Generator input to zero. |
| 7 | RESET | 0=>1 | RESET | Fault reset if an active fault exists (Enter SWITCH-ON INHIBITED). Effective if bypass parameter 1604 = COMM. |
| | | 0 | OPERATING | Continue normal operation |
| 8..9 | Unused | | | |

| ABB Drives Profile (EFB) CONTROL WORD | | | | |
|---------------------------------------|------------------------------|-------|-----------------|---|
| Bit | Name | Value | Commanded State | Comments |
| 10 | Unused (ABB DRV LIM) | | | |
| | REMOTE_CMD (ABB DRV FULL) | 1 | | Fieldbus control enabled. |
| | | 0 | | <ul style="list-style-type: none"> CW ≠ 0 or Ref ≠ 0: Retain last CW and Ref. CW = 0 and Ref = 0: Fieldbus control enabled. Ref and deceleration/acceleration ramp are locked. |
| 11 | EXT CTRL LOC | 1 | EXT2 SELECT | Select external control location 2 (EXT2). Effective if drive parameter 19.11 = EFB MCW bit 11. |
| | | 0 | EXT1 SELECT | Select external control location 1 (EXT1). Effective if drive parameter 19.11 = EFB MCW bit 11. |
| 12...15 | Unused | | | |

DCU profile

The following tables describe the CONTROL WORD content for the DCU profile.

| DCU Profile CONTROL WORD | | | | |
|--------------------------|-------------|-------|-----------------------|---|
| Bit | Name | Value | Command/Req. | Comments |
| 0 | STOP | 1 | Stop | Stops according to either the stop mode parameter or the stop mode requests (bits 7 and 8). |
| | | 0 | (no op) | |
| 1 | START | 1 | Start | Simultaneous STOP and START commands result in a stop command. |
| | | 0 | (no op) | |
| 2 | REVERSE | 1 | Reverse direction | Setting this bit forces the reference to be negative regardless of the sign of the reference sent over fieldbus. If the bit is cleared, the direction is set according to the ABB Drives Profile reference table on page 180. |
| | | 0 | Forward direction | |
| 3 | LOCAL | 1 | Local mode | When the fieldbus sets this bit, it steals control and the bypass moves to fieldbus local control mode. |
| | | 0 | External mode | |
| 4 | RESET | -> 1 | Reset | Edge sensitive. |
| | | other | (no op) | |
| 5 | EXT2 | 1 | Switch to EXT2 | |
| | | 0 | Switch to EXT1 | |
| 6 | RUN_DISABLE | 1 | Run disable | Inverted run permissive. |
| | | 0 | Run permissive on | |
| 7 | STPMODE_R | 1 | Normal ramp stop mode | |
| | | 0 | (no op) | |

| DCU Profile CONTROL WORD | | | | | |
|--------------------------|----------------|-------|---|---|---|
| Bit | Name | Value | Command/Req. | Comments | |
| 8 | STPMODE_EM | 1 | Emergency ramp stop mode | | |
| | | 0 | (no op) | | |
| 9 | STPMODE_C | 1 | Coast stop mode | | |
| | | 0 | (no op) | | |
| 10 | RAMP_2 | 1 | Ramp pair 2 | | |
| | | 0 | Ramp pair 1 | | |
| 11 | RAMP_OUT_0 | 1 | Ramp output to 0 | | |
| | | 0 | (no op) | | |
| 12 | RAMP_HOLD | 1 | Ramp freeze | | |
| | | 0 | (no op) | | |
| 13 | RAMP_IN_0 | 1 | Ramp input to 0 | | |
| | | 0 | (no op) | | |
| 14 | RREQ_LOCALLOC | 1 | Local mode lock | In lock, drive will not switch to local mode. | |
| | | 0 | (no op) | | |
| 15 | TORQLIM2 | 1 | Torque limit pair 2 | | |
| | | 0 | Torque limit pair 1 | | |
| 16 | FBLOCAL_CTL | 1 | FB Local mode for control word requested. | Field bus sets these bits-> drive moves to field bus local control mode of control word or reference (field bus steals the control) | |
| | | 0 | FB Local mode for control word requested. | | |
| 17 | FBLOCAL_REF | 1 | FB Local mode for control word requested. | | |
| | | 0 | FB Local mode for control word requested. | | |
| 18 | START_DISABLE1 | 1 | Start disabled 1 | | Inverted Start Interlock x2. When Start Interlock is missing, the drive doesn't set STARTED status bit. |
| | | 0 | Start enabled 1 on | | |
| 19 | START_DISABLE2 | 1 | Start disabled 2 | | |
| | | 0 | Start enabled 2 on | | |

| DCU Profile CONTROL WORD | | | | |
|--------------------------|-----------|-------|---------------------|---|
| Bit | Name | Value | Function | Comments |
| 16...26 | Reserved | | | |
| 27 | REF_CONST | 1 | Constant speed ref. | These bits are only for supervision purposes. |
| | | 0 | (no op) | |
| 28 | REF_AVE | 1 | Average speed ref. | |
| | | 0 | (no op) | |

| DCU Profile CONTROL WORD | | | | |
|--------------------------|--------------|-------|----------------------------------|----------|
| Bit | Name | Value | Function | Comments |
| 29 | LINK_ON | 1 | Master is detected in link | |
| | | 0 | Link is down | |
| 30 | REQ_STARTINH | 1 | Start inhibit request is pending | |
| | | 0 | Start inhibit request is OFF | |

Status Word

The contents of the STATUS WORD is status information, sent by the drive to the master station.

ABB drives profile

The following table and the state diagram later in this sub-section describe the status word content for the ABB Drives Profile.

| ABB Drives Profile (EFB) STATUS WORD | | | |
|--------------------------------------|--------------|-------|---|
| Bit | Name | Value | Description (Correspond to states/boxes in the state diagram) |
| 0 | RDY_ON | 1 | READY TO SWITCH ON |
| | | 0 | NOT READY TO SWITCH ON |
| 1 | RDY_RUN | 1 | READY TO OPERATE |
| | | 0 | OFF1 ACTIVE |
| 2 | RDY_REF | 1 | OPERATION ENABLED |
| | | 0 | OPERATION INHIBITED |
| 3 | TRIPPED | 0...1 | FAULT |
| | | 0 | No fault |
| 4 | OFF_2_STA | 1 | OFF2 INACTIVE |
| | | 0 | OFF2 ACTIVE |
| 5 | OFF_3_STA | 1 | OFF3 INACTIVE |
| | | 0 | OFF3 ACTIVE |
| 6 | SWC_ON_INHIB | 1 | SWITCH-ON INHIBIT ACTIVE |
| | | 0 | SWITCH-ON INHIBIT NOT ACTIVE |
| 7 | WARNING | 1 | Warning/warning (See Warning listing in the Diagnostics section for details on warnings.) |
| | | 0 | No warning/warning |
| 8 | AT_SETPOINT | 1 | OPERATING. Actual value equals (within tolerance limits) the reference value. |
| | | 0 | Actual value is outside tolerance limits (not equal to reference value). |
| 9 | REMOTE | 1 | Drive control location: REMOTE (EXT1 or EXT2) |
| | | 0 | Drive control location: LOCAL |

| ABB Drives Profile (EFB) STATUS WORD | | | |
|---|--------------------|--------------|---|
| Bit | Name | Value | Description (Correspond to states/boxes in the state diagram) |
| 10 | ABOVE_LIMIT | 1 | Supervised parameter's value \geq supervision high limit. Bit remains "1" until supervised parameter's value < supervision low limit. See group 32, Supervision |
| | | 0 | Supervised parameter's value < supervision low limit. Bit remains "0" until supervised parameter's value > supervision high limit. See group 32, Supervision |
| 11 | EXT CTRL LOC | 1 | External control location 2 (EXT2) selected |
| | | 0 | External control location 1 (EXT1) selected |
| 12 | EXT RUN PERMISSIVE | 1 | External Run Permissive signal received |
| | | 0 | No External Run Permissive signal received |
| 13... 15 | Unused | | |

DCU profile

The following tables describe the STATUS WORD content for the DCU profile.

| DCU Profile STATUS WORD | | | |
|--------------------------------|-------------|--------------|--|
| Bit | Name | Value | Status |
| 0 | READY | 1 | System is ready to receive start command. |
| | | 0 | System is not ready. |
| 1 | ENABLED | 1 | External run permissive signal received. |
| | | 0 | No external run permissive signal received. |
| 2 | STARTED | 1 | System has received start command. |
| | | 0 | System has not received start command. |
| 3 | RUNNING | 1 | System is modulating. |
| | | 0 | System is not modulating. |
| 4 | ZERO_SPEED | 1 | System is at zero speed. |
| | | 0 | System has not reached zero speed. |
| 5 | ACCELERATE | 1 | System is accelerating. |
| | | 0 | System is not accelerating. |
| 6 | DECELERATE | 1 | System is decelerating. |
| | | 0 | System is not decelerating. |
| 7 | AT_SETPOINT | 1 | System is at setpoint. |
| | | 0 | System has not reached setpoint. |
| 8 | LIMIT | 1 | Operation is limited by Group 30 settings. |
| | | 0 | Operation is within Group 30 settings. |
| 9 | SUPERVISION | 1 | Actual value (speed, frequency or torque) is above a limit. Limit is set with drive parameters 46.31...46. |
| | | 0 | Actual value (speed, frequency or torque) is within limits. |

| DCU Profile STATUS WORD | | | |
|-------------------------|-------------|-------|---|
| Bit | Name | Value | Status |
| 10 | REV_REF | 1 | Reference is in reverse direction. |
| | | 0 | Reference is in forward direction. |
| 11 | REV_ACT | 1 | System is running in reverse direction. |
| | | 0 | System is running in forward direction. |
| 12 | PANEL_LOCAL | 1 | Control is in control panel (or PC tool) local mode. |
| | | 0 | Control is not in control panel local mode. |
| 13 | FIELDLOCAL | 1 | Control is in fieldbus local mode (steals control panel local). |
| | | 0 | Control is not in fieldbus local mode. |
| 14 | EXT2_ACT | 1 | Control is in EXT2 mode. |
| | | 0 | Control is in EXT1 mode. |
| 15 | FAULT | 1 | Drive is in a fault state. |
| | | 0 | Drive is not in a fault state. |

| DCU Profile STATUS WORD | | | |
|-------------------------|--------------|-------|--|
| Bit | Name | Value | Status |
| 16 | WARNING | 1 | An warning is on. |
| | | 0 | No warnings are on. |
| 17 | REQ_MAINT | 1 | A maintenance request is pending. |
| | | 0 | No maintenance request is pending. |
| 18 | DIRLOCK | 1 | Direction lock is ON. (Direction change is locked out.) |
| | | 0 | Direction lock is OFF. |
| 19 | LOCALLOCK | 1 | Local mode lock is ON. (Local mode is locked out.) |
| | | 0 | Local mode lock is OFF. |
| 20 | CTL_MODE | 1 | Drive is in vector control mode. |
| | | 0 | Drive is in scalar control mode. |
| 21...25 | Reserved | | |
| 26 | REQ_CTL | 1 | Copy the control word |
| | | 0 | (no op) |
| 27 | REQ_REF1 | 1 | Reference 1 requested in this channel. |
| | | 0 | Reference 1 is not requested in this channel. |
| 28 | REQ_REF2 | 1 | Reference 2 requested in this channel. |
| | | 0 | Reference 2 is not requested in this channel. |
| 29 | REQ_REF2EXT | 1 | External PID reference 2 requested in this channel. |
| | | 0 | External PID reference 2 is not requested in this channel. |
| 30 | ACK_STARTINH | 1 | A start inhibit from this channel is granted. |
| | | 0 | A start inhibit from this channel is not granted. |
| 31 | ACK_OFF_ILCK | 1 | Start inhibit due to OFF button |
| | | 0 | Normal operation |

State Diagram

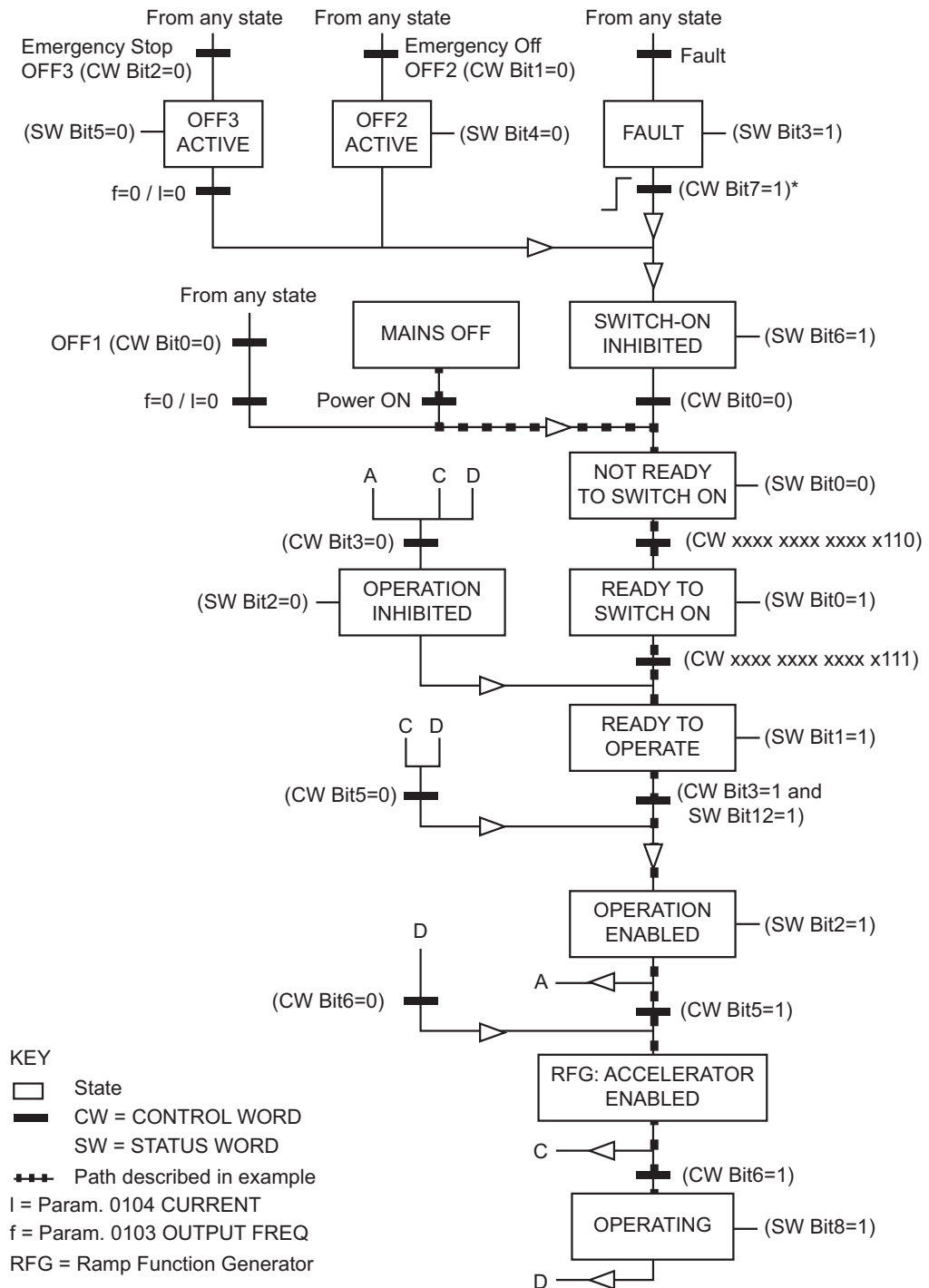
ABB drives profile

To illustrate the operation of the state diagram, the following example (ABB DRV LIM implementation of the ABB Drives profile) uses the control word to start the system:

- First, the requirements for using the CONTROL WORD must be met.
- When the power is first connected, the state of the bypass is not ready to switch on. See dotted lined path (---) in the state diagram below.
- Use the CONTROL WORD to step through the state machine states until the OPERATING state is reached, meaning that the bypass is running and follows the given reference. See table below.

| Step | CONTROL WORD Value | Description |
|------|--|--|
| 1 | CW = 0000 0000 0000 0110 <div style="display: flex; justify-content: space-around; width: 100%;"> <div style="text-align: center;"> bit 15</div> <div style="text-align: center;"> bit 0</div> </div> | This CW value changes the bypass state to READY TO SWITCH ON. |
| 2 | | Wait at least 100 ms before proceeding. |
| 3 | CW = 0000 0000 0000 0111 | This CW value changes the bypass state to READY TO OPERATE. |
| 4 | CW = 0000 0000 0000 1111 | This CW value changes the bypass state to OPERATION ENABLED. The drive starts, but will not accelerate. |
| 5 | CW = 0000 0000 0010 1111 | This CW value releases the ramp function generator (RFG) output, and changes the drive state to RFG: ACCELERATOR ENABLED. |
| 6 | CW = 0000 0000 0110 1111 | This CW value releases the ramp function generator (RFG) output, and changes the bypass state to OPERATING. The bypass accelerates to the given reference and follows the reference. |

The state diagram below describes the start-stop function of CONTROL WORD (CW) and STATUS WORD (SW) bits for the ABB Drives profile.



Modbus protocol technical data - system mode

Bypass overview

The new mode that is available on the E-Clipse bypass is selected by setting bypass parameter 1625 to SYSTEM. With this configuration the drive node is still present but network commands to start the drive are ignored. Instead, the user should send start commands to the bypass node. In this mode, a start command will start the bypass if in bypass mode or start the drive if in drive mode.

In system mode, the profile that controls system logic is always the ABB BYPASS PROFILE which is sent to the bypass device. The setting of bypass parameter 5825, PROFILE is only used for reference related control (e.g. ramp control bits) and for the drive status word. These bits are used when writing to or reading the drive device.

The following table defines the ABB bypass profile control word. Note that this word is written to the bypass.

| ABB Bypass Profile CONTROL WORD | | | | |
|---------------------------------|----------------|-------|--|--|
| Bit | Name | Value | Description | Comments |
| 0 | START | 1 | Start | |
| | | 0 | Stop | |
| 1 | RESET | 0->1 | Reset command | Fault reset. Edge sensitive. |
| | | Other | (no op) | |
| 2 | RUN_DISABLE | 1 | Run disabled | Inverted Run Permissive. The STARTED status bit may be set even when Run Permissive is missing. |
| | | 0 | Run Permissive on | |
| 3 | FBLOCAL_CTL | 1 | FB Local mode for control word requested | Field bus sets these bits to move the bypass to field bus local control mode of control word (field bus steals the control). |
| | | 0 | FB Local mode for control word not requested | |
| 4 | START_DISABLE1 | 1 | Start disabled 1 | Inverted Start Interlocks. When Start Interlock is missing, the drive doesn't set STARTED status bit. |
| | | 0 | Start Interlock 1 on | |
| 5 | START_DISABLE2 | 1 | Start disabled 2 | |
| | | 0 | Start Interlock 2 on | |
| 6 | START_DISABLE3 | 1 | Start disabled 3 | |
| | | 0 | Start Interlock 3 on | |
| 7 | START_DISABLE4 | 1 | Start disabled 4 | |
| | | 0 | Start Interlock 4 on | |
| 8 | OVERRIDE | 1 | Override selected | This selects override 2 which is controlled by Group 17. |
| | | 0 | Override not selected | |
| 9 | LINK_ON | 1 | Master is detected in link | This is not settable from the field bus but reflects the internal state of the link. |
| | | 0 | Link is down | |

| ABB Bypass Profile CONTROL WORD | | | | |
|---------------------------------|----------|-------|-------------|----------|
| Bit | Name | Value | Description | Comments |
| 10...15 | Reserved | | | |

The drive control words when bypass parameter 1625 = (1) SYSTEM are summarized in the following table. Note that these are written to the drive.

| DRIVE CONTROL WORD | | | |
|--------------------|--------------|---------------|-----------------------|
| Bit | ABB DRV LIM | DCU PROFILE | ABB DRV FULL |
| 0 | N/A | N/A | N/A |
| 1 | N/A | N/A | N/A |
| 2 | N/A | REVERSE | N/A |
| 3 | N/A | N/A | N/A |
| 4 | N/A | RESET | RAMP_OUT_ZERO |
| 5 | RAMP_HOLD | EXT2 | RAMP_HOLD |
| 6 | RAMP_IN_ZERO | N/A | RAMP_IN_ZERO |
| 7 | RESET | STP_MODE_R | RESET |
| 8 | N/A | STP_MODE_EM | N/A |
| 9 | N/A | STP_MODE_C | N/A |
| 10 | N/A | RAMP_2 | REMOTE_CMD (ref only) |
| 11 | EXT2 | RAMP_OUT_0 | EXT2 |
| 12 | N/A | RAMP_HOLD | N/A |
| 13 | N/A | RAMP_IN_0 | N/A |
| 14 | N/A | REQ_LOCALLOCK | N/A |
| 15 | N/A | TORQLIM2 | N/A |
| 16 | N/A | N/A | N/A |
| 17 | N/A | FBLOCAL_REF | N/A |
| 18 | N/A | N/A | N/A |
| 19 | N/A | N/A | N/A |
| 20-31 | N/A | Reserved | N/A |

The bypass status word is defined in table below. The drive status word depends on the profile selected and does not change when bypass parameter 1625 = DRIVE ONLY or SYSTEM modes (see drive manual).

| BYPASS STATUS WORD | | | | |
|--------------------|----------------|-------|--|---|
| Bit | NAME | Value | Description | Comments |
| 0 | READY | 1 | Bypass is ready to receive start command | |
| | | 0 | Bypass is not ready | |
| 1 | ENABLED | 1 | External Run Permissive and Start Interlock signals received | |
| | | 0 | External Run Permissive or Start Interlock signals missing | |
| 2 | STARTED | 1 | Bypass has received start command | |
| | | 0 | Bypass has not received start command | |
| 3 | RUNNING | 1 | Motor is running | |
| | | 0 | Motor is not modulating | |
| 4 | FIELDBUS_LOCAL | 1 | Bypass is in fieldbus local mode | Field bus is controlling all inputs that can have COMM setting. |
| | | 0 | Bypass is not in fieldbus local mode | |
| 5 | FAULT | 1 | Bypass is in fault state | |
| | | 0 | No faults | |
| 6 | WARNING | 1 | Warning is on | |
| | | 0 | No warnings | |
| 7 | Reserved | | | |
| 8 | REQ_CTL | 1 | Control word requested in this channel | This bit set indicates that the bypass is expecting at least one control bit from the serial channel. |
| | | 0 | Control word not requested | |
| 9 | OVERRIDE | 1 | In override | Override 1 or override 2 is active |
| | | 0 | Not in override | |
| 10 | POWERED_UP | 1 | Powered up | Input voltage has passed minimum level beyond which normal bypass operation can proceed including writing of parameters from the field bus. |
| 11 | MODE | 1 | Bypass mode | |
| | | 0 | Drive mode | |
| 12 | PANEL LOCAL | 1 | Bypass in local (Hand or Off) | |
| | | 0 | Bypass in Auto | |
| 13...15 | Reserved | | | |

MODBUS addressing – Bypass

0xxxx Registers

MODBUS addressing of 0xxxx registers maps the Bypass Control Word shown in the following table to the first 16 coils when using the bypass device ID. The coil number is the bit number plus 1. In other words, bits 0-31 are mapped to 1-32.

Relay output control is possible on the bypass by using coils 33-37 and the bypass device ID. Relay control on the drive is described in the 0xxxx mapping subsection of the [Modbus addressing](#) section for the drive device ID on page [139](#).

These registers are summarized in the following tables. Reminder: stop and enable related bits are valid at only one device subject to the status of bypass parameter 1625, COMM CTRL.

| MODBUS Registers (0xxxx) | | |
|--------------------------|-------|-----------------------|
| MODBUS Ref. | Bit | Bypass Device ID |
| | | BCU PROFILE |
| 00001 | 0 | START |
| 00002 | 1 | RESET |
| 00003 | 2 | RUN_DISABLE |
| 00004 | 3 | FBLOCAL_CTL |
| 00005 | 4 | START_DISABLE1 |
| 00006 | 5 | START_DISABLE2 |
| 00007 | 6 | START_DISABLE3 |
| 00008 | 7 | START_DISABLE4 |
| 00009 | 8 | OVERRIDE |
| 00010 | 9 | LINK_ON |
| 00011 | 10 | N/A |
| 00012 | 11 | N/A |
| 00013 | 12 | N/A |
| 00014 | 13 | N/A |
| 00015 | 14 | N/A |
| 00016 | 15 | N/A |
| 00017 | 16 | N/A |
| 00018 | 17 | N/A |
| 00019 | 18 | N/A |
| 00020 | 19 | N/A |
| 00021...00032 | 20-31 | N/A |
| 00033 | | Bypass Relay Output 1 |
| 00034 | | Bypass Relay Output 2 |
| 00035 | | Bypass Relay Output 3 |
| 00036 | | Bypass Relay Output 4 |
| 00037 | | Bypass Relay Output 5 |
| 00038 | | N/A |

1xxxx Registers – Bypass

MODBUS addressing of 1xxxx registers maps the Bypass Status Word shown in the following table to the first 16 coils when using the bypass device ID. The coil number is the bit number plus 1. In other words, bits 0-31 are mapped to 1-32.

Bypass digital input status can be read using registers 33-37 and the bypass device ID. Digital input status of the drive is described in the 1xxxx mapping subsection of the [Modbus addressing](#) section for the drive device ID on page [139](#).

These registers are summarized in the following table.

| 1.1.1 MODBUS Registers (1xxxx) | | |
|--------------------------------|-----|------------------|
| MODBUS Ref. | Bit | Bypass Device ID |
| | | BCU PROFILE |
| 10001 | 0 | READY |
| 10002 | 1 | ENABLED |
| 10003 | 2 | STARTED |
| 10004 | 3 | RUNNING |
| 10005 | 4 | FIELDBUS_LOCAL |
| 10006 | 5 | FAULT |
| 10007 | 6 | WARNING |
| 10008 | 7 | Reserved |
| 10009 | 8 | REQ_CTL |
| 10010 | 9 | OVERRIDE |
| 10011 | 10 | POWERED_UP |
| 10012 | 11 | N/A |
| 10013 | 12 | N/A |
| 10014 | 13 | N/A |
| 10015 | 14 | N/A |
| 10016 | 15 | N/A |
| 10017 | 16 | N/A |
| 10018 | 17 | N/A |
| 10019 | 18 | N/A |
| 10020 | 19 | N/A |
| 10021 | 20 | |
| 10022 | 21 | |
| 10023 | 22 | |
| 10024 | 23 | |
| 10025 | 24 | |
| 10026 | 25 | |
| 10027 | 26 | |
| 10028 | 27 | |
| 10029 | 28 | |

| 1.1.1 MODBUS Registers (1xxxx) | | |
|--------------------------------|-----|------------------|
| MODBUS Ref. | Bit | Bypass Device ID |
| | | BCU PROFILE |
| 10030 | 29 | |
| 10031 | 30 | |
| 10032 | 31 | |
| 10033 | | Bypass DI1 |
| 10034 | | Bypass DI2 |
| 10035 | | Bypass DI3 |
| 10036 | | Bypass DI4 |
| 10037 | | Bypass DI5 |
| 10038 | | Bypass DI6 |

4xxxxx Registers – Bypass

MODBUS addressing of 4xxxxx registers maps the drive's parameters and other values when using the drive device ID. The bypass's parameters and other values are mapped when using the bypass device ID.

Registers 400001 ... 400099 - Bypass

The bypass maps its parameters and other data to the 4xxxxx holding registers as follows:

400001...400099 map to bypass control and actual values. These registers are described in the table below.

400267...465535 map to bypass parameters 0101...255255. Register addresses that do not correspond to bypass parameters are invalid. If there is an attempt to read or write outside the parameters addresses, the Modbus interface returns an exception code to the controller.

Register addressing is done as follows: Use $400000 + 256 * (\text{parameter group}) + \text{parameter index}$.

For example: bypass parameter 0111 would be mapped to $400000 + 256 * 1 = 400267$.

The following table summarizes the 4xxxxx bypass control registers 400001...400099:

| MODBUS Registers (40001 to 40099) | | |
|-----------------------------------|-------------------------------------|--|
| MODBUS Ref. | Internal location (All profiles) | Bypass Device ID |
| 400001 | Control Word | Maps directly to BCU profile control word. |
| 400004 | Status Word | Maps directly to BCU profile status word. |

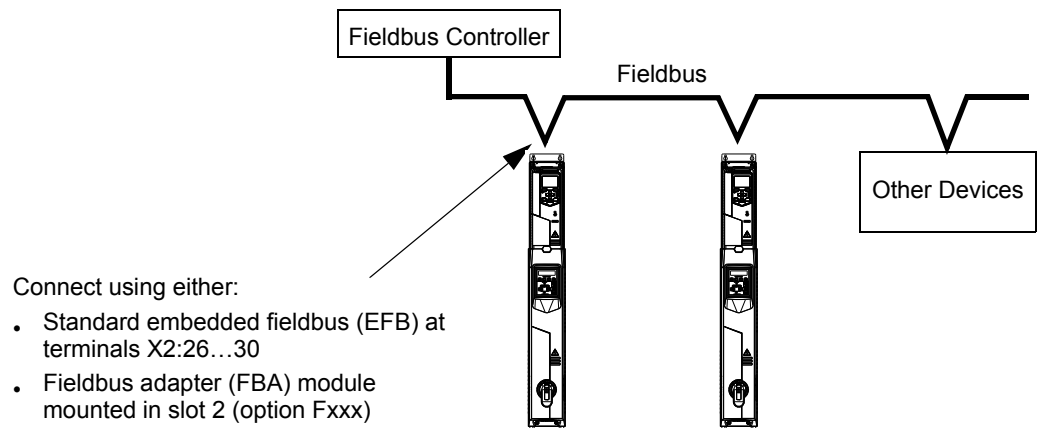
Note: All parameters referenced are bypass parameters.

Fieldbus adapter

Overview

The ACH580 can be set up to accept control from an external system using standard communication protocols. When using fieldbus communication, the ACH580 can either:

- Receive all of its control information from the fieldbus, or
- Be controlled from some combination of fieldbus control and other available control locations, such as digital or analog inputs, and the control panel.



Two basic fieldbus communications configurations are available:

- Embedded fieldbus (EFB) – See [Embedded fieldbus](#) on page 75.
- Fieldbus adapter (FBA) – With one of the optional FBA modules in the drive's expansion slot 2, the drive can communicate to a control system using one of the following protocols:
 - Profibus-DP®
 - LonWorks®
 - DeviceNet®
 - Ethernet/IP
 - Modbus TCP/IP

The E-Clipse Bypass detects automatically which communication protocol is used by the plug-in fieldbus adapter. The default settings for each protocol assume that the profile used is the protocol's industry-standard drive profile (e.g. PROFIdrive for PROFIBUS, AC/DC Drive for DeviceNet). All of the FBA protocols can also be configured for the ABB Drives profile.

Configuration details depend on the protocol and profile used. These details are provided in a user's manual supplied with the FBA module.

Details for the ABB Drives profile (which apply for all protocols) are provided in [ABB drives profile technical data](#) on page 175.

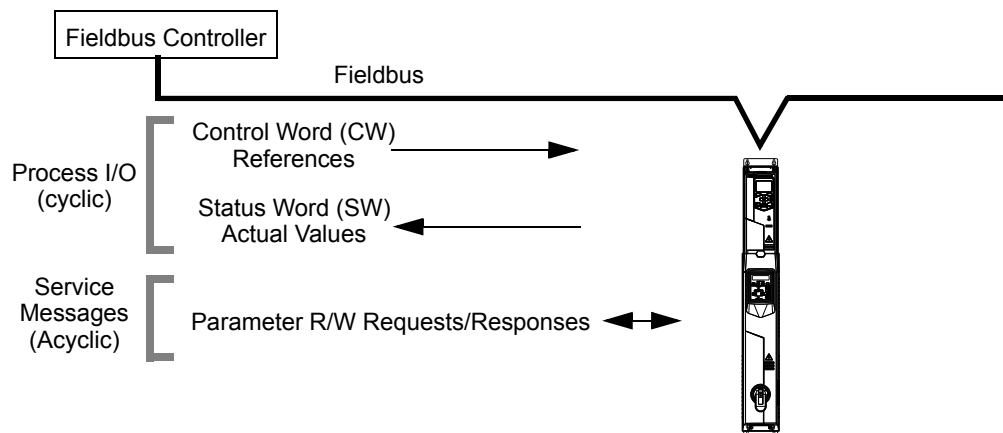
Control interface

In general, the basic control interface between the fieldbus system and the drive consists of:

- Output Words:
 - CONTROL WORD
 - REFERENCE (speed or frequency)
- Input Words:
 - STATUS WORD
 - Actual Value (speed or frequency)

Note: The words “output” and “input” are used as seen from the fieldbus controller point of view. For example an output describes data flow from the fieldbus controller to the drive and appears as an input from the drive point of view.

The meanings of the controller interface words are not restricted by the ACH580. However, the profile used may set particular meanings.



Control Word

The CONTROL WORD is the principal means for controlling the drive from a fieldbus system. The fieldbus controller sends the CONTROL WORD to the drive. The drive switches between states according to the bit-coded instructions in the CONTROL WORD. Using the CONTROL WORD requires that:

- The drive is in AUTO (AUTO) control.
- The communication channel is defined as the source for controlling commands from EXT1 or EXT2. Set E-Clipse Parameter 1601= COMM[2].
- The external plug-in fieldbus adapter is activated when:
 - Parameter 9802 COMM PROT SEL = 4 (EXT FBA) in E-Clipse Bypass Control Board.
 - The external plug-in fieldbus adapter is configured to use the drive profile mode or drive profile objects.

The content of the control word depends on the protocol/profile used. See the user's manual provided with the FBA module and/or the [ABB drives profile technical data](#).

Status Word

The STATUS WORD is a 16-bit word containing status information, sent by the drive to the fieldbus controller. The content of the STATUS WORD depends on the protocol/profile used. See the user's manual provided with the FBA module and/or the [ABB drives profile technical data](#) section.

Reference

The contents of each REFERENCE word:

- Is a 16-bit word comprised of a sign bit and a 15-bit integer.
- Negative references (indicating reversed rotation direction) are indicated by the two's complement of the corresponding positive reference value.

The use of a second reference (REF2) is supported only when a protocol is configured for the ABB Drives profile.

Reference scaling is fieldbus type specific. See the user's manual provided with the FBA module and/or the following sections as appropriate:

- [ABB drives profile technical data](#)
- [Generic profile technical data](#)

Actual Values

Actual Values are 16-bit words containing information on selected operations of the drive. Drive Actual Values (for example, group 01 parameters) can be mapped to Input Words using group 51 parameters (protocol-dependent, but typically parameters 5104...5126).

Planning

Network planning should address the following questions:

- What types and quantities of devices must be connected to the network?
- What control information must be sent down to the drives?
- What feedback information must be sent from the drives to the controlling system?

Mechanical and electrical installation – FBA



WARNING! Connections should be made only while the drive is disconnected from the power source.

Overview

The FBA (fieldbus adapter) is a plug-in module that fits in the bypass expansion slot 2. The module is held in place with plastic retaining clips and one screw. The screws also ground the shield for the module cable, and connect the module GND signals to the drive control board.

On installation of the module, electrical connection to the bypass is automatically established through the 34-pin connector.

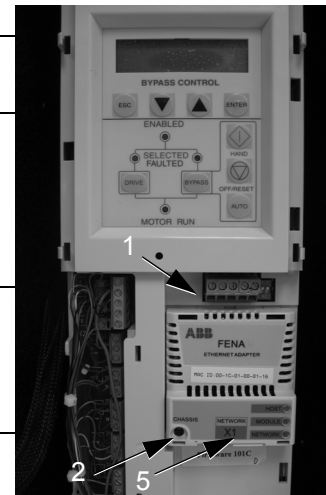
Mounting procedure

Note: Install the input power and motor cables first.

1. Insert the module carefully into the bypass expansion slot until the retaining clips lock the module into position.
2. Fasten the screw (included) to the stand-off.

Note: Correct installation of the screw is essential for fulfilling the EMC requirements and for proper operation of the module.

3. Open the appropriate knockout for the conduit and route the network cable into the enclosure.
4. Route the network cable using the appropriate cable tie points.
5. Connect the network cable to the module's network connector.
6. For configuration information see the following:
 - [Communication setup – FBA](#) below.
 - [Activate bypass control functions – FBA](#) on page 170.
 - The protocol specific documentation provided with the module.



Communication setup – FBA

Protocol selection

To activate the fieldbus adapter communication, use parameter 9802 COMM PROTOCOL SEL. Set bypass parameter 9802 = 4 (EXT FBA).

Protocol configuration

Setting 9802, together with mounting a particular FBA module, automatically sets the appropriate default values in parameters that define the communication process. These parameters and descriptions are defined in the user's manual supplied with the FBA module.

- Parameter 5101 is automatically configured.
- Parameters 5102...5126 are protocol-dependent and define, for example, the profile used, and additional I/O words. These parameters are referred to as the fieldbus configuration parameters. See the user's manual provided with the FBA module for details on the fieldbus configuration parameters.
- Parameter 5127 forces the validation of changes to parameters 5102...5126. If parameter 5127 is not used, changes to parameters 5102...5126 take affect only after the drive power is cycled.
- Parameters 5128...5133 provide data about the FBA module currently installed (e.g. component versions and status).
- Parameters 5201...5210 provide parameter mapping data from E-Clipse Bypass to field controller.
- Parameters 5301...5310 provide parameter mapping data from fieldbus controller to E-Clipse Bypass.
- To map ACH580 parameters in groups 52 or 53 program parameters 5201...5210 or 5301...5310 with the actual ACH580 parameter value in hexadecimal. For example: to read ACH580 parameter 2897 (Frequency ref unlimited) convert group 28 to hexadecimal and parameter 97 to hexadecimal and combine as follows:
 28 = 1ch
 97 = 61h
 parameter 52.01 is set to:
 1c61h
- To map E-Clipse Bypass parameters in groups 52 or 53 program parameters 5201...5210 or 5301...5310 add 8000h to the calculation:
 Bypass parameter 0106 (KW HOURS):
 01 = 01h
 06 = 06h
 parameter 5201 is set to:
 0106h + 8000h = 8106h

The [Parameters](#) section lists the group 51 parameters.

Activate drive control functions – FBA

Fieldbus control of various drive functions requires configuration to:

- Tell the drive (via the bypass) to accept fieldbus control of the function.
- Define as a fieldbus input, any drive data required for control.
- Define as a fieldbus output, any control data required by the drive.

The following sections describe, at a general level, the configuration required for each control function. The last column in each table below is deliberately blank. See the user's manual supplied with the FBA module for the appropriate entry.

Start/stop control

Using the fieldbus for start/stop/direction control of the drive only requires:

- Bypass parameter values set as defined below.
- Fieldbus controller supplied command(s) in the appropriate location. (The location is defined by the Protocol Reference, which is protocol dependent.)

| Bypass Parameter | | Value | Description | Protocol Reference | |
|------------------|------------|----------------|--|-------------------------|-----------------|
| | | | | Modbus TCP ¹ | |
| | | | | ABB DRV | DCU PROFILE |
| 1601 | START/STOP | 2 (COMM) | Selects Source for system start command. | 400001 bits 0...3 | 40031 bits 0, 1 |
| 1625 | COMM CTRL | 0 (DRIVE ONLY) | Enable drive only control. | N/A | |

Input reference select

Using the fieldbus to provide input reference to the drive requires:

- Drive parameter value set as defined below.
- Fieldbus controller supplied reference word(s) in the appropriate location. (The location is defined by the Protocol Reference, which is protocol dependent.)

| Ext1/Ext2 Select | | Scalar Control (Group 28) | Vector Control (Group 22) | Value |
|------------------|------|---------------------------|---------------------------|---|
| | | 19.11 | | |
| Ext1 | Ref1 | 28.11 | 22.11 | Flexibility to write to 3.04 (FB A ref1) or 3.05 (FB A ref 2) |
| | Ref2 | 28.12 | 22.12 | |
| Ext2 | Ref1 | 28.15 | 22.15 | |
| | Ref2 | 28.16 | 22.16 | |

FBA Ref1/Ref2

| Drive Parameter | Modbus TCP | |
|---------------------------|------------|-------------|
| | ABB DRV | DCU Profile |
| 19.11 Ext1/Ext2 Selection | 40001 | 40031 |
| | bit11 | bit5 |
| 3.04 FBA Ref1 | 40002 | |
| 3.05 FBA Ref2 | 40003 | |

Note: Multiple references are supported only when using the ABB Drives profile.

Reference scaling

Where required, REFERENCES can be scaled. See the [Reference scaling](#) in the following sections, as appropriate:

- [ABB drives profile technical data](#)
- [Generic profile technical data](#)

Drive relay output control

Using the fieldbus for relay output control requires:

- Drive parameter values set as defined below.
- Fieldbus controller supplied, binary coded, relay command(s) in the appropriate location. (The location is defined by the Protocol Reference, which is protocol dependent.)

| Drive Parameter | | Value | Description | Protocol Reference | |
|-------------------------------------|------------------|-------------------------------|---|-----------------------|-------------|
| | | | | Modbus TCP | |
| | | | | ABB DRV | DCU PROFILE |
| 10.24 RO1 Source | Relay Output 1 | 62, RO/DIO control word | Relay Output 1 controlled by fieldbus. | 402659 bit 0 or 00033 | |
| 10.27 | Relay Output 2 | | Relay Output 2 controlled by fieldbus. | 402659 bit 1 or 00034 | |
| 10.30 | Relay Output 3 | | Relay Output 3 controlled by fieldbus. | 402659 bit 2 or 00035 | |
| 15.07 ¹ | Relay Output 4 | | Relay Output 4 controlled by fieldbus. | 402659 bit 3 or 00036 | |
| 15.10 ¹ | Relay Output 5 | | Relay Output 5 controlled by fieldbus. | 402659 bit 4 or 00037 | |
| 15.23 ¹ DO1 Source | Digital Output 1 | | Digital Output 1 controlled by fieldbus. | 402659 bit 8 or 00038 | |

1) More than 3 relays requires the addition of a relay extension module.

Note: Relay status feedback occurs without configuration as defined below.

| Drive Parameter | | Value | Protocol Reference | |
|--------------------|---------------|---------------------|----------------------|-------------|
| | | | Modbus TCP | |
| | | | ABB DRV | DCU PROFILE |
| 10.21 RO Status | RO 1-3 STATUS | Relay 1...3 status. | 402581 or 00033...35 | |
| 15.04 RO/DO Status | RO 4-6 STATUS | Relay 4...6 status. | 403844 or 00036...37 | |

Analog output control

Using the fieldbus for analog output control (e.g. PID setpoint) requires:

- Drive parameter values set as defined below.
- Fieldbus controller supplied analog value(s) in the appropriate location. (The location is defined by the Protocol Reference, which is protocol dependent.)

| Drive Parameter | | Value | Description | Protocol Reference | |
|-----------------|------------------------|----------------------|---|--------------------|----------------|
| | | | | Modbus TCP | |
| | | | | ABB DRV | DCU PROFILE |
| 13.12 | AO1 Source | 37, AO1 Data Storage | Analog Output 1 controlled by writing to parameter 13.91. | – | |
| 13.91 | AO1 Data Storage | – | | 403419 | |
| 13.15 | AO1 Unit Selection | V or mA | Voltage or current output selection. | – | |
| 13.16 | Filter AO1 | – | Filter time constant for AO1 | | |
| 13.17 | AO1 source min | – | Used for scaling | | |
| 13.20 | AO1 out at AO1 src max | | | | |
| 13.22 | AO2 Source | 38, AO2 Data Storage | Analog Output 2 controlled by writing to parameter 13.92. | – | |
| 13.92 | AO2 Data Storage | – | | 403420 | |
| 13.26 | AO2 Filter Time | – | Filter time constant for AO2 | – | |
| 13.27 | AO2 source min | – | Used for scaling | | |
| 13.30 | AO2 out at AO2 src max | | | | |

PID control setpoint source

Using the fieldbus for the PID control setpoint requires:

- Drive parameter values set as defined below.
- Fieldbus controller supplied setpoint value in the appropriate location.

| Drive Parameter | | Value | Description | Protocol Reference |
|-----------------|-------------------------|---------------------------------------|--|--------------------|
| 40.16 | Set 1 setpoint 1 source | 24 (Setpoint data storage) | Communication channel setpoint source | – |
| 40.17 | Set 1 setpoint 2 source | 3 (AI1 scaled) | Optional analog input value. Needed if combining communication reference with analog input value | – |
| 40.18 | Set 1 setpoint function | 0 (In1) 1 (In1+In2) 3 (In1*In2) | Setpoint is 40.92 value itself/ +AI1/*AI1 | – |
| 40.92 | Set point storage | – | Communication channel setpoint value | 410332 |

NOTE: For 41.16 – 41.18, PID set 2 can be used. Setpoint data storage still uses 40.92, even when PID set 2 is used.

Feedback from the drive – FBA

Inputs to the controller (drive outputs) have pre-defined meanings established by the protocol. This feedback does not require drive configuration. The following table lists a sample of feedback data. For a complete listing, see all parameters listed in [Parameter list and descriptions](#).

| Drive Parameter | | Protocol Reference |
|-----------------|-------------------------------|--------------------|
| | | Modbus TCP |
| 01.01 | Motor Speed Used | 400257 |
| 01.06 | Output Frequency | 400262 |
| 01.07 | Motor Current | 400263 |
| 01.10 | Motor Torque | 400266 |
| 01.14 | Output Power | 400270 |
| 01.11 | DC Voltage | 400267 |
| 01.13 | Output Voltage | 400269 |
| 58.19 | FB STATUS WORD – bit 0 (STOP) | 414867 bit 0 |
| 58.19 | FB STATUS WORD – bit 2 (REV) | 414867 bit 2 |
| 10.02 | DI Delayed Status | 402562 |

Scaling

To scale the drive parameter values see the [Actual value scaling](#) in the following sections, as appropriate:

- [ABB drives profile technical data](#)
- [Generic profile technical data](#)

Activate bypass control functions – FBA

Controlling the bypass

Fieldbus control of various bypass functions requires configuration to:

- Tell the system to accept fieldbus control of the function.
- Define as a fieldbus input, any bypass data required for control.
- Define as a fieldbus output, any control data required by the drive/bypass.

The following sections describe, at a general level, the configuration required for each control function. The last column in each table below is deliberately blank. See the User's Manual supplied with the FBA module for the appropriate entry.

Start/stop direction control

Using the fieldbus for start/stop control of the system requires:

- Bypass parameter values set as defined below.
- Fieldbus controller supplied command(s) in the appropriate location. (The location is defined by the Protocol Reference, which is protocol dependent.)

| Bypass Parameter | | Value | Description | Protocol Reference | |
|------------------|------------|------------|--|-------------------------|-----------------|
| | | | | Modbus TCP ¹ | |
| | | | | ABB DRV | DCU PROFILE |
| 1601 | START/STOP | 2 (COMM) | Start/Stop by fieldbus with Ext1 or Ext2 selected. | 400001 bits 0...3 | 40031 bits 0, 1 |
| 1625 | COMM CTRL | 1 (SYSTEM) | Enable system control. | N/A | |

1) For Modbus TCP, the protocol reference can depend on the profile used, hence two columns in these tables. One column refers to the ABB Drives profile, selected when parameter 51.02 = 0 (ABB Drives-Classic) or 51.02 = 1 (ABB Drives-Enhanced). The other column refers to the DCU profile selected when parameter 51.02 = 2 (Transparent-16-Bit). See [ABB drives profile technical data](#) section on page 175.

Miscellaneous system control

Note: Control of system commands is dependent upon the setting of bypass parameter 1625.

Using the fieldbus miscellaneous system control requires:

- Bypass parameter values set as defined below.
- Fieldbus controller supplied reference word(s) in the appropriate location. (The location is defined by the Protocol Reference, which is protocol dependent.)

| Bypass Parameter | | Value | Setting | Protocol Reference |
|------------------|-------------------|-------------------------------|--|--------------------|
| | | | | Modbus TCP |
| 1602 | RUN PERMISSIVE | 2 (COMM) (Not Recommended) | Run permissive by fieldbus. | 400001 bit 2 |
| 1603 | START INTERLOCK 1 | 2 (COMM) (Not Recommended) | Source for Start Interlock 1 is the fieldbus Command word. | 400001 bit 4 |
| 1604 | START INTERLOCK 2 | 2 (COMM) (Not Recommended) | Source for Start Interlock 2 is the fieldbus Command word. | 400001 bit 5 |
| 1605 | START INTERLOCK 3 | 2 (COMM) (Not Recommended) | | 400001 bit 6 |
| 1606 | START INTERLOCK 4 | 2 (COMM) (Not Recommended) | | 400001 bit 7 |
| 1607 | START RESET SEL | 2 (COMM) | Fault reset by fieldbus | 400001 bit 1 |
| 1625 | COMM CTROL | 1 (SYSTEM) | Enable System Control. | N/A |

Bypass relay output control

Using the fieldbus for relay output control requires:

- Bypass parameter values set as defined below.
- Fieldbus controller supplied, binary coded, relay command(s) in the appropriate location. (The location is defined by the Protocol Reference, which is protocol dependent.)

| Bypass Parameter | | Value | Description | Protocol Reference |
|------------------|----------------|----------------------|--|--------------------|
| | | | | Modbus TCP |
| 1401 | RELAY OUTPUT 1 | 16 (COMM CTRL) | Relay Output 1 controlled by fieldbus. | 433031 bit 0 |
| 1402 | RELAY OUTPUT 2 | | Relay Output 2 controlled by fieldbus. | |
| 1403 | RELAY OUTPUT 3 | | Relay Output 3 controlled by fieldbus. | |
| 1410 | RELAY OUTPUT 4 | | Relay Output 4 controlled by fieldbus. | 433031 bit 3 |
| 1411 | RELAY OUTPUT 5 | | Relay Output 5 controlled by fieldbus. | |

Note: Relay status feedback occurs without configuration as defined below.

| Bypass Parameter | | Value | Protocol Reference |
|------------------|---------------|---------------------|--------------------|
| 0122 | RO 1-3 STATUS | Relay 1...3 status. | 400278 |
| 0123 | RO 4-5 STATUS | Relay 4...5 status. | 400279 |

Communication fault

When using fieldbus control, specify the bypass action if communication is lost.

| Drive Parameter | | Value | Description | Protocol Reference |
|-----------------|-----------------------|---|---|--------------------|
| 50.02 | FBA A COMM LOSS FUNC | 0 = No action 1 = Fault 2 = Last speed 3 = Speed ref safe 4 = Fault always 5 = Warning | Set for appropriate drive/ bypass response. NOTE: If the system is in bypass mode when communication is lost, choices 2 and 3 will cause the bypass contactor to remain in its present state. | – |
| 50.03 | FBA A COMM LOSS T OUT | Set time delay before acting on a communication loss. | | – |

Diagnostics – FBA

Fault Handling

The ACH580 or E-Clipse provides fault information as follows:

- The control panel display shows a fault code and text. See [Diagnostics](#) starting on page [185](#) for a complete description.
- Parameters 0401 LAST FAULT, 0402 PREVIOUS FAULT1 and 0403 PREVIOUS FAULT2 store the most recent faults.

- For fieldbus access, the drive reports faults as a hexadecimal value, assigned and coded according to the DRIVECOM specification. See table below. Not all profiles support requesting fault codes using this specification. For profiles that support this specification, the profile documentation defines the proper fault request process.

| | Drive Fault Code | Fieldbus Fault Code (DRIVECOM specification) |
|----|-------------------------|---|
| 1 | OVERCURRENT | 2310h |
| 2 | DC OVERVOLT | 3210h |
| 3 | DEV OVERTEMP | 4210h |
| 4 | SHORT CIRC | 2340h |
| 5 | Reserved | FF6Bh |
| 6 | DC UNDERVOLT | 3220h |
| 7 | AI1 LOSS | 8110h |
| 8 | AI2 LOSS | 8110h |
| 9 | MOT TEMP | 4310h |
| 10 | PANEL LOSS | 5300h |
| 11 | ID RUN FAIL | FF84h |
| 12 | MOTOR STALL | 7121h |
| 14 | EXTERNAL FLT 1 | 9000h |
| 15 | EXTERNAL FLT 2 | 9001h |
| 16 | EARTH FAULT | 2330h |
| 17 | UNDERLOAD | FF6Ah |
| 18 | THERM FAIL | 5210h |
| 19 | OPEX LINK | 7500h |
| 20 | OPEX PWR | 5414h |
| 21 | CURR MEAS | 2211h |
| 22 | SUPPLY PHASE | 3130h |
| 23 | ENCODER ERR | 7301h |
| 24 | OVERSPEED | 7310h |
| 25 | Reserved | FF80h |
| 26 | DRIVE ID | 5400h |
| 27 | CONFIG FILE | 630Fh |
| 28 | SERIAL 1 ERR | 7510h |
| 29 | EFB CONFIG FILE | 6306h |
| 30 | FORCE TRIP | FF90h |
| 31 | EFB 1 | FF92h |
| 32 | EFB 2 | FF93h |
| 33 | EFB 3 | FF94h |
| 34 | MOTOR PHASE | FF56h |
| 35 | OUTPUT WIRING | FF95h |

| Drive Fault Code | | Fieldbus Fault Code (DRIVECOM specification) |
|------------------|---------------------|---|
| 36 | INCOMP SWTYPE | 630Fh |
| 101 | SERF CORRUPT | FF55h |
| 102 | Reserved | FF55h |
| 103 | SERF MACRO | FF55h |
| 104 | Reserved | FF55h |
| 105 | Reserved | FF55h |
| 201 | DSP T1 OVERLOAD | 6100h |
| 202 | DSP T2 OVERLOAD | 6100h |
| 203 | DSP T3 OVERLOAD | 6100h |
| 204 | DSP STACK ERROR | 6100h |
| 205 | Reserved | 5000h |
| 206 | OMIO ID ERROR | 5000h |
| 207 | EFB LOAD ERR | 6100h |
| 1000 | PAR HZRPM | 6320h |
| 1001 | PAR PFAREFNG | 6320h |
| 1002 | Reserved (obsolete) | 6320h |
| 1003 | PAR AI SCALE | 6320h |
| 1004 | PAR AO SCALE | 6320h |
| 1005 | PAR PCU 2 | 6320h |
| 1006 | EXT ROMISSING | 6320h |
| 1007 | PAR FBUSMISSING | 6320h |
| 1008 | PAR PFAWOSCALAR | 6320h |
| 1009 | PAR PCU 1 | 6320h |
| 1010 | PAR PFA OVERRIDE | 6320h |
| 1011 | PAR OVERRIDE PARS | 6320h |
| 1012 | PAR PFC IO 1 | 6320h |
| 1013 | PAR PFC IO 2 | 6320h |
| 1014 | PAR PFC IO 3 | 6320h |

Communication diagnostics

Besides the drive fault codes, the FBA module has diagnostic tools. Refer to the user's manual supplied with the FBA module.

ABB drives profile technical data

Overview

ABB drives profile

The ABB Drives profile provides a standard profile that can be used on multiple protocols, available on the FBA modules. This section describes the ABB Drives profile implemented for FBA modules.

- ABB DRV LIM – The primary (and default) profile is the ABB DRV LIM profile, which standardizes the control interface with ACH580 and ACH550 drive products. This profile is based on the PROFIBUS interface, and is discussed in detail in the following sections.
- ABB DRV FULL – This profile standardizes the control interface with the ACH580 and ACH550 drive products. This profile is also based on the PROFIBUS interface, and supports two control word bits not supported by the ABB DRV LIM profile.

Control Word

As described earlier in [Control interface](#) the CONTROL WORD is the principal means for controlling the drive from a fieldbus system.

The following table and the state diagram later in this sub-section describe the CONTROL WORD content for the ABB Drives profile.

| ABB Drives Profile (FBA) CONTROL WORD | | | | |
|---------------------------------------|--------------|-------|------------------|---|
| Bit | Name | Value | Commanded State | Comments |
| 0 | OFF1 CONTROL | 1 | READY TO OPERATE | Enter READY TO OPERATE |
| | | 0 | EMERGENCY OFF | Drive ramps to stop according to currently active deceleration ramp (2203 or 2205) Normal command sequence: <ul style="list-style-type: none"> • Enter OFF1 ACTIVE • Proceed to READY TO SWITCH ON, unless other interlocks (OFF2, OFF3) are active. |
| 1 | OFF2 CONTROL | 1 | OPERATING | Continue operation (OFF2 inactive) |
| | | 0 | EMERGENCY OFF | Drive coasts to stop. Normal command sequence: <ul style="list-style-type: none"> • Enter OFF2 ACTIVE • Proceed to SWITCHON INHIBITED |

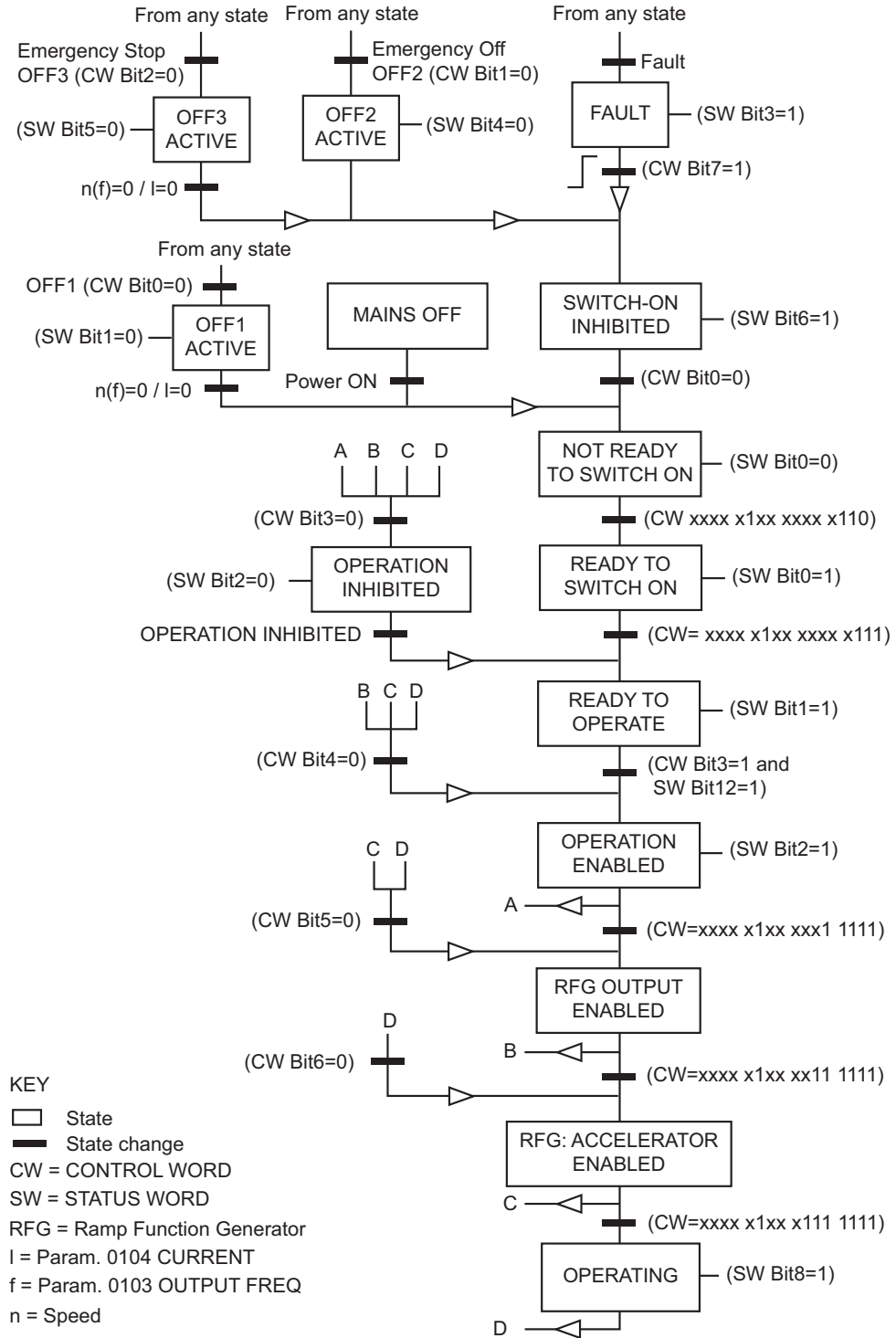
| ABB Drives Profile (FBA) CONTROL WORD | | | | |
|---------------------------------------|-------------------|-------|---------------------|--|
| Bit | Name | Value | Commanded State | Comments |
| 2 | OFF3 CONTROL | 1 | OPERATING | Continue operation (OFF3 inactive) |
| | | 0 | EMERGENCY STOP | Drive stops within in time specified by parameter 2208. Normal command sequence: <ul style="list-style-type: none"> • Enter OFF3 ACTIVE • Proceed to SWITCH ON INHIBITED WARNING! Be sure motor and driven equipment can be stopped using this mode. |
| 3 | INHIBIT OPERATION | 1 | OPERATION ENABLED | Enter OPERATION ENABLED (Note the Run Permissive signal must be active. See 1601. If 1601 is set to COMM, this bit also activates the Run Permissive signal.) |
| | | 0 | OPERATION INHIBITED | Inhibit operation. Enter OPERATION INHIBITED |
| 4 | RAMP_OUT_ZERO | 1 | NORMAL OPERATION | Enter RAMP FUNCTION GENERATOR: ACCELERATION ENABLED |
| | | 0 | RFG OUT ZERO | Force ramp function generator output to Zero. Drive ramps to stop (current and DC voltage limits in force). |
| 5 | RAMP_HOLD | 1 | RFG OUT ENABLED | Enable ramp function. Enter RAMP FUNCTION GENERATOR: ACCELERATOR ENABLED |
| | | 0 | RFG OUT HOLD | Halt ramping (Ramp Function Generator output held) |
| 6 | RAMP_IN_ZERO | 1 | RFG INPUT ENABLED | Normal operation. Enter OPERATING |
| | | 0 | RFG INPUT ZERO | Force Ramp Function Generator input to zero. |
| 7 | RESET | 0=>1 | RESET | Fault reset if an active fault exists (Enter SWITCH-ON INHIBITED). Effective if 1604 = COMM. |
| | | 0 | OPERATING | Continue normal operation |
| 8...9 | Unused | | | |
| 10 | REMOTE_CMD | 1 | | Fieldbus control enabled |
| | | 0 | | <ul style="list-style-type: none"> • CW ≠ 0 or Ref ≠ 0: Retain last CW and Ref. • CW = 0 and Ref = 0: Fieldbus control enabled. • Ref and deceleration/acceleration ramp are locked. |
| 11 | EXT CTRL LOC | 1 | EXT2 SELECT | Select external control location 2 (EXT2). Effective if 1102 = COMM. |
| | | 0 | EXT1 SELECT | Select external control location 1 (EXT1). Effective if 1102 = COMM. |
| 12...15 | Unused | | | |

Status Word

As described earlier in [Control interface](#), the contents of the STATUS WORD is status information, sent by the drive to the master station. The following table and the state diagram later in this sub-section describe the status word content.

| ABB Drives Profile (FBA) STATUS WORD | | | |
|--------------------------------------|--------------------|-------|---|
| Bit | Name | Value | Description (Correspond to states/boxes in the state diagram) |
| 0 | RDY_ON | 1 | READY TO SWITCH ON |
| | | 0 | NOT READY TO SWITCH ON |
| 1 | RDY_RUN | 1 | READY TO OPERATE |
| | | 0 | OFF1 ACTIVE |
| 2 | RDY_REF | 1 | OPERATION ENABLED |
| | | 0 | OPERATION INHIBITED |
| 3 | TRIPPED | 0...1 | FAULT |
| | | 0 | NO FAULT |
| 4 | OFF_2_STA | 1 | OFF2 INACTIVE |
| | | 0 | OFF2 ACTIVE |
| 5 | OFF_3_STA | 1 | OFF3 INACTIVE |
| | | 0 | OFF3 ACTIVE |
| 6 | SWC_ON_INHIB | 1 | SWITCH-ON INHIBIT ACTIVE |
| | | 0 | SWITCH-ON INHIBIT NOT ACTIVE |
| 7 | | 1 | Warning/ (See Warning listing in the Diagnostics section for details on warnings.) |
| | | 0 | No warning/ |
| 8 | AT_SETPOINT | 1 | OPERATING. Actual value equals (within tolerance limits) the reference value. |
| | | 0 | Actual value is outside tolerance limits (not equal to reference value). |
| 9 | REMOTE | 1 | Drive control location: REMOTE (EXT1 or EXT2) |
| | | 0 | Drive control location: LOCAL |
| 10 | ABOVE_LIMIT | 1 | Supervised parameter's value \geq supervision high limit. Bit remains "1" until supervised parameter's value < supervision low limit. See group 32, Supervision |
| | | 0 | Supervised parameter's value < supervision low limit. Bit remains "0" until supervised parameter's value > supervision high limit. See group 32, Supervision |
| 11 | EXT CTRL LOC | 1 | External control location 2 (EXT2) selected |
| | | 0 | External control location 1 (EXT1) selected |
| 12 | EXT RUN PERMISSIVE | 1 | External Run Permissive signal received |
| | | 0 | No External Run Permissive signal received |
| 13... 15 | Unused | | |

The state diagram below describes the start-stop function of CONTROL WORD (CW) and STATUS WORD (SW) bits.



Reference

As described earlier in [Control interface](#), the REFERENCE word is a speed or frequency reference.

Reference scaling

The following table describes REFERENCE scaling for the ABB Drives profile.

| ABB Drives Profile (FBA) | | | | |
|--------------------------|---------------------|----------------|---|--|
| Reference | Range | Reference Type | Scalar | Remarks |
| REF1 | -32767... +32767 | Frequency | -20000 = -(par 46.02) +20000 = (par 46.02) | Final reference limited by 30.13/30.14 |
| | | Speed | -20000 = -(par 46.01) +20000 = (par 46.01) | Final reference limited by 30.11/30.12 |
| REF2 | -32767... +32767 | Frequency | -20000 = -(par 46.02) +20000 = (par 46.02) | Final reference limited by 30.13/30.14 |
| | | Speed | -20000 = -(par 46.01) +20000 = (par 46.01) | Final reference limited by 30.11/30.12 |

Note: The setting of parameter 1104 REF1 MIN and 1107 REF2 MIN has no effect on the scaling of references.

Reference handling

Use drive parameter 20.21 to control the rotation direction when using FBA A reference 1, FBA A reference 2, EFB reference 1 or EFB reference 2. The following diagrams illustrate how parameter 20.21 and the sign of the fieldbus reference interact to produce Reference values.

Note: Fieldbus references are bipolar; that is, they can be positive or negative.

| ABB Drives Profile | | |
|--------------------|---------------|--|
| Parameter | Value Setting | Resultant Reference |
| 20.21 Direction | 1 (Forward) | <p>The graph shows the relationship between Fieldbus Reference and Resultant Reference for parameter 20.21 Direction 1 (Forward). The Fieldbus Reference is plotted on the x-axis, ranging from -100% to 100%. The Resultant Reference is plotted on the y-axis, ranging from -(Max. Ref.) to Max. Ref. For negative fieldbus references, the resultant reference is zero. For positive fieldbus references, the resultant reference increases linearly from zero to Max. Ref. at 100% fieldbus reference.</p> |
| 20.21 Direction | 2 (Reverse) | <p>The graph shows the relationship between Fieldbus Reference and Resultant Reference for parameter 20.21 Direction 2 (Reverse). The Fieldbus Reference is plotted on the x-axis, ranging from -100% to 100%. The Resultant Reference is plotted on the y-axis, ranging from -(Max. Ref.) to Max. Ref. For positive fieldbus references, the resultant reference is zero. For negative fieldbus references, the resultant reference decreases linearly from zero to -(Max. Ref.) at -100% fieldbus reference.</p> |
| 20.21 Direction | 3 (Request) | <p>The graph shows the relationship between Fieldbus Reference and Resultant Reference for parameter 20.21 Direction 3 (Request). The Fieldbus Reference is plotted on the x-axis, ranging from -100% to 100%. The Resultant Reference is plotted on the y-axis, ranging from -(Max. Ref.) to Max. Ref. For positive fieldbus references, the resultant reference increases linearly from zero to Max. Ref. at 100% fieldbus reference. For negative fieldbus references, the resultant reference increases linearly from zero to Max. Ref. at -100% fieldbus reference.</p> |

Actual value

As described earlier in [Control interface](#), Actual Values are words containing drive values.

Actual value scaling

The scaling of the integers sent to the fieldbus as Actual Values depends on the resolution of the selected drive parameter. Except as noted for Data Words 5 and 6 below, scale the feedback integer using the resolution listed for the parameter in the *ACH580 HVAC control program firmware manual (3AXD50000027537)*. For example:

| Feedback Integer | Scaling | (Feedback Integer) / (Scaling) = Scaled Value |
|--|---------------|---|
| 100 (example: 12.11 AI1 actual feedback) | 1000 = 1 unit | 100 / 1000 = 0.1 mA |
| 10 | 10 = 1% | 10 / 10 = 1% |

Data words 5 and 6 are scaled as follows:

| ABB Drives Profile | | |
|--------------------|------------------------------|--|
| Data Word | Contents | Scaling |
| 5 | Set by drive parameter 58.28 | -20000 ... +20000 = -(par 46.01) ... +(par 46.01) if content is Speed -20000 ... +20000 = -(par 46.02) ... +(par 46.02) if content is Frequency -10000 ... +10000 = -(par 46.03) ... +(par 46.03) if content is Torque |
| 6 | Set by drive parameter 58.29 | -20000 ... +20000 = -(par 46.01) ... +(par 46.01) if content is Speed -20000 ... +20000 = -(par 46.02) ... +(par 46.02) if content is Frequency -10000 ... +10000 = -(par 46.03) ... +(par 46.03) if content is Torque |

Actual value mapping

See the user's manual supplied with the FBA module.

Generic profile technical data

Overview

The generic profile aims to fulfill the industry-standard drive profile for each protocol (e.g. PROFIdrive for PROFIBUS, AC/DC Drive for DeviceNet).

Control Word

As described earlier in [Control interface](#) the control word is the principal means for controlling the drive from a fieldbus system. For specific CONTROL WORD content, see the user's manual provided with the FBA module.

Status Word

As described earlier in [Control interface](#), the contents of the STATUS WORD is status information, sent by the drive to the master station. For specific STATUS WORD content, see the user's manual provided with the FBA module.

Reference

As described earlier in [Control interface](#), the REFERENCE WORD is a speed or frequency reference.

Note: REF2 is not supported by the Generic Drive profiles.

Reference scaling

REFERENCE scaling is fieldbus type specific. However, at the drive, the meaning of a 100% REFERENCE value is fixed as described in the table below. For a detailed description on the range and scaling of the REFERENCE, see the user's manual supplied with the FBA module.

| ABB Drives Profile (FBA) | | | | |
|--------------------------|---------------------|----------------|---|--|
| Reference | Range | Reference Type | Scalar | Remarks |
| REF | -32767... +32767 | Frequency | -20000 = -(par 46.02) +20000 = (par 46.02) | Final reference limited by 30.13/30.14 |
| | | Speed | -20000 = -(par 46.01) +20000 = (par 46.01) | Final reference limited by 30.11/30.12 |

Actual Values

As described earlier in [Control interface](#), Actual Values are words containing drive values.

Actual value scaling

For Actual Values, scale the feedback integer using the parameter's resolution. (See the *ACH580 HVAC control program firmware manual* (3AXD50000027537) for parameter resolutions.) For example:

| Feedback Integer | Scaling | (Feedback Integer) / (Scaling) = Scaled Value |
|--|---------------|---|
| 100 (example: 12.11 AI1 actual feedback) | 1000 = 1 unit | 100 / 1000 = 0.1 mA |
| 10 | 10 = 1% | 10 / 10 = 1% |

Actual value mapping

See the user's manual supplied with the FBA module.

Diagnostics



WARNING! Do not attempt any measurement, parts replacement or other service procedure not described in this manual. Such action will void the warranty, may endanger correct operation, and increase downtime and expense.



WARNING! All electrical installation and maintenance work described in this chapter should only be undertaken by qualified service personnel. The Safety instructions on the first pages of this manual must be followed.

Diagnostic displays

The bypass detects error situations and reports them using:

- The green and red status LEDs on the bypass control panel
- The bypass control panel display

The form of the display depends on the severity of the error. You can specify the severity for many errors by directing the bypass to:

- Ignore the error situation.
- Report the situation as a warning.
- Report the situation as a fault.

Red – faults

The bypass signals that it has detected a severe error, or fault, by:

- Enabling the red Faulted LED on the bypass (LED is either steady on or blinking).
- Overriding the control panel display with the display of a fault code.
- Stopping the motor (if it was on).

The message reappears after 30 seconds if the control panel is not touched and the fault is still active. The Faulted LED remains active (either steady on or blinking) even when the fault display is silenced.

Flashing display – warnings

For less severe errors, called warnings, the diagnostic display is advisory. For these situations, the bypass is simply reporting that it had detected something “unusual.” In these situations, the bypass overrides the control panel display with the display of a warning code and/or name.

The warning code on the display flashes over the current display. Pressing any key silences the warning message. The message reappears after 30 seconds if the control panel is not touched and the warning is still active.

Correcting faults

The recommended corrective action for faults is:

- Use the following *Fault listing* table to find and address the root cause of the problem.
- Reset the system.

Fault listing

| Fault Code | Fault Name In Panel | Fault | Possible Cause | Corrective Action |
|------------|---------------------|--|--|---|
| 3001 | COIL CURR FBK | RBCU is sensing abnormal current feedback when neither contactor should be energized | Defective component on RBCU | Change RBCU |
| 3002 | BYP CONTACT STUCK | M2 contactor indicates it is not prepared to move on a power up check of the contactor or after contact is commanded to open | Defective Contactor Defective RBCU | Disconnect incoming power from unit Check if contactor armature moves freely. If armature moves freely, then change the RBCU. If armature does not move freely, then change individual contactor (M2) or the complete assembly (RCSA-0x) |
| 3003 | DRV CONTACT STUCK | M1 contactor indicates it is not prepared to move on a power up check of the contactor or after contact is commanded to open | Defective Contactor Defective RBCU | Disconnect incoming power from unit Check if contactor armature moves freely. If armature moves freely, then change the RBCU. If armature does not move freely, then change individual contactor (M1) or the complete assembly (RCSA-0x) |
| 3004 | BYPASS COIL OPEN | M2 contactor will not close when commanded to do so | Loose J8 connector on RBCU Loose wires on contactor terminals A1 and/or A2 Bad Output on RBCU Bad Contactor | Verify that J8 connector is firmly seated. With incoming power disconnected, check for tightness of A1 and A2 terminals Swap RBCU Change Contactor/Assembly |
| 3005 | DRIVE COIL OPEN | M1 contactor will not close when commanded to do so | Loose J8 connector on RBCU Loose wires on contactor terminals A1 and/or A2 Bad Output on RBCU Bad Contactor | Verify that J8 connector is firmly seated. With incoming power disconnected, check for tightness of A1 and A2 terminals Swap RBCU Change Contactor/Assembly |

| Fault Code | Fault Name In Panel | Fault | Possible Cause | Corrective Action |
|------------|---------------------|---|--|--|
| 3006 | UNDERVOLT AGE | Fault will be generated only if the drive is controlling the motor and the power to the bypass is removed before the drive shuts down. This fault is generated when the drive contactor opens while the drive is operating. | Loose J7 connector on RBCU unit (refer to page 17 for the J7 connector location) Loose input wiring Incoming power problems | Check that J7 connector is firmly seated in RBCU (refer to page 17 for the J7 connector location) Check tightness of incoming connections Check Parameter 0413 to view voltage level at time of trip Check upstream protection |
| 3008 | DRIVE AI2 LOSS | Only displayed when in Supervisory mode. Indicates that AI2 on the drive has failed. | Check ACH580 manual for AI2 loss | Check ACH580 manual for AI2 loss |
| 3009 | MTR OVERLOAD | Bypass opens on motor overload conditions defined in the drive | Drive Mode: Bad Motor Bad CTs Bad RBCU Bypass mode: Bad motor Bad CTs Bad RBCU Either mode: low input voltage | Check if overload condition exists Drive Mode: Refer to 580 manual for proper troubleshooting techniques Bypass Mode: Check that J2 connector is firmly seated in RBCU Use clamp meter to verify mtr current vs. display in parameter 0101 Check input voltage |
| 3010 | INP PHASE A LOSS | Fault will be generated when the bypass contactor is requested to be closed and the RBCU does not sense voltage on Phase A | Loose J7 connector (refer to page 17 for the J7 connector location) Loose wiring on Contactor assembly. Blown upstream fuse | Check J7 connector (refer to page 17 for the J7 connector location) Check yellow wire on input block Check incoming voltage, phase to ground |
| 3011 | INP PHASE B LOSS | Fault will be generated when the bypass contactor is requested to be closed and the RBCU does not sense voltage on Phase B | Loose J7 connector (refer to page 17 for the J7 connector location) Loose wiring on Contactor assembly. Blown upstream fuse | Check J7 connector (refer to page 17 for the J7 connector location) Check black wire on input block Check incoming voltage, phase to ground |
| 3012 | INP PHASE C LOSS | Fault will be generated when the bypass contactor is requested to be closed and the RBCU does not sense voltage on Phase C | Loose J7 connector (refer to page 17 for the J7 connector location) Loose wiring on Contactor assembly. Blown upstream fuse | Check J7 connector (refer to page 17 for the J7 connector location) Check red on input block Check incoming voltage, phase to ground |
| 3013 | DRIVE 1ST START | Fault generated if attempting to close the bypass contactor with out running the bypass in drive mode first. | N/A | Run bypass unit in drive mode before attempting bypass mode |

| Fault Code | Fault Name In Panel | Fault | Possible Cause | Corrective Action |
|-------------------|----------------------------|---|--|---|
| 3014 | COIL POW SUPPLY | Coil power supply has failed to reach rated voltage | Internal failure on RBCU unit Shorted contactor coil | Cycle power on bypass unit. If contactor coil is shorted, fault 3023 or 3024 will be generated. If 3023 or 3024 is generated, replace respective contactor If 3023 or 3024 is not generated on power up, replace RBCU unit. |
| 3016 | EARTH FAULT | Declared if attempting to close the bypass contactor when the drive has earth fault declared | Earth fault in motor | Refer to the ACH580 manual |
| 3017 | MTR UNDERLOAD | If motor power(%) level falls below minimum power level establish in parameter 3003 for the time (s) set in parameter 3002 fault will be generated. Parameter 3003 is a percentage of motor power as defined in the drive via parameter 9909. Fault only applies to bypass mode | Broken belt | Check load Reset bypass keypad Check ACH580 manual, fault code 17, for further action |
| 3018 | MAX CYCLE FAULT | Supervisory Mode only. Declared if bypass contactor is closed by supervisory control 16 times within a 1 hour period. | High and low levels of hysteresis band are too tight | Check parameters 3202–3205. Increase time delays on parameters 3204 and 3205 |
| 3019 | DRIVE LINK FAULT | Supervisory Mode Only. Fault generated if RS-485 link between drive and bypass stops communicating. | Bad cable/ connection between drive and bypass. Drive parameter 95.21, bit 5 not set for Bypass present. | Proper seating of cable in drive and RBCU (connector J3). Check that drive parameter 95.21, bit 5 is set. |
| 3020 | PHASE SEQ | Sequence of 3 phase voltage input is such that bypass operation will result in motor rotation opposite of drive forward operation. | Phase sequence unknown at time of wiring | Swap any two of the three input wires to the bypass unit |
| 3021 | PH A CURR FBK | Fault is generated when current in Phase A is detected and the bypass contactor is open | Loose CT connection Bad RBCU Bad CT | Check J2 connector for proper seating Check connector on Current Assembly Replace RBCU Replace RCSA unit |
| 3022 | PH C CURR FBK | Fault is generated when current in Phase C is detected and the bypass contactor is open | Loose CT connection Bad RBCU Bad CT | Check J2 connector for proper seating Check connector on Current Assembly Replace RBCU Replace RCSA unit |

| Fault Code | Fault Name In Panel | Fault | Possible Cause | Corrective Action |
|---------------------|----------------------------|---|--|--|
| 3023 | BYP COIL SHORTED | Coil characteristics are checked only on power up and coil current is greater than allowable values | Shorted contactor coil Shorted/damaged cable Bad RBCU | Replace RBCU Replace RCSA unit |
| 3024 | DRV COIL SHORTED | Coil characteristics are checked only on power up and coil current is greater than allowable values | Shorted contactor coil Shorted/damaged cable Bad RBCU | Replace RBCU Replace RCSA unit |
| 3027 | INVALID SUB ASM | Contactors assembly as recorded in the RBCU unit does not match drive information communicated via 485 link | RBCU unit from a different size bypass used to replace a defective RBCU. Parameters not matched after Firmware change. | Contact ABB at 1-800-752-0696 option 1 |
| 3028 | EXT COMM LOSS | Time between fieldbus messages has exceeded timeout interval set with parameter 3005 | Incorrect Communication settings in Group 51 and 58. Poor Connections Noise on Communication Line | Check Group 51 and 58 Tighten Connections Check Communication Cable Grounding |
| 3029 | EFB CONFIG FILE | Error reading configuration file for embedded fieldbus | Internal Startup error | Cycle Power Replace RBCU |
| 3030 | FORCE TRIP | Fault trip forced by external fieldbus | Overriding Control System tripped E-Clipse unit via fieldbus. | Check Overriding Control System |
| 3031 ... 3033 | EFB 1...EFB 3 | Fault code reserved for embedded fieldbus. | For Bacnet: Device object instances for the drive and or bypass are set greater than 4194302 in parameters 5040 5099 and/or 5840 5899 respectively | Check Parameters 5040, 5099 and/or 5840, 5899 |
| 3034 | MTR PHASE | Detects open motor phase. Detection is done by current transformers in bypass unit. | Internal problem Cable problem Motor problem | Check wiring in E-Clipse Unit Check motor cabling Check Motor Check if 3006 is Disabled |
| 3037 | PCB TEMP | RBCU unit has reached 190 degrees Fahrenheit, 88 degrees Celsius | Cabinet cooling has failed Ambient conditions too high Bad RBCU unit | Stop drive and let cool down and restart Add additional cooling Replace RBCU |

| Fault Code | Fault Name In Panel | Fault | Possible Cause | Corrective Action |
|-------------------|----------------------------|--|--|--|
| 3038 | NO DRIVE DATA | No drive data available (Group 112) | Bypass not able to extract drive data on initial power up due to: Bad cable/ connection between drive and bypass. Drive parameter 95.21, bit 5 not set for Bypass present. | Proper seating of cable in drive and RBCU (connector J3). Check that drive parameter 95.21, bit 5 is set. |
| 3039 | FBA PAR CONF | Non embedded fieldbus has detected an error in Group 51 parameters | Incorrect settings in Group 51 | Verify Group 51 parameters |
| 3101 | SFLASH CORRUPT | Internal checksum error | N/A | Cycle power Replace RBCU Upgrade firmware |
| 3102 | PMAP FILE | Parameter file is corrupt | | Cycle Power Contact ABB with information that preceded fault |
| 3201 | T1 OVERLOAD | T1 program cycle is overloaded | N/A | Contact ABB with information that preceded fault Cycle Power Replace RBCU |
| 3202 | T2 OVERLOAD | T2 program cycle is overloaded | N/A | Contact ABB with information that preceded fault Cycle Power Replace RBCU |
| 3203 | T3 OVERLOAD | T3 program cycle is overloaded | N/A | Contact ABB with information that preceded fault Cycle Power Replace RBCU |
| 3204 | STACK OVERFLOW | Program cycle is overloaded | N/A | Contact ABB with information that preceded fault Cycle Power Replace RBCU |
| 3205 | UNKNOWN CB | Bypass control board type is unknown. | Firmware is not compatible with control board in RBCU. | Contact ABB at 1-800-752-0696 option 1 |
| 3206 | UNKNOWN DRIVE | Drive reports rating not found in bypass software | Drive does not match drives configured in bypass RBCU | Replace RBCU or reload with most current firmware |
| 3207 | UNKNOWN BYPASS | N/A | N/A | Replace RBCU or load most current firmware Contact ABB at 1-800-752-0696 option 1 Replace RBCU or load most current firmware |

Fault resetting

WARNING! If an external source for start command is selected and it is active, the system may start immediately after fault reset.

Flashing red LED

To reset the bypass for faults indicated by a flashing red LED:

- Turn off the power for 5 minutes.

Red LED

To reset the bypass for faults indicated by a red LED (on, not flashing), correct the problem and do one of the following:

- From the bypass control panel, press OFF/RESET
- Turn off the power for 5 minutes.

Depending on the value of 1607, FAULT RESET SELECT, the following could also be used to reset the drive:

- Digital input
- Fieldbus communication

When the fault has been corrected, the motor can be started.

Note: For some faults such as motor phase open and motor OC, it is suggested that you check the drive to motor wiring and/or meggar the motor before attempting to restart the system on bypass.

History

For reference, the last five fault codes are stored into parameters 0401, 0410, 0419, 0420 and 0421. For the most recent fault (identified by parameter 0401) and Fault 2 (identified by parameter 0410), the drive stores additional data (in group 4 and the event log) to aid in troubleshooting a problem.

To clear the fault history (all of the Group 04, Fault History parameters):

1. Using the control panel in Parameters mode, select parameter 0401.
2. Press ENTER.
3. Press Up and Down simultaneously.
4. Press ENTER.

Correcting warnings

The recommended corrective action for warnings is:

- Determine if the Warning requires any corrective action (action is not always required).
- Use the following [Warning listing](#) to find and address the root cause of the problem.

Diagnostics

Warning listing

The following table lists the warnings by code number and describes each.

| Warning Code | Warning Name In Panel | Warning | Possible Cause | Corrective Action |
|--------------|---|--|---|--|
| 4001 | INP PHASE A LOSS | Warning will occur in drive mode. In bypass, warning will occur if bypass contactor has not closed. Unit will trip on Fault 3010 if the bypass contactor is closed | Loose J8 connector Loose wiring on Contactor assembly. Blown upstream fuse | Check J8 connector Check yellow wire on input block Check incoming voltage, phase to ground |
| 4002 | INP PHASE B LOSS | Warning will occur in drive mode. In bypass, warning will occur if bypass contactor has not closed. Unit will trip on Fault 3011 if the bypass contactor is closed | Loose J8 connector Loose wiring on Contactor assembly. Blown upstream fuse | Check J8 connector Check black wire on input block Check incoming voltage, phase to ground |
| 4003 | INP PHASE C LOSS | Warning will occur in drive mode. In bypass, warning will occur if bypass contactor has not closed. Unit will trip on Fault 3012 if the bypass contactor is closed | Loose J8 connector Loose wiring on Contactor assembly. Blown upstream fuse | Check J8 connector Check red wire on input block Check incoming voltage, phase to ground |
| 4004 | AUTO TRANSFER | Message is displayed when the drive faults and the bypass switches to bypass mode as configured in Parameter 1608 | Drive fault | Check drive |
| 4005 | EXT COMM ERR | Time between fieldbus messages has exceeded timeout interval set with parameter 3005 | Incorrect Communication settings in Group 51 and 58. Poor Connections Noise on Communication Line | Check Group 51 and 58 Tighten Connections Check Communication Cable Grounding |
| 4006 | Selected by PAR 1620: RUN PERMISSIVE DAMPER END SWITCH VALVE OPENING PRE-LUBE CYCLE | Warning will occur when start order is given and the "RUN Permissive" is not present | Run Permissive condition is not satisfied. Bad 24v supply Bad digital input | Check 24 Volts on RBCU unit Check for 24 volts on respective DI when condition is satisfied Check Parameter 0103 for status of digital input |
| 4007 | PCB TEMP | RBCU unit reached 181 degrees Fahrenheit, 83 degrees Celsius | Cabinet cooling has failed Ambient conditions too high Bad RBCU unit | Stop drive and let cool down and restart Add additional cooling Replace RBCU |

| Warning Code | Warning Name In Panel | Warning | Possible Cause | Corrective Action |
|--------------|-----------------------|--|---|--|
| 4008 | DRIVE SETUP | Warning generated when configuration of drive is such that bypass can not properly control the drive. Specifically, drive parameter 95.21, bit 5 | Incorrect parameters settings | Check that drive parameter 95.21, bit 5 = "Bypass present" |
| 4009 | BYPASS RUN DELAY | Warning is generated when a bypass start command is issued and there is non zero time value in bypass parameter 1614 | N/A | N/A |
| 4010 | MTR OVERLOAD | Bypass warning if motor overload conditions exist as defined in the drive | Overloaded motor drive mode: Bad Motor Bad CTs Bad RBCU Bypass mode: Bad motor Bad CTs Bad RBCU Either mode: low input voltage | Drive Mode: Refer to ACH580 manual for proper troubleshooting techniques Bypass Mode: Check that J2 connector is firmly seated in RBCU Check input voltage Does overload condition exist? |
| 4011 | MTR UNDERLOAD | Warning comes at half the time of a mtr underload fault. See fault 3017 for further text | N/A | Parameter 3002 is the time Parameter 3003 is the level |
| 4012 | BYPASS DISABLED | Warning will be generated if parameter 1613 is set to "Disable" | N/A | N/A |
| 4013 | DRIVE LINK ERROR | Same as Fault 3019 however will occur when not in supervisory mode | Bad cable between drive and bypass Drive parameter 95.21, bit 5 not set for "Bypass present" | Proper seating of cable in drive and RBCU (connector J3) Check that drive parameter 95.21, bit 5 = "Bypass present" Follow DriveLink recovery procedure |
| 4014 | DRIVE TEST | Warning is generated when bypass parameter 1617 is set to "enable" | N/A | N/A |
| 4015 | START DRIVE 1ST | Message displayed on initial "out of box" power up sequence | N/A | Run drive in Hand |

| Warning Code | Warning Name In Panel | Warning | Possible Cause | Corrective Action |
|--------------|---|---|---|--|
| 4016 | INP VOLTAGE LOW | 3-Phase input voltage has not reached a sufficient level to enable editing of parameters via the keypad. This message is generated within a few seconds of power up | N/A | Loose J7 connector Low input voltage. Incoming voltage has not reached at least 155 VAC within a few seconds of powerup |
| 4019 | OVERRIDE 1 | Warning is generated when override 1 is active | N/A | Check Parameter 0103 and 0104 for digital input status |
| 4020 | OVRD2 BYP | Warning is generated when override 2 is active and the bypass is controlling the motor | N/A | Check Parameter 0103 and 0104 for digital input status |
| 4021 | Selected by PAR 1621 START INTERLOCK 1 VIBRATION SWITCH FIRESTAT FREEZESTAT OVERPRESSURE VIBRATION TRIP SMOKE SAFETY OPEN LOW SUCTION PRES | Warning will occur when start order is given and the "RUN Permissive" is not present | Run Permissive condition is not satisfied. Bad 24 V supply Bad digital input 24 V common is not tied to Digital input common on bypass when using external 24 V supply | Check 24 Volts on RBCU unit Check for 24 volts on respective DI when condition is satisfied Check Parameter 0103 For status of digital input |
| 4022 | Selected by PAR 1622 START INTERLOCK 2 VIBRATION SWITCH ... LOW SUCTION PRES | Warning will occur when start order is given and the "RUN Permissive" is not present | Run Permissive condition is not satisfied. Bad 24v supply Bad digital input 24 V common is not tied to Digital input common on bypass when using external 24 v supply | Check 24 Volts on RBCU unit Check for 24 volts on respective DI when condition is satisfied Check Parameter 0103 For status of digital input |
| 4023 | Selected by PAR 1623 START INTERLOCK 3 VIBRATION SWITCH ... LOW SUCTION PRES | Warning will occur when start order is given and the "RUN Permissive" is not present | Run Permissive condition is not satisfied. Bad 24 V supply Bad digital input 24 V common is not tied to Digital input common on bypass when using external 24 V supply | Check 24 Volts on RBCU unit Check for 24 volts on respective DI when condition is satisfied Check Parameter 0103 For status of digital input |

| Warning Code | Warning Name In Panel | Warning | Possible Cause | Corrective Action |
|--------------|--|--|---|--|
| 4024 | Selected by PAR 1624 START INTERLOCK 4 VIBRATION SWITCH ... LOW SUCTION PRES | Warning will occur when start order is given and the "RUN Permissive" is not present | Run Permissive condition is not satisfied. Bad 24 V supply Bad digital input 24 V common is not tied to Digital input common on bypass when using external 24 V supply | Check 24 Volts on RBCU unit Check for 24 volts on respective DI when condition is satisfied Check Parameter 0103 For status of digital input |
| 4025 | LOCAL DISABLED | Warning is displayed if MODE LOCK (16.29) is set to AUTO MODE and the Hand or Off key is pressed | | |
| 4026 | AUTO DISABLED | This warning is displayed if MODE LOCK (1629) is set to LOCAL MODE and the Auto key is pressed. | | |
| 4027 | COMM CONFIG ERR | Warning is displayed if the drive and bypass MAC addresses are equal or invalid. | E-Clipse parameters 5003 (BP MAC ID) and 5803 (DV MAC ID) are set to the same value | Change MAC address to unique values |
| 4028 | FBA PAR CONF | Non embedded fieldbus has detected an error in Group 51 parameters | | Verify Group 51 parameters |
| 4029 | DRIVE FAULTED | The drive is faulted. | | Reset drive |
| 4030 | OVRD2 VFD | Warning is generated when override 2 is active and the drive is controlling the motor | N/A | Check Parameter 0103 and 0104 for digital input status |
| 4031 | OVRD2 STOP | Warning is generated when override 2 is active and both the bypass and drive output contactors are deenergized | N/A | Check Parameter 0103 and 0104 for digital input status |

Bypass status listing

| Bypass Status (16 Characters) | Condition | Description |
|--|------------------------------------|---|
| DRIVE/BYPASS? | DRIVE SELECTED BYPASS SELECTED | Displays which one is selected, drive or bypass |
| SAFETIES? | OPEN CLOSED | Displays if safeties (=START INTERLOCK 1 and/or START INTERLOCK 2) have been applied, or if they are missing |
| RUN PERMISSIVES? | OPEN CLOSED | Displays if RUN PERMISSIVE is present or not |
| START REQUEST? | NOT PRESENT PRESENT | Displays if start request has been applied to the system |
| AUTO TRANSFER? | NOT TRANSFERRED TRANSFERRED | Displays if the system is in Auto Transfer state or not. Does not reflect to PAR 16.08 AUTO XFER value itself |
| BYP OVERRIDE 1? | NOT ACTIVATED ACTIVATED | Status of Override 1 |
| BYP OVERRIDE 2? | NOT ACTIVATED ACTIVATED | Status of Override 2 |
| DRIVE FAULTED? | NO YES | Displays if drive is faulted or not |
| BYPASS FAULTED? | NO YES | Displays if bypass is faulted or not |
| SYSTEM STARTED? | NO YES | Displays if system is started or not |
| SYSTEM RUNNING? | NO YES | Displays if system is running or not |
| BYPASS ALARMS? | NO ALARMS ACTIVE | Displays if there is an active warning(s) in bypass or not |
| HAND/OFF/AUTO? | OFF MODE HAND MODE AUTO MODE | Displays operating mode of the bypass - OFF, HAND or AUTO |

Error messages

| # | Error Message | Description |
|----|--------------------------------|--|
| 1 | CAN'T EDIT PAR IS READ ONLY | Try to save value (=press the ENTER key in Parameter Edit State) of a read-only parameter. E.g. try to change value PAR 01.02 INPUT VOLT |
| 2 | CAN'T EDIT WHEN STARTED | Try to change value of a parameter, which is allowed to be changed only when system is not started. E.g. PAR 16.02 RUN PERMISSIVE |
| 3 | CAN'T EDIT UP+DOWN ONLY | Try to change value of a "reset only" parameter other than zero. UP+DOWN buttons must be pressed simultaneously for requesting default value of the PAR on the display (value zero), and after that ENTER pressed for saving it (reset the parameter). E.g. PAR 04.01 LAST FAULT |
| 4 | CAN'T EDIT INP VOLTAGE LOW | Input voltage too low. Changing of parameters prohibited since system cannot save values to nv-mem w/ insufficient voltage. |
| 5 | CAN'T EDIT PAR IS HIDDEN | Try to save value (=press the ENTER key in Parameter Edit State) of a hidden parameter. Should not be possible. If hidden parameters are turned visible, this message is not given. |
| 6 | CAN'T EDIT UNDER LO-LIMIT | Try to save value which is over LO-LIMIT of the parameter. Should not be possible when changing parameters from control panel. |
| 7 | CAN'T EDIT UNDER HI-LIMIT | Try to save value which is over HI-LIMIT of the parameter. Should not be possible when changing parameters from control panel. |
| 8 | CAN'T EDIT ENUM VAL ONLY | Try to save value which is out of enumerated value list. Should not be possible when changing parameters from control panel. |
| 9 | CAN'T EDIT NO DEFAULT | Try to request default value (=press UP and DOWN buttons simultaneously) for a parameter which is defined not to have a default value. Should not be possible when changing parameters from control panel. |
| 10 | CAN'T EDIT TRY AGAIN. | Parameter system is busy, e.g. application macro change is in process at the same time when someone is trying to save a value for a parameter. Should not be possible when changing parameters from control panel. |

Maintenance

Maintenance

Maintenance intervals

If installed in an appropriate environment, the drive requires very little maintenance. This table lists the routine maintenance intervals recommended by ABB for ACH580 enclosures.

| Maintenance | Configuration | Interval | Instruction |
|---|---|--|---|
| Check/replace hinged door wall mount enclosure inlet air filter | Hinged door wall mount UL (NEMA) Type 12 enclosures | Check every 3 months. Replace as needed. | Enclosure air filter replacement – UL (NEMA) Type 12 hinged door wall mount enclosures on page 199. |

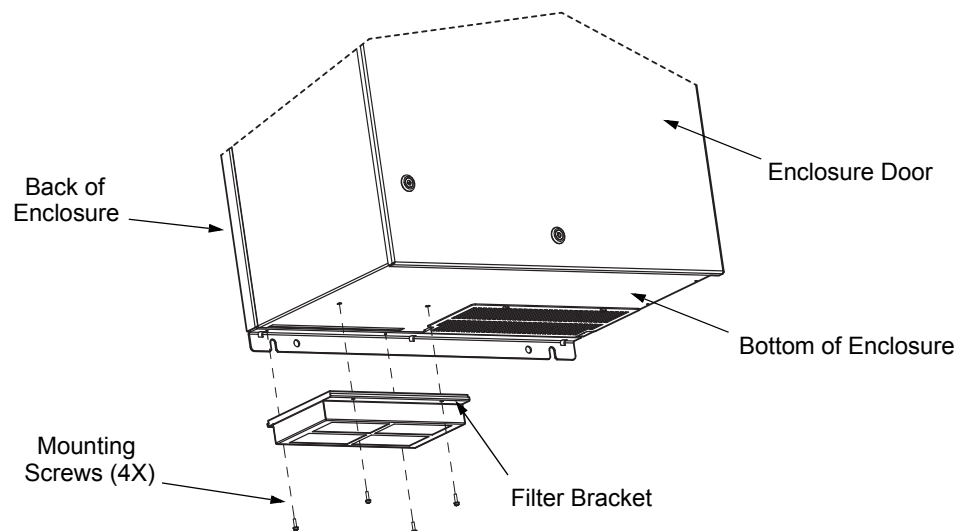
Enclosure air filter replacement – UL (NEMA) Type 12 hinged door wall mount enclosures

Filter material

| Material | Filter Type |
|--------------------------------------|--|
| American Air Filter (358-35-06A-12A) | POLYKLEON WHITE 12.7mm (1/2 in.) X 152.4mm (6 in.) X 304.6mm (12 in.) stk. |

This procedure applies to drive with input disconnect configurations in UL (NEMA) Type 12 hinged door wall mount enclosures. This filter is located at the bottom of the enclosure. Use the following procedure to check and replace filters.

1. On the enclosure, remove the screws holding the filter bracket in place.
2. Remove the filter kit from the enclosure.



3. Lift the filter out of the filter bracket and replace as appropriate.
4. With the filter in the filter bracket, reinstall filter kit onto enclosure.
5. Replace the mounting screws. Tighten to the recommended torque of 2 N•m (1.47 ft-lbs) per installation instruction 3AXD50000221370.

Technical data

Vertical enclosure terminals maximum wire size and terminal torque values

| Type Code ¹ | Nominal Output Ratings | | Frame Size | Maximum Wire Size and Terminal Torque | | | |
|------------------------|------------------------|---------------|------------|---------------------------------------|-------------------|--------------------|-----------------|
| | Drive Current | Package Power | | Circuit Breaker | Disconnect Switch | Motor Termination | Ground Lugs |
| | A | HP | | | | | |
| 208/230 Volts | | | | | | | |
| ACH580-VxR-04A6-2 | 4.6 | 1 | R1 | #10 62 in-lbs | #10 55 in-lbs | #6 11-13 in-lbs | #4 35 in-lbs |
| ACH580-VxR-06A6-2 | 6.6 | 1.5 | R1 | | | | |
| ACH580-VxR-07A5-2 | 7.5 | 2 | R1 | | | | |
| ACH580-VxR-10A6-2 | 10.6 | 3 | R1 | #8 62 in-lbs | #6 55 in-lbs | #1 35 in-lbs | #2 50 in-lbs |
| ACH580-VxR-017A-2 | 16.7 | 5 | R1 | | | | |
| ACH580-VxR-024A-2 | 24.2 | 7.5 | R2 | | | | |
| ACH580-VxR-031A-2 | 30.8 | 10 | R2 | #2 62 in-lbs | #4 55 in-lbs | #2/0 110 in-lbs | #2 50 in-lbs |
| ACH580-VxR-046A-2 | 46.2 | 15 | R3 | | | | |
| ACH580-VxR-059A-2 | 59.4 | 20 | R3 | | | | |
| ACH580-VxR-075A-2 | 74.8 | 25 | R4 | #1/0 75 in-lbs | #1 55 in-lbs | #2/0 110 in-lbs | #2 50 in-lbs |

1) "VxR" represents both VCR and VDR.

| Type Code ¹ | Nominal Output Ratings | | Frame Size | Maximum Wire Size and Terminal Torque | | | |
|------------------------|------------------------|---------------|------------|---------------------------------------|-------------------|--------------------|-----------------|
| | Drive Current | Package Power | | Circuit Breaker | Disconnect Switch | Motor Termination | Ground Lugs |
| | A | HP | | | | | |
| 460 Volts | | | | | | | |
| ACH580-VxR-02A1-4 | 2.1 | 1 | R1 | #12 62 in-lbs | #10 55 in-lbs | #6 11-13 in-lbs | #4 35 in-lbs |
| ACH580-VxR-03A0-4 | 3.0 | 1.5 | R1 | | | | |
| ACH580-VxR-03A5-4 | 3.5 | 2 | R1 | | | | |
| ACH580-VxR-04A8-4 | 4.8 | 3 | R1 | | | | |
| ACH580-VxR-07A6-4 | 7.6 | 5 | R1 | | | | |
| ACH580-VxR-012A-4 | 12 | 7.5 | R1 | #10 62 in-lbs | #8 55 in-lbs | #1 35 in-lbs | #2 50 in-lbs |
| ACH580-VxR-014A-4 | 14 | 10 | R2 | | | | |
| ACH580-VxR-023A-4 | 23 | 15 | R2 | #8 62 in-lbs | #6 55 in-lbs | #1 35 in-lbs | #2 50 in-lbs |
| ACH580-VxR-027A-4 | 27 | 20 | R3 | | | | |
| ACH580-VxR-034A-4 | 34 | 25 | R3 | | | | |
| ACH580-VxR-044A-4 | 44 | 30 | R3 | #2 62 in-lbs | #4 55 in-lbs | #2/0 110 in-lbs | #2 50 in-lbs |
| ACH580-VxR-052A-4 | 52 | 40 | R4 | | | | |
| ACH580-VxR-065A-4 | 65 | 50 | R4 | | | | |
| ACH580-VxR-077A-4 | 77 | 60 | R4 | #1/0 75 in-lbs | #1 55 in-lbs | #2/0 110 in-lbs | #2 50 in-lbs |

1) "VxR" represents both VCR and VDR.

| Type Code ¹ | Nominal Output Ratings | | Frame Size | Maximum Wire Size and Terminal Torque | | | |
|------------------------------|------------------------|---------------|------------|---------------------------------------|-------------------|--------------------|-----------------|
| | Drive Current | Package Power | | Circuit Breaker | Disconnect Switch | Motor Termination | Ground Lugs |
| | A | HP | | | | | |
| 575 Volts² | | | | | | | |
| ACH580-VxR-02A7-6 | 2.7 | 2 | R2 | #10 62 in-lbs | #10 55 in-lbs | #6 11-13 in-lbs | #4 35 in-lbs |
| ACH580-VxR-03A9-6 | 3.9 | 3 | R2 | | | | |
| ACH580-VxR-06A1-6 | 6.1 | 5 | R2 | | | | |
| ACH580-VxR-09A0-6 | 9 | 7.5 | R2 | | | | |
| ACH580-VxR-011A-6 | 11 | 10 | R2 | | #6 55 in-lbs | #1 35 in-lbs | #2 50 in-lbs |
| ACH580-VxR-017A-6 | 17 | 15 | R2 | | | | |
| ACH580-VxR-022A-6 | 22 | 20 | R3 | | | | |
| ACH580-VxR-027A-6 | 27 | 25 | R3 | | | | |
| ACH580-VxR-032A-6 | 32 | 30 | R3 | #4 55 in-lbs | | | |

1) "VxR" represents both VCR and VDR.

2) VCR is rated 600Y/347V. For use on a solidly grounded Wye source only.

Box enclosure terminals maximum wire size and terminal torque values

| Type Code ¹ | Nominal Output Ratings | | Base Drive Frame Size | Maximum Wire Size and Terminal Torque | | | | | | | | |
|------------------------|------------------------|------------------|-----------------------|---|-----------------------------------|---|-------------------------------------|--|-----------------------------------|------------------------------------|-------------------------------|---------------------------|
| | Drive Current | Package Power | | Circuit Breaker UL (NEMA) Type 1 and 12 | Circuit Breaker UL (NEMA) Type 3R | Disconnect Switch UL (NEMA) Type 1 and 12 | Disconnect Switch UL (NEMA) Type 3R | Motor Terminals UL (NEMA) Type 1 and 2 | Motor Terminals UL (NEMA) Type 3R | Ground Lugs UL (NEMA) Type 1 and 2 | Ground Lugs UL (NEMA) Type 3R | |
| | A | HP | | | | | | | | | | |
| 208/230 Volts | | | | | | | | | | | | |
| ACH580-BxR-04A6-2 | 4.6 | 1 | R1 | #12 62 in-lbs | #12 62 in-lbs | #10 55 in-lbs | #10 55 in-lbs | #6 11-13 in-lbs | #6 11-13 in-lbs | #4 35 in-lbs | #4 35 in-lbs | |
| ACH580-BxR-06A6-2 | 6.6 | 1.5 | R1 | | | | | | | | | |
| ACH580-BxR-07A5-2 | 7.5 | 2 | R1 | | | | | | | | | |
| ACH580-BxR-10A6-2 | 10.6 | 3 | R1 | | | | | | | | | |
| ACH580-BxR-017A-2 | 16.7 | 5 | R1 | #8 62 in-lbs | #8 62 in-lbs | #6 55 in-lbs | #6 55 in-lbs | | | | | |
| ACH580-BxR-024A-2 | 24.2 | 7.5 | R2 | #6 62 in-lbs | #6 62 in-lbs | #4 55 in-lbs | #4 55 in-lbs | #1 35 in-lbs | #1 35 in-lbs | | | |
| ACH580-BxR-031A-2 | 30.8 | 10 | R2 | #6 62 in-lbs | #6 62 in-lbs | #4 55 in-lbs | #4 55 in-lbs | #1 35 in-lbs | #1 35 in-lbs | | | |
| ACH580-BxR-046A-2 | 46.2 | 15 | R3 | #2 62 in-lbs | #2 62 in-lbs | #2 55 in-lbs | #2 55 in-lbs | #2/0 110 in-lbs | #2/0 110 in-lbs | #2 50 in-lbs | #2 50 in-lbs | |
| ACH580-BxR-059A-2 | 59.4 | 20 | R3 | | | #1 55 in-lbs | #1 55 in-lbs | | | | | |
| ACH580-BxR-075A-2 | 74.8 | 25 | R4 | | | #1/0 75 in-lbs | #1/0 75 in-lbs | | | | | |
| ACH580-BxR-088A-2 | 88 | 30 | R5 | #1/0 124 in-lbs | Consult factory | #2/0 275 in-lbs | Consult factory | #2/0 71 in-lbs | Consult factory | #1/0 50 in-lbs | Consult factory | |
| ACH580-BxR-114A-2 | 114 | 40 | R6 | | | #4/0 275 in-lbs | | 300 MCM 301 in-lbs | | | | |
| ACH580-BxR-143A-2 | 143 | 50 | R6 | | | #3/0 124 in-lbs | | 300 MCM 275 in-lbs | | | | 500 MCM 372 in-lbs |
| ACH580-BxR-169A-2 | 169 | 60 | R7 | | | 373 MCM 274 in-lbs | | 2 X 500 MCM 274 in-lbs | | | | 2 X 500 MCM 372 in-lbs |
| ACH580-BxR-211A-2 | 211 | 75 | R7 | | | | | | | | | |
| ACH580-BxR-248A-2 | 248 | 100 ² | R8 | | | | | | | | | |

1) "BxR" represents both BCR and BDR.

2) 100 HP @ 230V.

| Type Code ¹ | Nominal Output Ratings | | Base Drive Frame Size | Maximum Wire Size and Terminal Torque | | | | | | | |
|------------------------|------------------------|---------------|-----------------------|---|-----------------------------------|---|-------------------------------------|--|-----------------------------------|------------------------------------|-------------------------------|
| | Drive Current | Package Power | | Circuit Breaker UL (NEMA) Type 1 and 12 | Circuit Breaker UL (NEMA) Type 3R | Disconnect Switch UL (NEMA) Type 1 and 12 | Disconnect Switch UL (NEMA) Type 3R | Motor Terminals UL (NEMA) Type 1 and 2 | Motor Terminals UL (NEMA) Type 3R | Ground Lugs UL (NEMA) Type 1 and 2 | Ground Lugs UL (NEMA) Type 3R |
| | A | HP | | | | | | | | | |
| 460 Volts | | | | | | | | | | | |
| ACH580-BxR-02A1-4 | 2.1 | 1 | R1 | #12 62 in-lbs | #12 62 in-lbs | #10 55 in-lbs | #10 55 in-lbs | #6 11-13 in-lbs | #6 11-13 in-lbs | #4 35 in-lbs | #4 35 in-lbs |
| ACH580-BxR-03A0-4 | 3.0 | 1.5 | R1 | | | | | | | | |
| ACH580-BxR-03A5-4 | 3.5 | 2 | R1 | | | | | | | | |
| ACH580-BxR-04A8-4 | 4.8 | 3 | R1 | | | | | | | | |
| ACH580-BxR-07A6-4 | 7.6 | 5 | R1 | | | | | | | | |
| ACH580-BxR-012A-4 | 12 | 7.5 | R1 | #10 62 in-lbs | #10 62 in-lbs | #8 55 in-lbs | #8 55 in-lbs | #1 35 in-lbs | #1 35 in-lbs | #2 50 in-lbs | #2 50 in-lbs |
| ACH580-BxR-014A-4 | 14 | 10 | R2 | | | #6 55 in-lbs | #6 55 in-lbs | | | | |
| ACH580-BxR-023A-4 | 23 | 15 | R2 | #8 62 in-lbs | #8 62 in-lbs | #4 55 in-lbs | #4 55 in-lbs | #1 35 in-lbs | #1 35 in-lbs | #2 50 in-lbs | #2 50 in-lbs |
| ACH580-BxR-027A-4 | 27 | 20 | R3 | | | #3 55 in-lbs | #3 55 in-lbs | | | | |
| ACH580-BxR-034A-4 | 34 | 25 | R3 | | | #2 62 in-lbs | #2 62 in-lbs | | | | |
| ACH580-BxR-044A-4 | 44 | 30 | R3 | #1 55 in-lbs | #1 55 in-lbs | | | | | | |
| ACH580-BxR-052A-4 | 52 | 40 | R4 | #2 62 in-lbs | #2 62 in-lbs | #2 55 in-lbs | #2 55 in-lbs | #2/0 110 in-lbs | #2/0 110 in-lbs | #2 50 in-lbs | #2 50 in-lbs |
| ACH580-BxR-065A-4 | 65 | 50 | R4 | | | #1 55 in-lbs | #1 55 in-lbs | | | | |
| ACH580-BxR-077A-4 | 77 | 60 | R4 | | | #1/0 75 in-lbs | #1/0 75 in-lbs | | | | |
| ACH580-BxR-096A-4 | 96 | 75 | R5 | #1/0 124 in-lbs | Consult factory | #3/0 275 in-lbs | Consult factory | #2/0 71 in-lbs | Consult factory | #1/0 50 in-lbs | Consult factory |
| ACH580-BxR-124A-4 | 124 | 100 | R6 | #2/0 124 in-lbs | | 250 MCM 275 in-lbs | | 300 MCM 301 in-lbs | | | |
| ACH580-BxR-156A-4 | 156 | 125 | R7 | #3/0 124 in-lbs | | 300 MCM 275 in-lbs | | 500 MCM 372 in-lbs | | | |
| ACH580-BxR-180A-4 | 180 | 150 | R7 | 350 MCM 274 in-lbs | | 350 MCM 274 in-lbs | | 2 X 500 MCM 372 in-lbs | | | |
| ACH580-BxR-240A-4 | 240 | 200 | R8 | | | | | | | | |

1) "BxR" represents both BCR and BDR.

| Type Code ¹ | Nominal Output Ratings | | Base Drive Frame Size | Maximum Wire Size and Terminal Torque | | | | | | | | |
|--------------------------------|------------------------|---------------|-----------------------|---|-----------------------------------|---|-------------------------------------|--|-----------------------------------|------------------------------------|-------------------------------|-----------------|
| | Drive Current | Package Power | | Circuit Breaker UL (NEMA) Type 1 and 12 | Circuit Breaker UL (NEMA) Type 3R | Disconnect Switch UL (NEMA) Type 1 and 12 | Disconnect Switch UL (NEMA) Type 3R | Motor Terminals UL (NEMA) Type 1 and 2 | Motor Terminals UL (NEMA) Type 3R | Ground Lugs UL (NEMA) Type 1 and 2 | Ground Lugs UL (NEMA) Type 3R | |
| | A | HP | | | | | | | | | | |
| 575 Volts² | | | | | | | | | | | | |
| ACH580-BxR-02A7-6 | 2.7 | 2 | R2 | #12 62 in-lbs | #12 62 in-lbs | #10 55 in-lbs | #10 55 in-lbs | #6 11-13 in lbs | #6 11-13 in lbs | #4 35 in-lbs | #4 35 in-lbs | |
| ACH580-BxR-03A9-6 | 3.9 | 3 | R2 | | | | | | | | | |
| ACH580-BxR-06A1-6 | 6.1 | 5 | R2 | | | | | | | | | |
| ACH580-BxR-09A0-6 | 9 | 7.5 | R2 | | | | | | | | | |
| ACH580-BxR-011A-6 | 11 | 10 | R2 | | | | | | | | | |
| ACH580-BxR-017A-6 | 17 | 15 | R2 | #10 62 in-lbs | #10 62 in-lbs | #6 55 in-lbs | #6 55 in-lbs | #1 35 in-lbs | #1 35 in-lbs | #2 50 in-lbs | #4 35 in-lbs | |
| ACH580-BxR-022A-6 | 22 | 20 | R3 | | | | | | | | | |
| ACH580-BxR-027A-6 | 27 | 25 | R3 | #6 62 in-lbs | Consult factory | #4 55 in-lbs | #4 55 in-lbs | #2/0 110 in-lbs | Consult factory | 3 x #3/0 | 250 in-lbs | Consult factory |
| ACH580-BxR-032A-6 | 32 | 30 | R3 | | | | | | | | | |
| ACH580-BxR-041A-6 | 41 | 40 | R5 | | | | | | | | | |
| ACH580-BxR-052A-6 ³ | 52 | 50 | R5 | #2 62 in-lbs | Consult factory | #3 55 in-lbs | #2 55 in-lbs | #2/0 71 in-lbs | Consult factory | 3 x #3/0 | 250 in-lbs | Consult factory |
| ACH580-BxR-062A-6 | 62 | 60 | R5 | | | | | | | | | |
| ACH580-BxR-077A-6 | 77 | 75 | R5 | | | | | | | | | |
| ACH580-BxR-099A-6 | 99 | 100 | R7 | | | | | | | | | |
| ACH580-BxR-125A-6 | 125 | 125 | R7 | | | | | | | | | |
| ACH580-BxR-144A-6 | 144 | 150 | R8 | 250 MCM 124 in-lbs | 250 MCM 275 in-lbs | 250 MCM 275 in-lbs | 300 MCM 301 in-lbs | 300 MCM 301 in-lbs | | | | |

1) "BxR" represents both BCR and BDR.

2) BCR is rated 600Y/347V unless otherwise specified. For use on a solidly grounded Wye source only.

3) BCR supports Delta network configuration.

Branch circuit protection

Input power is connected to the ACH580 with E-Clipse Bypass through a door interlocked disconnect switch or circuit breaker. Neither of these inputs are fused. The branch circuit that provides power to the ACH580 with E-Clipse Bypass with disconnect switch must include the specified external fuses to provide short circuit and ground fault protection for the motor in the bypass mode.

When connected to a 240V or 480V power source, the ACH580 with E-Clipse Bypass with the circuit breaker option is suitable for use on a circuit capable of delivering not more than 100,000 RMS symmetrical amperes. When connected to a 600V power source ABB E-Clipse units provided with a circuit breaker, VCR and BCR configurations, are suitable for use on a circuit capable of delivering not more than 10,000 RMS symmetrical amperes.

Fuses

Note: The UL listed drive fuses in the table are provided in the purchased product.

- Replacement fuses are required to be of the same class, current rating, and voltage rating. Fuses from other manufacturers can be used if they are 600V rated and meet the specifications given in the table.
- Fuses with higher current rating than specified must not be used.

208/230 Volt fuses for vertical enclosures

| Type Code ¹ | Nominal Output Ratings | | Base Drive Frame Size | Internal Drive Fuse Rating | | External Fuse for Disconnect Option | |
|------------------------|------------------------|---------------|-----------------------|----------------------------|--------------------|-------------------------------------|--------------------|
| | Drive Current | Package Power | | Class | Max Current Rating | Class | Max Current Rating |
| | A | HP | | | | | |
| 208/230 Volts | | | | | | | |
| ACH580-VxR-04A6-2 | 4.6 | 1 | R1 | Class CC | 15A | Class J | 15A |
| ACH580-VxR-06A6-2 | 6.6 | 1.5 | R1 | Class CC | 15A | Class J | 15A |
| ACH580-VxR-07A5-2 | 7.5 | 2 | R1 | Class CC | 15A | Class J | 20A |
| ACH580-VxR-10A6-2 | 10.6 | 3 | R1 | Class CC | 15A | Class J | 25A |
| ACH580-VxR-017A-2 | 16.7 | 5 | R1 | Class CC | 30A | Class J | 40A |
| ACH580-VxR-024A-2 | 24.2 | 7.5 | R2 | Class CC | 30A | Class J | 45A |
| ACH580-VxR-031A-2 | 30.8 | 10 | R2 | Class T | 40A | Class J | 60A |
| ACH580-VxR-046A-2 | 46.2 | 15 | R3 | Class T | 80A | Class J | 100A |
| ACH580-VxR-059A-2 | 59.4 | 20 | R3 | Class T | 80A | Class J | 100A |
| ACH580-VxR-075A-2 | 74.8 | 25 | R4 | Class T | 100A | Class J | 100A |

1) "VxR" represents both VCR and VDR.

460 Volt fuses for vertical enclosures

| Type Code ¹ | Nominal Output Ratings | | Base Drive Frame Size | Internal Drive Fuse Rating | | External Fuse for Disconnect Option | |
|------------------------|------------------------|---------------|-----------------------|----------------------------|--------------------|-------------------------------------|--------------------|
| | Drive Current | Package Power | | Class | Max Current Rating | Class | Max Current Rating |
| | A | HP | | | | | |
| 460 Volts | | | | | | | |
| ACH580-VxR-02A1-4 | 2.1 | 1 | R1 | Class CC | 15A | Class J | 15A |
| ACH580-VxR-03A0-4 | 3.0 | 1.5 | R1 | Class CC | 15A | Class J | 15A |
| ACH580-VxR-03A5-4 | 3.5 | 2 | R1 | Class CC | 15A | Class J | 15A |
| ACH580-VxR-04A8-4 | 4.8 | 3 | R1 | Class CC | 15A | Class J | 15A |
| ACH580-VxR-07A6-4 | 7.6 | 5 | R1 | Class CC | 15A | Class J | 20A |
| ACH580-VxR-012A-4 | 12 | 7.5 | R1 | Class CC | 15A | Class J | 25A |
| ACH580-VxR-014A-4 | 14 | 10 | R2 | Class CC | 30A | Class J | 35A |
| ACH580-VxR-023A-4 | 23 | 15 | R2 | Class CC | 30A | Class J | 45A |
| ACH580-VxR-027A-4 | 27 | 20 | R3 | Class T | 40A | Class J | 60A |
| ACH580-VxR-034A-4 | 34 | 25 | R3 | Class T | 60A | Class J | 60A |
| ACH580-VxR-044A-4 | 44 | 30 | R3 | Class T | 60A | Class J | 60A |
| ACH580-VxR-052A-4 | 52 | 40 | R4 | Class T | 80A | Class J | 100A |
| ACH580-VxR-065A-4 | 65 | 50 | R4 | Class T | 90A | Class J | 100A |
| ACH580-VxR-077A-4 | 77 | 60 | R4 | Class T | 100A | Class J | 100A |

1) "VxR" represents both VCR and VDR.

575 Volt fuses for vertical enclosures

| Type Code ¹ | Nominal Output Ratings | | Base Drive Frame Size | Internal Drive Fuse Rating | | External Fuse for Disconnect Option | |
|------------------------------|------------------------|---------------|-----------------------|----------------------------|--------------------|-------------------------------------|--------------------|
| | Drive Current | Package Power | | Class | Max Current Rating | Class | Max Current Rating |
| | A | HP | | | | | |
| 575 Volts² | | | | | | | |
| ACH580-VxR-02A7-6 | 2.7 | 2 | R2 | Class CC | 30A | Class J | 15A |
| ACH580-VxR-03A9-6 | 3.9 | 3 | R2 | Class CC | 30A | Class J | 15A |
| ACH580-VxR-06A1-6 | 6.1 | 5 | R2 | Class CC | 30A | Class J | 15A |
| ACH580-VxR-09A0-6 | 9 | 7.5 | R2 | Class CC | 30A | Class J | 20A |
| ACH580-VxR-011A-6 | 11 | 10 | R2 | Class CC | 30A | Class J | 25A |
| ACH580-VxR-017A-6 | 17 | 15 | R2 | Class CC | 30A | Class J | 40A |
| ACH580-VxR-022A-6 | 22 | 20 | R3 | Class T | 40A | Class J | 50A |
| ACH580-VxR-027A-6 | 27 | 25 | R3 | Class T | 40A | Class J | 60A |

1) "VxR" represents both VCR and VDR.

2) VCR is rated 600Y/347V. For use on a solidly grounded Wye source only.

208/230 Volt fuses for box enclosures

| Type Code ¹ | Nominal Output Ratings | | Base Drive Frame Size | Internal Drive Fuse Rating | | External Fuse for Disconnect Option | |
|------------------------|------------------------|------------------|-----------------------|----------------------------|--------------------|-------------------------------------|--------------------|
| | Drive Current | Package Power | | Class | Max Current Rating | Class | Max Current Rating |
| | A | HP | | | | | |
| 208/230 Volts | | | | | | | |
| ACH580-BxR-04A6-2 | 4.6 | 1 | R1 | Class CC | 15A | Class J | 15A |
| ACH580-BxR-06A6-2 | 6.6 | 1.5 | R1 | Class CC | 15A | Class J | 15A |
| ACH580-BxR-07A5-2 | 7.5 | 2 | R1 | Class CC | 15A | Class J | 20A |
| ACH580-BxR-10A6-2 | 10.6 | 3 | R1 | Class CC | 15A | Class J | 25A |
| ACH580-BxR-017A-2 | 16.7 | 5 | R1 | Class CC | 30A | Class J | 40A |
| ACH580-BxR-024A-2 | 24.2 | 7.5 | R2 | Class CC | 30A | Class J | 60A |
| ACH580-BxR-031A-2 | 30.8 | 10 | R2 | Class T | 40A | Class J | 60A |
| ACH580-BxR-046A-2 | 46.2 | 15 | R3 | Class T | 80A | Class J | 100A |
| ACH580-BxR-059A-2 | 59.4 | 20 | R3 | Class T | 80A | Class J | 100A |
| ACH580-BxR-075A-2 | 74.8 | 25 | R4 | Class T | 100A | Class J | 100A |
| ACH580-BxR-088A-2 | 88 | 30 | R5 | Class T | 110A | Class J | 200A |
| ACH580-BxR-114A-2 | 114 | 40 | R5 | Class T | 150A | Class J | 300A |
| ACH580-BxR-143A-2 | 143 | 50 | R6 | Class T | 200A | Class J | 350A |
| ACH580-BxR-169A-2 | 169 | 60 | R7 | Class T | 250A | Class J | 350A |
| ACH580-BxR-211A-2 | 211 | 75 | R7 | Class T | 300A | Class J | 400A |
| ACH580-BxR-248A-2 | 248 | 100 ² | R8 | Class T | 350A | Class J | 400A |

1) "BxR" represents both BCR and BDR.

2) 100 HP @ 230V.

460 Volt fuses for box enclosures

| Type Code ¹ | Nominal Output Ratings | | Base Drive Frame Size | Internal Drive Fuse Rating | | External Fuse for Disconnect Option | |
|------------------------|------------------------|---------------|-----------------------|----------------------------|--------------------|-------------------------------------|--------------------|
| | Drive Current | Package Power | | Class | Max Current Rating | Class | Max Current Rating |
| | A | HP | | | | | |
| 460 Volts | | | | | | | |
| ACH580-BxR-02A1-4 | 2.1 | 1 | R1 | Class CC | 15A | Class J | 15A |
| ACH580-BxR-03A0-4 | 3.0 | 1.5 | R1 | Class CC | 15A | Class J | 15A |
| ACH580-BxR-03A5-4 | 3.5 | 2 | R1 | Class CC | 15A | Class J | 15A |
| ACH580-BxR-04A8-4 | 4.8 | 3 | R1 | Class CC | 15A | Class J | 15A |
| ACH580-BxR-07A6-4 | 7.6 | 5 | R1 | Class CC | 15A | Class J | 20A |
| ACH580-BxR-012A-4 | 12 | 7.5 | R1 | Class CC | 15A | Class J | 25A |
| ACH580-BxR-014A-4 | 14 | 10 | R2 | Class CC | 30A | Class J | 35A |
| ACH580-BxR-023A-4 | 23 | 15 | R2 | Class CC | 30A | Class J | 50A |
| ACH580-BxR-027A-4 | 27 | 20 | R3 | Class T | 40A | Class J | 60A |
| ACH580-BxR-034A-4 | 34 | 25 | R3 | Class T | 60A | Class J | 60A |
| ACH580-BxR-044A-4 | 44 | 30 | R3 | Class T | 60A | Class J | 60A |
| ACH580-BxR-052A-4 | 52 | 40 | R4 | Class T | 80A | Class J | 100A |

| Type Code ¹ | Nominal Output Ratings | | Base Drive Frame Size | Internal Drive Fuse Rating | | External Fuse for Disconnect Option | |
|------------------------|------------------------|---------------|-----------------------|----------------------------|--------------------|-------------------------------------|--------------------|
| | Drive Current | Package Power | | Class | Max Current Rating | Class | Max Current Rating |
| | A | HP | | | | | |
| ACH580-BxR-065A-4 | 65 | 50 | R4 | Class T | 90A | Class J | 100A |
| ACH580-BxR-077A-4 | 77 | 60 | R4 | Class T | 100A | Class J | 100A |
| ACH580-BxR-096A-4 | 96 | 75 | R5 | Class T | 150A | Class J | 225A |
| ACH580-BxR-124A-4 | 124 | 100 | R6 | Class T | 200A | Class J | 300A |
| ACH580-BxR-156A-4 | 156 | 125 | R7 | Class T | 225A | Class J | 350A |
| ACH580-BxR-180A-4 | 180 | 150 | R7 | Class T | 300A | Class J | 350A |
| ACH580-BxR-240A-4 | 240 | 200 | R8 | Class T | 350A | Class J | 400A |

1) "BxR" represents both BCR and BDR.

575 Volt fuses for box enclosures

| Type Code ¹ | Nominal Output Ratings | | Base Drive Frame Size | Internal Drive Fuse Rating | | External Fuse for Disconnect Option | |
|--------------------------------|------------------------|---------------|-----------------------|----------------------------|--------------------|-------------------------------------|--------------------|
| | Drive Current | Package Power | | Class | Max Current Rating | Class | Max Current Rating |
| | A | HP | | | | | |
| 575 Volts² | | | | | | | |
| ACH580-BxR-02A7-6 | 2.7 | 2 | R2 | Class CC | 15A | Class J | 15A |
| ACH580-BxR-03A9-6 | 3.9 | 3 | R2 | Class CC | 15A | Class J | 15A |
| ACH580-BxR-06A1-6 | 6.1 | 5 | R2 | Class CC | 15A | Class J | 15A |
| ACH580-BxR-09A0-6 | 9 | 7.5 | R2 | Class CC | 15A | Class J | 20A |
| ACH580-BxR-011A-6 | 11 | 10 | R2 | Class CC | 15A | Class J | 25A |
| ACH580-BxR-017A-6 | 17 | 15 | R2 | Class CC | 30A | Class J | 40A |
| ACH580-BxR-022A-6 | 22 | 20 | R3 | Class T | 40A | Class J | 50A |
| ACH580-BxR-027A-6 | 27 | 25 | R3 | Class T | 40A | Class J | 60A |
| ACH580-BxR-032A-6 | 32 | 30 | R3 | Class T | 40A | Class J | 60A |
| ACH580-BxR-041A-6 | 41 | 40 | R5 | Class T | 50A | Class J | 100A |
| ACH580-BxR-052A-6 ³ | 52 | 50 | R5 | Class T | 80A | Class J | 100A |
| ACH580-BxR-062A-6 | 62 | 60 | R5 | Class T | 80A | Class J | 150A |
| ACH580-BxR-077A-6 | 77 | 75 | R5 | Class T | 100A | Class J | 175A |
| ACH580-BxR-099A-6 | 99 | 100 | R7 | Class T | 150A | Class J | 225A |
| ACH580-BxR-125A-6 | 125 | 125 | R7 | Class T | 175A | Class J | 300A |
| ACH580-BxR-144A-6 | 144 | 150 | R8 | Class T | 200A | Class J | 350A |

1) "BxR" represents both BCR and BDR.

2) BCR is rated 600Y/347V unless otherwise specified. For use on a solidly grounded Wye source only.

3) BCR supports Delta network configuration.

Motor connections

Motor Terminals

See [Wiring overview](#) on page 8.

Bypass Contactors

The bypass circuit available with the ACH580 E-Clipse Bypass includes two contactors. One contactor is the bypass contactor (2M) that can be used to manually connect the motor directly to the incoming power line in the event that the ACH580 is out of service. The other contactor is the ACH580 output contactor (1M) that disconnects the ACH580 from the motor when the motor is operating in the Bypass mode. The drive output contactor and the bypass contactor are interlocked to prevent “back feeding,” applying line voltage to the ACH580 output terminals.

Motor Overload Protection

Motor overload protection is set using the ACH580 drive control panel. Refer to the *ACH580 HVAC control program firmware manual* (3AXD50000027537). The overload protection parameters set on the ACH580 drive are used by both the drive and the bypass.

In the *Drive* mode, motor overload protection is provided by the ACH580.

In the *Bypass* mode, motor overload protection is provided by the bypass control board.



WARNING! If power is applied and the switches and contacts in the control circuit are commanding the motor to run, the motor will start as soon as the overload protection is reset.

Use caution when resetting the overload protection to make sure it is safe to start the motor.

Maximum recommended motor cable length

Operational functionality and motor cable length

The drive is designed to operate with optimum performance with maximum motor cable lengths found in the *ACH580-01 Hardware Manual* (3AXD50000044839) or *ACH580 Installation, Operation and Maintenance Manual* (3AXD50000049127).

E-Clipse Bypass control unit connections (RBCU)

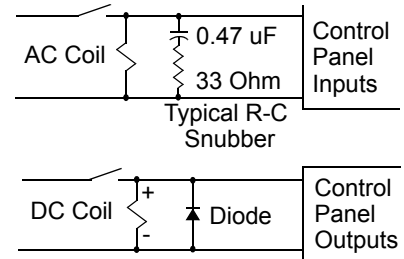
Control cable requirements for connections to the E-Clipse Bypass (RBCU) (X2) are the same as those described for the ACH580 control panel (X1). Refer to the *ACH580-01 Hardware Manual* (3AXD50000044839) for additional information.

Bypass control unit connection specifications

| Control Connection Specifications | |
|-----------------------------------|---|
| Digital Inputs | Digital input impedance 1.5 kΩ. Maximum voltage for digital inputs is 30 V AC/DC |
| Relays (Digital Outputs) | <ul style="list-style-type: none"> • Max. contact voltage: 30 V DC, 250 V AC • Max. contact current / power: 6 A, 30 V DC; 1500 VA, 250 V AC • Max. continuous current: 2 A rms (cos φ = 1), 1 A rms (cos φ = 0.4) • Minimum load: 500 mW (12 V, 10 mA) • Contact material: Silver-nickel (AgN) • Isolation between relay digital outputs, test voltage: 2.5 kV rms, 1 minute |



WARNING! Relay coils generate noise spikes in response to steps in applied power. To avoid drive damage from such spikes, all AC relay coils mounted across control panel inputs require R-C snubbers, and all DC relay coils mounted across control panel outputs require diodes – see figure.



Bypass control unit terminals

The following table provides specifications for the E-Clipse Bypass's control unit terminals.

| Frame Size | Control | | | |
|------------|-------------------|---------|--------|-------|
| | Maximum Wire Size | | Torque | |
| | mm ² | AWG | N•m | lb-ft |
| All | 0.12...2.5 | 26...14 | 0.4 | 0.3 |

Dimensional references

The following tables contain dimensional references that identify the dimensional information applying to a given type code.

Vertical enclosures – E-Clipse bypass drive with circuit breaker

| Type Code | Nominal Output Ratings | | Frame Size | Dim Ref |
|--|------------------------|------------------|------------|---------|
| | Drive Current A | Package Power HP | | |
| $U_1 = 208$ to 240V. Power ratings are valid at nominal output voltage $U_N = 208/230$ V 60 Hz | | | | |
| ACH580-VxR-04A6-2 | 4.6 | 1 | R1 | Vx1-1 |
| ACH580-VxR-06A6-2 | 6.6 | 1.5 | R1 | Vx1-1 |
| ACH580-VxR-07A5-2 | 7.5 | 2 | R1 | Vx1-1 |
| ACH580-VxR-10A6-2 | 10.6 | 3 | R1 | Vx1-1 |
| ACH580-VxR-017A-2 | 16.7 | 5 | R1 | Vx1-1 |
| ACH580-VxR-024A-2 | 24.2 | 7.5 | R2 | Vx1-2 |
| ACH580-VxR-031A-2 | 30.8 | 10 | R2 | Vx1-3 |
| ACH580-VxR-046A-2 | 46.2 | 15 | R3 | Vx1-3 |
| ACH580-VxR-059A-2 | 59.4 | 20 | R3 | Vx1-4 |
| ACH580-VxR-075A-2 | 74.8 | 25 | R4 | Vx1-4 |

1) "VxR" represents VCR and VDR.

| Type Code | Nominal Output Ratings | | Frame Size | Dim Ref |
|--|------------------------|------------------|------------|---------|
| | Drive Current A | Package Power HP | | |
| $U_1 = 440$ to 480V. Power ratings are valid at nominal output voltage $U_N = 460$ V 60 Hz | | | | |
| ACH580-VxR-02A1-4 | 2.1 | 1 | R1 | Vx1-1 |
| ACH580-VxR-03A0-4 | 3 | 1.5 | R1 | Vx1-1 |
| ACH580-VxR-03A5-4 | 3.5 | 2 | R1 | Vx1-1 |
| ACH580-VxR-04A8-4 | 4.8 | 3 | R1 | Vx1-1 |
| ACH580-VxR-07A6-4 | 7.6 | 5 | R1 | Vx1-1 |
| ACH580-VxR-012A-4 | 12 | 7.5 | R1 | Vx1-1 |
| ACH580-VxR-014A-4 | 14 | 10 | R2 | Vx1-2 |
| ACH580-VxR-023A-4 | 23 | 15 | R2 | Vx1-2 |
| ACH580-VxR-027A-4 | 27 | 20 | R3 | Vx1-3 |
| ACH580-VxR-034A-4 | 34 | 25 | R3 | Vx1-3 |
| ACH580-VxR-044A-4 | 44 | 30 | R3 | Vx1-3 |
| ACH580-VxR-052A-4 | 52 | 40 | R4 | Vx1-4 |
| ACH580-VxR-065A-4 | 65 | 50 | R4 | Vx1-4 |
| ACH580-VxR-077A-4 | 77 | 60 | R4 | Vx1-4 |

1) "VxR" represents VCR and VDR.

| Type Code ¹ | Nominal Output Ratings | | Frame Size | Dim Ref |
|---|------------------------|------------------|------------|---------|
| | Drive Current A | Package Power HP | | |
| $U_1 = 500$ to 600V. Power ratings are valid at nominal output voltage $U_N = 575$ V 60 Hz² | | | | |
| ACH580-VxR-02A7-6 | 2.7 | 2 | R2 | Vx1-2 |
| ACH580-VxR-03A9-6 | 3.9 | 3 | R2 | Vx1-2 |
| ACH580-VxR-06A1-6 | 6.1 | 5 | R2 | Vx1-2 |
| ACH580-VxR-09A0-6 | 9 | 7.5 | R2 | Vx1-2 |
| ACH580-VxR-011A-6 | 11 | 10 | R2 | Vx1-2 |
| ACH580-VxR-017A-6 | 17 | 15 | R2 | Vx1-2 |
| ACH580-VxR-022A-6 | 22 | 20 | R3 | Vx1-3 |
| ACH580-VxR-027A-6 | 27 | 25 | R3 | Vx1-3 |
| ACH580-VxR-032A-6 | 32 | 30 | R3 | Vx1-3 |

1) "VxR" represents VCR and VDR.

2) VCR is rated 600Y/347V. For use on a solidly grounded Wye source only.

Standard enclosures – E-Clipse bypass drive with circuit breaker

| Type Code ¹ | Nominal Output Ratings | | Frame Size | UL (NEMA) Type 1 Dim Ref | UL (NEMA) Type 12 (+B056) Dim Ref | UL (NEMA) Type 3R (+B058) Dim Ref |
|---|------------------------|------------------|------------|--------------------------|-----------------------------------|-----------------------------------|
| | Current A | Package Power HP | | | | |
| U₁ = 208 to 240V. Power ratings are valid at nominal output voltage U_N = 208 V 60 Hz | | | | | | |
| ACH580-BxR-04A6-2 | 4.6 | 1 | R1 | Bx1-1 | Bx12-1 | Bx3R-1 |
| ACH580-BxR-06A6-2 | 6.6 | 1.5 | R1 | Bx1-1 | Bx12-1 | Bx3R-1 |
| ACH580-BxR-07A5-2 | 7.5 | 2 | R1 | Bx1-1 | Bx12-1 | Bx3R-1 |
| ACH580-BxR-10A6-2 | 10.6 | 3 | R1 | Bx1-1 | Bx12-1 | Bx3R-1 |
| ACH580-BxR-017A-2 | 16.7 | 5 | R1 | Bx1-1 | Bx12-1 | Bx3R-1 |
| ACH580-BxR-024A-2 | 24.2 | 7.5 | R2 | Bx1-1 | Bx12-1 | Bx3R-1 |
| ACH580-BxR-031A-2 | 30.8 | 10 | R2 | Bx1-2 | Bx12-2 | Bx3R-2 |
| ACH580-BxR-046A-2 | 46.2 | 15 | R3 | Bx1-2 | Bx12-2 | Bx3R-2 |
| ACH580-BxR-059A-2 | 59.4 | 20 | R3 | Bx1-2 | Bx12-2 | Bx3R-2 |
| ACH580-BxR-075A-2 | 74.8 | 25 | R4 | Bx1-2 | Bx12-2 | Bx3R-2 |
| ACH580-BxR-088A-2 | 88 | 30 | R5 | Bx1-3 | Bx12-3 | Consult factory |
| ACH580-BxR-114A-2 | 114 | 40 | R5 | Bx1-3 | Bx12-3 | |
| ACH580-BxR-143A-2 | 143 | 50 | R6 | Bx1-3 | Bx12-3 | |
| ACH580-BxR-169A-2 | 169 | 60 | R7 | Bx1-3 | Bx12-3 | |
| ACH580-BxR-211A-2 | 211 | 75 | R7 | Bx1-3 | Bx12-3 | |
| ACH580-BxR-248A-2 | 248 | 100 ² | R8 | Bx1-3 | Bx12-3 | |

1) "BxR" represents BCR and BDR.

2) 100 HP @ 230V

| Type Code ¹ | Nominal Output Ratings | | Frame Size | UL (NEMA) Type 1 Dim Ref | UL (NEMA) Type 12 (+B056) Dim Ref | UL (NEMA) Type 3R (+B058) Dim Ref |
|---|------------------------|------------------|------------|--------------------------|-----------------------------------|-----------------------------------|
| | Current A | Package Power HP | | | | |
| U₁ = 440 to 480V. Power ratings are valid at nominal output voltage U_N = 460 V 60 Hz | | | | | | |
| ACH580-BxR-02A1-4 | 2.1 | 1 | R1 | Bx1-1 | Bx12-1 | Bx3R-1 |
| ACH580-BxR-03A0-4 | 3 | 1.5 | R1 | Bx1-1 | Bx12-1 | Bx3R-1 |
| ACH580-BxR-03A5-4 | 3.5 | 2 | R1 | Bx1-1 | Bx12-1 | Bx3R-1 |
| ACH580-BxR-04A8-4 | 4.8 | 3 | R1 | Bx1-1 | Bx12-1 | Bx3R-1 |
| ACH580-BxR-07A6-4 | 7.6 | 5 | R1 | Bx1-1 | Bx12-1 | Bx3R-1 |
| ACH580-BxR-012A-4 | 12 | 7.5 | R1 | Bx1-1 | Bx12-1 | Bx3R-1 |
| ACH580-BxR-014A-4 | 14 | 10 | R2 | Bx1-1 | Bx12-1 | Bx3R-1 |
| ACH580-BxR-023A-4 | 23 | 15 | R2 | Bx1-1 | Bx12-1 | Bx3R-1 |
| ACH580-BxR-027A-4 | 27 | 20 | R3 | Bx1-2 | Bx12-2 | Bx3R-2 |
| ACH580-BxR-034A-4 | 34 | 25 | R3 | Bx1-2 | Bx12-2 | Bx3R-2 |
| ACH580-BxR-044A-4 | 44 | 30 | R3 | Bx1-2 | Bx12-2 | Bx3R-2 |
| ACH580-BxR-052A-4 | 52 | 40 | R4 | Bx1-2 | Bx12-2 | Bx3R-2 |
| ACH580-BxR-065A-4 | 65 | 50 | R4 | Bx1-2 | Bx12-2 | Bx3R-2 |
| ACH580-BxR-077A-4 | 77 | 60 | R4 | Bx1-2 | Bx12-2 | Bx3R-2 |

| | | | | | | |
|-------------------|-----|-----|----|-------|--------|-----------------|
| ACH580-BxR-096A-4 | 96 | 75 | R5 | Bx1-3 | Bx12-3 | Consult factory |
| ACH580-BxR-124A-4 | 124 | 100 | R6 | Bx1-3 | Bx12-3 | |
| ACH580-BxR-156A-4 | 156 | 125 | R7 | Bx1-3 | Bx12-3 | |
| ACH580-BxR-180A-4 | 180 | 150 | R7 | Bx1-3 | Bx12-3 | |
| ACH580-BxR-240A-4 | 240 | 200 | R8 | Bx1-3 | Bx12-3 | |

1) "BxR" represents BCR and BDR.

| Type Code ¹ | Nominal Output Ratings | | Frame Size | UL (NEMA) Type 1 Dim Ref | UL (NEMA) Type 12 (+B056) Dim Ref | UL (NEMA) Type 3R (+B058) Dim Ref |
|--|------------------------|------------------|------------|--------------------------|-----------------------------------|-----------------------------------|
| | Current A | Package Power HP | | | | |
| $U_1 = 575$ to 600V. Power ratings are valid at nominal output voltage $U_N = 575$ V 60 Hz² | | | | | | |
| ACH580-BxR-02A7-6 | 2.7 | 2 | R2 | Bx1-1 | Bx12-1 | Bx3R-1 |
| ACH580-BxR-03A9-6 | 3.9 | 3 | R2 | Bx1-1 | Bx12-1 | Bx3R-1 |
| ACH580-BxR-06A1-6 | 6.1 | 5 | R2 | Bx1-1 | Bx12-1 | Bx3R-1 |
| ACH580-BxR-09A0-6 | 9 | 7.5 | R2 | Bx1-1 | Bx12-1 | Bx3R-1 |
| ACH580-BxR-011A-6 | 11 | 10 | R2 | Bx1-1 | Bx12-1 | Bx3R-1 |
| ACH580-BxR-017A-6 | 17 | 15 | R2 | Bx1-1 | Bx12-1 | Bx3R-1 |
| ACH580-BxR-022A-6 | 22 | 20 | R3 | Bx1-2 | Bx12-2 | Bx3R-2 |
| ACH580-BxR-027A-6 | 27 | 25 | R3 | Bx1-2 | Bx12-2 | Bx3R-2 |
| ACH580-BxR-032A-6 | 32 | 30 | R3 | Bx1-2 | Bx12-2 | Bx3R-2 |
| ACH580-BxR-041A-6 | 41 | 40 | R5 | Bx1-3 | Bx12-3 | Consult factory |
| ACH580-BxR-052A-6 ³ | 52 | 50 | R5 | Bx1-3 | Bx12-3 | |
| ACH580-BxR-062A-6 | 62 | 60 | R6 | Bx1-3 | Bx12-3 | |
| ACH580-BxR-077A-6 | 77 | 75 | R6 | Bx1-3 | Bx12-3 | |
| ACH580-BxR-099A-6 | 99 | 100 | R7 | Bx1-3 | Bx12-3 | |
| ACH580-BxR-125A-6 | 125 | 125 | R7 | Bx1-3 | Bx12-3 | |
| ACH580-BxR-144A-6 | 144 | 150 | R8 | Bx1-3 | Bx12-3 | |

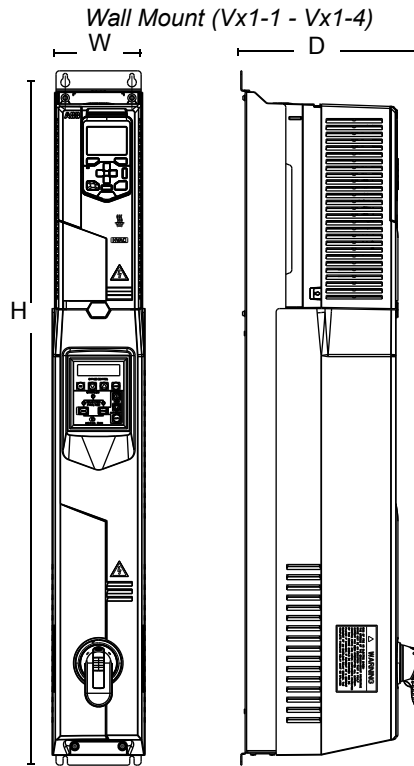
1) "BxR" represents BCR and BDR.

2) BCR is rated 600Y/347V unless otherwise specified. For use on a solidly grounded Wye source only.

3) BCR supports Delta network configuration.

Dimensions and weights 580-01

Dimensions: ACH580-VxR UL (NEMA) Type 1, R1 through R4 Frame Size



Drawing is not for engineering purposes.

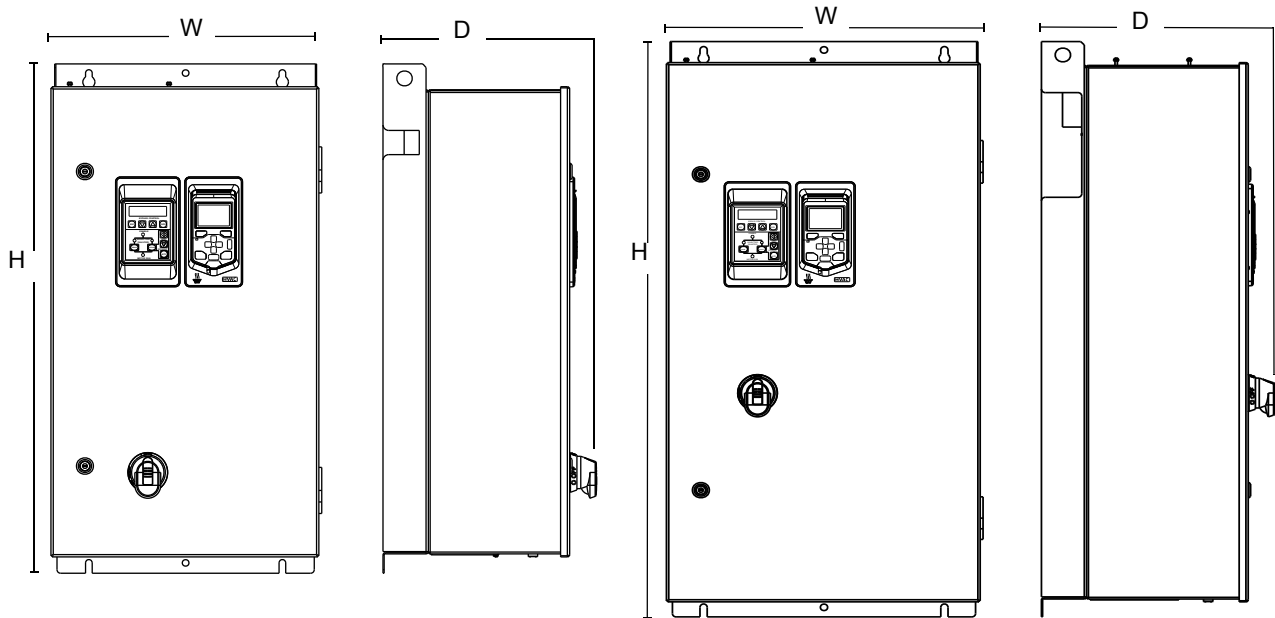
| Frame | Height (H) | | Width (W) | | Depth (D) | | Weight | | Dimensional Drawings |
|-------|------------|------|-----------|-----|-----------|-----|--------|------|----------------------|
| | in | mm | in | mm | in | mm | lb | kg | |
| Vx1-1 | 40.18 | 1020 | 5.39 | 136 | 10.55 | 268 | 30.0 | 13.6 | 3AXD50000037428 |
| Vx1-2 | 44.10 | 1120 | 5.39 | 136 | 10.77 | 273 | 50.7 | 23.0 | 3AXD50000037429 |
| Vx1-3 | 38.81 | 985 | 8.44 | 214 | 10.90 | 276 | 59.5 | 27.0 | 3AXD50000153787 |
| Vx1-4 | 47.93 | 1217 | 8.44 | 214 | 12.00 | 304 | 86.0 | 39.0 | 3AXD50000153770 |

*Keep a minimum of 50 mm (2 in) of free space on each side and 200 mm (8 in) of free space above and below all units from non-heat producing sources. Double these distances from heat producing sources.

Dimensions ACH580-BxR UL (NEMA) Type 1, R1 through R8 Frame Size

Wall Mount (Bx1-1)

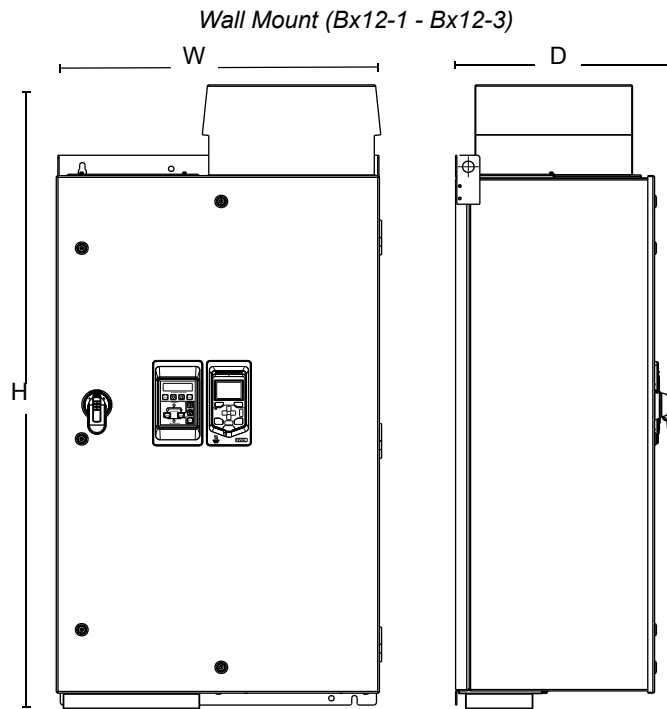
Wall Mount (Bx1-2 to Bx1-3)



Drawing is not for engineering purposes.

| Frame | Height (H) | | Width (W) | | Depth (D) | | Weight | | Dimensional Drawings |
|-------|------------|------|-----------|-----|-----------|-----|--------|-------|----------------------|
| | in | mm | in | mm | in | mm | lb | kg | |
| Bx1-1 | 33.16 | 842 | 17.63 | 447 | 13.90 | 353 | 84.0 | 38.1 | 3AXD50000234028 |
| Bx1-2 | 40.60 | 1030 | 20.50 | 521 | 15.30 | 388 | 139.0 | 63.0 | 3AXD50000234639 |
| Bx1-3 | 47.72 | 1212 | 28.24 | 717 | 19.04 | 483 | 448.0 | 203.0 | 3AXD50000203253 |

*Keep a minimum of 50 mm (2 in) of free space on each side and 200 mm (8 in) of free space above and below all units from non-heat producing sources. Double these distances from heat producing sources.

Dimensions: ACH580-BxR UL (NEMA) Type 12, R1 through R8 Frame Size

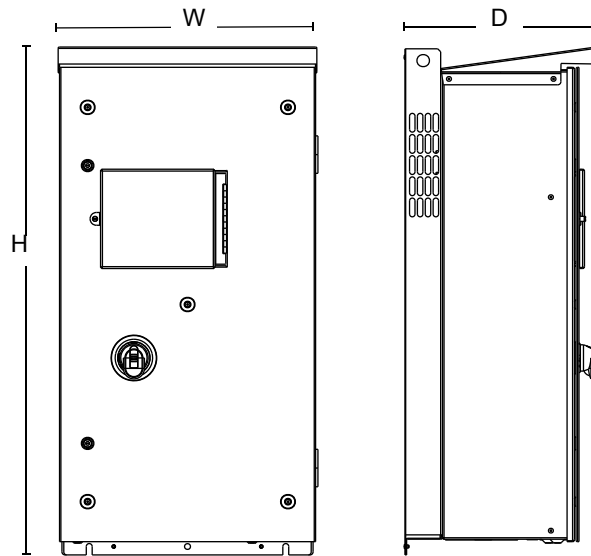
Drawing is not for engineering purposes.

| Frame | Height (H) | | Width (W) | | Depth (D) | | Weight | | Dimensional Drawings |
|--------|------------|------|-----------|-----|-----------|-----|--------|-------|----------------------|
| | in | mm | in | mm | in | mm | lb | kg | |
| Bx12-1 | 33.16 | 842 | 17.63 | 447 | 13.90 | 353 | 84.0 | 38.1 | 3AXD50000234028 |
| Bx12-2 | 40.60 | 1030 | 20.50 | 521 | 15.30 | 388 | 139.0 | 63.0 | 3AXD50000235193 |
| Bx12-3 | 54.17 | 1376 | 28.24 | 717 | 19.04 | 483 | 448.0 | 203.0 | 3AXD50000211159 |

*Keep a minimum of 50 mm (2 in.) of free space on each side and 200 mm (8 in.) of free space above and below all units from non-heat producing sources. Double these distances from heat producing sources.

Dimensions: ACH580-BxR UL (NEMA) Type 3R, R1 through R4 Frame Size

Wall Mount (Bx3R-1 - Bx3R-2)



Drawing is not for engineering purposes.


| Frame | Height (H) | | Width (W) | | Depth (D) | | Weight | | Dimensional Drawings |
|--------|------------|------|-----------|-----|-----------|-----|--------|------|----------------------|
| | in | mm | in | mm | in | mm | lb | kg | |
| Bx3R-1 | 33.30 | 846 | 17.70 | 449 | 14.00 | 355 | 83.8 | 38.0 | 3AXD50000234622 |
| Bx3R-2 | 40.60 | 1032 | 20.10 | 511 | 15.40 | 391 | 193.0 | 88.0 | 3AXD50000235315 |

*Keep a minimum of 50 mm (2 in.) of free space on each side and 200 mm (8 in.) of free space above and below all units from non-heat producing sources. Double these distances from heat producing sources.

Note: UL (NEMA) Type 3R, Bx3R-1...Bx3R-2 enclosures are designed to be mounted on a wall. Mounting these 3R enclosures on an open rack system requires the use of the supplied 3R enclosure back plates to maintain 3R integrity.

Applicable standards

E-Clipse bypass compliance with the following standards is identified by the standards “marks” on the drive type code label.

| Mark | Applicable Standards | |
|---|----------------------|---|
|  | UL 508A | UL Standard for Industrial Control Panels |

Compliance is valid with the following provisions:

- The motor and control cables are chosen as specified in this manual.
- The installation rules of this manual are followed.

Additional ACH580-01 standards information can be located in the Technical data/ applicable standards section of the *ACH580 Hardware Manual* (3AXD50000044839).

ACH580-PCR/PDR Packaged Drives
with Disconnect
1...200 HP

Installation

Installation

This information is unique to ACH580 input disconnect configurations (PCR or PDR). The ACH580 with Input Disconnect is an ACH580 AC adjustable frequency drive packaged with an input disconnect switch or circuit breaker. Refer to the [Preparing for installation](#) instructions on page 226, for all other information. **Failure to observe the warnings and instructions may cause a malfunction or personal hazard.**



WARNING! Before you begin read [Safety instructions](#) on page *iv*.



WARNING! When the ACH580 with Input Disconnect is connected to the line power, the Motor Terminals T1, T2, and T3 are live even if the motor is not running. Do not make any connections when the ACH580 with Input Disconnect is connected to the line. Disconnect and lock out power to the drive before servicing the drive. Failure to disconnect power may cause serious injury or death.

Study these installation instructions carefully before proceeding. **Failure to observe the warnings and instructions may cause a malfunction or personal hazard.**



WARNING!

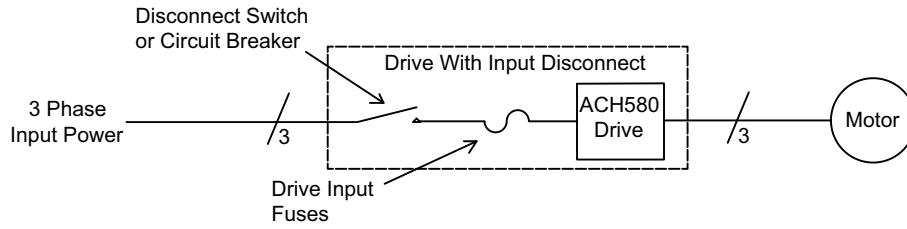
- Metal shavings or debris in the enclosure can damage electrical equipment and create a hazardous condition. Where parts, such as conduit plates require cutting or drilling, first remove the part. If that is not practical, cover nearby electrical components to protect them from all shavings or debris.
- Do not connect or disconnect input or output power wiring, or control wires, when power is applied.
- Never connect line voltage to drive output Terminals T1, T2, and T3.
- Do not make any voltage tolerance tests (Hi Pot or Megger) on any part of the unit. Disconnect motor wires before taking any measurements in the motor or motor wires.

Make sure that power factor correction capacitors are not connected between the drive and the motor.

Input disconnect configuration

The ACH580 with Input Disconnect is an ACH580 AC adjustable frequency drive packaged with an input disconnect switch or circuit breaker, and with a door interlocked, external operating handle. The operating handle can be padlocked in the OFF position (padlock not supplied). Enclosure options are UL (NEMA) Type 1, UL (NEMA) Type 12, and UL (NEMA) Type 3R.

The following is a typical power diagram.

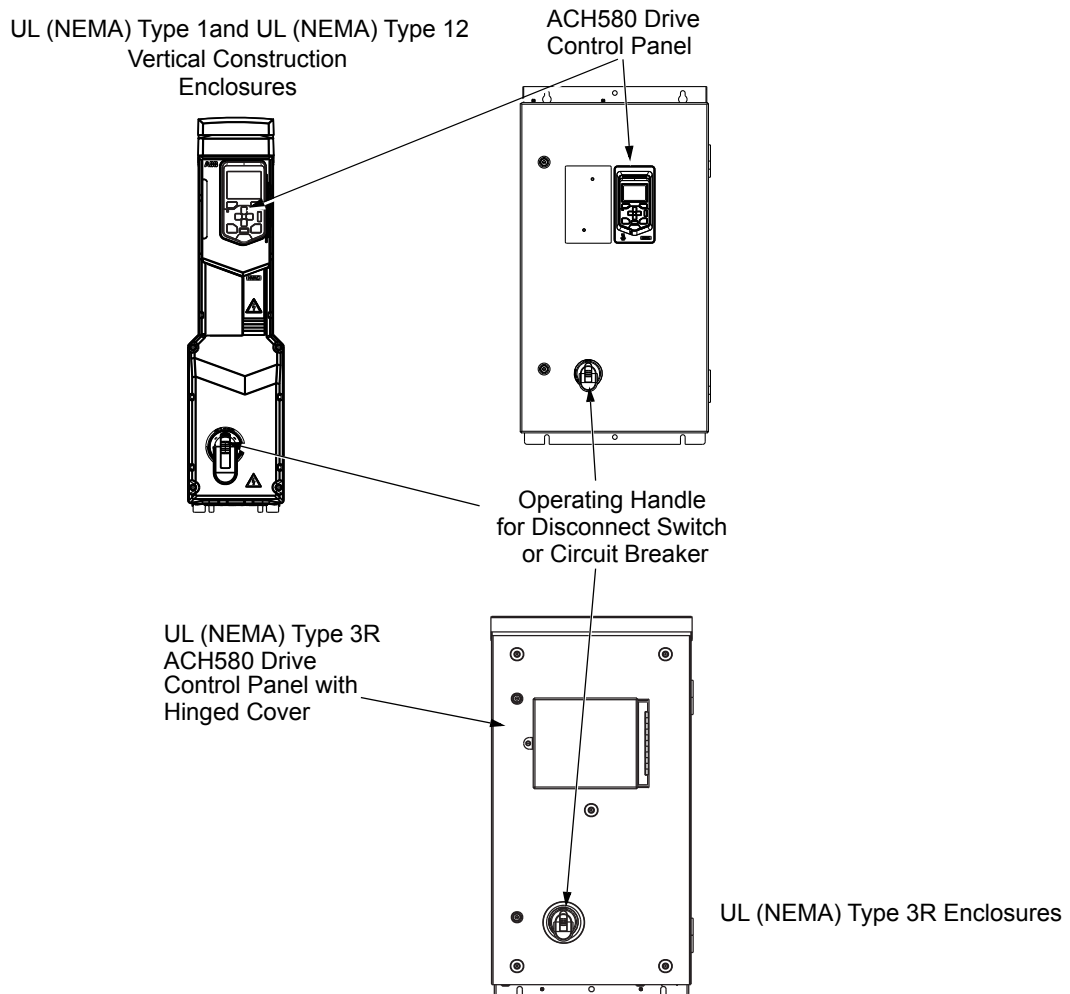


Application

This manual contains supplemental information that is unique to ACH580 input disconnect configurations (PCR or PDR). Refer to the *ACH580-01 Hardware Manual* (3AXD50000044839) for all other information.

The following shows the front view of the ACH580 Drive with Input Disconnect standard configurations, and identifies the major components.

UL (NEMA) Type 1 and UL (NEMA) Type 12
Hinged Door Wall Mount Enclosures



Installation flow chart

The installation of Input Disconnect configurations for ACH580 drives follows the outline below. The steps must be carried out in the order shown. At the right of each step are references to the detailed information needed for the correct installation of the unit.

Note: References in the middle column below are to the *ACH580-01 Hardware Manual* (3AXD50000044839). References in the third column below are to this manual.

| Task | Reference in <i>ACH580-01 Hardware Manual</i> (3AXD50000044839) <i>Installation</i> section | Additional References in the <i>ACH580-01 Hardware Manual</i> (3AXD50000044839), including: |
|--------------------------------------|---|---|
| PREPARE for installation | <i>Preparing for installation in the ACH580-01 Hardware Manual</i> (3AXD50000044839) | <ul style="list-style-type: none"> • Drive identification • Suitable mounting/venting Note: Some instructions in this document vary, depending on the drive's frame size. |
| PREPARE the mounting location | PREPARE the mounting location | -- |
| REMOVE the front cover | <i>REMOVE the front cover</i> | -- |
| MOUNT the drive | <i>MOUNT the drive</i> | -- |
| INSTALL wiring | <i>Wiring overview and Install the wiring</i> | <i>Installing the wiring (ACH580-01 Hardware Manual [3AXD50000044839]).</i> |
| CHECK installation | <i>Check installation</i> | -- |
| RE-INSTALL the cover | <i>Re-install cover</i> | -- |
| APPLY power | <i>Apply power</i> | -- |
| START-UP | -- | -- |

For more details, refer to the *ACH580-01 Hardware Manual* (3AXD50000044839).

Preparing for installation

Drive identification

Drive label

To identify the type of device you are installing, refer to the type code number on the device identification label.

- Wall mounting base drives – label attached on the side surface of the enclosure.
- Packaged drive with screw cover – label on side surface of the enclosure.
- Enclosure with hinged cover/door – label on inside surface of the cover/door.
- 3R enclosure with hinged cover/door – label attached to outside surface on the left side of enclosure.

Type code

Use the following to interpret the type code found on the identification label.

ACH580-PCR-012A-4 +...+...

| | | | |
|--|--|--|--|
| AC, HVAC Drive = 580 Product Series | | | |
| Construction | | | |
| 01 = Base Drive | | | |
| BCR = E-Clipse Bypass with circuit breaker | | | |
| BDR = E-Clipse Bypass with disconnect switch | | | |
| PCR = Packaged Drive with circuit breaker | | | |
| PDR = Packaged Drive with disconnect switch | | | |
| VCR = Vertical bypass with circuit breaker | | | |
| VDR = Vertical bypass with disconnect switch | | | |
| VFD output current rating (See ratings chart for details) | | | |
| Voltage rating | | | |
| 2 = 208...240 VAC | | | |
| 4 = 440...480 VAC | | | |
| 6 = 575...600 VAC | | | |
| Enclosure protection class | | | |
| No specification = UL (NEMA) Type 1 | | | |
| +B056 = UL (NEMA) Type 12 | | | |
| +B058 = UL (NEMA) Type 3R | | | |
| Power options | | | |
| +E213 = Line reactor (PxR or BxR Configurations) | | | |
| +F267 = Service switch (VxR or BxR Configurations) | | | |
| Input/Output option modules | | | |
| +L501 = Ext 24V DC/AC and digital I/O Extension | | | |
| +L512 = 115/230 V digital input interface | | | |
| +L523 = Ext 24V and isolated PTC Interface | | | |
| Fieldbus adaptors | | | |
| +K451 = DeviceNet Adapter | | | |
| +K452 = LonWorks Adapter | | | |
| +K454 = Profibus Adapter | | | |
| +K462 = ControlNet Adapter | | | |
| +K465 = BACnet/IP (2-port) Adapter (PxR or -01 configurations) | | | |
| +K475 = Ethernet Adapter | | | |
| Keypad | | | |
| +J429 = Control panel with Bluetooth® interface | | | |

Ratings and frame size

The charts in the *Ratings* section of the *ACH580-01 Hardware Manual* (3AXD50000044839) list technical specifications, and identify the drive's frame size.

Note: Some instructions in this document vary, depending on the drive's frame size. To read the Ratings table, you need the "Output current rating" entry from the [Type code](#) (see page 226).

Suitable mounting location

For selecting a suitable mounting location for PCR/PDR configurations, refer to:

- The *ACH580-01 Hardware Manual* (3AXD50000044839), and
- The [Technical data](#) section on page 237 in this manual for the appropriate information on dimensions and weights
- UL (NEMA) Type 3R, Px3R-1...Px3R-4 enclosures are designed to be mounted on a wall. Mounting these 3R enclosures on an open rack system requires the use of the supplied 3R enclosure back plates to maintain 3R integrity.

Installing the wiring

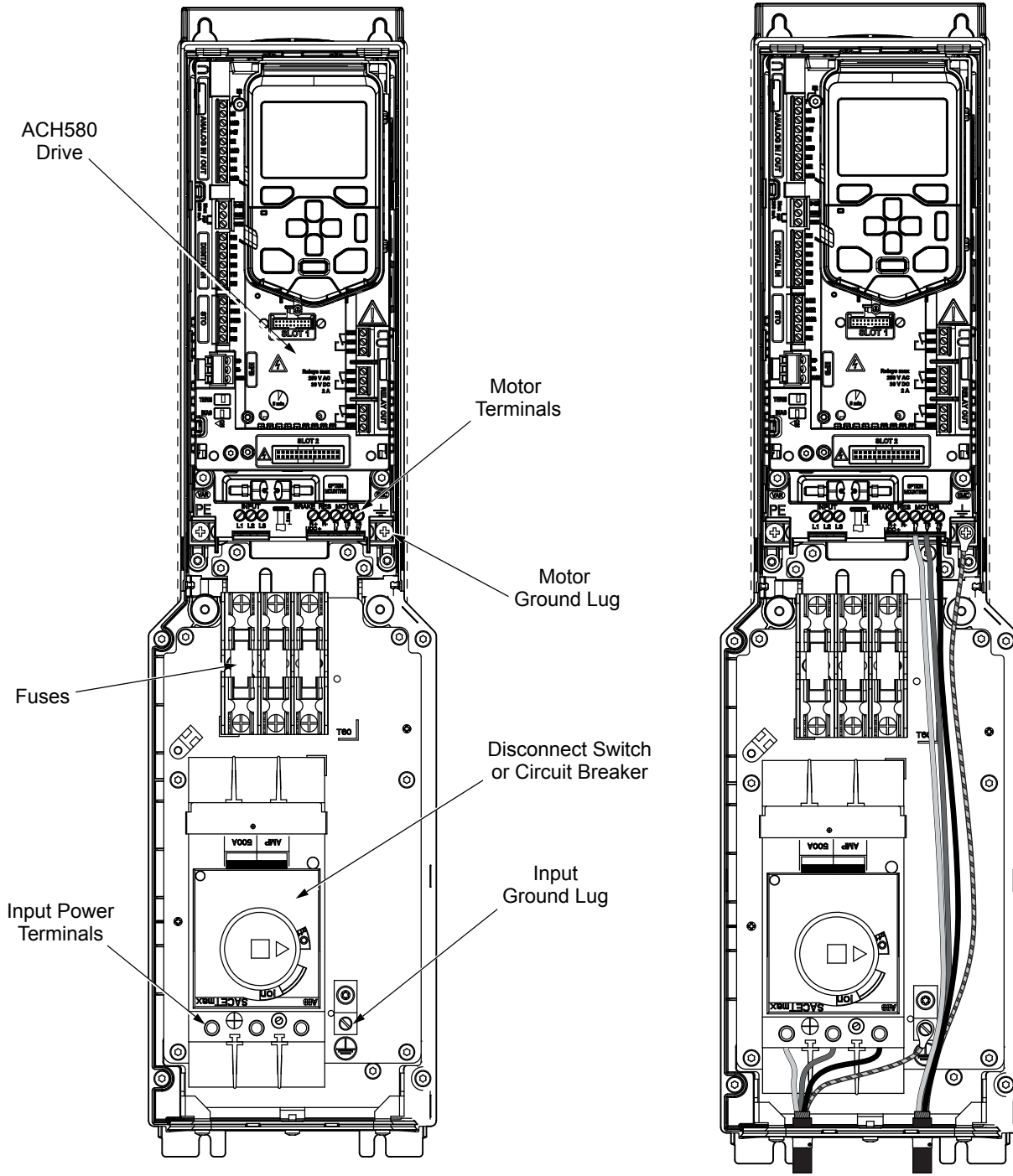
Wiring requirements

The wiring requirements apply to all ACH580 drives. In particular:

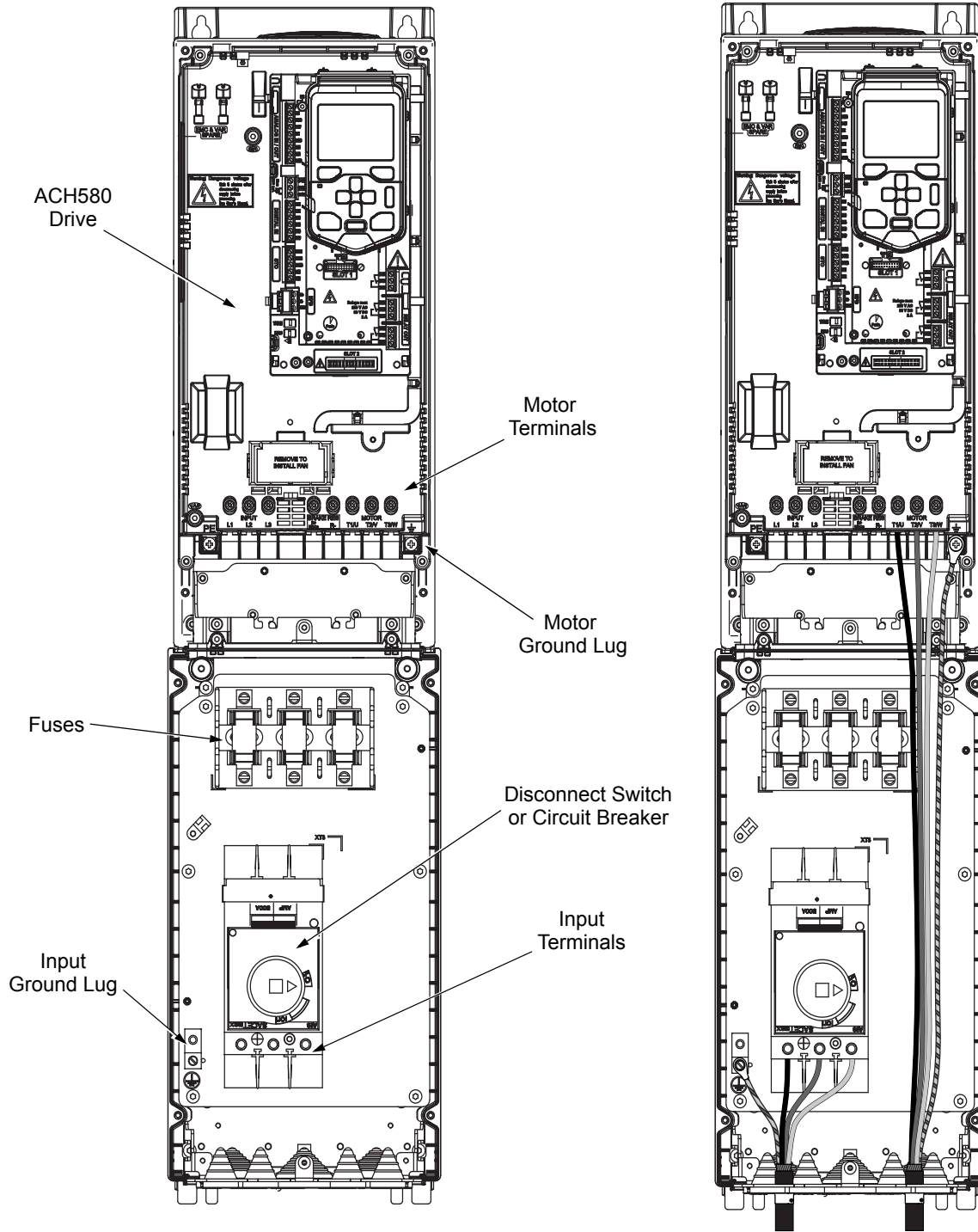
- Use separate, metal conduit runs for the following different classes of wiring:
 - Input power wiring.
 - Motor wiring.
 - Control/communications wiring.
- Properly and individually ground the drive, the motor and cable shields.

Connection diagrams – Vertical Packaged Drive with input disconnect

ACH580 Vertical Packaged Drive units are configured for wiring access from the bottom only. The following figures show the layout and wiring connection points. Refer to the *ACH580-01 Hardware Manual (3AXD50000044839)* for control connections to the drive. Maintain appropriate separation of control and power wires.



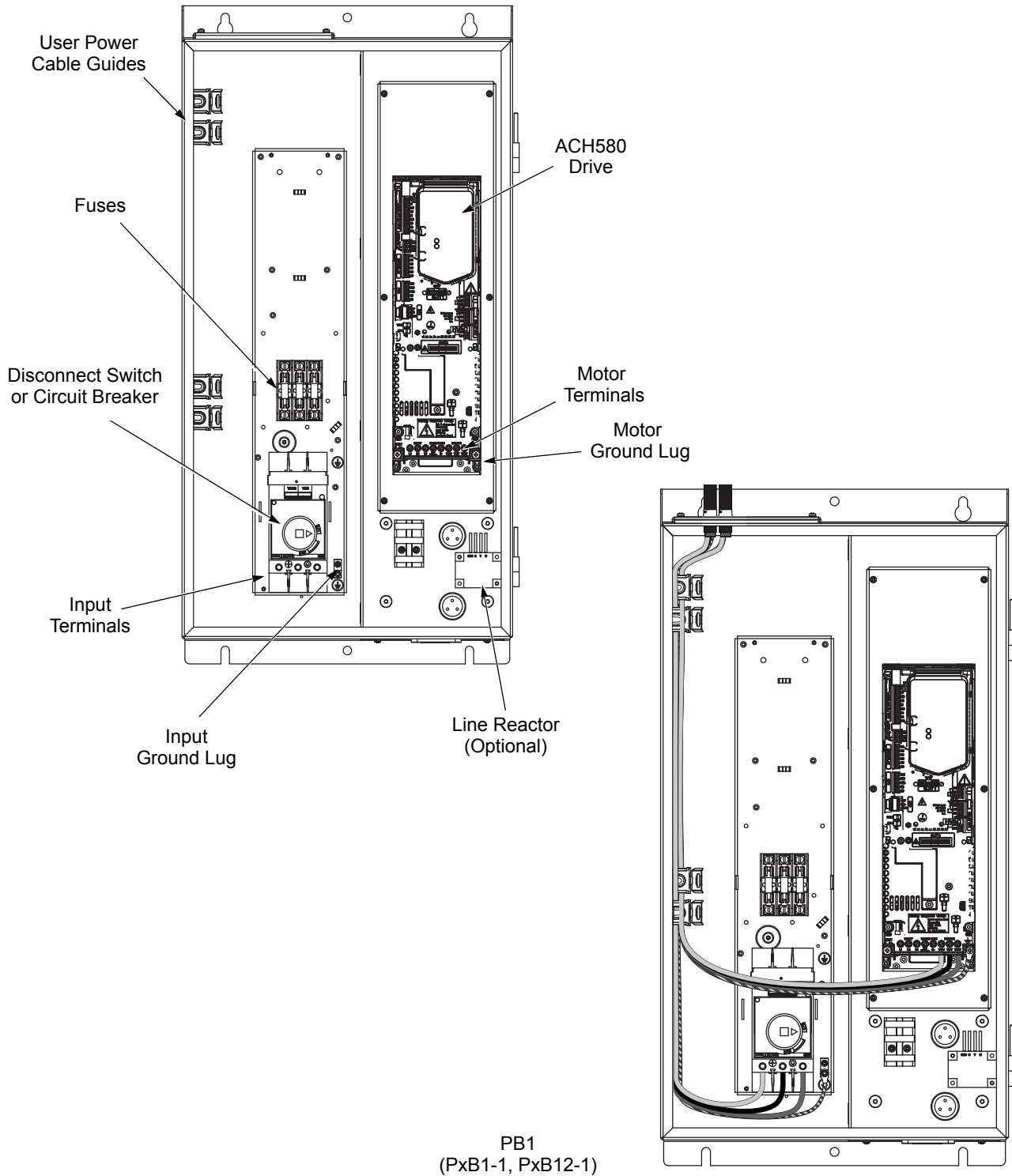
P1/P2
(Px1-1, Px12-1, Px1-2, Px12-2)

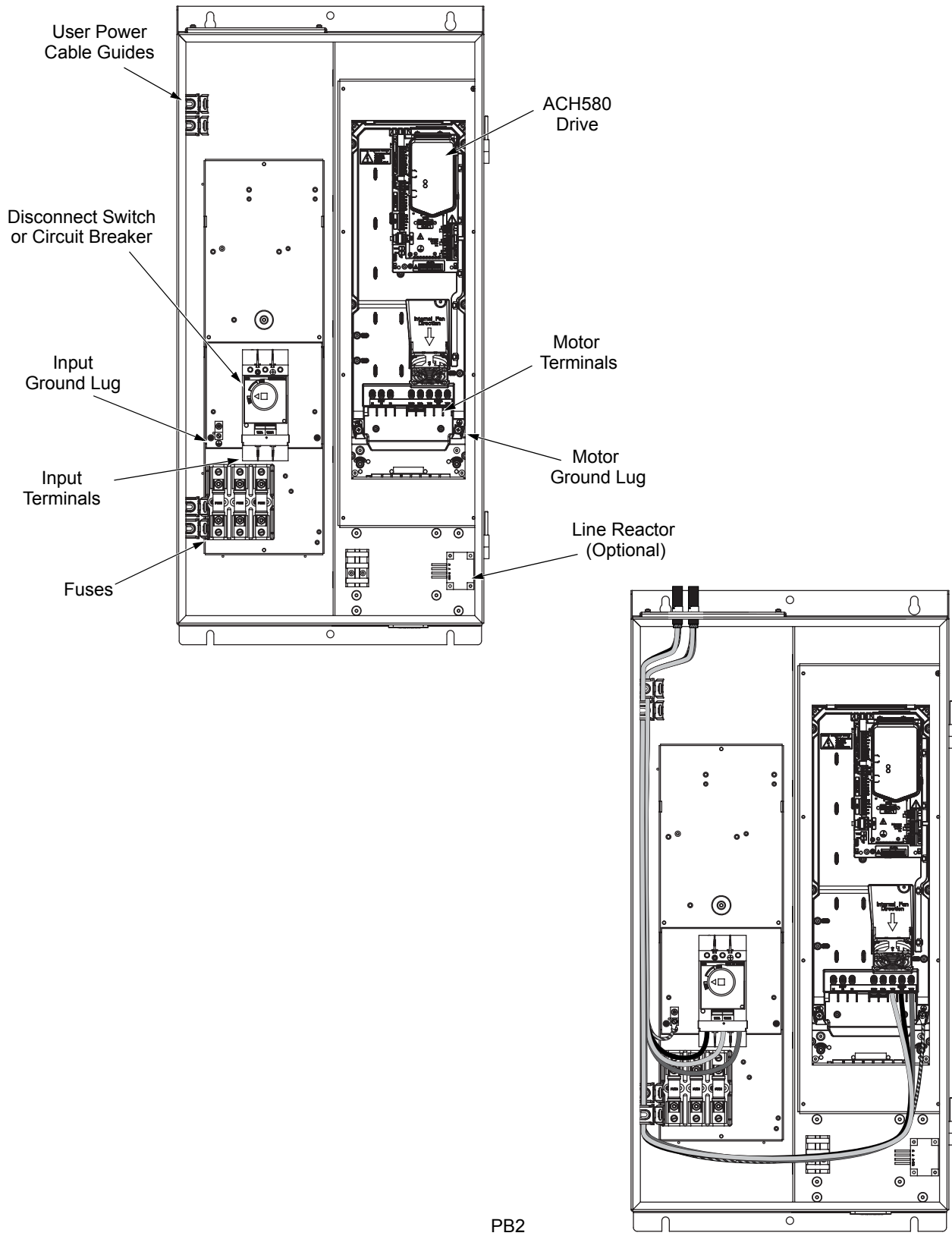


P3/P4
(Px1-3, Px12-3, Px1-4, Px12-4)

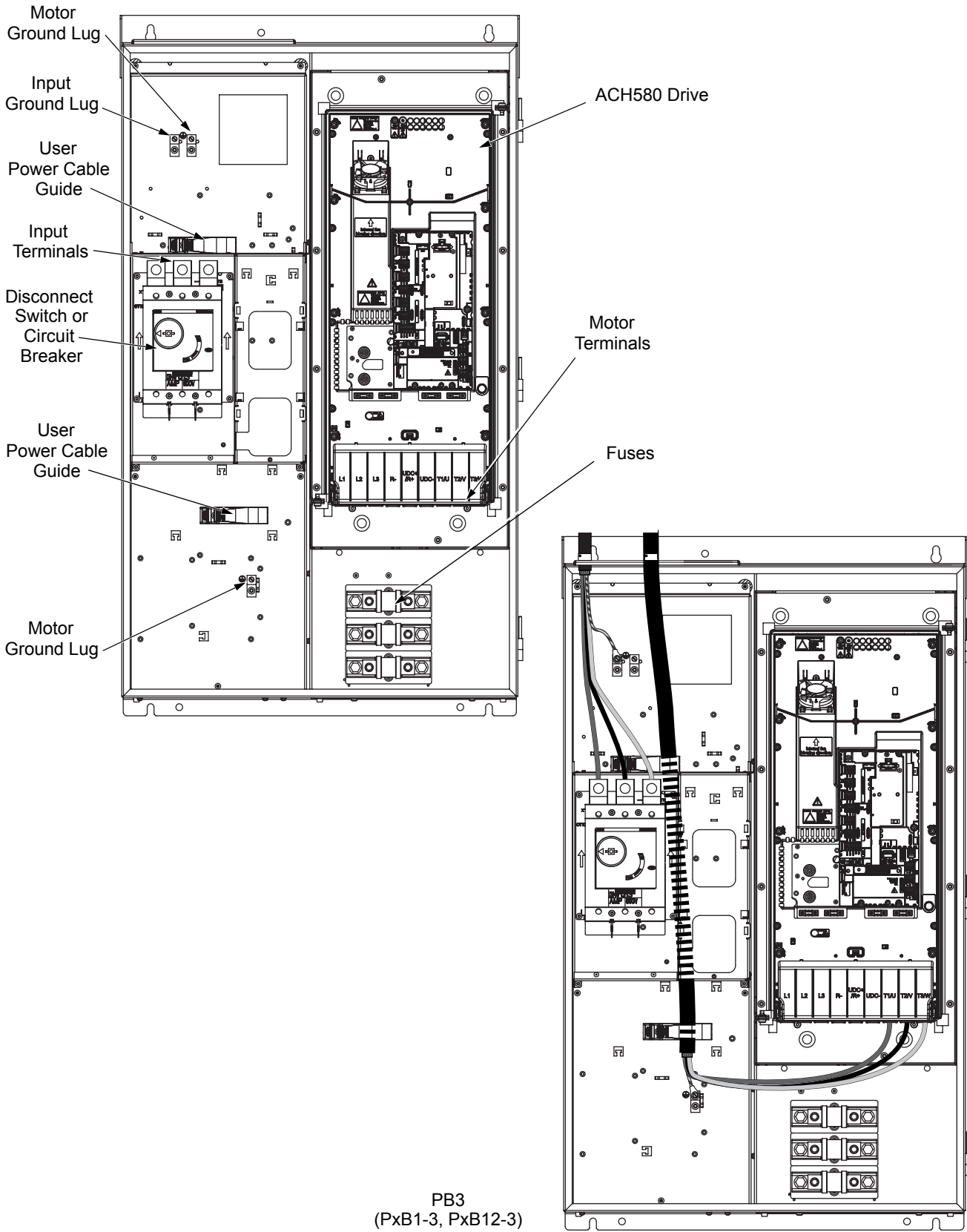
Connection diagrams – Box Packaged Drive with input disconnect

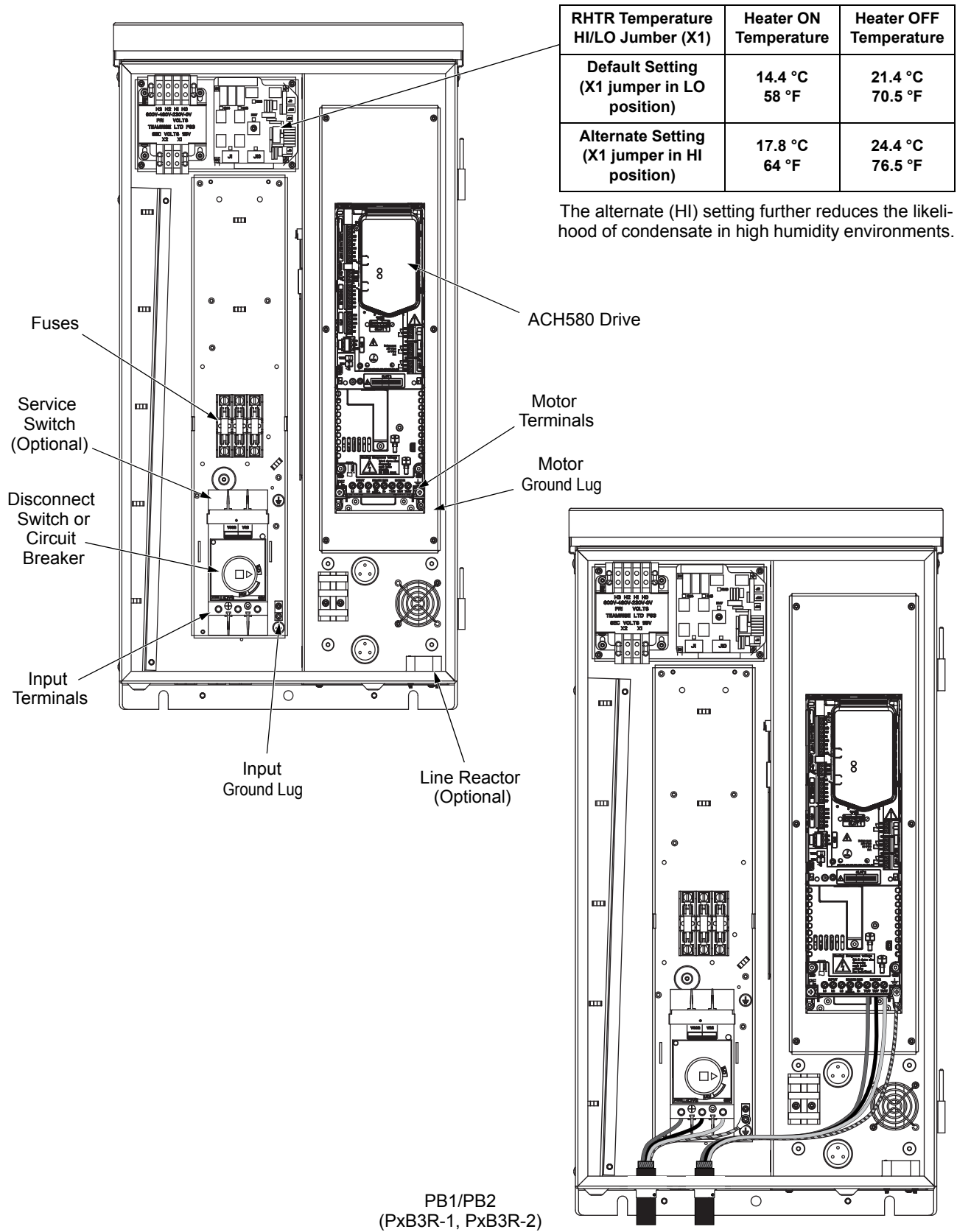
ACH580 Packaged Drive units are configured for wiring access from the top (for UL (NEMA) Type 1 and 12) and from the bottom (for UL (NEMA) Type 3R). The following figures show the layout and wiring connection points. Refer to the ACH580-01 Hardware Manual (3AXD50000044839) for control connections to the drive.





PB2
(PxB1-2, PxB12-2)





Maintenance

Maintenance

Maintenance intervals

If installed in an appropriate environment, the drive requires very little maintenance. This table lists the routine maintenance intervals recommended by ABB for ACH580 enclosures.

| Maintenance | Configuration | Interval | Instruction |
|---|---|--|---|
| Check/replace hinged door wall mount enclosure inlet air filter | Hinged door wall mount UL (NEMA) Type 12 enclosures | Check every 3 months. Replace as needed. | Enclosure air filter replacement – UL (NEMA) Type 12 hinged door wall mount enclosures on page 235. |

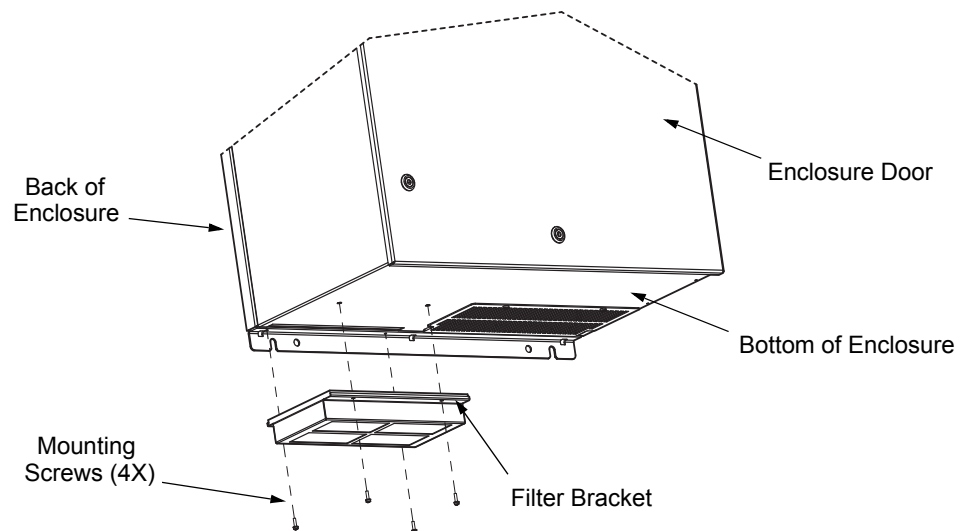
Enclosure air filter replacement – UL (NEMA) Type 12 hinged door wall mount enclosures

Filter material

| Material | Filter Type |
|--------------------------------------|--|
| American Air Filter (358-35-06A-12A) | POLYKLEON WHITE 12.7mm (1/2 in.) X 152.4mm (6 in.) X 304.6mm (12 in.) stk. |

This procedure applies to drive with input disconnect configurations in UL (NEMA) Type 12 hinged door wall mount enclosures. This filter is located at the bottom of the enclosure. Use the following procedure to check and replace filters.

1. On the enclosure, remove the screws holding the filter bracket in place.
2. Remove the filter kit from the enclosure.



3. Lift the filter out of the filter bracket and replace as appropriate.
4. With the filter in the filter bracket, reinstall filter kit onto enclosure.
5. Replace the mounting screws. Tighten to the recommended torque of 2 N•m (1.47 ft-lbs) per installation instruction 3AXD50000221370.

Technical data

Power connection terminals

The following tables show maximum wire size and required tightening torque for incoming power, grounding and motor terminals.

| 208/230 Volt | Output Ratings | | Base Drive Frame Size | Maximum Power Wiring Data | | | | | | |
|-------------------|----------------|------------------|-----------------------|---|-----------------------------------|---|-------------------------------------|-------------------------------|-------------------------------------|-------------------------------|
| | A | HP | | Circuit Breaker UL (NEMA) Type 1 and 12 | Circuit Breaker UL (NEMA) Type 3R | Disconnect Switch UL (NEMA) Type 1 and 12 | Disconnect Switch UL (NEMA) Type 3R | Motor Terminals | Ground Lugs UL (NEMA) Type 1 and 12 | Ground Lugs UL (NEMA) Type 3R |
| ACH580-PxR-04A6-2 | 4.6 | 1 | R1 | #10 62 in-lbs | #10 62 in-lbs | #10 55 in-lbs | #10 55 in-lbs | #10 0.7 ft-lbs | #2 50 in-lbs | #2 50 in-lbs |
| ACH580-PxR-06A6-2 | 6.6 | 1.5 | R1 | | | | | | | |
| ACH580-PxR-07A5-2 | 7.5 | 2 | R1 | | | | | | | |
| ACH580-PxR-10A6-2 | 10.6 | 3 | R1 | | | | | | | |
| ACH580-PxR-017A-2 | 16.7 | 5 | R1 | #6 62 in-lbs | #6 62 in-lbs | #6 55 in-lbs | #6 55 in-lbs | #6 1.1 ft-lbs | | |
| ACH580-PxR-024A-2 | 24.2 | 7.5 | R2 | | | | | | | |
| ACH580-PxR-031A-2 | 30.8 | 10 | R2 | #4 62 in-lbs | #4 62 in-lbs | #4 55 in-lbs | #4 55 in-lbs | | | |
| ACH580-PxR-046A-2 | 46.2 | 15 | R3 | #2 62 in-lbs | #2 62 in-lbs | #2 55 in-lbs | #2 55 in-lbs | #2 2.6 ft-lbs | | |
| ACH580-PxR-059A-2 | 59.4 | 20 | R3 | #1 62 in-lbs | #1 62 in-lbs | #1 55 in-lbs | #1 55 in-lbs | | | |
| ACH580-PxR-075A-2 | 74.8 | 25 | R4 | #1/0 62 in-lbs | #1/0 62 in-lbs | #1/0 55 in-lbs | #1/0 55 in-lbs | #1 3.0 ft-lbs | | |
| ACH580-PxR-088A-2 | 88 | 30 | R5 | #2/0 124 in-lbs | Consult Factory | #2/0 275 in-lbs | Consult Factory | #2/0 4.1 ft-lbs | | |
| ACH580-PxR-114A-2 | 114 | 40 | R5 | #1/0 124 in-lbs | | #4/0 275 in-lbs | | | | |
| ACH580-PxR-143A-2 | 143 | 50 | R6 | #3/0 124 in-lbs | | 200 MCM 275 in-lbs | | 300 MCM 22.1 ft-lbs | | |
| ACH580-PxR-169A-2 | 169 | 60 | R7 | #4/0 124 in-lbs | | 2 X 500 MCM 274 in-lbs | | 500 MCM 29.5 ft-lbs | | |
| ACH580-PxR-211A-2 | 211 | 75 | R7 | 2 X 500 MCM 274 in-lbs | | | | 2 x 300 MCM 29.6 ft-lbs | | |
| ACH580-PxR-248A-2 | 248 | 100 ² | R8 | 373 MCM 274 in-lbs | | | | | | |

1) "PxR" represents both PCR and PDR.

2) 100 HP @ 230V.

| 460 Volt | Output Ratings | | Base Drive Frame Size | Maximum Power Wiring Data | | | | | | |
|-------------------|------------------------|-----|-----------------------|---------------------------|---|-----------------------------------|---|-------------------------------------|------------------------|-------------------------------------|
| | Type Code ¹ | A | | HP | Circuit Breaker UL (NEMA) Type 1 and 12 | Circuit Breaker UL (NEMA) Type 3R | Disconnect Switch UL (NEMA) Type 1 and 12 | Disconnect Switch UL (NEMA) Type 3R | Motor Terminals | Ground Lugs UL (NEMA) Type 1 and 12 |
| ACH580-PxR-02A1-4 | 2.1 | 1 | R1 | #12 62 in-lbs | #12 62 in-lbs | #10 55 in-lbs | #10 55 in-lbs | #10 0.7 ft-lbs | #2 50 in-lbs | #2 50 in-lbs |
| ACH580-PxR-03A0-4 | 3 | 1.5 | R1 | | | | | | | |
| ACH580-PxR-03A5-4 | 3.5 | 2 | R1 | | | | | | | |
| ACH580-PxR-04A8-4 | 4.8 | 3 | R1 | | | | | | | |
| ACH580-PxR-07A6-4 | 7.6 | 5 | R1 | | | | | | | |
| ACH580-PxR-012A-4 | 12 | 7.5 | R1 | | | | | | | |
| ACH580-PxR-014A-4 | 14 | 10 | R2 | #10 62 in-lbs | #10 62 in-lbs | #8 55 in-lbs | #8 55 in-lbs | #6 1.1 ft-lbs | | |
| ACH580-PxR-023A-4 | 23 | 15 | R2 | #8 62 in-lbs | #8 62 in-lbs | #6 55 in-lbs | #6 55 in-lbs | #2 2.6 ft-lbs | | |
| ACH580-PxR-027A-4 | 27 | 20 | R3 | | | #4 55 in-lbs | #4 55 in-lbs | | | |
| ACH580-PxR-034A-4 | 34 | 25 | R3 | | | #6 62 in-lbs | #6 62 in-lbs | | | |
| ACH580-PxR-044A-4 | 44 | 30 | R3 | #1/0 124 in-lbs | #6 62 in-lbs | #2 55 in-lbs | #2 55 in-lbs | #1 3.0 ft-lbs | | |
| ACH580-PxR-052A-4 | 52 | 40 | R4 | | | #1 55 in-lbs | #1 55 in-lbs | | | |
| ACH580-PxR-065A-4 | 65 | 50 | R4 | #1/0 124 in-lbs | #1/0 124 in-lbs | #1/0 55 in-lbs | #1/0 55 in-lbs | | | |
| ACH580-PxR-077A-4 | 77 | 60 | R4 | #1/0 55 in-lbs | | #1/0 55 in-lbs | | | | |
| ACH580-PxR-096A-4 | 96 | 75 | R5 | #1/0 124 in-lbs | Consult Factory | #3/0 275 in-lbs | Consult Factory | #2/0 4.1 ft-lbs | 3 x #3/0 250 in-lbs | Consult Factory |
| ACH580-PxR-124A-4 | 124 | 100 | R6 | #2/0 124 in-lbs | | 250 MCM 275 in-lbs | | 300 MCM 22.1 ft-lbs | | |
| ACH580-PxR-156A-4 | 156 | 125 | R7 | #3/0 124 in-lbs | | 300 MCM 275 in-lbs | | 500 MCM 29.5 ft-lbs | | |
| ACH580-PxR-180A-4 | 180 | 150 | R7 | #4/0 124 in-lbs | | 2 x 500 MCM 274 in-lbs | | 2 x 300 MCM 29.6 ft-lbs | | |
| ACH580-PxR-240A-4 | 240 | 200 | R8 | 350 MCM 274 in-lbs | | | | | | |

1) "PxR" represents both PCR and PDR.

| 575 Volt | Output Range | | Base Drive Frame Size | Maximum Power Wiring Data | | | | | | |
|--------------------------------|---------------------------|-----|-----------------------|---------------------------|---|-----------------------------------|---|-------------------------------------|------------------------|-------------------------------------|
| | Type Code ^{1, 2} | A | | HP | Circuit Breaker UL (NEMA) Type 1 and 12 | Circuit Breaker UL (NEMA) Type 3R | Disconnect Switch UL (NEMA) Type 1 and 12 | Disconnect Switch UL (NEMA) Type 3R | ACH580 Motor Terminals | Ground Lugs UL (NEMA) Type 1 and 12 |
| ACH580-PxR-02A7-6 | 2.7 | 2 | R2 | #10 62 in-lbs | #10 62 in-lbs | #10 55 in-lbs | #10 55 in-lbs | #6 1.1 ft-lbs | #2 50 in-lbs | #2 50 in-lbs |
| ACH580-PxR-03A9-6 | 3.9 | 3 | R2 | #12 62 in-lbs | #12 62 in-lbs | | | | | |
| ACH580-PxR-06A1-6 | 6.1 | 5 | R2 | #10 62 in-lbs | #10 62 in-lbs | #6 55 in-lbs | #6 55 in-lbs | #6 1.1 ft-lbs | #2 50 in-lbs | #2 50 in-lbs |
| ACH580-PxR-09A0-6 | 9 | 7.5 | R2 | | | | | | | |
| ACH580-PxR-011A-6 | 11 | 10 | R2 | #6 62 in-lbs | #6 62 in-lbs | #6 55 in-lbs | #6 55 in-lbs | #2 2.6 ft-lbs | #2 50 in-lbs | #2 50 in-lbs |
| ACH580-PxR-017A-6 | 17 | 15 | R2 | | | | | | | |
| ACH580-PxR-022A-6 | 22 | 20 | R3 | #4 62 in-lbs | #4 62 in-lbs | #4 55 in-lbs | #4 55 in-lbs | #2 2.6 ft-lbs | #2 50 in-lbs | #2 50 in-lbs |
| ACH580-PxR-027A-6 | 27 | 25 | R3 | | | | | | | |
| ACH580-PxR-032A-6 | 32 | 30 | R3 | #3 62 in-lbs | #2 62 in-lbs | #3 55 in-lbs | #2 55 in-lbs | #2/0 4.1 ft-lbs | #2 50 in-lbs | #2 50 in-lbs |
| ACH580-PxR-041A-6 | 41 | 40 | R5 | | | | | | | |
| ACH580-PxR-052A-6 ³ | 52 | 50 | R5 | #1 62 in-lbs | #1/0 62 in-lbs | #1 275 in-lbs | #1/0 275 in-lbs | 300 MCM 22.1 ft-lbs | 3 x #3/0 250 in-lbs | Consult Factory |
| ACH580-PxR-062A-6 | 62 | 60 | R6 | | | | | | | |
| ACH580-PxR-077A-6 | 77 | 75 | R6 | 250 MCM 124 in-lbs | #3/0 124 in-lbs | 250 MCM 275 in-lbs | #3/0 275 in-lbs | 500 MCM 29.5 ft-lbs | 3 x #3/0 250 in-lbs | Consult Factory |
| ACH580-PxR-099A-6 | 99 | 100 | R7 | | | | | | | |
| ACH580-PxR-125A-6 | 125 | 125 | R7 | 250 MCM 124 in-lbs | 300 MCM 275 in-lbs | 300 MCM 275 in-lbs | 2 x 300 MCM 29.6 ft-lbs | 500 MCM 29.5 ft-lbs | 3 x #3/0 250 in-lbs | Consult Factory |
| ACH580-PxR-144A-6 | 144 | 150 | R8 | | | | | | | |

1) "PxR" represents both PCR and PDR.

2) PCR is rated 600Y/347V unless otherwise specified. For use on a solidly grounded Wye source only.

3) PCR supports Delta network configuration.

Branch circuit protection

Input power is connected to the ACH580 with E-Clipse Bypass through a door interlocked disconnect switch or circuit breaker. Neither of these inputs are fused. The branch circuit that provides power to the ACH580 with E-Clipse Bypass with disconnect switch must include the specified external fuses to provide short circuit and ground fault protection for the motor in the bypass mode.

When connected to a 240V or 480V power source, the ACH580 with E-Clipse Bypass with the circuit breaker option is suitable for use on a circuit capable of delivering not more than 100,000 RMS symmetrical amperes. When connected to a 600V power source, PCR configurations are suitable for use on a circuit capable of delivering not more than 10,000 RMS symmetrical amperes (75-150 HP), and not more than 25,000 RMS symmetrical amperes (2-60 HP).

Fuses

Note: The UL listed drive fuses in the table are provided in the purchased product.

- Replacement fuses are required to be of the same class, current rating, and voltage rating. Fuses from other manufacturers can be used if they are 600V rated and meet the specifications given in the table.
- Fuses with higher current rating than specified must not be used.

208 Volt fuses for packaged drive

| 208 Volt | Nominal Output Range | | Base Drive Frame Size | Internal Drive Fuse Rating | | External Fuse for Disconnect Option | |
|------------------------|----------------------|------------------|-----------------------|----------------------------|----------------|-------------------------------------|--------------------|
| | Drive Current | Package Power | | Class | Current Rating | Class | Max Current Rating |
| Type Code ¹ | A | HP | | | | | |
| ACH580-PxR-04A6-2 | 4.6 | 1 | R1 | Class CC | 15A | N/A | N/A |
| ACH580-PxR-06A6-2 | 6.6 | 1.5 | R1 | Class CC | 15A | N/A | N/A |
| ACH580-PxR-07A5-2 | 7.5 | 2 | R1 | Class CC | 15A | N/A | N/A |
| ACH580-PxR-10A6-2 | 10.6 | 3 | R1 | Class CC | 15A | N/A | N/A |
| ACH580-PxR-017A-2 | 16.7 | 5 | R1 | Class CC | 30A | N/A | N/A |
| ACH580-PxR-024A-2 | 24.2 | 7.5 | R2 | Class CC | 30A | N/A | N/A |
| ACH580-PxR-031A-2 | 30.8 | 10 | R2 | Class T | 40A | N/A | N/A |
| ACH580-PxR-046A-2 | 46.2 | 15 | R3 | Class T | 80A | N/A | N/A |
| ACH580-PxR-059A-2 | 59.4 | 20 | R3 | Class T | 80A | N/A | N/A |
| ACH580-PxR-075A-2 | 74.8 | 25 | R4 | Class T | 100A | N/A | N/A |
| ACH580-PxR-088A-2 | 88 | 30 | R5 | Class T | 110A | N/A | N/A |
| ACH580-PxR-114A-2 | 114 | 40 | R5 | Class T | 150A | N/A | N/A |
| ACH580-PxR-144A-2 | 143 | 50 | R6 | Class T | 200A | N/A | N/A |
| ACH580-PxR-169A-2 | 169 | 60 | R7 | Class T | 250A | N/A | N/A |
| ACH580-PxR-211A-2 | 211 | 75 | R7 | Class T | 300A | Class J or RK1 | 400A |
| ACH580-PxR-248A-2 | 248 | 100 ² | R8 | Class T | 350A | Class J or RK1 | 400A |

1) "PxR" represents both PCR and PDR.

2) 100 HP @ 230V

460 Volt fuses for packaged drive

| 480 Volt | Nominal Output Range | | Base Drive Frame Size | Internal Drive Fuse Rating | | External Fuse for Disconnect Option | |
|-------------------|----------------------|---------------|-----------------------|----------------------------|----------------|-------------------------------------|--------------------|
| | Drive Current | Package Power | | Class | Current Rating | Class | Max Current Rating |
| | A | HP | | | | | |
| ACH580-PxR-02A1-4 | 2.1 | 1 | R1 | Class CC | 15A | N/A | N/A |
| ACH580-PxR-03A0-4 | 3 | 1.5 | R1 | Class CC | 15A | N/A | N/A |
| ACH580-PxR-03A5-4 | 3.5 | 2 | R1 | Class CC | 15A | N/A | N/A |
| ACH580-PxR-04A8-4 | 4.8 | 3 | R1 | Class CC | 15A | N/A | N/A |
| ACH580-PxR-07A6-4 | 7.6 | 5 | R1 | Class CC | 15A | N/A | N/A |
| ACH580-PxR-012A-4 | 12 | 7.5 | R1 | Class CC | 15A | N/A | N/A |
| ACH580-PxR-014A-4 | 14 | 10 | R2 | Class CC | 30A | N/A | N/A |
| ACH580-PxR-023A-4 | 23 | 15 | R2 | Class CC | 30A | N/A | N/A |
| ACH580-PxR-027A-4 | 27 | 20 | R3 | Class T | 40A | N/A | N/A |
| ACH580-PxR-034A-4 | 34 | 25 | R3 | Class T | 60A | N/A | N/A |
| ACH580-PxR-044A-4 | 44 | 30 | R3 | Class T | 60A | N/A | N/A |
| ACH580-PxR-052A-4 | 52 | 40 | R4 | Class T | 80A | N/A | N/A |
| ACH580-PxR-065A-4 | 65 | 50 | R4 | Class T | 90A | N/A | N/A |
| ACH580-PxR-077A-4 | 77 | 60 | R4 | Class T | 100A | N/A | N/A |
| ACH580-PxR-096A-4 | 96 | 75 | R5 | Class T | 150A | N/A | N/A |
| ACH580-PxR-124A-4 | 124 | 100 | R6 | Class T | 200A | N/A | N/A |
| ACH580-PxR-156A-4 | 156 | 125 | R7 | Class T | 225A | N/A | N/A |
| ACH580-PxR-180A-4 | 180 | 150 | R7 | Class T | 300A | N/A | N/A |
| ACH580-PxR-240A-4 | 240 | 200 | R8 | Class T | 350A | Class J or RK1 | 400A Max |

1) "PxR" represents both PCR and PDR.

575 Volt fuses for packaged drive

| 575 Volt | Nominal Output Range | | Base Drive Frame Size | Internal Drive Fuse Rating | | External Fuse for Disconnect Option | |
|-------------------|----------------------|---------------|-----------------------|----------------------------|----------------|-------------------------------------|--------------------|
| | Drive Current | Package Power | | Class | Current Rating | Class | Max Current Rating |
| | A | HP | | | | | |
| ACH580-PxR-02A7-6 | 2.7 | 2 | R2 | Class CC | 15A | N/A | N/A |
| ACH580-PxR-03A9-6 | 3.9 | 3 | R2 | Class CC | 15A | N/A | N/A |
| ACH580-PxR-06A1-6 | 3.5 | 6.1 | R2 | Class CC | 15A | N/A | N/A |
| ACH580-PxR-09A0-6 | 4.8 | 9 | R2 | Class CC | 15A | N/A | N/A |
| ACH580-PxR-011A-6 | 7.6 | 11 | R2 | Class CC | 30A | N/A | N/A |
| ACH580-PxR-017A-6 | 17 | 15 | R2 | Class CC | 30A | N/A | N/A |
| ACH580-PxR-022A-6 | 22 | 20 | R3 | Class T | 40A | N/A | N/A |
| ACH580-PxR-027A-6 | 27 | 25 | R3 | Class T | 40A | N/A | N/A |
| ACH580-PxR-032A-6 | 32 | 30 | R3 | Class T | 40A | N/A | N/A |
| ACH580-PxR-041A-6 | 41 | 40 | R5 | Class T | 50A | N/A | N/A |

| 575 Volt | Nominal Output Range | | Base Drive Frame Size | Internal Drive Fuse Rating | | External Fuse for Disconnect Option | |
|--------------------------------|----------------------|---------------|-----------------------|----------------------------|----------------|-------------------------------------|--------------------|
| | Drive Current | Package Power | | Class | Current Rating | Class | Max Current Rating |
| | A | HP | | | | | |
| ACH580-PxR-052A-6 ³ | 52 | 50 | R5 | Class T | 80A | N/A | N/A |
| ACH580-PxR-062A-6 | 62 | 60 | R5 | Class T | 80A | N/A | N/A |
| ACH580-PxR-077A-6 | 77 | 75 | R5 | Class T | 100A | N/A | N/A |
| ACH580-PxR-099A-6 | 99 | 100 | R7 | Class T | 150A | N/A | N/A |
| ACH580-PxR-125A-6 | 125 | 125 | R7 | Class T | 175A | N/A | N/A |
| ACH580-PxR-144A-6 | 144 | 150 | R8 | Class T | 200A | N/A | N/A |
| ACH580-PxR-180A-4 | 180 | 150 | R2 | Class T | 300A | N/A | N/A |
| ACH580-PxR-240A-4 | 240 | 200 | R2 | Class T | 350A | Class J or RK1 | 400A Max |

1) "PxR" represents both PCR and PDR.

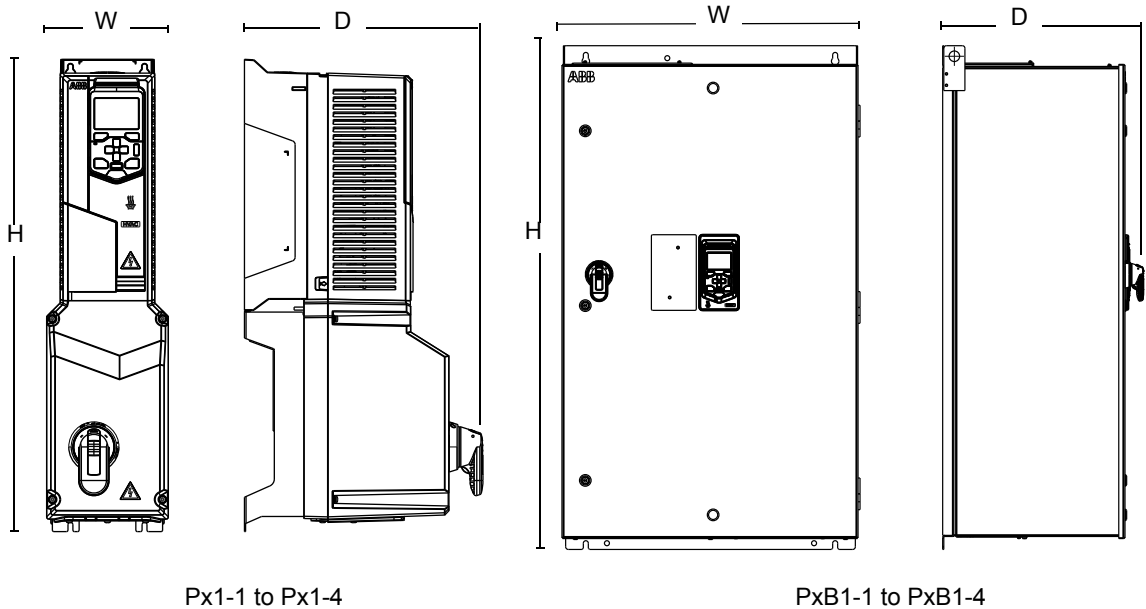
2) PCR is rated 600Y/347V unless otherwise specified. For use on a solidly grounded Wye source only.

3) PCR supports Delta network configuration.

Dimensions and weights

Mounting dimensions

Dimensions: ACH580-PxR UL (NEMA) Type 1

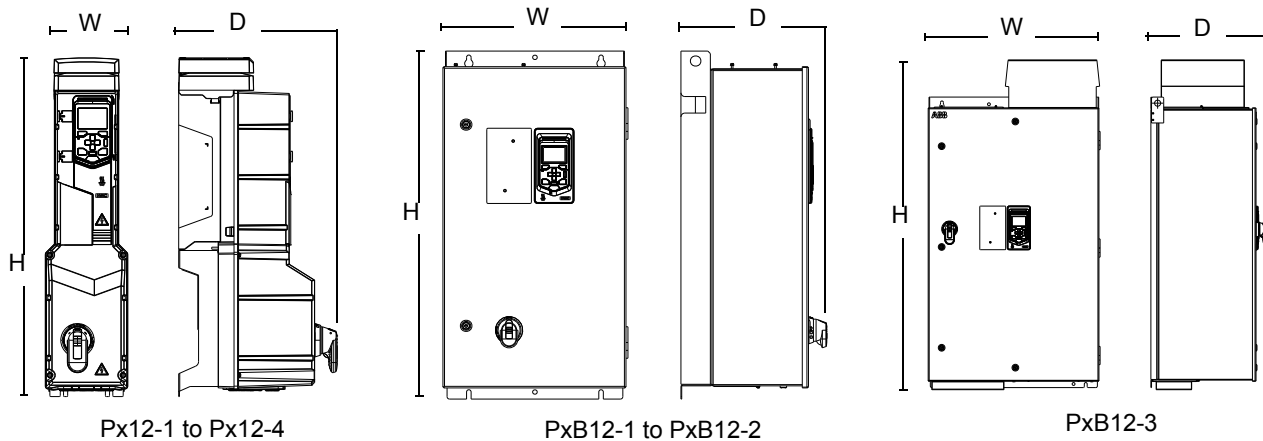


| Frame | Height (H) | | Width (W) | | Depth (D) | | Weight | | Dimensional Drawings |
|--------|------------|------|-----------|-----|-----------|-----|--------|-------|----------------------|
| | in | mm | in | mm | in | mm | lb | kg | |
| Px1-1 | 24.60 | 624 | 6.34 | 160 | 12.42 | 315 | 18.1 | 8.2 | 3AXD50000220946 |
| Px1-2 | 28.49 | 723 | 6.34 | 161 | 12.63 | 320 | 22.0 | 10.0 | 3AXD50000221738 |
| Px1-3 | 34.86 | 885 | 8.39 | 213 | 13.22 | 335 | 39.0 | 17.7 | 3AXD50000222636 |
| Px1-4 | 40.61 | 1031 | 8.39 | 213 | 14.26 | 362 | 60.0 | 27.2 | 3AXD50000222940 |
| PxB1-1 | 33.16 | 842 | 17.63 | 447 | 13.90 | 353 | 77.0 | 35.0 | 3AXD50000236596 |
| PxB1-2 | 40.60 | 1030 | 20.50 | 521 | 15.30 | 388 | 122.0 | 55.3 | 3AXD50000236602 |
| PxB1-3 | 47.72 | 1212 | 28.24 | 717 | 19.04 | 483 | 393.0 | 178.3 | 3AXD50000236374 |

See page [243](#) for mounting dimension details and additional free space recommendations.

Note: Keep a minimum of 50 mm (2 in.) of free space on each side and 200 mm (8 in.) of free space above and below all units from non-heat producing sources. Double these distances from heat producing sources.

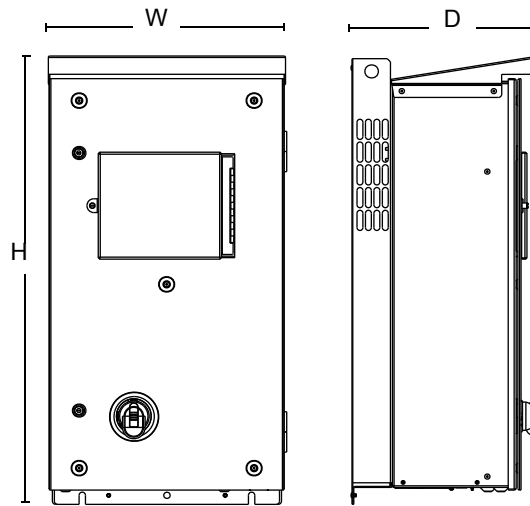
Dimensions: ACH580-PxR UL (NEMA) Type 12



| Frame | Height (H) | | Width (W) | | Depth (D) | | Weight | | Dimensional Drawings |
|---------|------------|------|-----------|-----|-----------|-----|--------|-------|----------------------|
| | in | mm | in | mm | in | mm | lb | kg | |
| Px12-1 | 26.50 | 673 | 6.50 | 164 | 12.40 | 315 | 18.2 | 8.2 | 3AXD50000220953 |
| Px12-2 | 30.22 | 768 | 6.50 | 164 | 12.64 | 321 | 22.0 | 10.0 | 3AXD50000221912 |
| Px12-3 | 36.51 | 927 | 8.39 | 213 | 13.22 | 335 | 39.0 | 17.7 | 3AXD50000222834 |
| Px12-4 | 42.50 | 1079 | 8.39 | 213 | 14.26 | 362 | 60.0 | 27.2 | 3AXD50000222674 |
| PxB12-1 | 33.16 | 842 | 17.63 | 447 | 13.90 | 353 | 77.0 | 35.0 | 3AXD50000236305 |
| PxB12-2 | 40.60 | 1030 | 20.50 | 521 | 15.30 | 388 | 122.0 | 55.3 | 3AXD50000236619 |
| PxB12-3 | 54.17 | 1376 | 28.24 | 717 | 19.04 | 483 | 393.0 | 178.3 | 3AXD50000236718 |

See page [243](#) for mounting dimension details and additional free space recommendations.

Note: Keep a minimum of 50 mm (2 in.) of free space on each side and 200 mm (8 in.) of free space above and below all units from non-heat producing sources. Double these distances from heat producing sources.

Dimensions: ACH580-PxR UL (NEMA) Type 3R

PxB3R-1 to PxB3R-2

| Frame | Height (H) | | Width (W) | | Depth (D) | | Weight | | Dimensional Drawings |
|---------|------------|------|-----------|-----|-----------|-----|--------|------|----------------------|
| | in | mm | in | mm | in | mm | lb | kg | |
| PxB3R-1 | 33.30 | 846 | 17.70 | 449 | 14.00 | 355 | 83.8 | 38.0 | 3AXD50000236367 |
| PxB3R-2 | 40.60 | 1032 | 20.10 | 511 | 15.00 | 391 | 193.0 | 88.0 | 3AXD50000237531 |

Note: UL (NEMA) Type 3R, Px3R-1...Px3R-4 enclosures are designed to be mounted on a wall.

Note: Keep a minimum of 50 mm (2 in.) of free space on each side and 200 mm (8 in.) of free space above and below all units from non-heat producing sources. Double these distances from heat producing sources.


Degrees of protection

Available enclosures:

- UL (NEMA) Type 1 enclosure. The site must be free of airborne dust, corrosive gases or liquids, and conductive contaminants such as condensation, carbon dust, and metallic particles.
- UL (NEMA) Type 12 enclosure. This enclosure provides protection from airborne dust and light sprays or splashing water from all directions.
- UL (NEMA) Type 3R enclosure. This enclosure provides protection from the ingress of water (rain, sleet, or snow). The external formation of ice does not damage this enclosure.

Applicable standards

Packaged drive compliance with the following standards is identified by the standards “marks” on the type code label.

| Mark | Applicable Standards | |
|---|----------------------|---|
|  | UL 508A | UL Standard for Industrial Control Panels |

Compliance is valid with the following provisions:

- The motor and control cables are chosen as specified in this manual.
- The installation rules of this manual are followed.

Additional ACH580-01 standards information can be located in the Technical data/ applicable standards section of the *ACH580 Hardware Manual* (3AXD50000044839).



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