

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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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

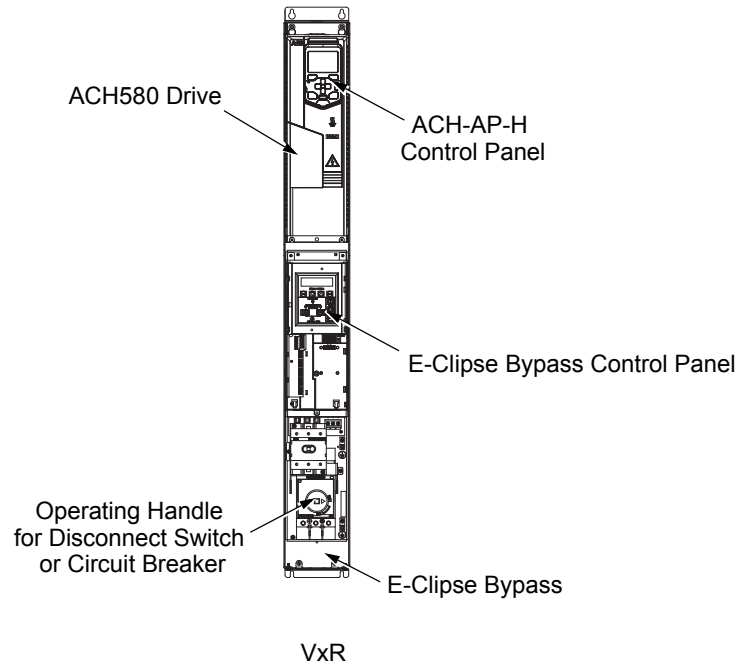
This manual is a supplement to the ACH580-01 User's Manual and documents E-Clipse Bypass configurations.

E-Clipse bypass features and functions

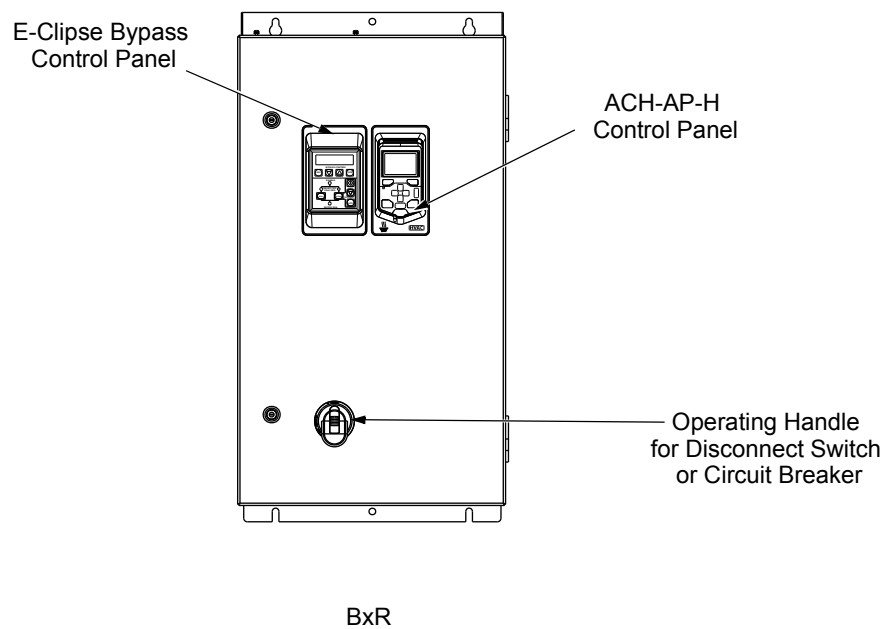
The ACH580 with E-Clipse Bypass is an ACH580 AC adjustable frequency drive in an integrated UL (NEMA) Type 1, UL (NEMA) Type 12, or UL (NEMA) Type 3R package with a bypass motor starter. The ACH580 with E-Clipse Bypass provides:

- 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.

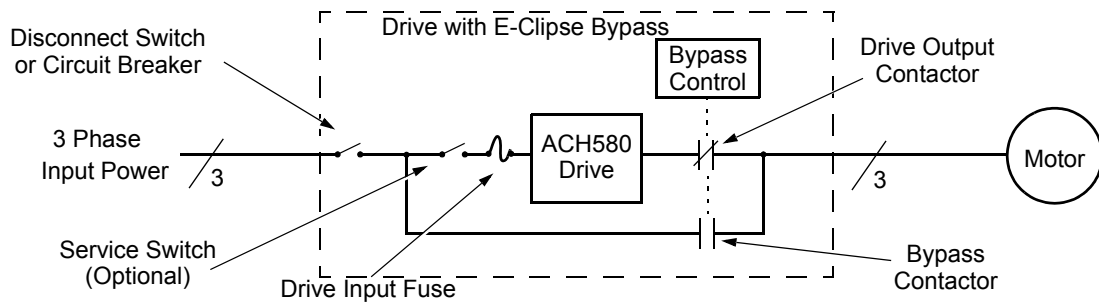
The following shows the front view of the ACH580 E-Clipse Bypass vertical configuration, and identifies the major components.



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 ACH580-01 Hardware Manual (3AXD50000044839) Installation section	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.

ACH580-BCR-316A-4



S/N 2090501769

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:

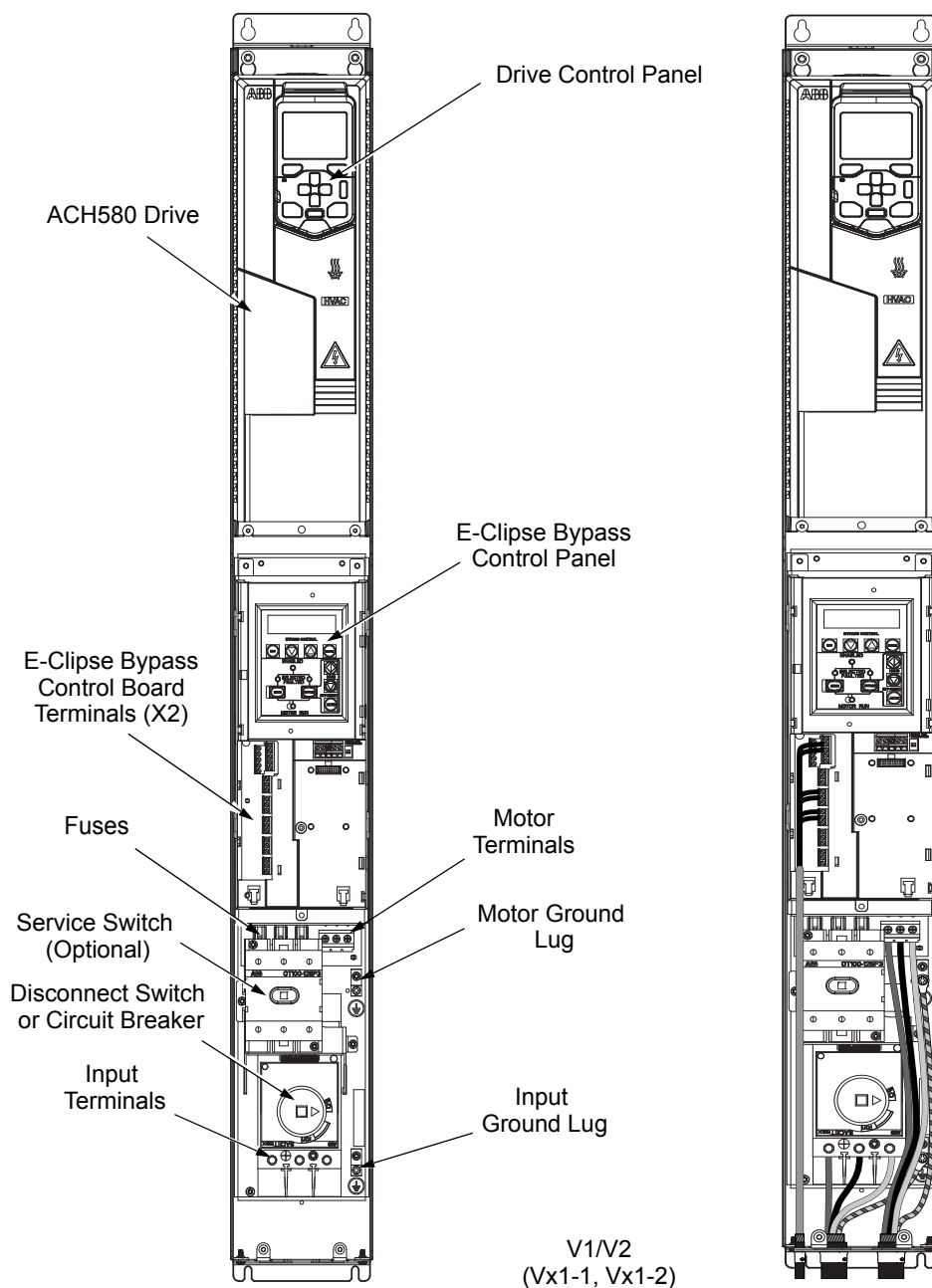
- Use separate, metal conduit runs to keep these three classes of wiring apart:
 - Input power wiring.
 - Motor wiring.
 - Control/communications wiring.
- Properly and individually ground the drive, the motor and cable shields.

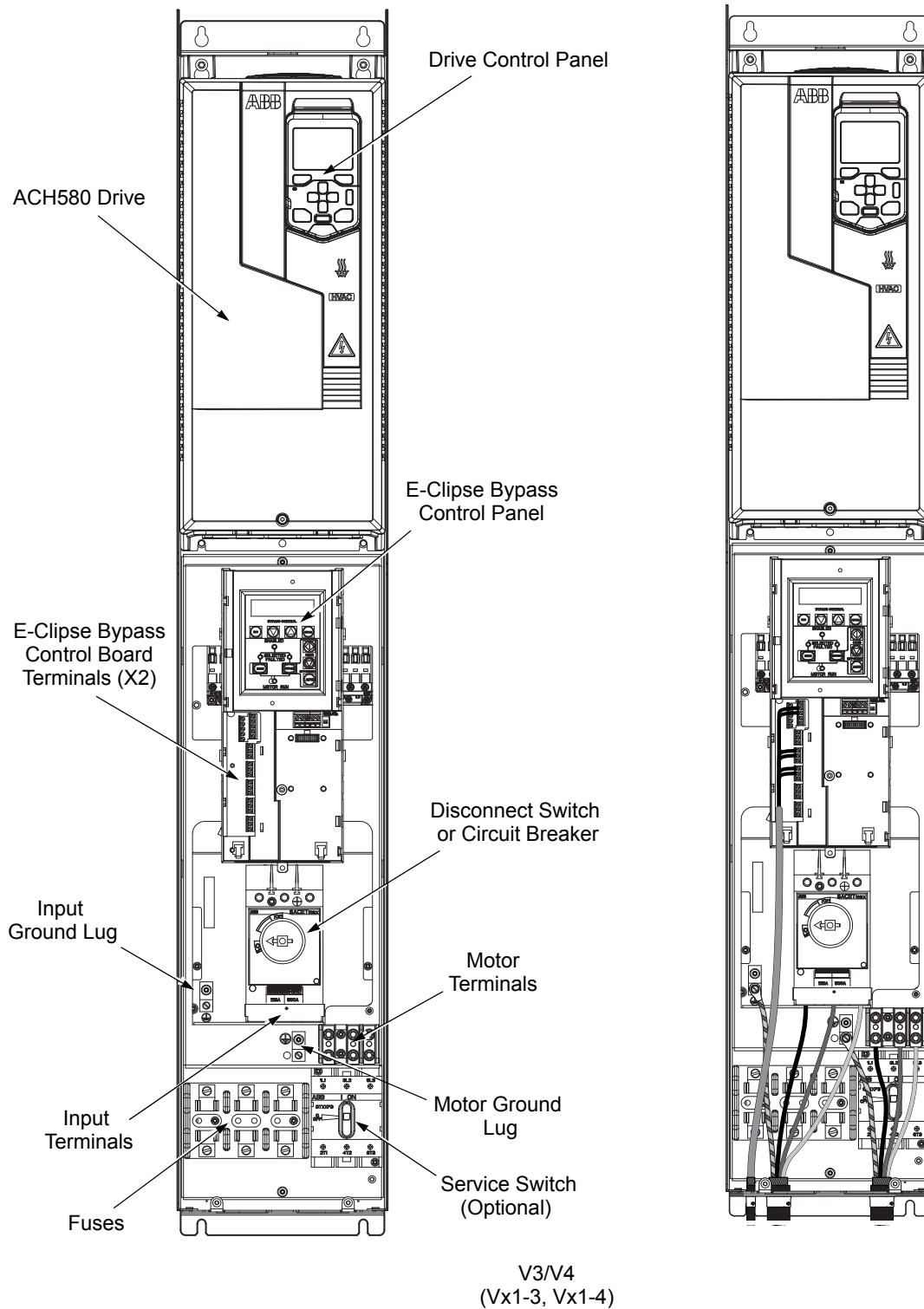
- Use wire ties to permanently affix control/communications wiring to the hooked wire race tie points provided maintaining a minimum 6 mm (1/4 in.) spacing from power wiring.
- Use a separate motor conduit run for each motor.

Wiring overview

Connection and wiring diagrams – Vertical E-Clipse Bypass

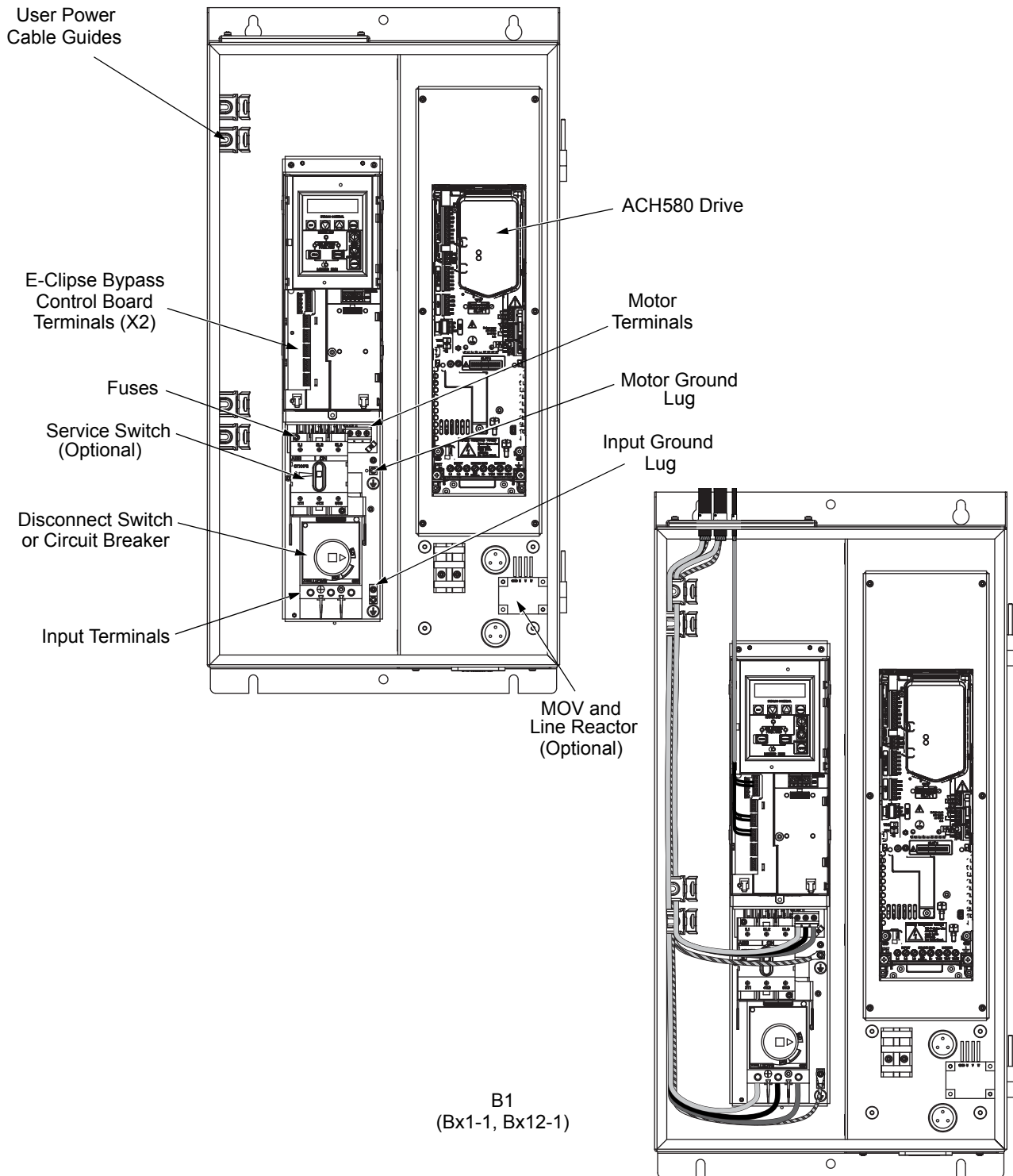
ACH580 Vertical E-Clipse Bypass units are configured for wiring access from the bottom only. The following figures show the layout and wiring connection points. For drive control wiring, see page 52. Maintain appropriate separation of control and power wires.

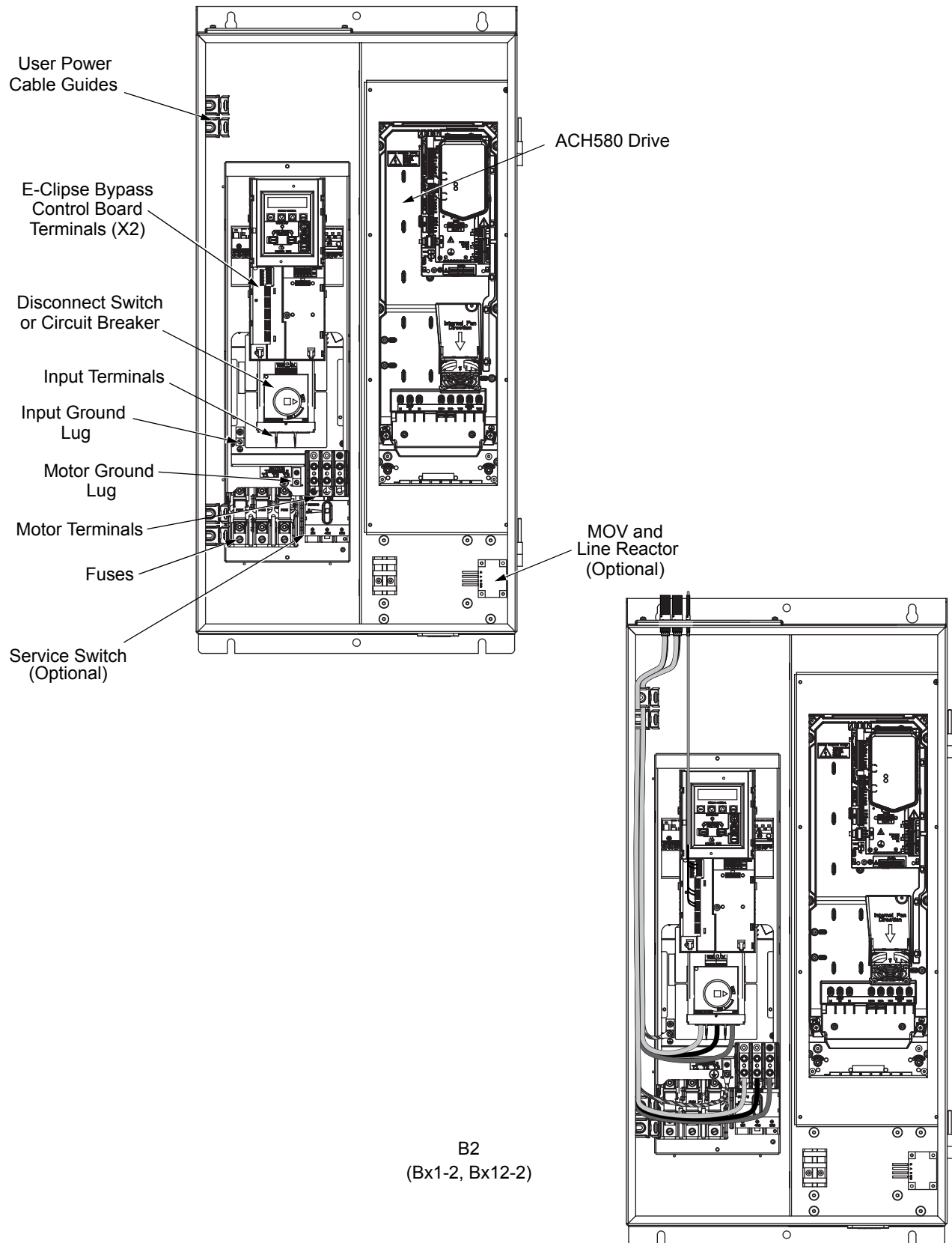


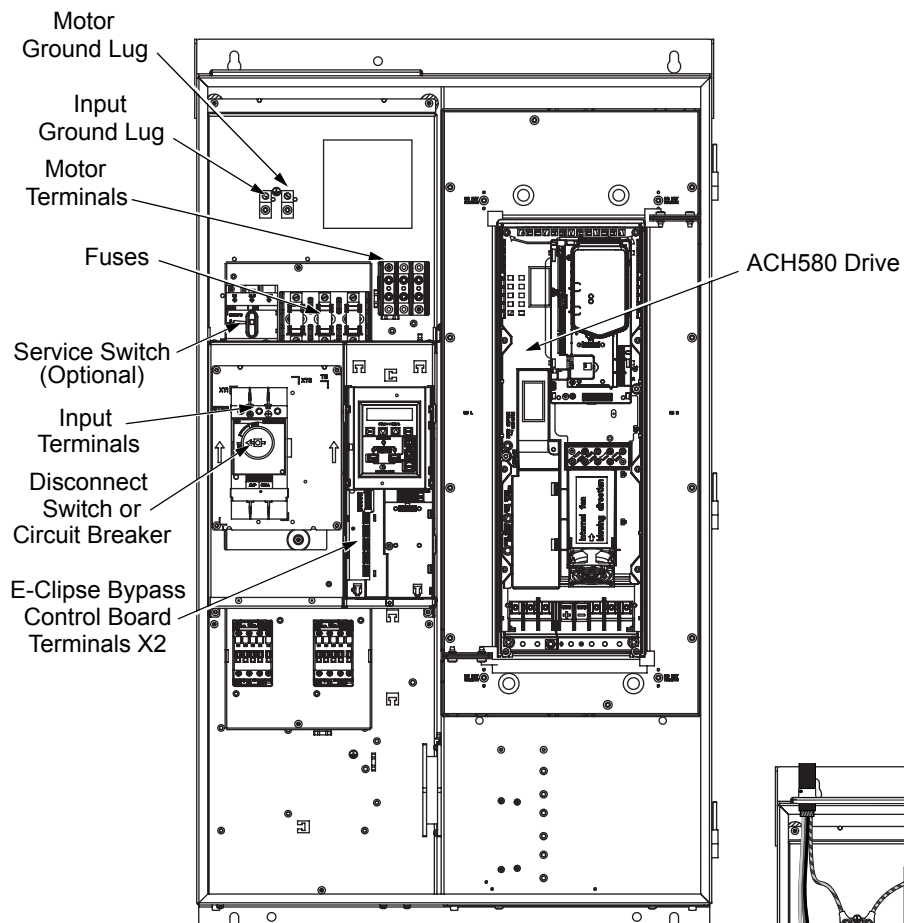


Connection and wiring diagrams – Box E-Clipse Bypass

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.

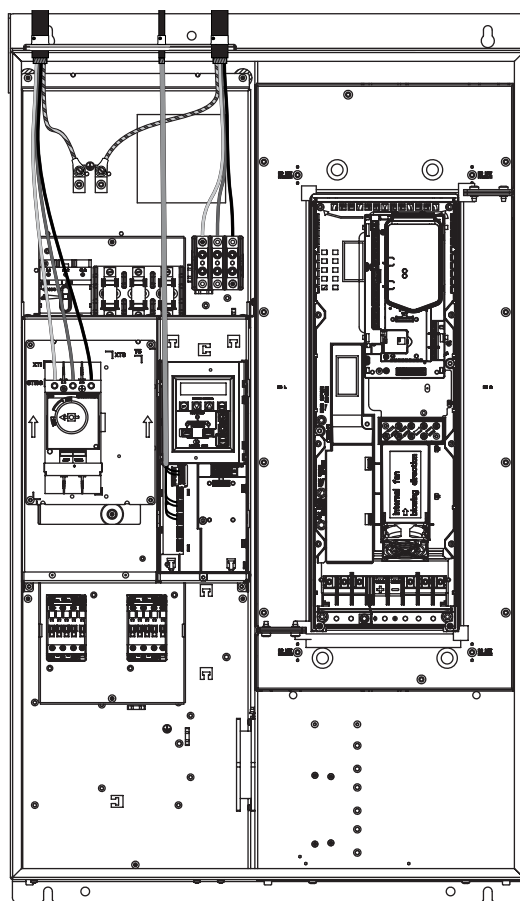


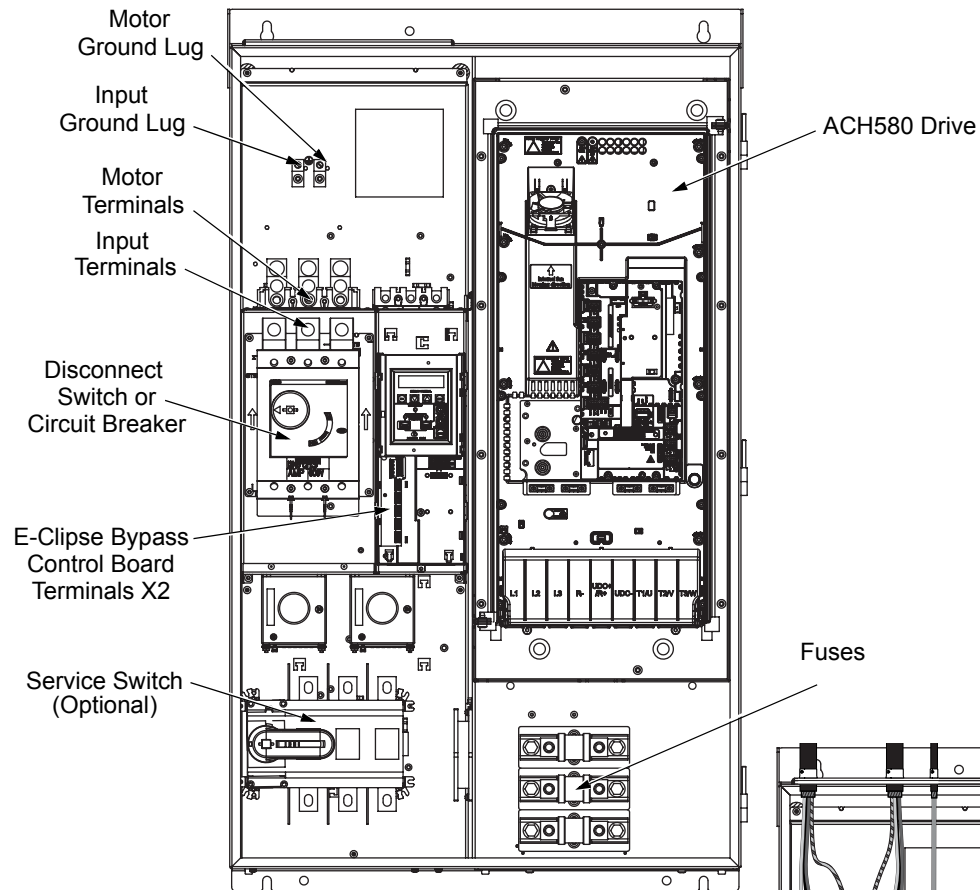




B3
600V, 41A - 77A
(Bx1-3, Bx12-3*)

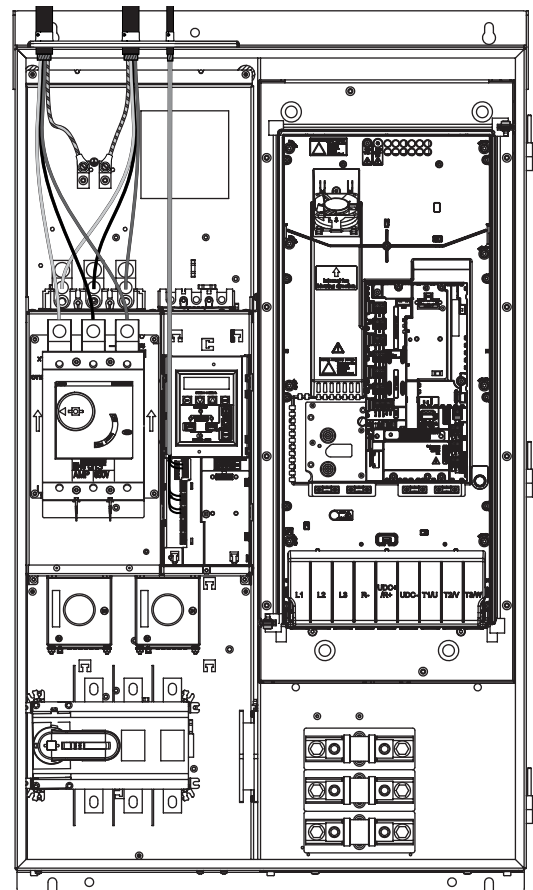
*Hood and filter kit not shown

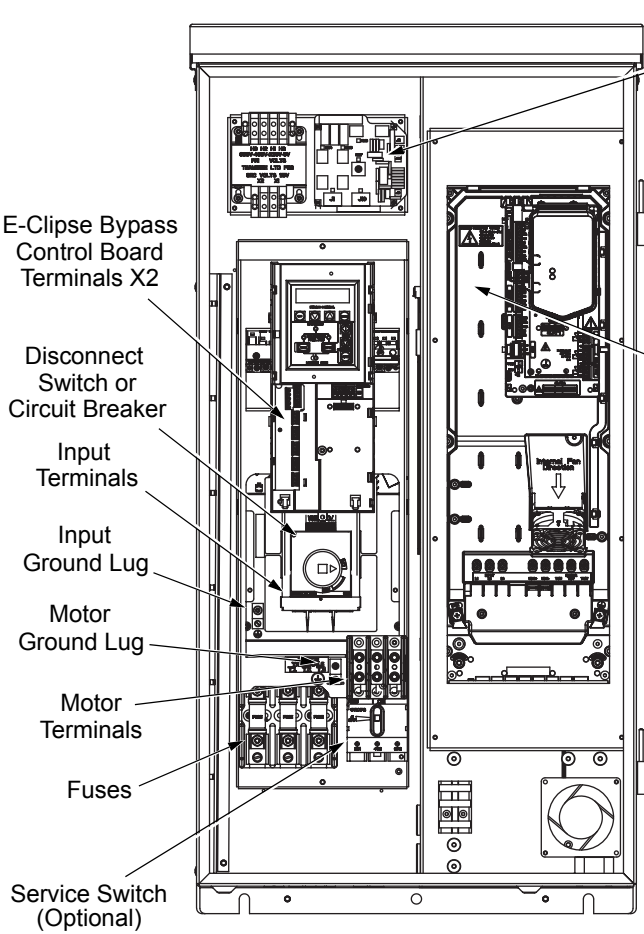




B3
Units above 77A
(Bx1-3, Bx12-3*)

*Hood and filter kit not shown



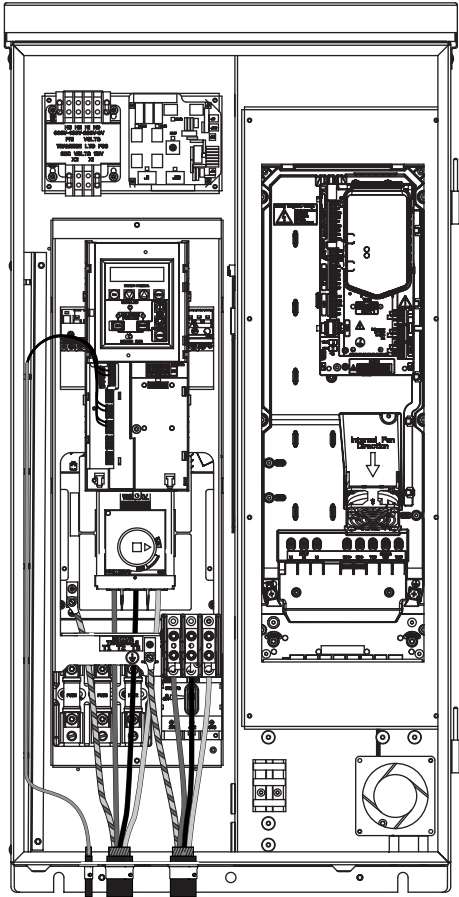


RHTR Temperature HI/LO Jumper (X1)	Heater ON Temperature	Heater OFF Temperature
Default Setting (X1 jumper in LO position)	14.4 °C 58 °F	21.4 °C 70.5 °F
Alternate Setting (X1 jumper in HI position)	17.8 °C 64 °F	24.4 °C 76.5 °F

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

ACH580 Drive

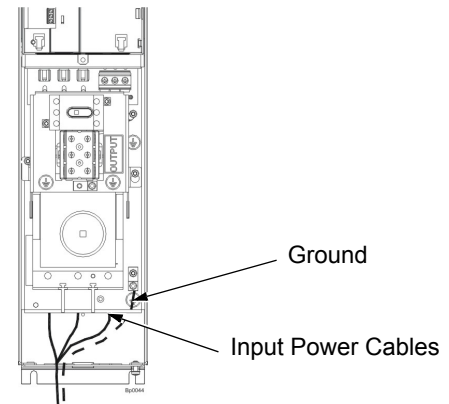
B2
(Bx3R-2)



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.



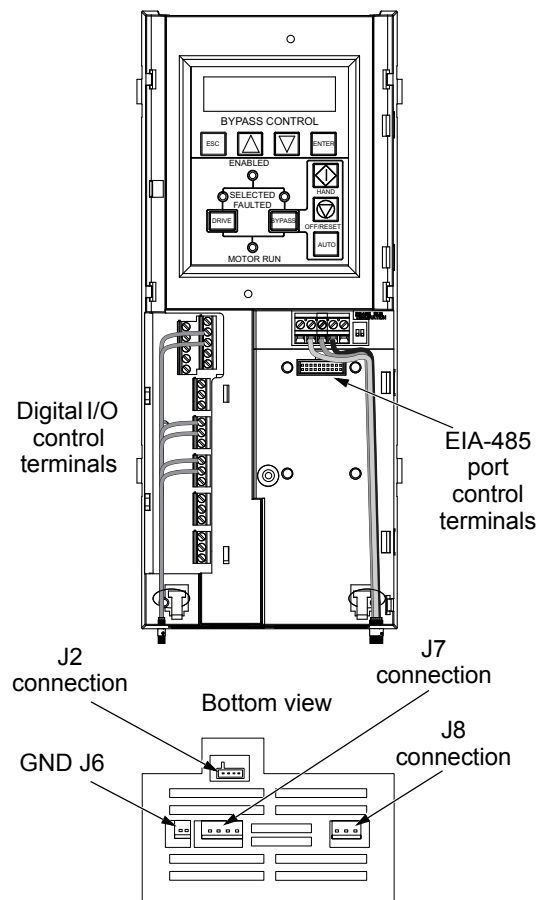
WARNING! Check the motor and motor wiring insulation before connecting the ACH580 to line power. Refer to the *ACH580-01 Hardware Manual* (3AXD50000044839). Before proceeding with the insulation resistance measurements, check that the ACH580 is disconnected from incoming line power. Failure to disconnect 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-Cclipse 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-Cclipse Bypass](#) on page 8.
- X2 terminal data are provided in [Basic control connections for E-Cclipse HVAC Default](#) on page 18.
- Basic connections are described in the following paragraphs. Alternate configurations using the E-Cclipse 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-Cclipse 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-Cclipse Bypass HVAC Default macro. These connections are described in the following paragraphs.

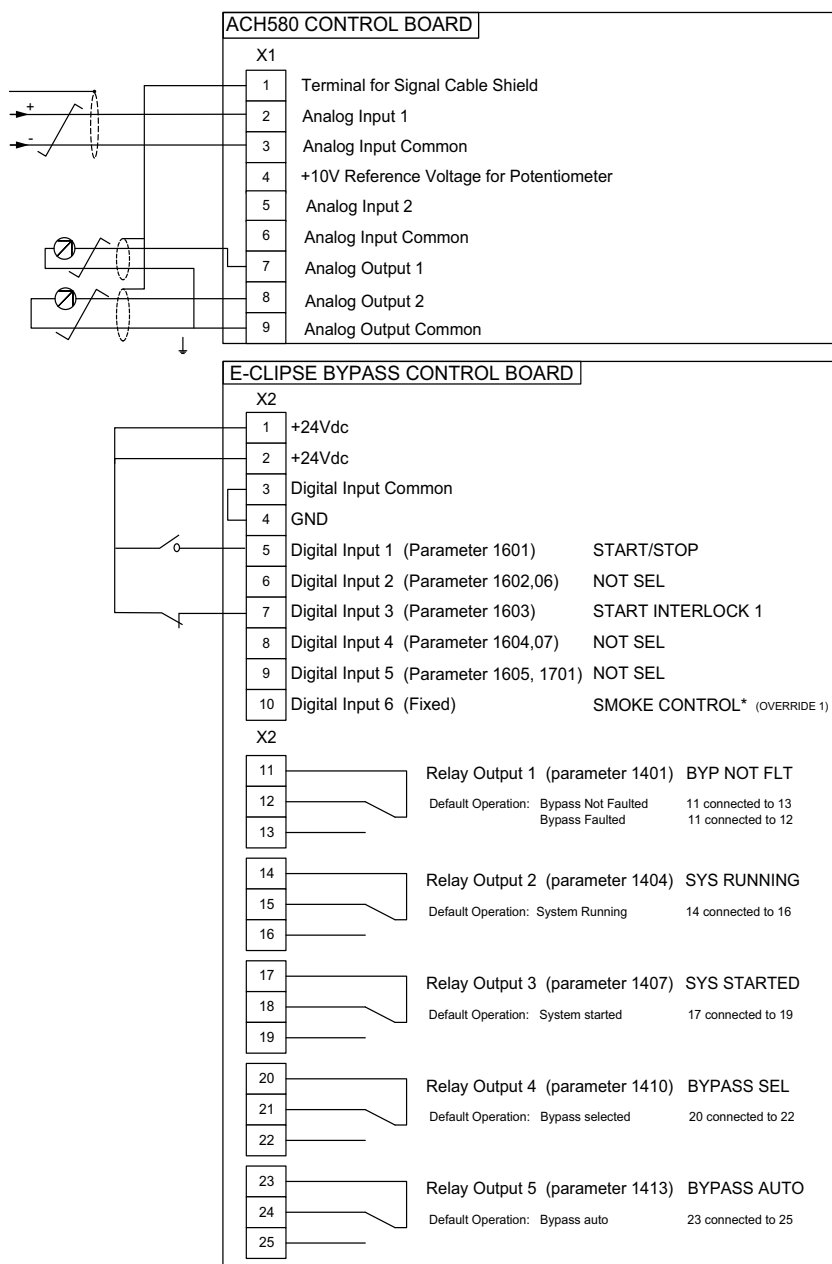
In typical installations, only analog input wires connect to the ACH580 terminal block, with other control connections made on the E-Cclipse Bypass control board.

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 – 76.8kbts/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-Cclipse 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.

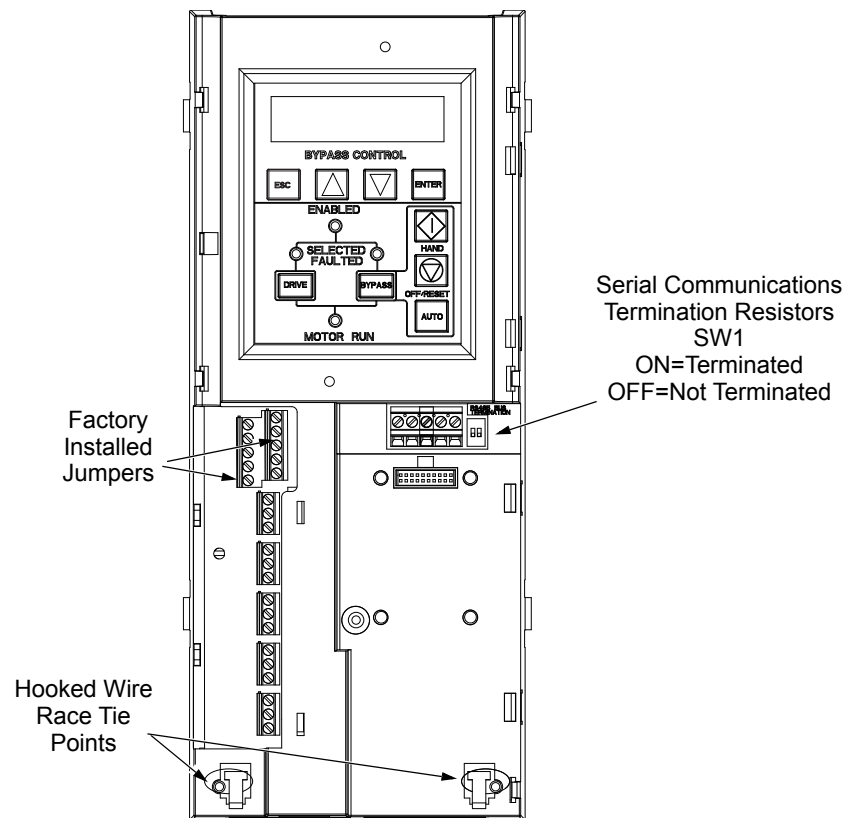
If the drive does not operate according to these steps, refer to the *ACH580-01 Hardware Manual* (3AXD50000044839).

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.

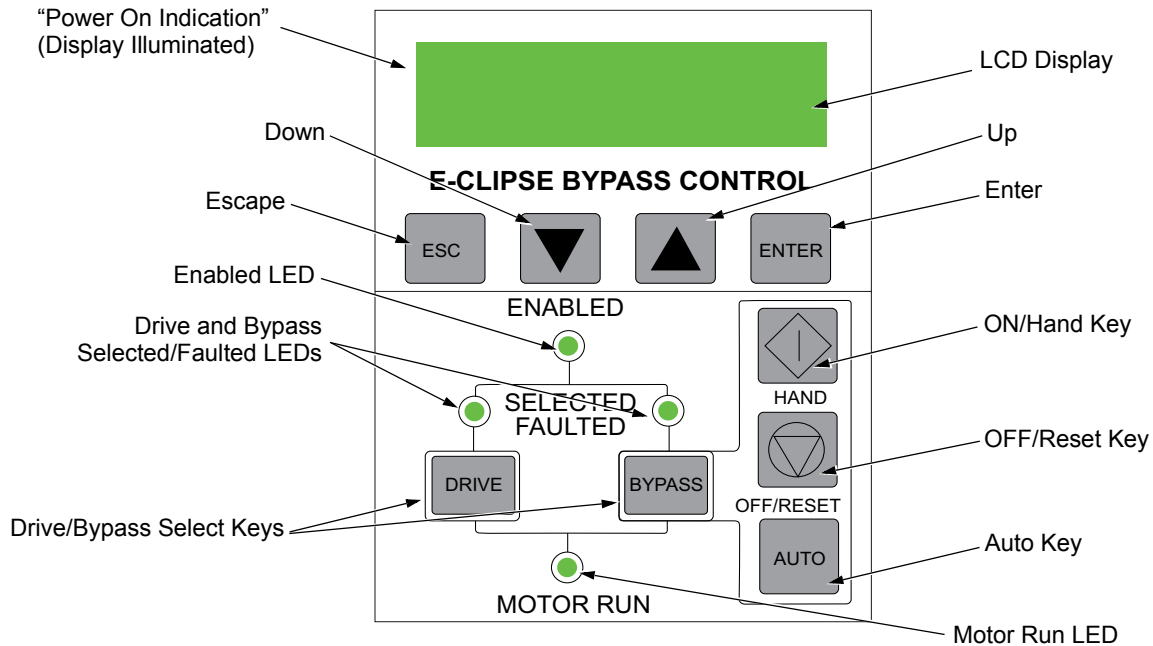
Circuit breaker settings

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.

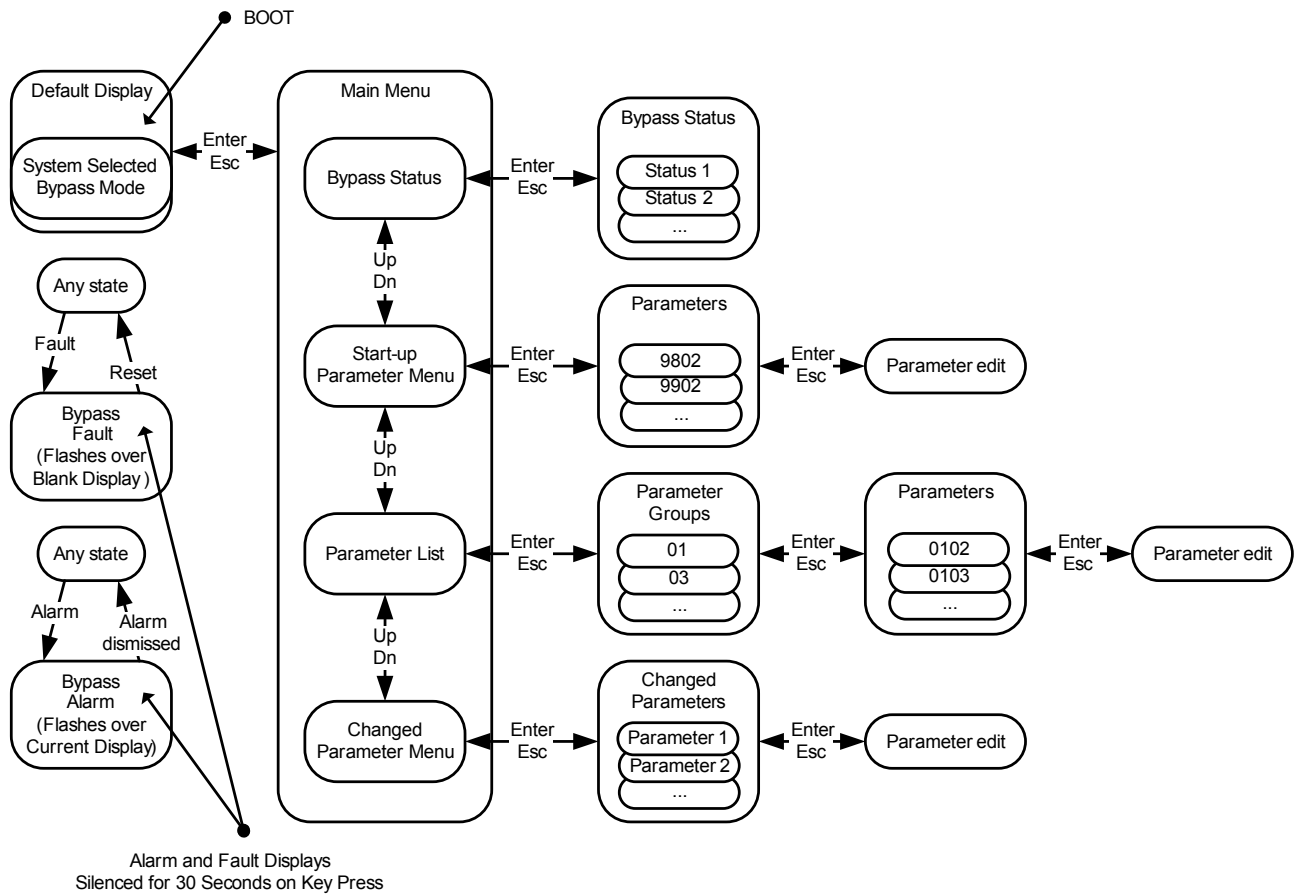
Hand Key

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.

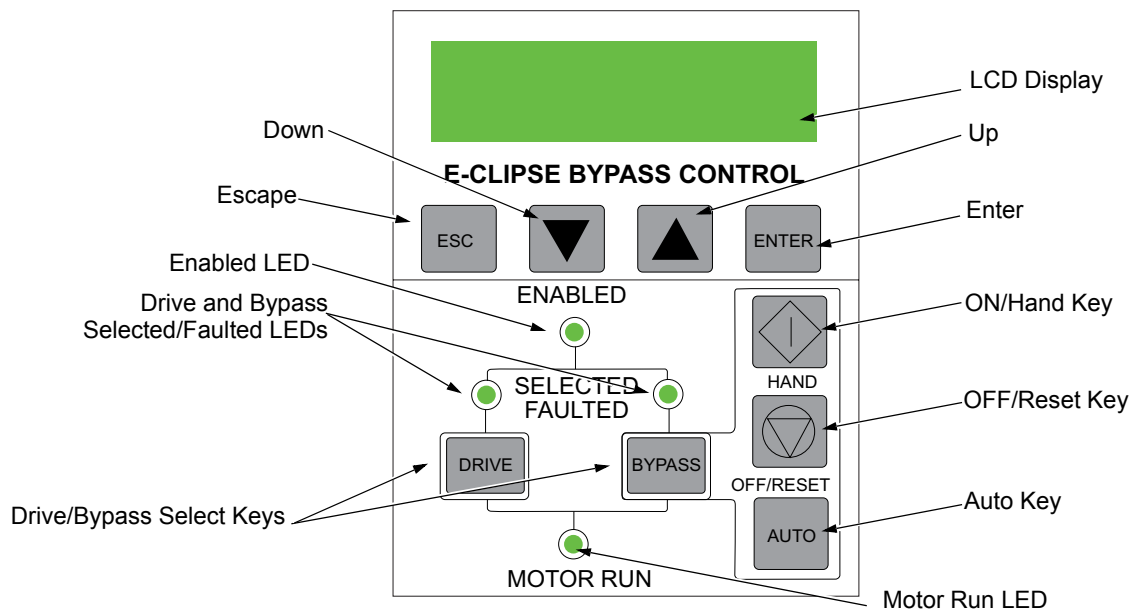
Start-up

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

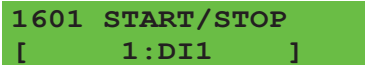
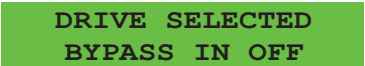
To change the parameters, follow these steps:

1	The Default Display indicates the Bypass Control mode.		DRIVE SELECTED BYPASS IN OFF
2	Press ENTER to enter the Main Menu .	ENTER	*BYPASS STATUS STARTUP PARAMS
3	Select the Startup Params with the Up/Down arrows and press ENTER .	▼ ▲ ENTER	BYPASS STATUS *STARTUP PARAMS
4	Select the appropriate Parameter with the Up/Down arrows and press ENTER .	▼ ▲ 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.	ENTER or ESC	*1601 START/STOP 1613 BP DISABLE
7	Press ESC to return to the Main Menu , and again to return to the Default Display .	ESC	*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 .	ENTER	*BYPASS STATUS STARTUP PARAMS
3	Select the Parameter List with the Up/Down arrows and press ENTER .	▼ ▲ ENTER	STARTUP PARAMS *PARAMETER LIST
4	Select the appropriate Parameter Group with the Up/Down arrows and press ENTER .	▼ ▲ ENTER	14 RELAY OUT *16 SYSTEM CTRL
5	Select the appropriate Parameter in a group with the Up/Down arrows and press ENTER .	▼ ▲ 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.

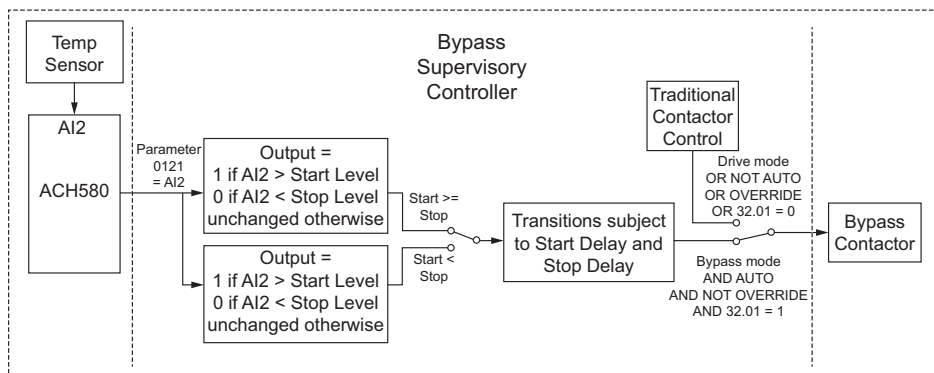
Smoke Control Mode (Override 1)

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.

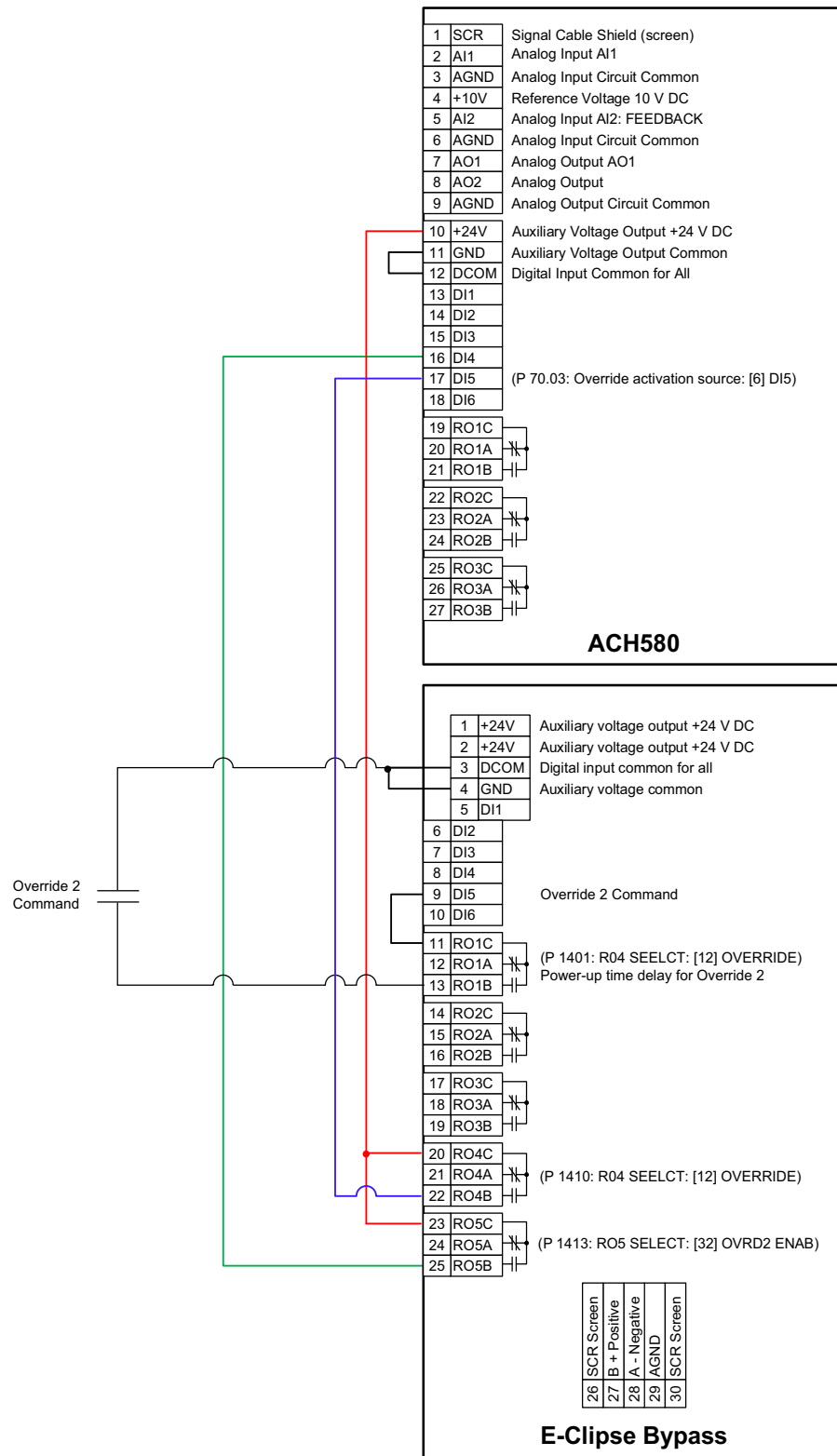
Programming Advanced Override (Override 2)

Parameter Number	Parameter Name	Parameter Value	Comments
E-Clipse Bypass Parameters	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
	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 <i>[0] Off</i> - 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 <i>[3] Override speed/freq</i> The drive will use the Hz value programmed in 70.06 Note that <i>[0] 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 <i>[0] 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 <i>[1] 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 >	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 <i>[0] 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.
	☒ 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
-

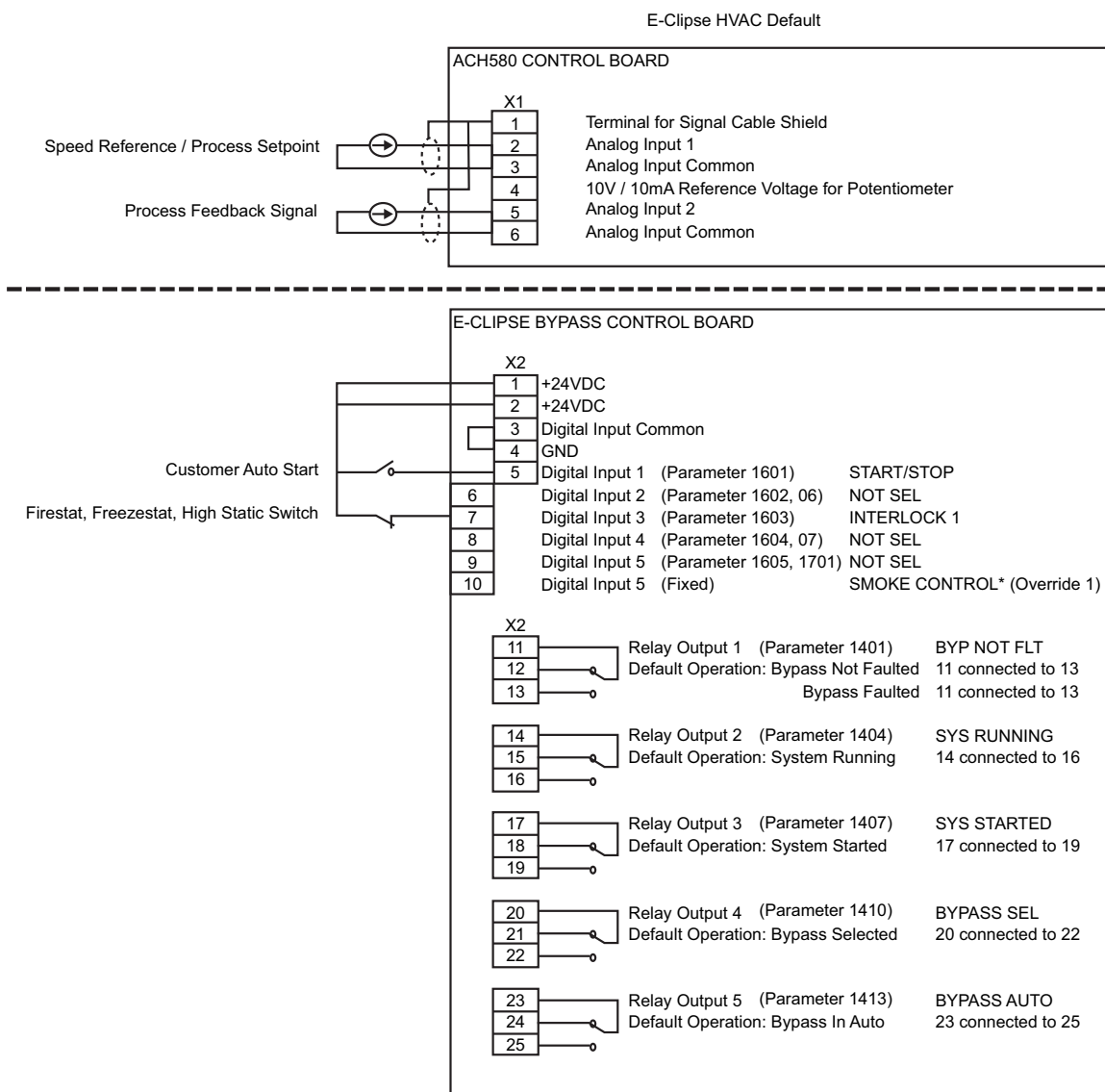
Application macros

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

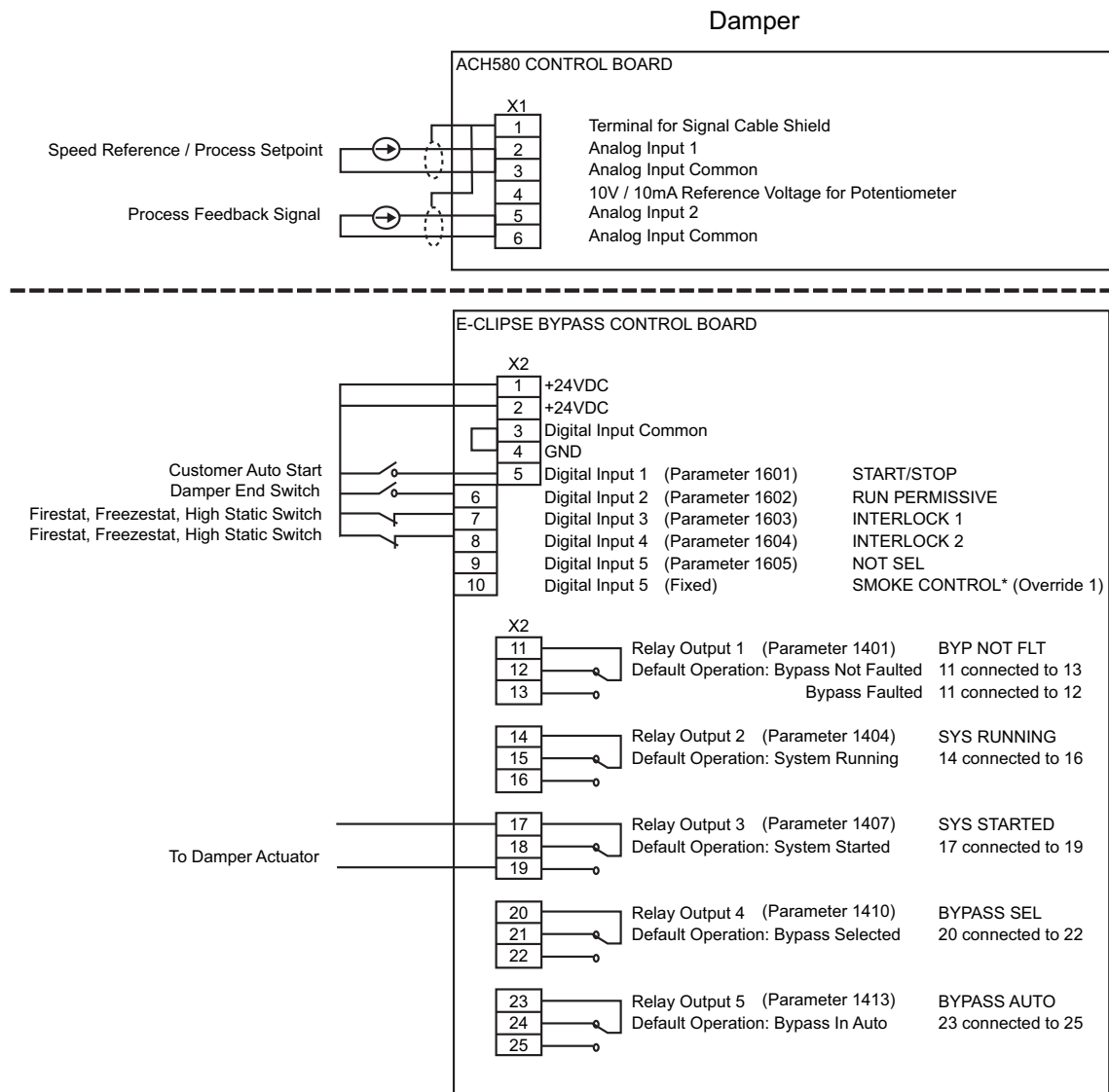


Parameters Changed Relative to E-Clipse HVAC Default

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

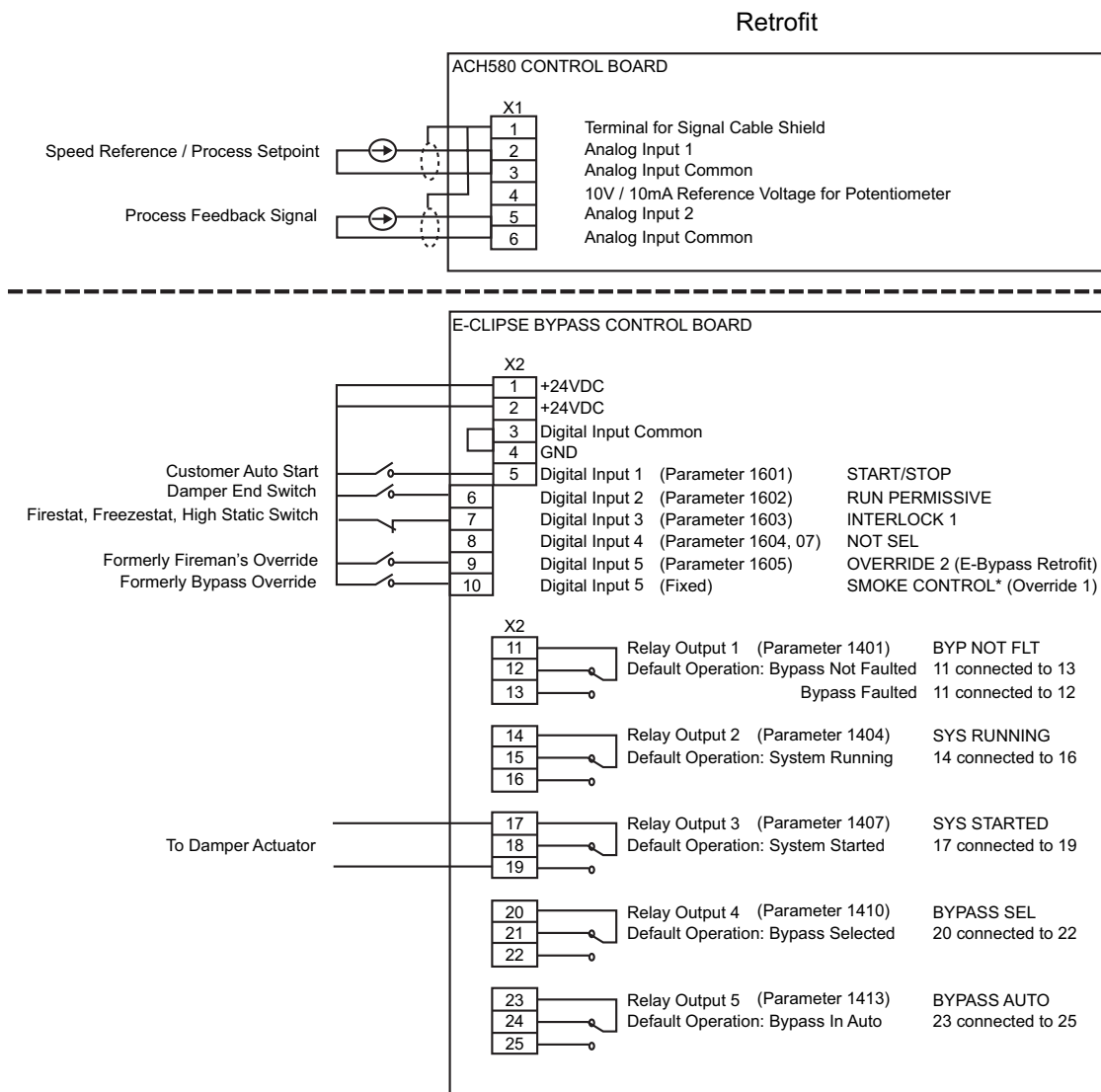


Parameters Changed Relative to HVAC Default

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

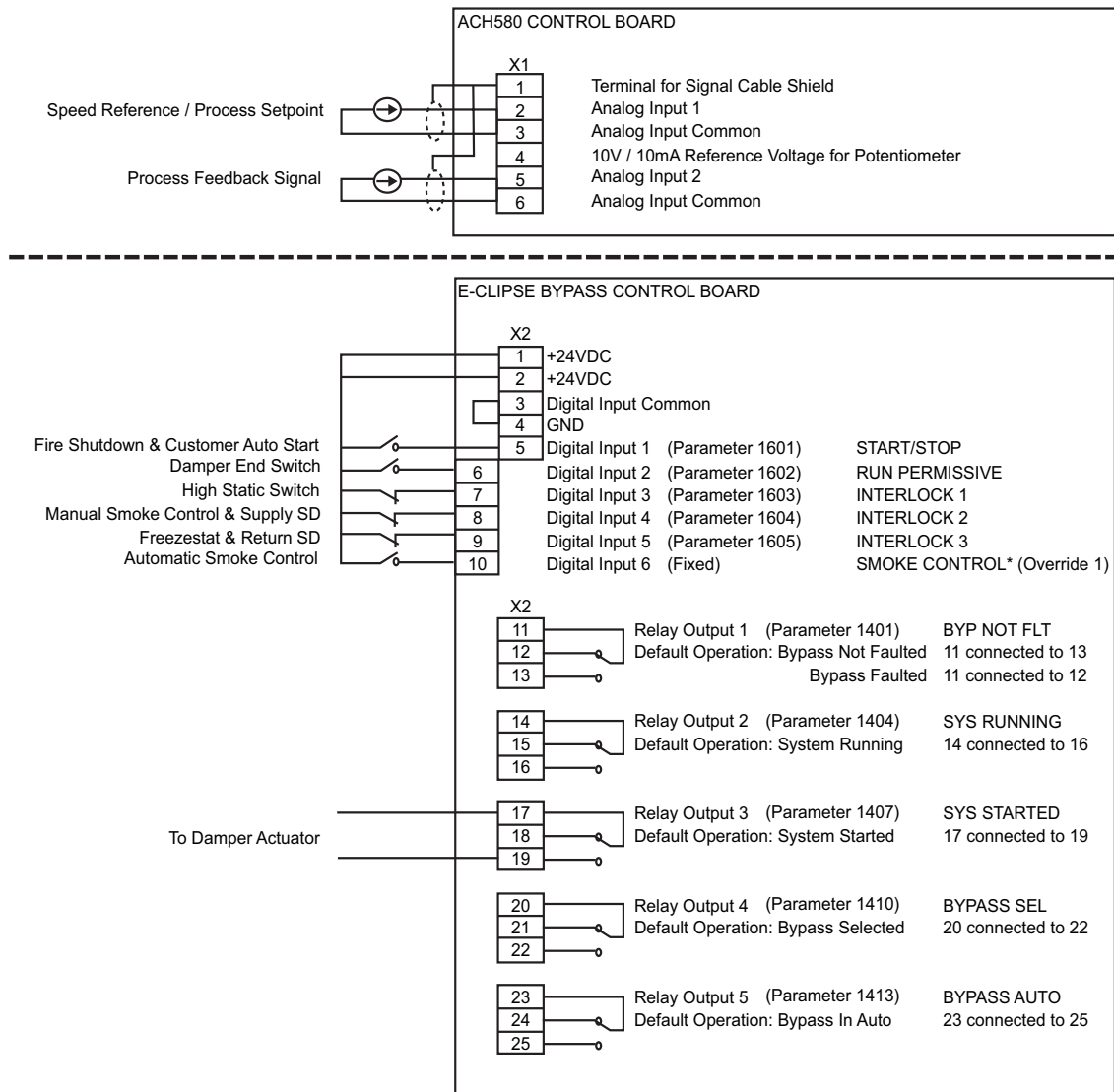


Parameters Changed Relative to HVAC Default

Parameter Number	Description	Setting
1602	Damper End Switch PERMISSIVE	DI2
1701	Refer to page 37 OVERRIDE 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



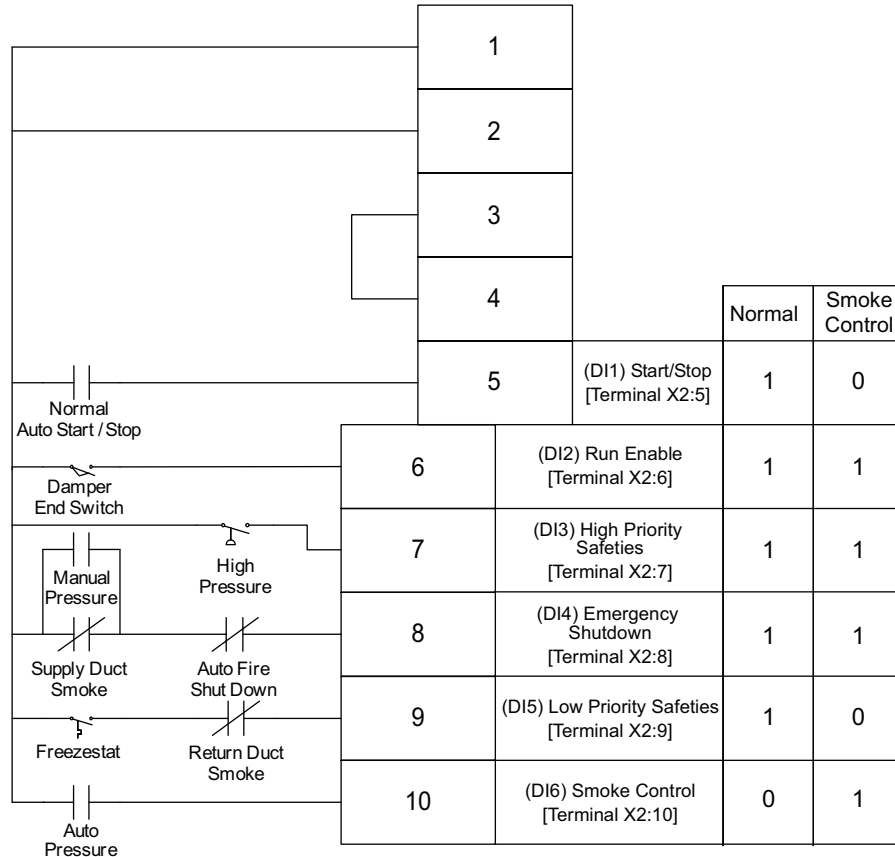
Parameter Number	Description	Setting
1602	Damper End Switch PERMISSIVE	DI2
1603	High Pressure Switch, High Priority Safeties INTERLOCK 1	DI3
1604	Supply Smoke Detector, Emergency Shutdown INTERLOCK 2	DI4
1605	Freezestat, Low Priority Safeties INTERLOCK 3	DI5

* 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:

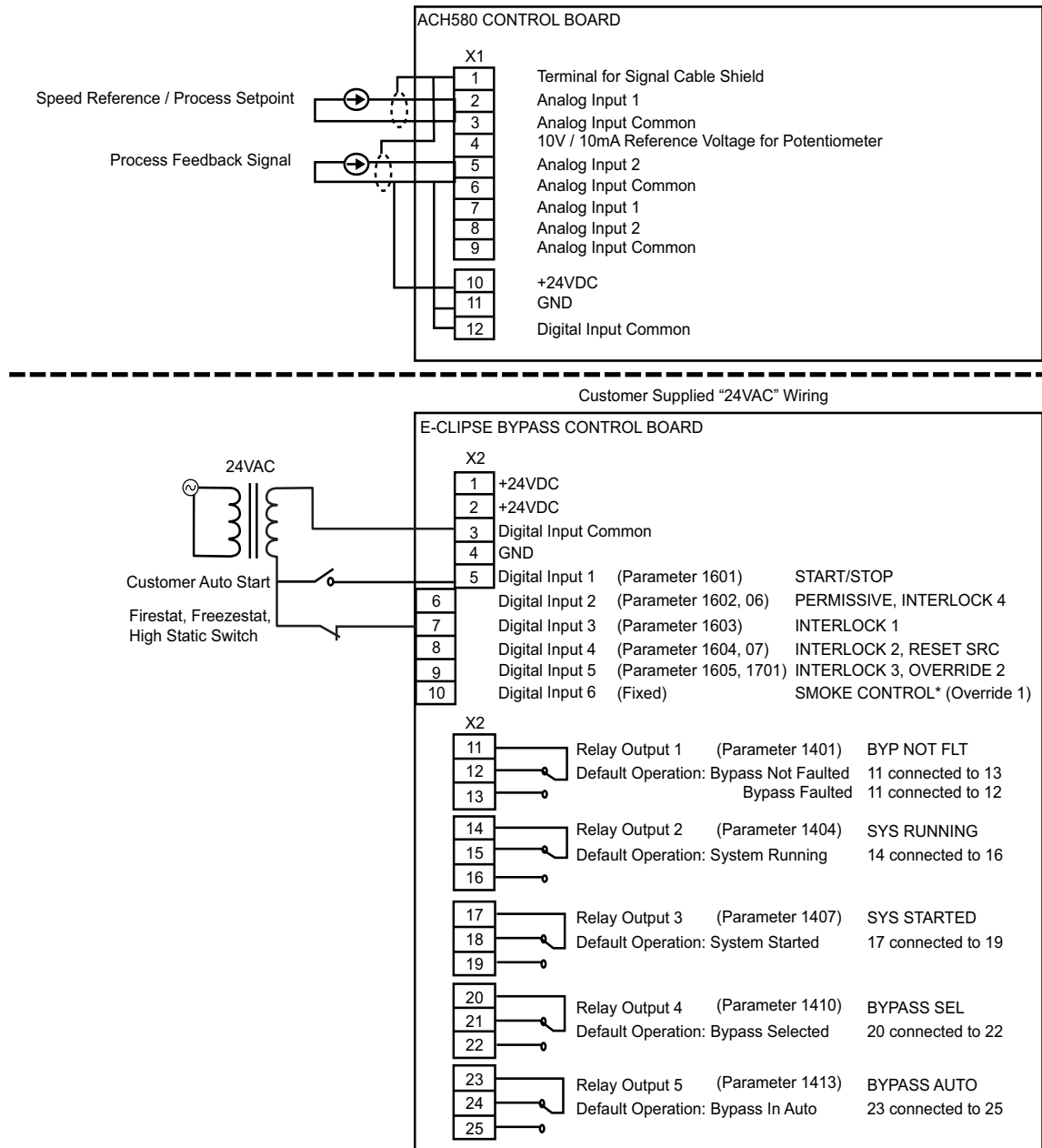
- Open auto fire shutdown, unit stops

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 - 15: 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

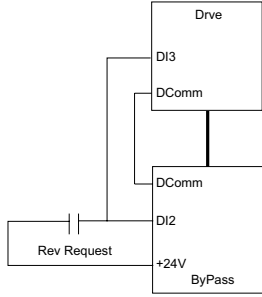
Group 14: Relay Outputs					
Code	Name	Resolution	Range	Default	Description
1401	RO1 SELECT	1	0 = NOT SEL 1 = SYS READY 2 = SYS RUNNING 3 = SYS STARTED 4 = BYPASS SEL 5 = BYPASS RUN 6 = BYPASS FLT 7 = BYP NOT FLT 8 = BYPASS WRNG 9 = DRIVE FAULT 10 = DRV NOT FLT 11 = DRIVE WARNING 12 = OVERRIDE 13 = BYPASS 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)	 • 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)	- 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. 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

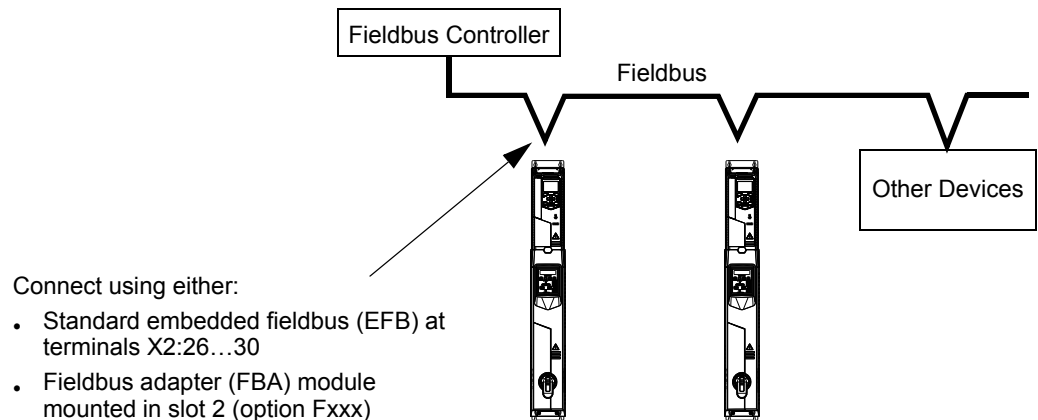
Group 99: Startup Data					
Code	Name	Resolution	Range	Default	Description
9902	B.P. MACRO	1	1 = HVAC DEFAULT 2 = DAMPER 3 = RETROFIT 4 = SMOKE CONTROL	1	Select bypass macro. Predefined set of parameter values for certain application is loaded in use.

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	• Output Words – Control word – Reference1 – Reference2 • Input Words – 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	• 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	• 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)



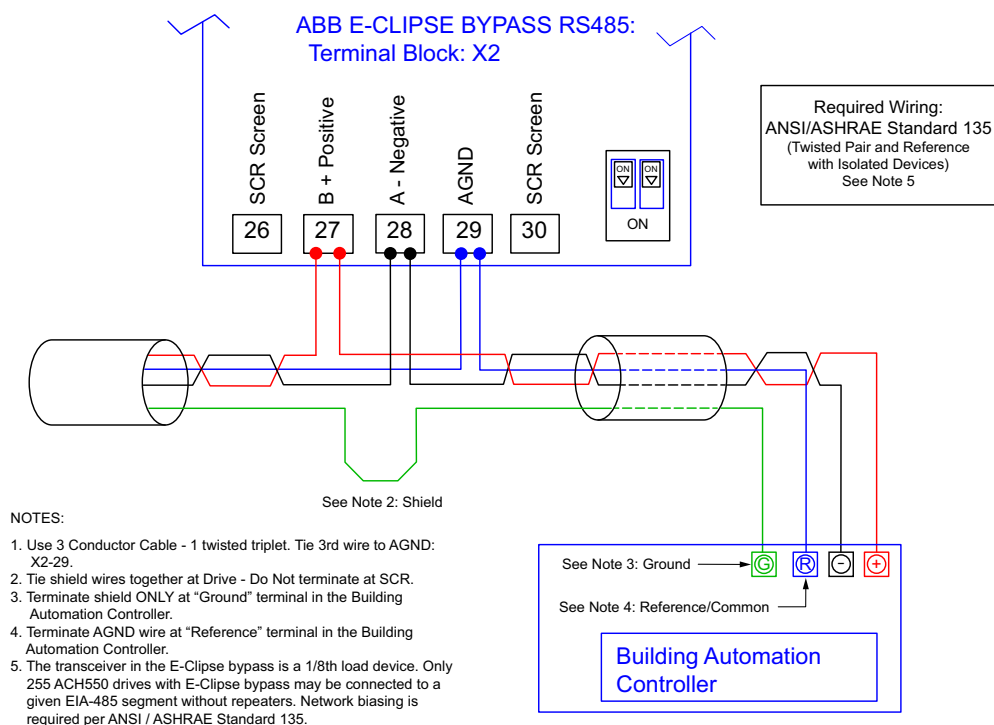
Warning! Connections should be made only while the bypass is disconnected from the power source.

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

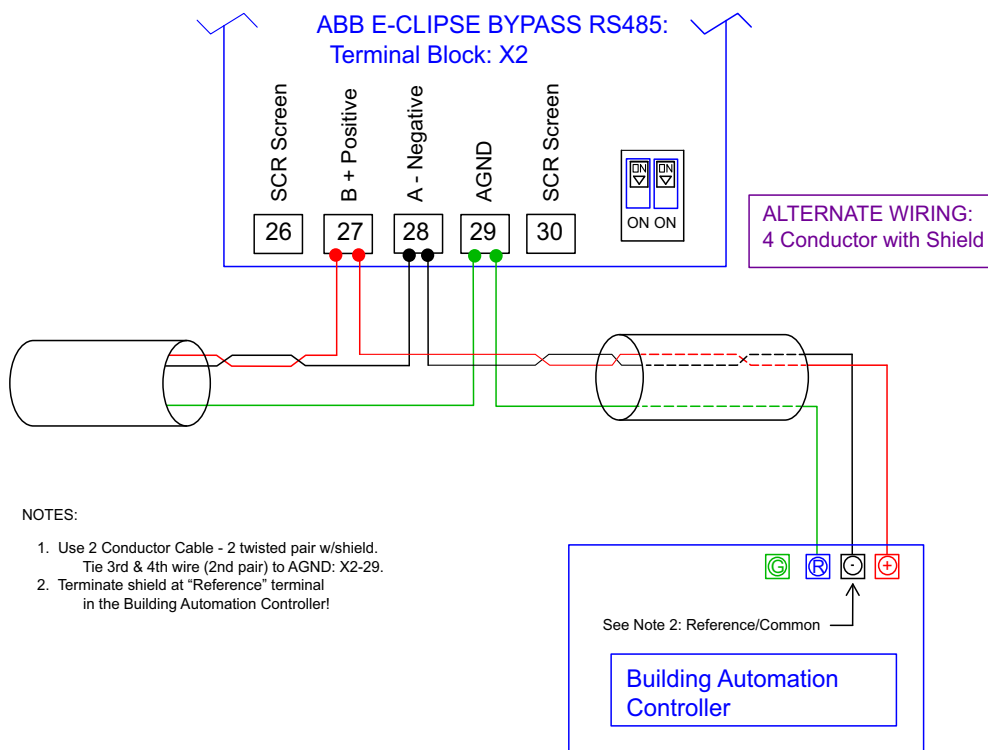
- Use Belden 9842 or equivalent. Belden 9842 is a dual twisted, shielded pair cable with a wave impedance of 120 Ω .
- Use one of these twisted shielded pairs for the EIA 485 link. Use this pair to connect all A (-) terminals together and all B (+) terminals together.
- Use both of the other wires in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



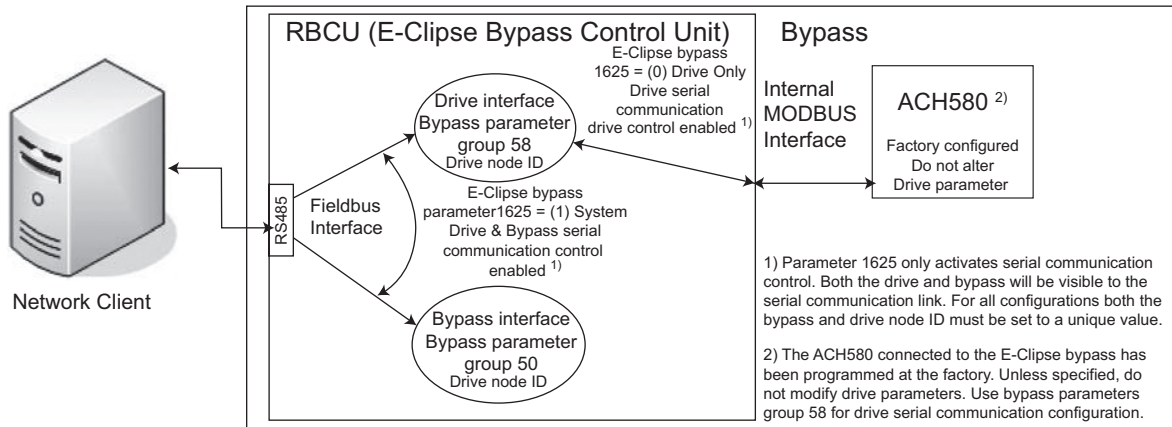
Alternate wiring diagram



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.

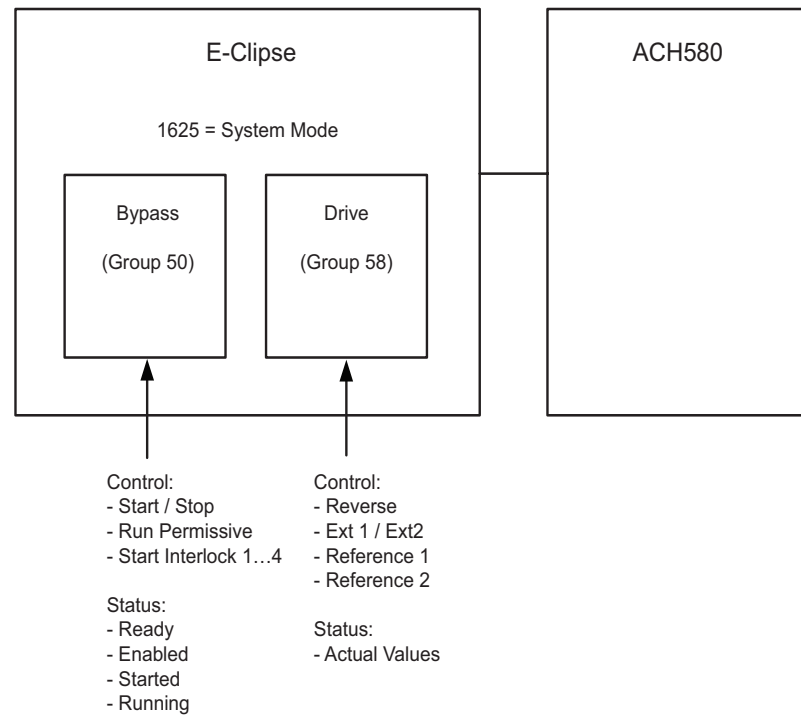
For all EFB Protocols, the drive is viewed as one node and the bypass is viewed as a separate node. This node and bypass, along with the physical and logical connections for communications are illustrated in the following figure.



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: XXYY, 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	EFB PARITY Defines the data length, parity and stop bits to be used with the EIA 485 link communication. The same settings must be used in all on-line stations. 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.	Default: 1	Default: 0	
5825	PROFILE Selects the communication profile used by the EFB protocol. 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.	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 from Modbus and N2 is 1.		
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
				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
10.27	RELAY OUTPUT 2	62, RO/DIO control word	Relay Output 2 controlled by fieldbus.	402659 bit 1 or 00034		BO8
10.30	RELAY OUTPUT 3	62, RO/DIO control word	Relay Output 3 controlled by fieldbus.	402659 bit 2 or 00035		BO9
15.07 ¹⁾	RELAY OUTPUT 4	62, RO/DIO control word	Relay Output 4 controlled by fieldbus.	402659 bit 3 or 00036		BO10
15.10 ¹⁾	RELAY OUTPUT 5	62, RO/DIO control word	Relay Output 5 controlled by fieldbus.	402659 bit 4 or 00037		BO11
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

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
				ABB DRV	DCU PROFILE	
10.21 RO Status	RO 1-3 STATUS	Relay 1...3 status.	N/A	402581 or 00033...35		BI4...BI6
15.04 RO/DO Status	RO 4-5 STATUS	Relay 4...6 status.	N/A	403844 or 00036...37		BI7...BI8
	DOI STATUS		N/A	403844 or 00038		BI9

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
				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: 400000 + (group #) * 256 + 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 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	AI1	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	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	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. a. Power unit down. b. Remove bus wires and re-tighten connections. c. Turn bus termination ON. d. Measure impedance between B(+) and A(-) 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	1. Duplicate Addresses 2. Too many devices on wire 3. Noise on EIA-485 wire	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	1. No network connection 2. Blown EIA-485 transceiver	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	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.	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	1. Master/Client not communicating with drive. 2. Failed router	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

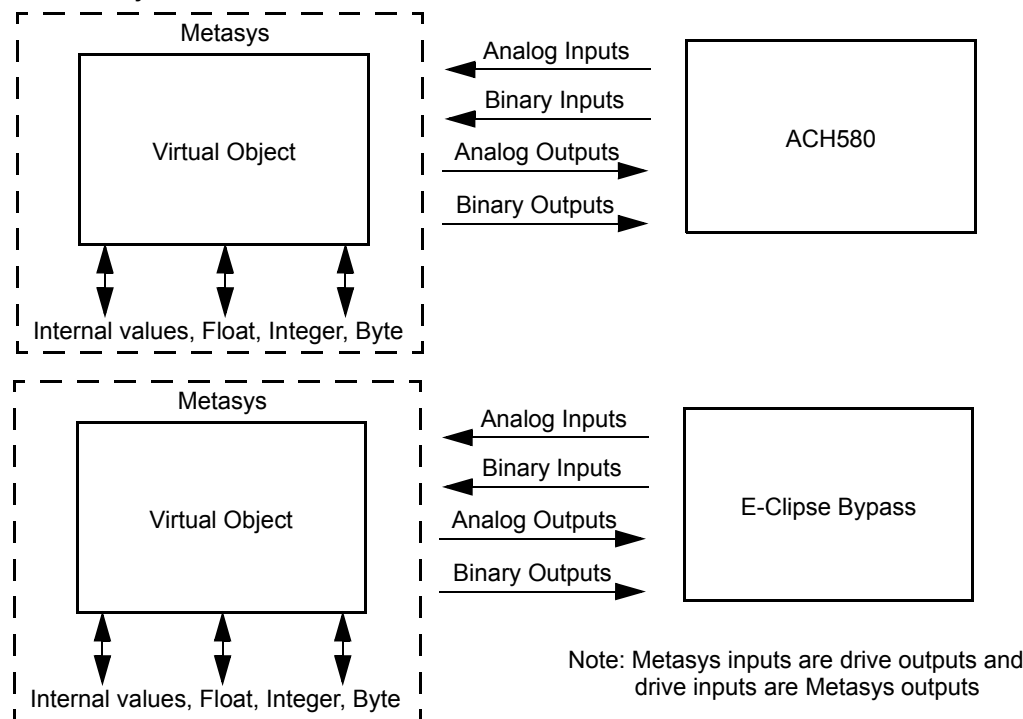
The N2 Fieldbus connection to the system is based on an industry standard RS-485 physical interface. The N2 Fieldbus protocol is a master-slave type, serial communication protocol, used by the Johnson Controls Metasys® system. In the Metasys architecture the N2 Fieldbus connects object interfaces and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

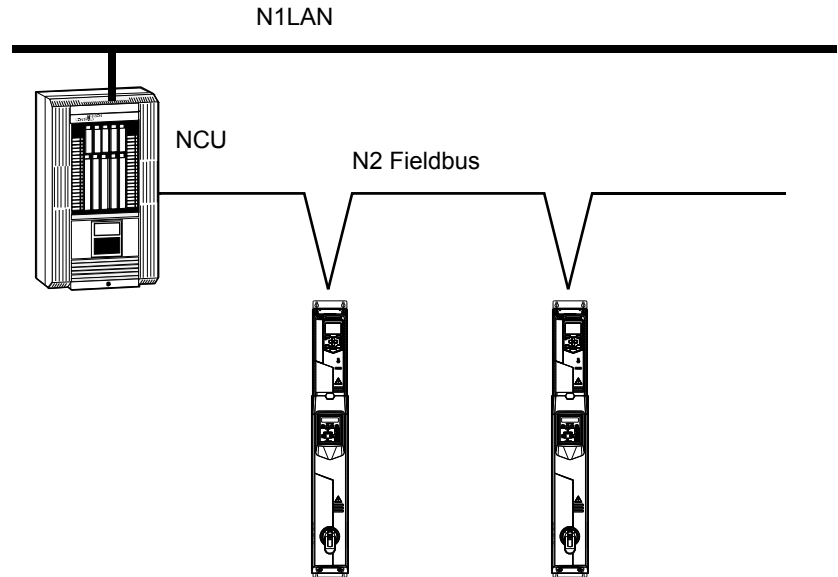


A virtual object is made up of:

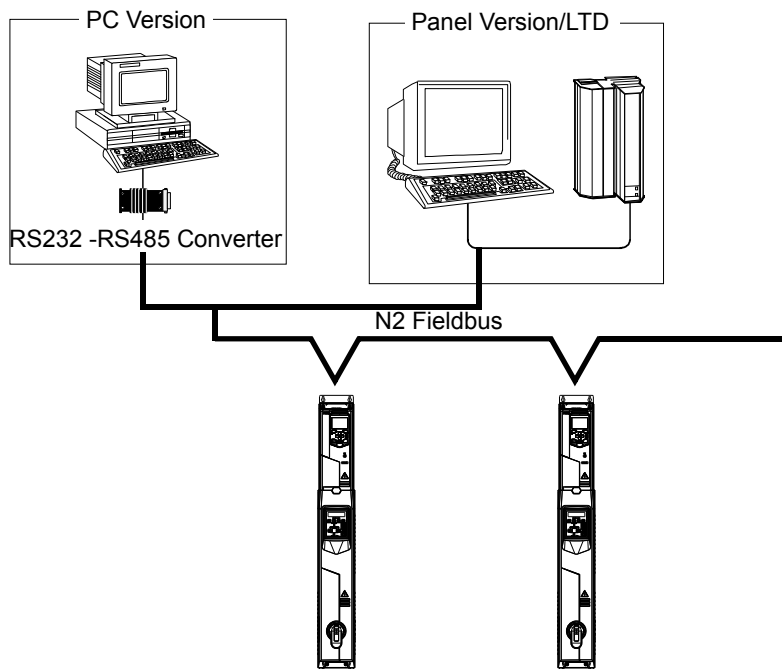
- Analog Inputs
- Binary Inputs
- Analog Outputs
- Binary Outputs
- Internal values for Floating point, Integer, and Byte values.

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 Parmeter
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.

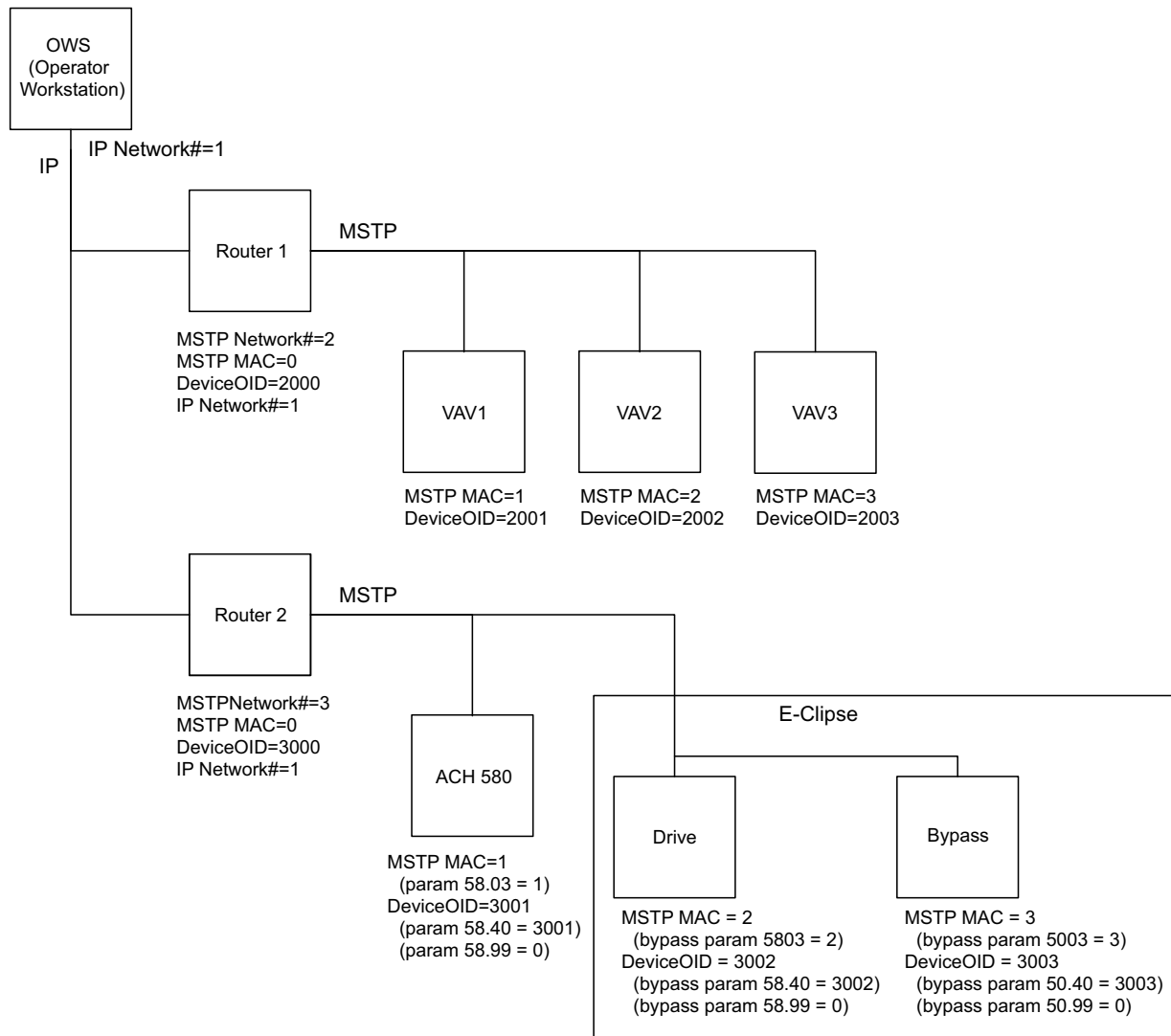
Quick-start sequence - drive communications

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	BI0...BI2
15.04 RO/DO Status	RO 4-5 STATUS	Relay 4...6 status.	N/A	BI3...BI4
	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 5317. 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	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
- Control Bits - Relay Outputs	Coils(0xxxx)	01 – Read Coil Status 05 – Force Single Coil 15 – Force Multiple Coils
- Status Bits - Discrete Inputs	Discrete Inputs(1xxxx)	02 – Read Input Status
Analog Inputs	Input Registers(3xxxxx)	04 – Read Input Registers
- Parameters - Control/Status Words - References	Holding Registers(4xxxx)	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 4xxxxx 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: • 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: • 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: • 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: • 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 activates 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		- 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	
		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	FIELDDBUS_LOCAL	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

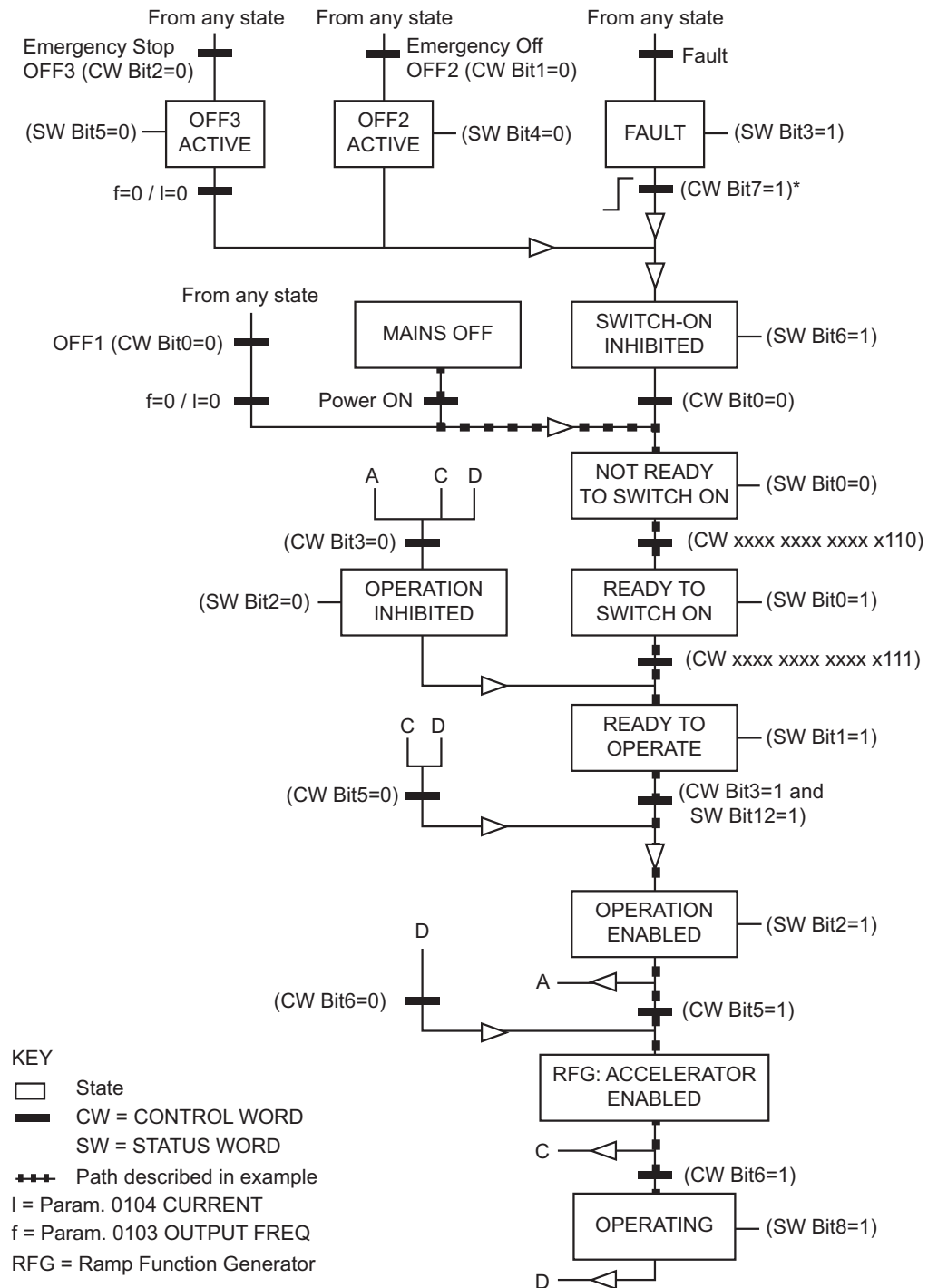
ABB drives profile

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 bit 15 bit 0	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.



*This state transition also occurs if the fault is reset from any other source (e.g. digital input).

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	FIELD BUS 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	FIELD BUS_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.

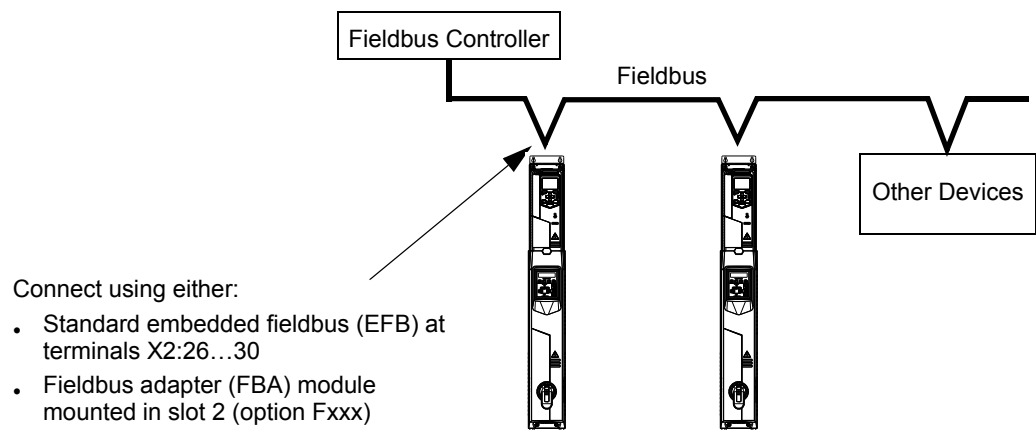
Note: All parameters referenced are bypass parameters.

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.

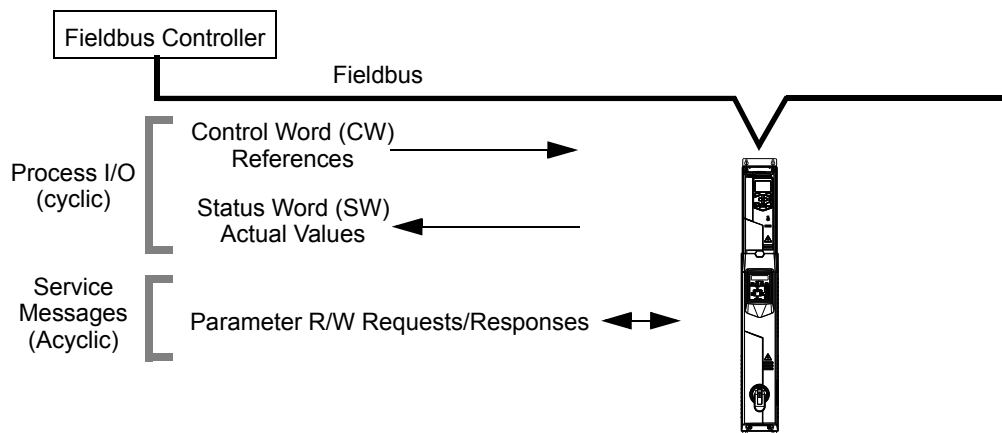
Control interface

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.

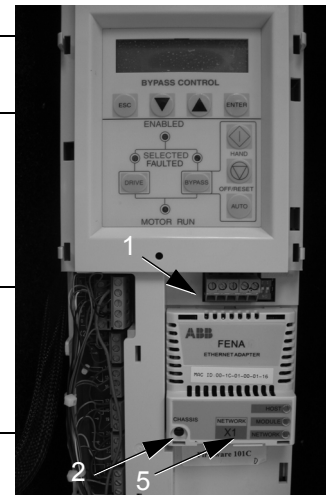
Mounting procedure

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		2 FBA MCW bit 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	Description	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	FBAA 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	FBAA 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: • 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: • Enter OFF2 ACTIVE • Proceed to SWITCHON INHIBITED

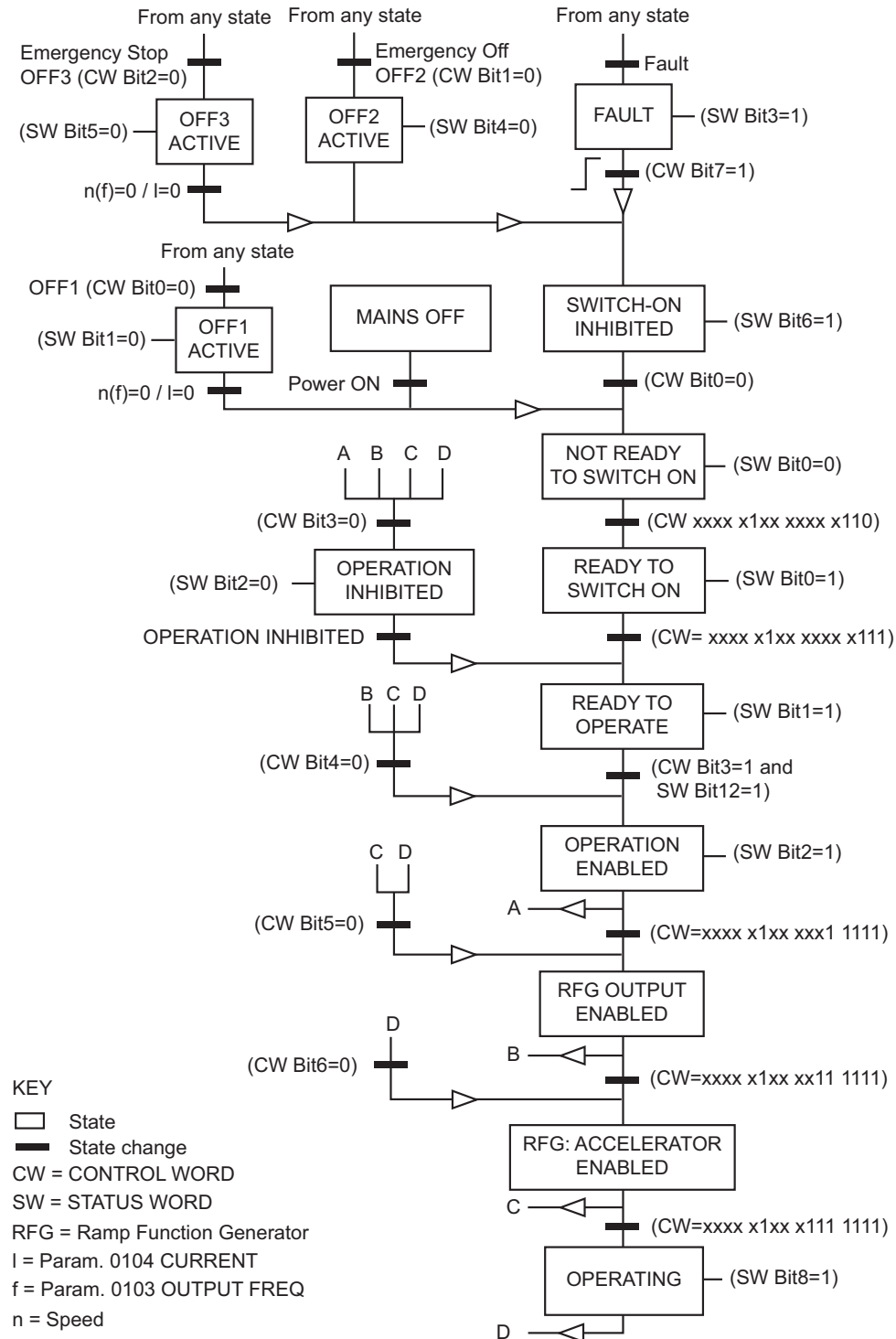
ABB Drives Profile (FBA) CONTROL WORD				
Bit	Name	Value	Commanded State	Comments
2	OFF3 CONTROL	1	OPERATING	Continue operation (OFF3 inactive)
		0	EMERGENCY STOP	Drive stops within in time specified by parameter 2208. Normal command sequence: • Enter OFF3 ACTIVE • Proceed to SWITCH ON INHIBITED WARNING! 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		• 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)	
20.21 Direction	2 (Reverse)	
20.21 Direction	3 (Request)	

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 CNTACT 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 CNTACT 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	Contactor 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.

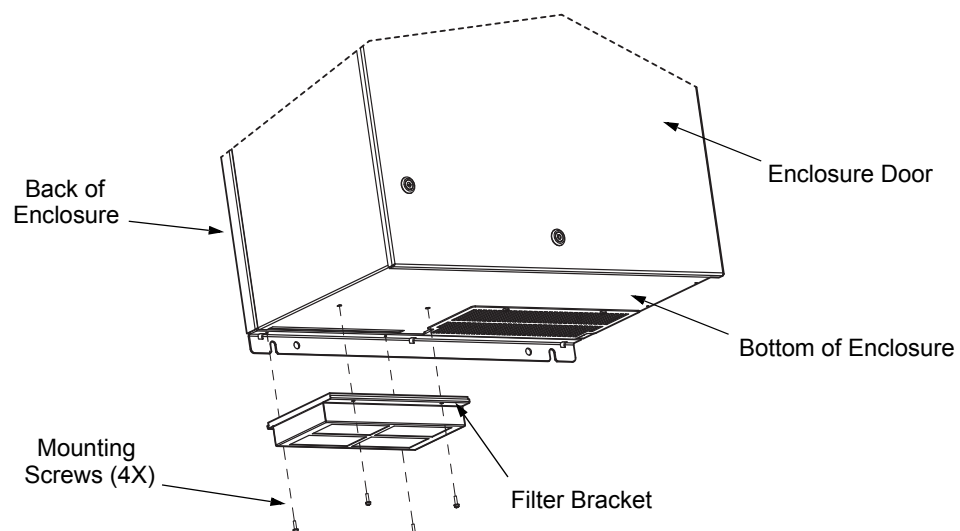
Enclosure air filter replacement – UL (NEMA) Type 12 hinged door wall mount enclosures

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				
ACH580-VxR-017A-2	16.7	5	R1	#8 62 in-lbs	#6 55 in-lbs	#1 35 in-lbs	#2 50 in-lbs
ACH580-VxR-024A-2	24.2	7.5	R2		#4 55 in-lbs		
ACH580-VxR-031A-2	30.8	10	R2				
ACH580-VxR-046A-2	46.2	15	R3	#2 62 in-lbs	#2 55 in-lbs	#2/0 110 in-lbs	#2 50 in-lbs
ACH580-VxR-059A-2	59.4	20	R3		#1 55 in-lbs		
ACH580-VxR-075A-2	74.8	25	R4		#1/0 75 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				
ACH580-VxR-014A-4	14	10	R2	#10 62 in-lbs	#8 55 in-lbs	#1 35 in-lbs	#2 50 in-lbs
ACH580-VxR-023A-4	23	15	R2		#6 55 in-lbs		
ACH580-VxR-027A-4	27	20	R3	#8 62 in-lbs	#4 55 in-lbs	#1 35 in-lbs	
ACH580-VxR-034A-4	34	25	R3		#3 55 in-lbs		
ACH580-VxR-044A-4	44	30	R3				
ACH580-VxR-052A-4	52	40	R4	#2 62 in-lbs	#2 55 in-lbs	#2/0 110 in-lbs	
ACH580-VxR-065A-4	65	50	R4		#1 55 in-lbs		
ACH580-VxR-077A-4	77	60	R4		#1/0 75 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 Volts ²							
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		#4 55 in-lbs		
ACH580-VxR-032A-6	32	30	R3				

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	#1 35 in-lbs	#1 35 in-lbs	#4 35 in-lbs	#4 35 in-lbs	
ACH580-BxR-024A-2	24.2	7.5	R2									
ACH580-BxR-031A-2	30.8	10	R2	#2 62 in-lbs	#2 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-046A-2	46.2	15	R3									
ACH580-BxR-059A-2	59.4	20	R3									
ACH580-BxR-075A-2	74.8	25	R4									
ACH580-BxR-088A-2	88	30	R5	#1/0 124 in-lbs	Consult factory	#2/0 275 in-lbs	#2/0 275 in-lbs	#2/0 71 in-lbs	Consult factory	#1/0 50 in-lbs	Consult factory	
ACH580-BxR-114A-2	114	40	R6									
ACH580-BxR-143A-2	143	50	R6									
ACH580-BxR-169A-2	169	60	R7									
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										
ACH580-BxR-014A-4	14	10	R2	#10 62 in-lbs	#10 62 in-lbs	#8 55 in-lbs	#8 55 in-lbs						
ACH580-BxR-023A-4	23	15	R2			#6 55 in-lbs	#6 55 in-lbs						
ACH580-BxR-027A-4	27	20	R3	#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-034A-4	34	25	R3			#3 55 in-lbs	#3 55 in-lbs						
ACH580-BxR-044A-4	44	30	R3										
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				
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										
ACH580-BxR-240A-4	240	200	R8	350 MCM 274 in-lbs		350 MCM 274 in-lbs		2 X 500 MCM 372 in-lbs					

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 Volts ²											
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	#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	
ACH580-BxR-017A-6	17	15	R2								
ACH580-BxR-022A-6	22	20	R3								
ACH580-BxR-027A-6	27	25	R3								
ACH580-BxR-032A-6	32	30	R3	#6 62 in-lbs		#3 55 in-lbs		#2/0 110 in-lbs			
ACH580-BxR-041A-6	41	40	R5								
ACH580-BxR-052A-6 ³	52	50	R5								
ACH580-BxR-062A-6	62	60	R5								
ACH580-BxR-077A-6	77	75	R5	#1/0 62 in-lbs	Consult factory	#1/0 275 in-lbs	Consult factory		Consult factory		Consult factory
ACH580-BxR-099A-6	99	100	R7								
ACH580-BxR-125A-6	125	125	R7								
ACH580-BxR-144A-6	144	150	R8								

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 Volts ²							
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 Volts ²							
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)

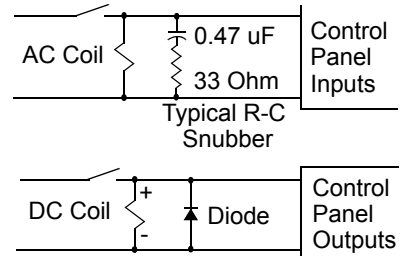
Control cable requirements for connections to the E-Clipse Bypass (RBCU) (X2) are the same as those described for the ACH580 control panel (X1). Refer to the *ACH580-01 Hardware Manual* (3AXD50000044839) for additional information.

Bypass control unit connection specifications

Control Connection Specifications	
Digital Inputs	Digital input impedance 1.5 k Ω . Maximum voltage for digital inputs is 30 V AC/DC
Relays (Digital Outputs)	- 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 ($\cos \phi = 1$), 1 A rms ($\cos \phi = 0.4$) - 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 Hz ²				
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				
U ₁ = 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				
U ₁ = 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 Hz ²						
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	

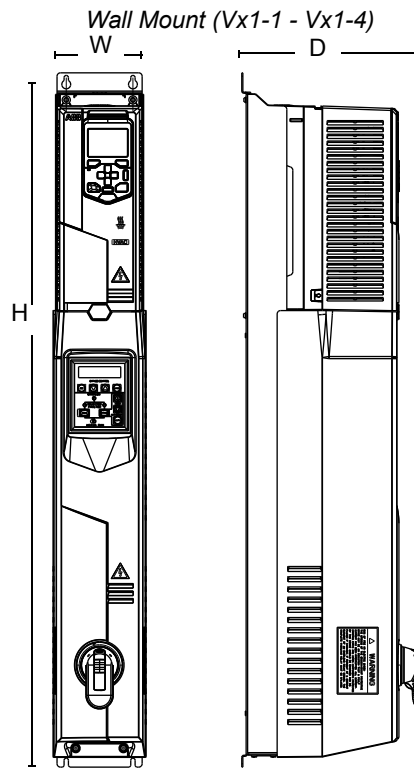
1) "BxR" represents BCR and BDR.

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.

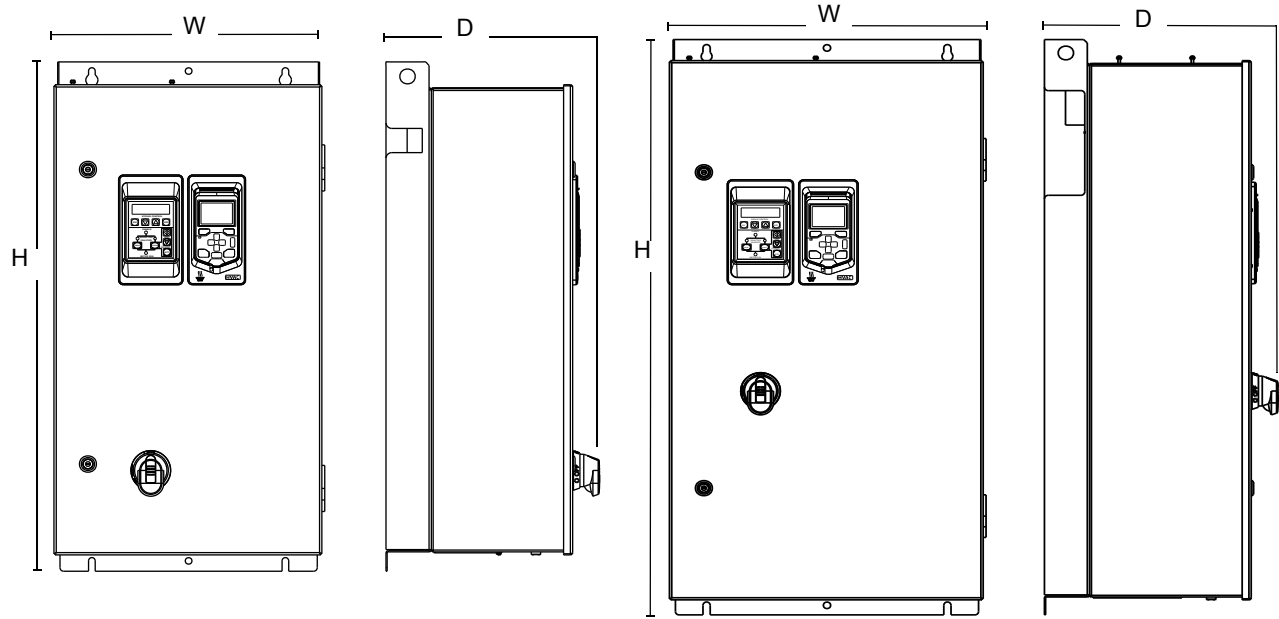
Frame	Height (H)		Width (W)		Depth (D)		Weight		Dimensional Drawings
	in	mm	in	mm	in	mm	lb	kg	
Vx1-1	40.18	1020	5.39	136	10.55	268	30.0	13.6	3AXD50000037428
Vx1-2	44.10	1120	5.39	136	10.77	273	50.7	23.0	3AXD50000037429
Vx1-3	38.81	985	8.44	214	10.90	276	59.5	27.0	3AXD50000153787
Vx1-4	47.93	1217	8.44	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)

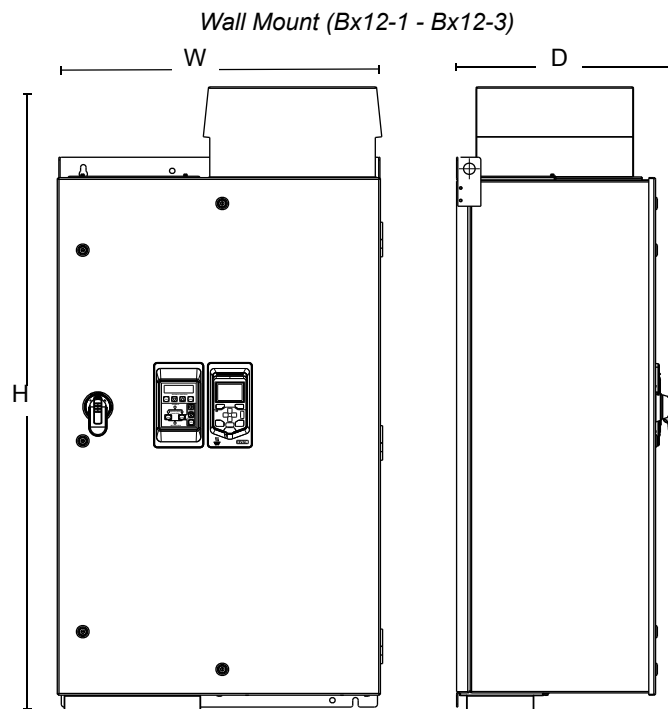
Wall Mount (Bx1-2 to Bx1-3)



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

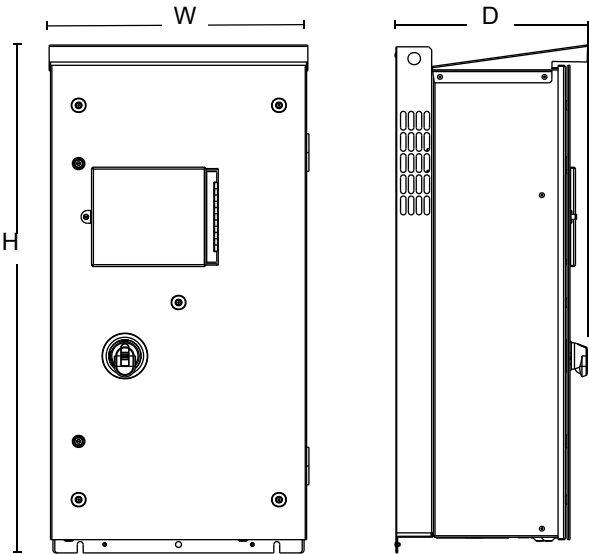
Drawing is not for engineering purposes.

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!

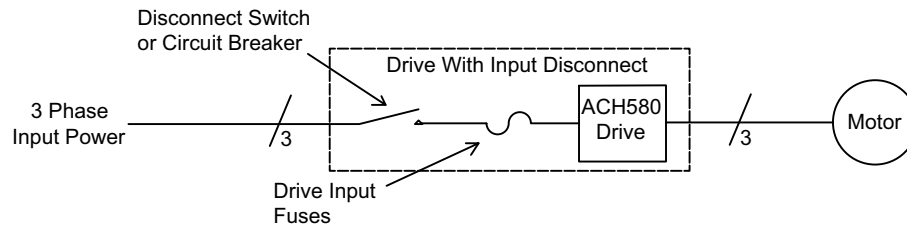
- Metal shavings or debris in the enclosure can damage electrical equipment and create a hazardous condition. Where parts, such as conduit plates require cutting or drilling, first remove the part. If that is not practical, cover nearby electrical components to protect them from all shavings or debris.
- 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.

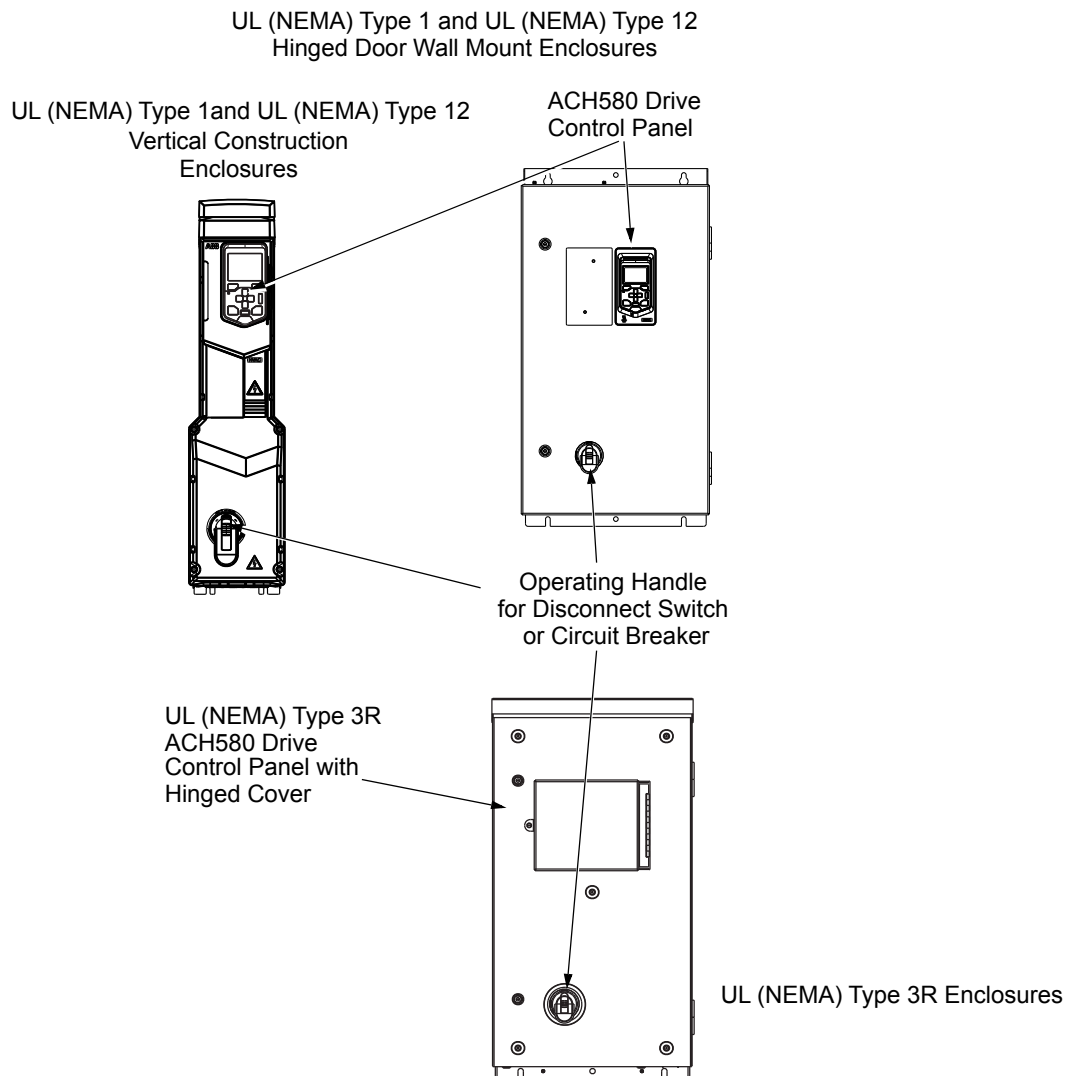
The following is a typical power diagram.



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.



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)	• 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

•

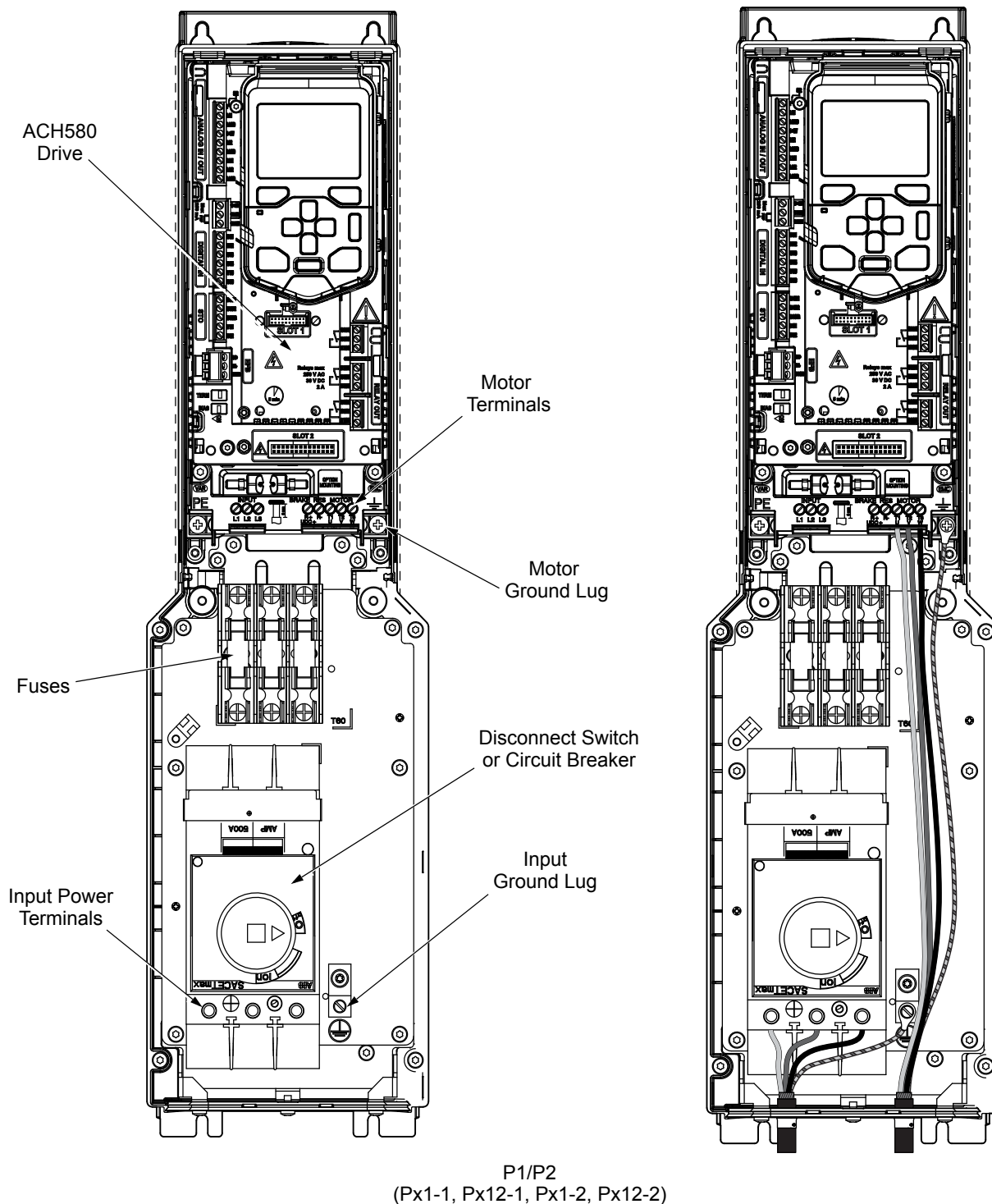
Wiring requirements

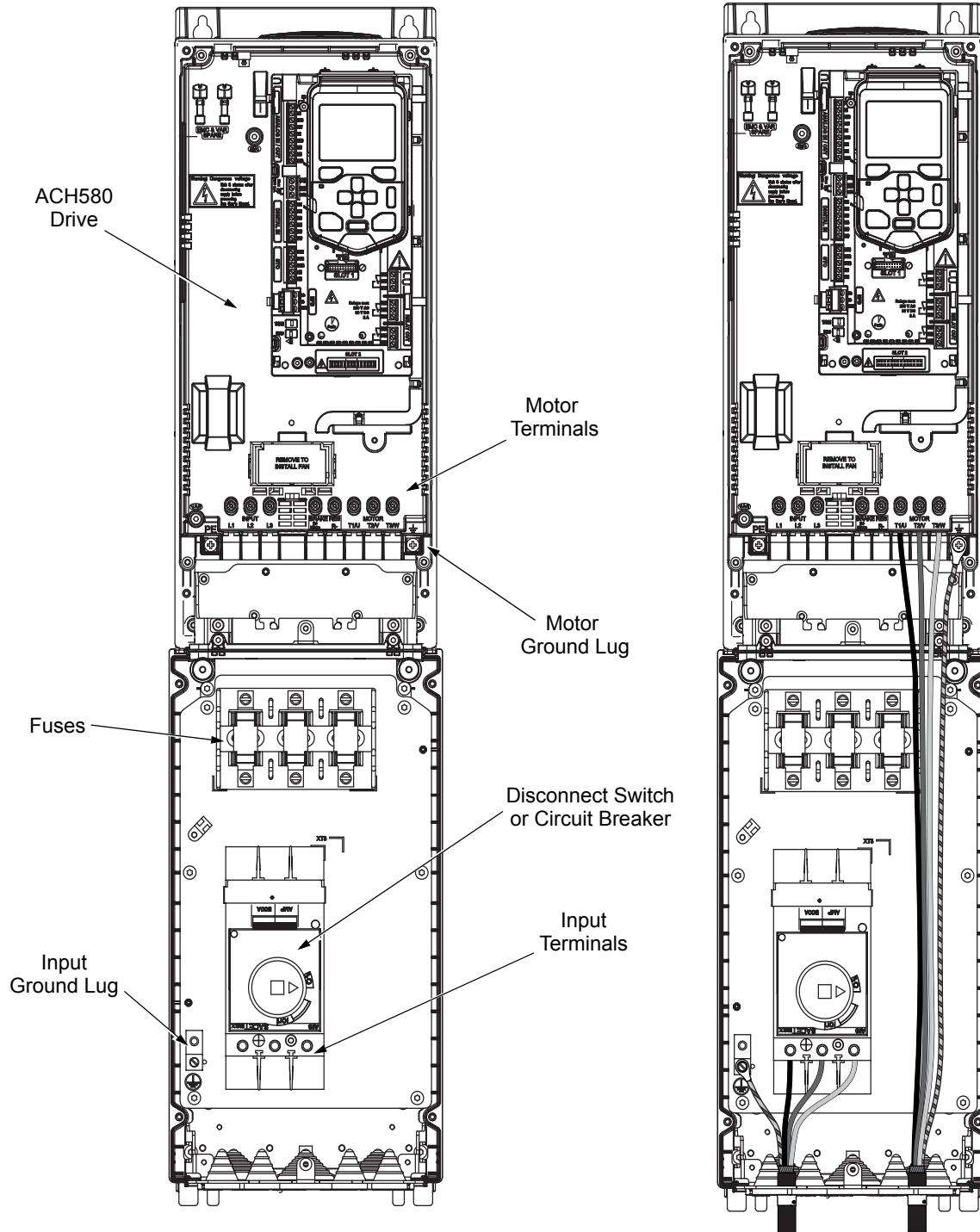
The wiring requirements apply to all ACH580 drives. In particular:

- 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.

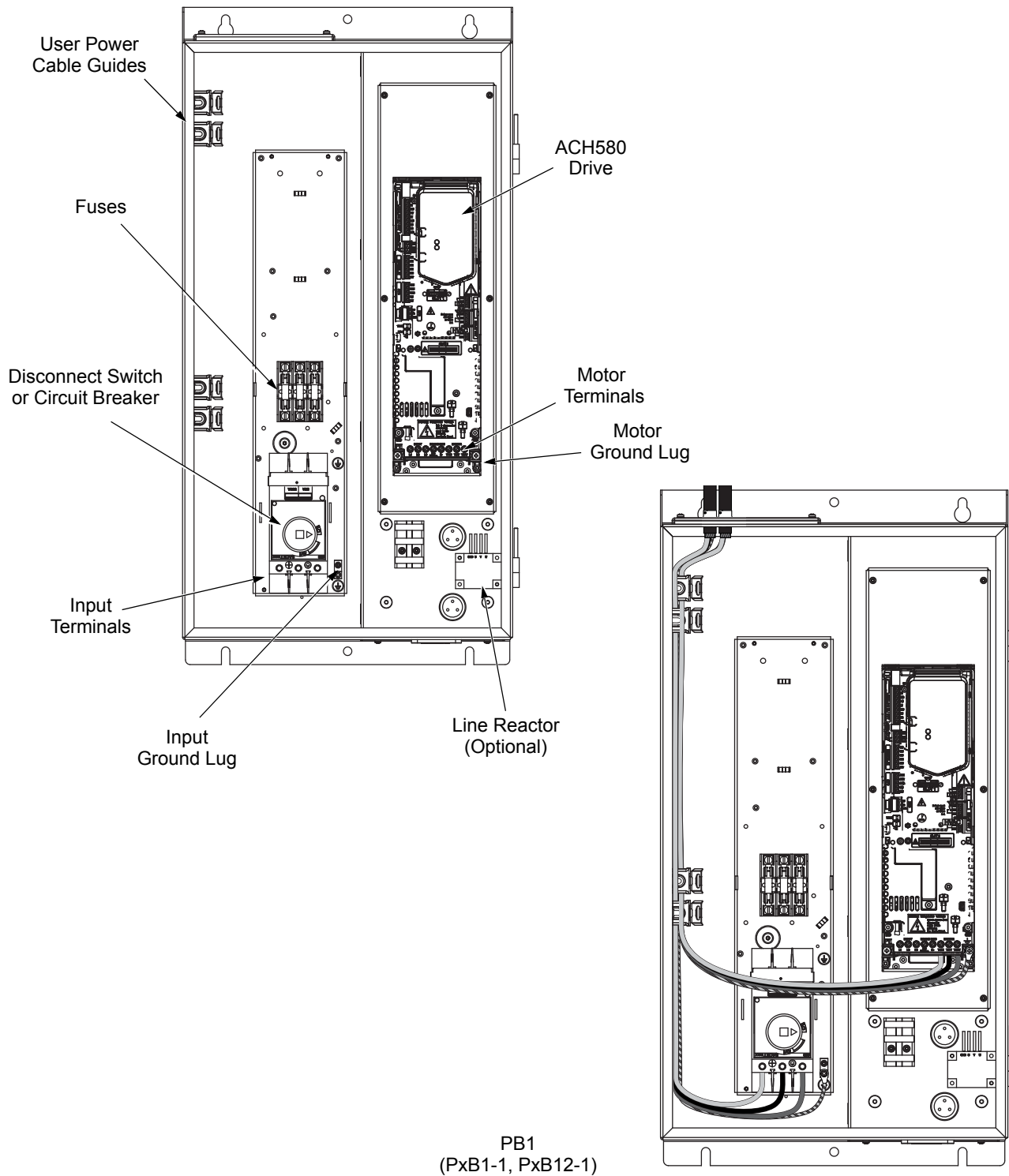


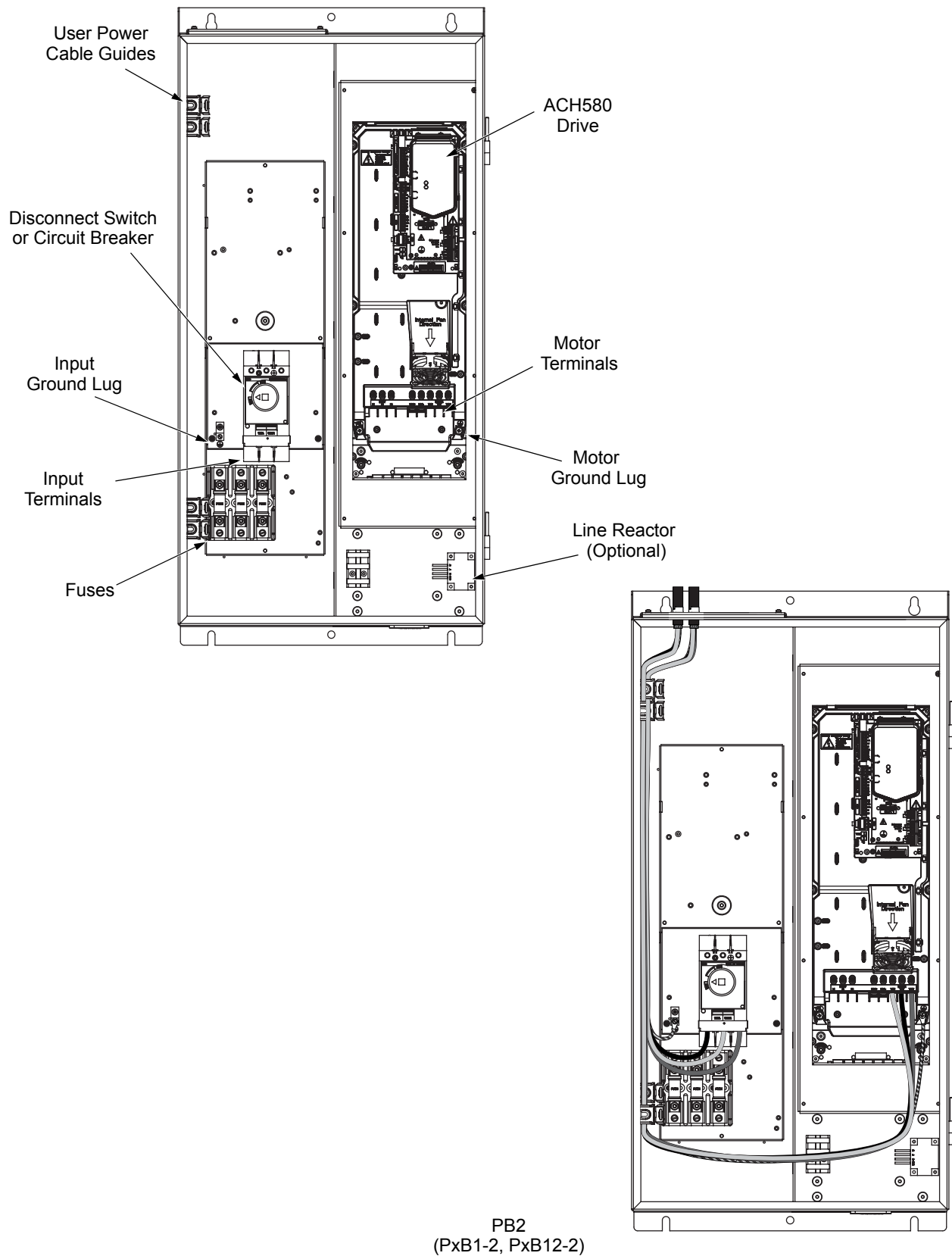


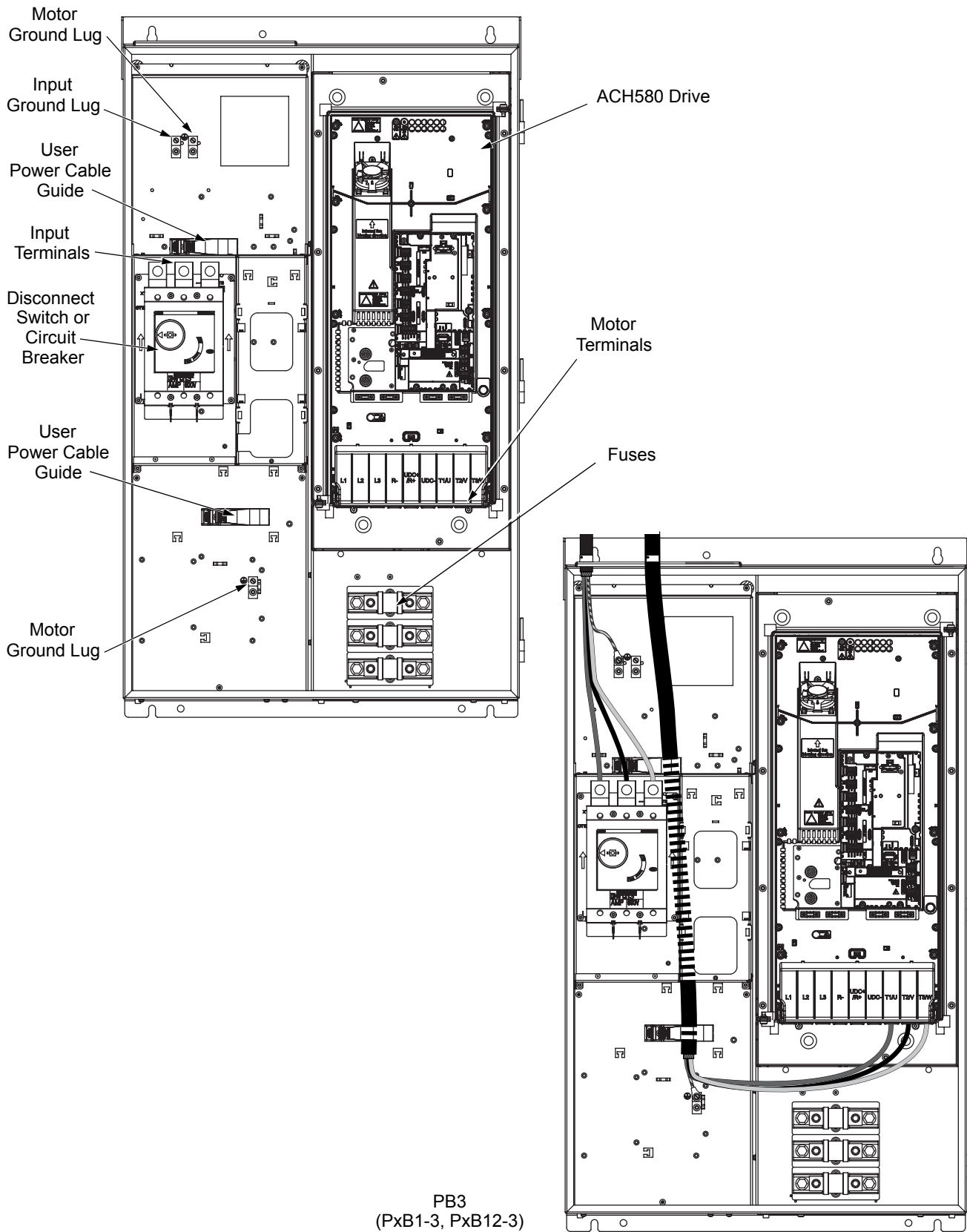
P3/P4
(Px1-3, Px12-3, Px1-4, Px12-4)

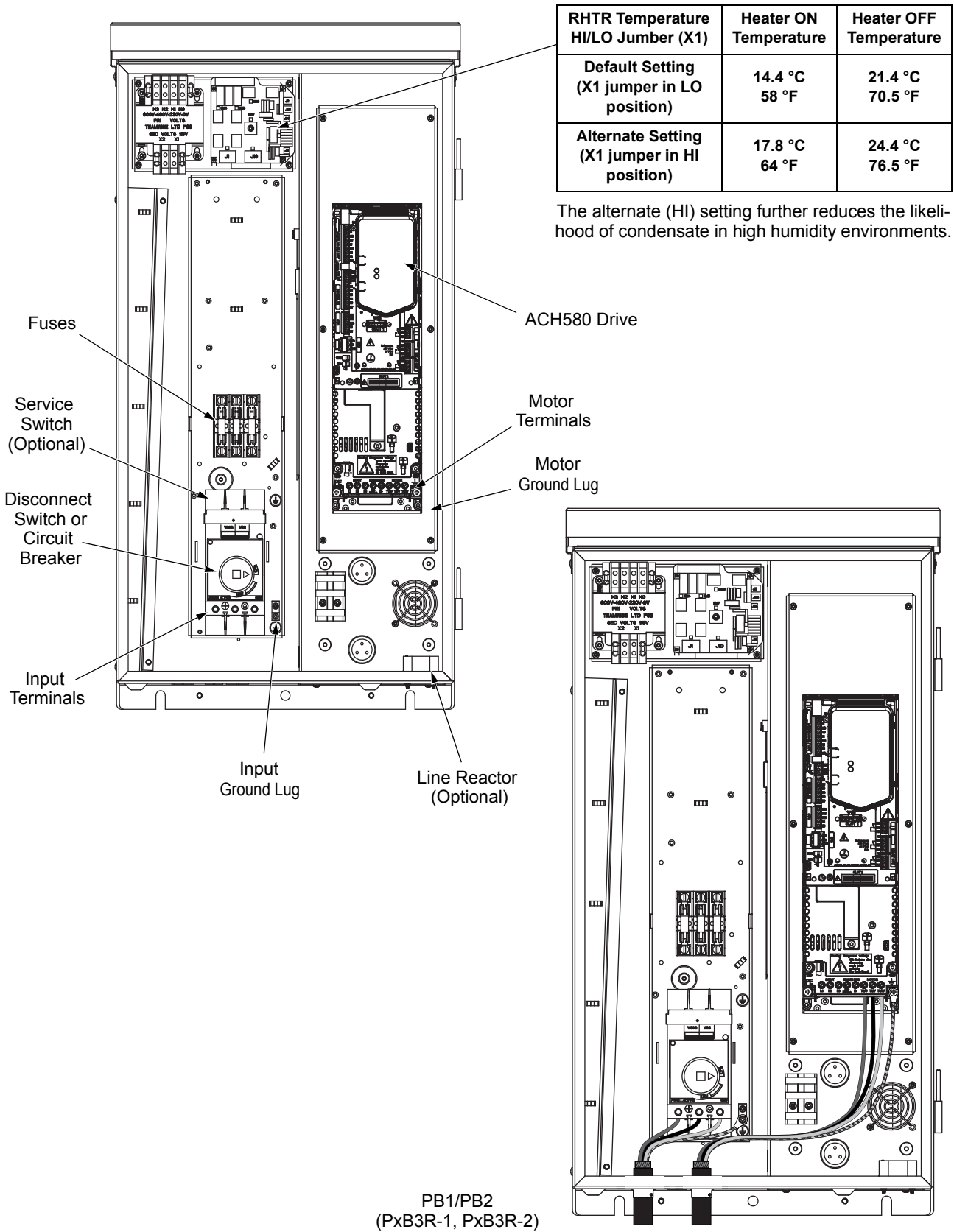
Connection diagrams – Box Packaged Drive with input disconnect

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.









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.

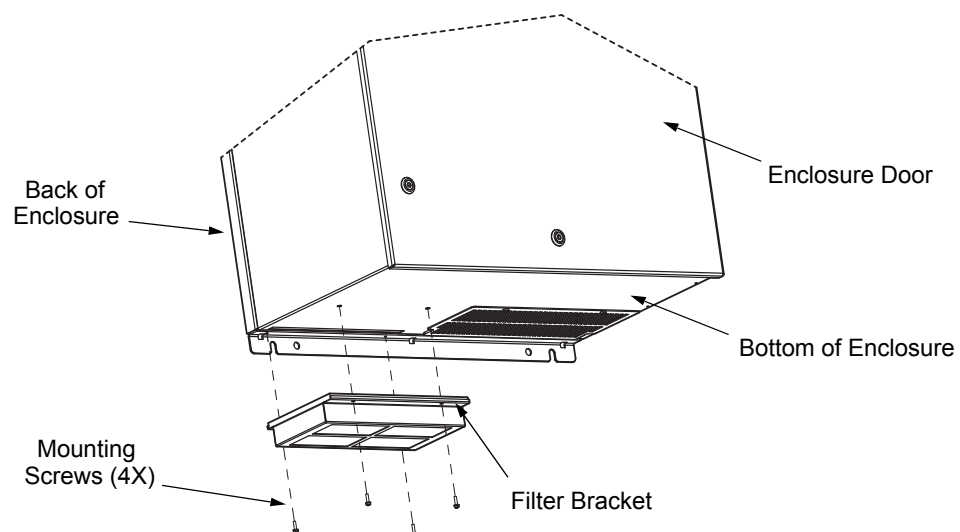
Enclosure air filter replacement – UL (NEMA) Type 12 hinged door wall mount enclosures

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						
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	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	#4 62 in-lbs	#4 62 in-lbs	#4 55 in-lbs	#4 55 in-lbs			
ACH580-PxR-031A-2	30.8	10	R2	#2 62 in-lbs	#2 62 in-lbs	#2 55 in-lbs	#2 55 in-lbs	#2 2.6 ft-lbs		
ACH580-PxR-046A-2	46.2	15	R3	#1 62 in-lbs	#1 62 in-lbs	#1 55 in-lbs	#1 55 in-lbs			
ACH580-PxR-059A-2	59.4	20	R3	#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-075A-2	74.8	25	R4	#2/0 124 in-lbs	Consult Factory	#2/0 275 in-lbs	Consult Factory	#2/0 4.1 ft-lbs	#1/0 50 in-lbs	Consult Factory
ACH580-PxR-088A-2	88	30	R5	#1/0 124 in-lbs		#4/0 275 in-lbs		300 MCM 22.1 ft-lbs		
ACH580-PxR-114A-2	114	40	R5	#3/0 124 in-lbs		200 MCM 275 in-lbs		500 MCM 29.5 ft-lbs		
ACH580-PxR-143A-2	143	50	R6	#4/0 124 in-lbs				2 X 500 MCM 274 in-lbs		
ACH580-PxR-169A-2	169	60	R7	2 X 500 MCM 274 in-lbs		2 x 300 MCM 29.6 ft-lbs				
ACH580-PxR-211A-2	211	75	R7	373 MCM 274 in-lbs						
ACH580-PxR-248A-2	248	100 ²	R8							

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	Ground Lugs UL (NEMA) Type 3R			
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			#6 55 in-lbs	#6 55 in-lbs						
ACH580-PxR-027A-4	27	20	R3	#8 62 in-lbs	#8 62 in-lbs	#4 55 in-lbs	#4 55 in-lbs	#2 2.6 ft-lbs					
ACH580-PxR-034A-4	34	25	R3	#6 62 in-lbs	#6 62 in-lbs	#3 55 in-lbs	#3 55 in-lbs						
ACH580-PxR-044A-4	44	30	R3			#2 55 in-lbs	#2 55 in-lbs	#1 3.0 ft-lbs					
ACH580-PxR-052A-4	52	40	R4	#1/0 124 in-lbs									
ACH580-PxR-065A-4	65	50	R4	#1/0 124 in-lbs	#1/0 124 in-lbs	#1 55 in-lbs	#1 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	Ground Lugs UL (NEMA) Type 3R			
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								
ACH580-PxR-09A0-6	9	7.5	R2										
ACH580-PxR-011A-6	11	10	R2										
ACH580-PxR-017A-6	17	15	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-022A-6	22	20	R3	#4 62 in-lbs	#4 62 in-lbs	#4 55 in-lbs	#4 55 in-lbs						
ACH580-PxR-027A-6	27	25	R3										
ACH580-PxR-032A-6	32	30	R3	#4 62 in-lbs	#4 62 in-lbs	#4 55 in-lbs	#4 55 in-lbs	#2/0 4.1 ft-lbs					3 x #3/0 250 in-lbs
ACH580-PxR-041A-6	41	40	R5	#3 62 in-lbs	Consult Factory	#3 55 in-lbs	Consult Factory		300 MCM 22.1 ft-lbs				
ACH580-PxR-052A-6 ³	52	50	R5	#2 62 in-lbs		#2 55 in-lbs							
ACH580-PxR-062A-6	62	60	R6	#1 62 in-lbs		#1 275 in-lbs							
ACH580-PxR-077A-6	77	75	R6	#1/0 62 in-lbs		#1/0 275 in-lbs		500 MCM 29.5 ft-lbs					
ACH580-PxR-099A-6	99	100	R7	#3/0 124 in-lbs		#3/0 275 in-lbs		2 x 300 MCM 29.6 ft-lbs					
ACH580-PxR-125A-6	125	125	R7	250 MCM 124 in-lbs		250 MCM 275 in-lbs							
ACH580-PxR-144A-6	144	150	R8			300 MCM 275 in-lbs							

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 Type Code ¹	Nominal Output Range		Base Drive Frame Size	Internal Drive Fuse Rating		External Fuse for Disconnect Option	
	Drive Current A	Package Power HP		Class	Current Rating	Class	Max Current Rating
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	
Type Code ¹	Drive Current	Package Power					
	A	HP		Class	Current Rating	Class	Max Current Rating
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	
Type Code ^{1, 2}	Drive Current	Package Power					
	A	HP		Class	Current Rating	Class	Max Current Rating
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	
Type Code ^{1, 2}	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.

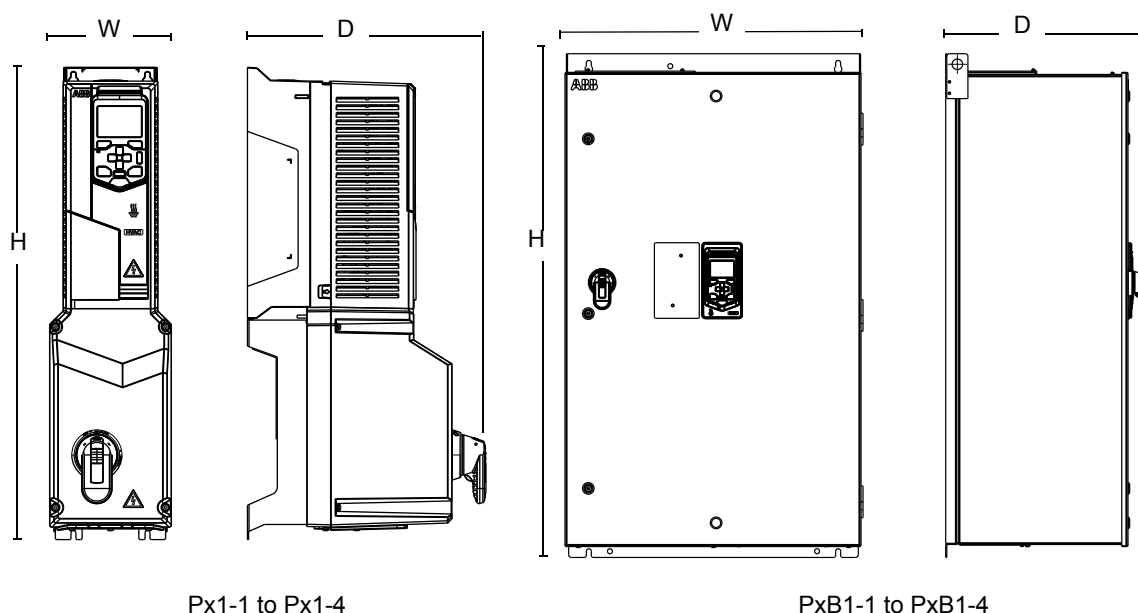
2) PCR is rated 600Y/347V unless otherwise specified. For use on a solidly grounded Wye source only.

3) PCR supports Delta network configuration.

Dimensions and weights

Mounting dimensions

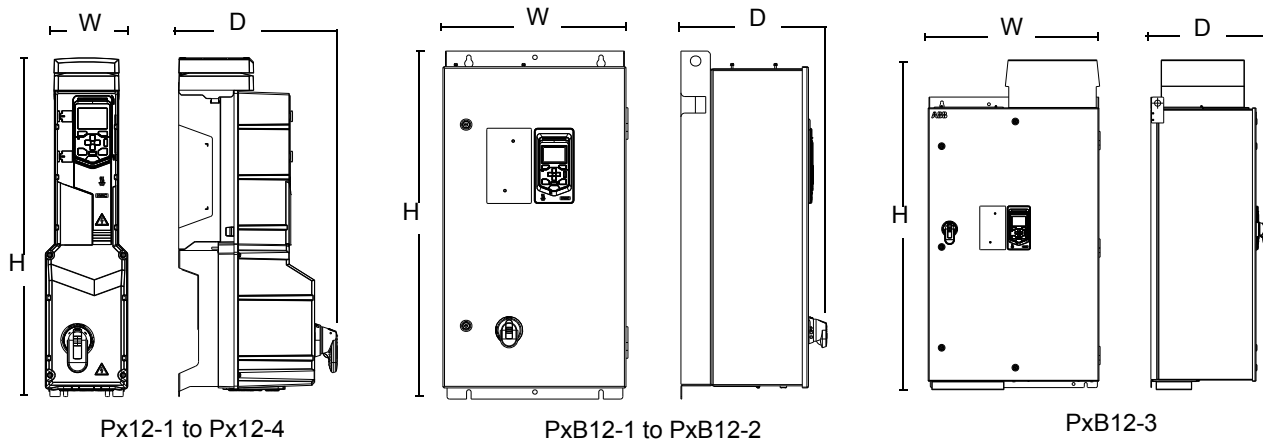
Dimensions: ACH580-PxR UL (NEMA) Type 1



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.

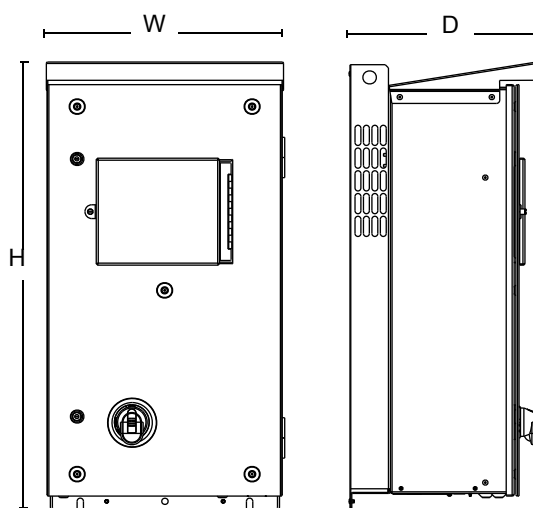
Note: Keep a minimum of 50 mm (2 in.) of free space on each side and 200 mm (8 in.) of free space above and below all units from non-heat producing sources. Double these distances from heat producing sources.

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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