ACH550 BCR/BDR/VCR/VDR E-Clipse Bypass Drives 1…400 HP

User's Manual

ACH550-EB_UM (3AUA0000016461) Rev D
EN
EFFECTIVE: 2010-04-01
SUPERSEDES: ACH550-EB_UM (3AUA0000016461) Rev C 2009-03-11

Safety

Use of warnings and notes

There are two types of safety instructions throughout this manual:

- Notes draw attention to a particular condition or fact, or give information on a subject.
- Warnings caution you about conditions which can result in serious injury or death and/or damage to the equipment. They also tell you how to avoid the danger. The warning symbols are used as follows:

Electricity warning warns of hazards from electricity which can cause physical injury and/or damage to the equipment.

General warning warns about conditions, other than those caused by electricity, which can result in physical injury and/or damage to the equipment.

WARNING! The ACH550 adjustable speed AC drive should ONLY be installed by a qualified electrician.

WARNING! Even when the motor is stopped, dangerous voltage is present at the power circuit terminals U1, V1, W1 (L1, L2, L3) and U2, V2, W2 (T1, T2 T3) and, depending on the frame size, UDC+ and UDC-, or BRK+ and BRK-.

WARNING! Dangerous voltage is present when input power is connected. After disconnecting the supply, wait at least 5 minutes (to let the intermediate circuit capacitors discharge) before removing the cover.

WARNING! Even when power is switched off from the input terminals of the ACH550, there may be dangerous voltage (from external sources) on the terminals of the relay outputs.

WARNING! When the control terminals of two or more drives are connected in parallel, the auxiliary voltage for these control connections must be taken from a single source which can either be one of the drives or an external supply.

WARNING! Disconnect the internal EMC filter when installing the drive on an IT system (an ungrounded power system or a high-resistance-grounded [over 30 ohm] power system).

WARNING! Do not attempt to install or remove EM1, EM3, F1 or F2 screws while power is applied to the drive's input terminals.

WARNING! Do not control the motor with the disconnecting device (disconnecting means); instead, use the control panel keys or commands via the I/O board of the drive. The maximum allowed number of charging cycles of the DC capacitors (i.e. power-ups by applying power) is five in ten minutes.

WARNING! Never attempt to repair a malfunctioning ACH550; contact the factory or your local Authorized Service Center for repair or replacement.

WARNING! The ACH550 will start up automatically after an input voltage interruption if the external run command is on.

WARNING! The heat sink may reach a high temperature.

Note: For more technical information, contact the factory or your local ABB representative.

Table of contents

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* on page *2-3*.

WARNING! When the ACH550 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 ACH550 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

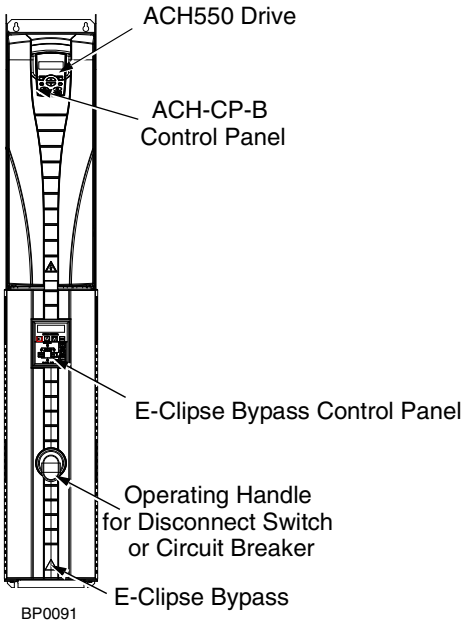
This manual is a supplement to the ACH550-UH User's Manual and documents E-Clipse Bypass configurations.

E-Clipse bypass features and functions

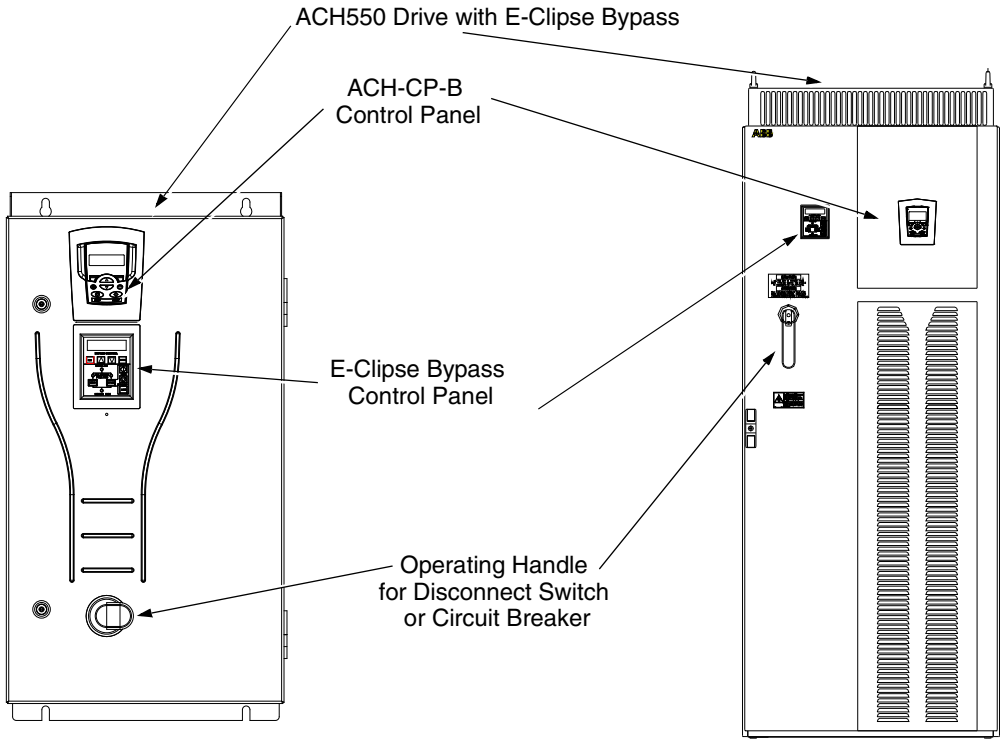
The ACH550 with E-Clipse Bypass is an ACH550 AC adjustable frequency drive in an integrated UL type 1, UL type 12 or UL type 3R package with a bypass motor starter. The ACH550 with E-Clipse Bypass provides:

- Disconnect switch or circuit breaker with door mounted control lever. The lever 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, Siemens Building Technologies FLN, and Modbus
- Optional fieldbus adapters for connection to additional BMS protocols including LonWorks and Ethernet
- Optional drive service switch (drive input disconnect), the functional equivalent of a three-contactor bypass arrangement.

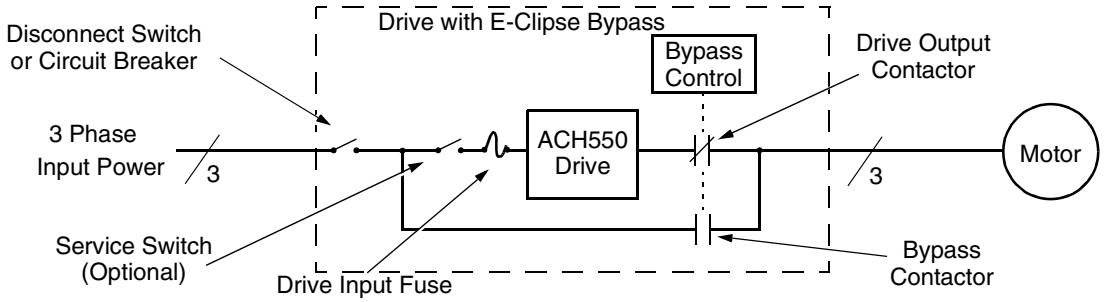
The following shows the front view of the ACH550 E-Clipse Bypass vertical configuration, and identifies the major components.



The following shows the front view of the ACH550 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 ACH550 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 ACH550-UH User's Manual ***Installation*** section	Reference in this Manual
PREPARE for installation	*Preparing for installation*	*Drive identification* on page *2-10*. *Suitable mounting location (supplement to ACH550-UH User's Manual)* on page *2-11*
PREPARE the mounting location	*Prepare the mounting location*	—
MOUNT the unit	*Mount the drive*	—
REMOVE the covers from Vertical E-Clipse Bypass Unit	*Remove front cover*	—
INSTALL wiring	*Wiring overview* and *Install the wiring*	*Installing the wiring (supplement to ACH550-UH User's Manual)* starting on page *2-11*.
CHECK jumpers and switches	—	*Check E-Clipse Bypass jumpers and switches* on page *2-28*.
CHECK installation	*Check installation*	*Initial settings and checks* on page *2-22*.
RE-INSTALL the covers	*Re-install cover*	—
APPLY power	*Apply power*	—
START-UP	*Start-up*	*Start-up* on page *2-33*.

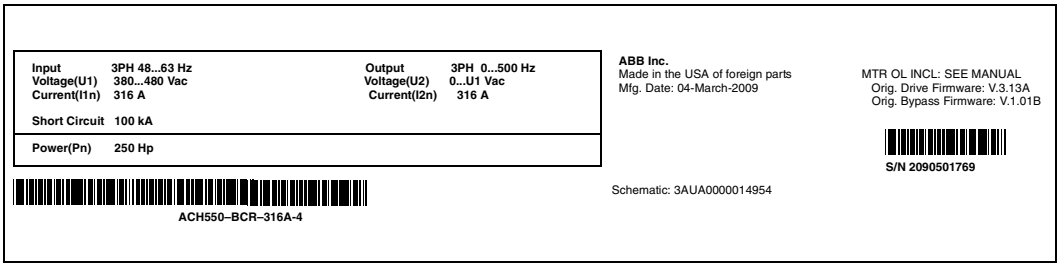
Preparing for installation (supplement to ACH550-UH User's Manual)

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.



Type code

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

ACH550-BCR-316A-4+…+…

AC, HVAC Drive – 550 product series

Construction
- UH = Base drive
- BCR = E-Clipse Bypass with circuit breaker
- BDR = E-Clipse Bypass with disconnect switch
- PCR = Drive with circuit breaker
- PDR = Drive with disconnect switch
- VCR = Vertical E-Clipse Bypass with circuit breaker
- VDR = Vertical E-Clipse Bypass with disconnect switch

Output current rating (See *Ratings* for details on page *1-299*)

Voltage rating
- 2 = 208…240 VAC
- 4 = 380…480 VAC
- 6 = 500…600 VAC

Enclosure protection class
- No specification = IP 21 / UL type 1
- +B055 = IP 54 / UL type 12
- +B058 = IP 58 / UL type 3R

Line reactor
- +E213 = Line Reactor

Service Switch
- +F267 = Service switch

Fieldbus Adapters
- +K451 = DeviceNet Adapter
- +K452 = LonWorks Adapter
- +K454 = Profibus Adapter
- +K466 = EtherNet Adapter

Ratings and frame size

The chart in the *Ratings* section of the ACH550-UH User's Manual on page *1-299* lists technical specifications, and identifies the drive's frame size – 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 the *Type code* (see above). Also, when using the Ratings tables, note that there are three tables based on the drive's "Voltage rating".

Suitable mounting location (supplement to ACH550-UH User's Manual)

In selecting a suitable mounting location for E-Clipse Bypass configurations, refer to the *Technical data* on page *2-235* in this manual for the appropriate information on:

- Branch circuit protection
- Dimensions and weights

Installing the wiring (supplement to ACH550-UH User's Manual)

WARNING!

- 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.

Wiring requirements

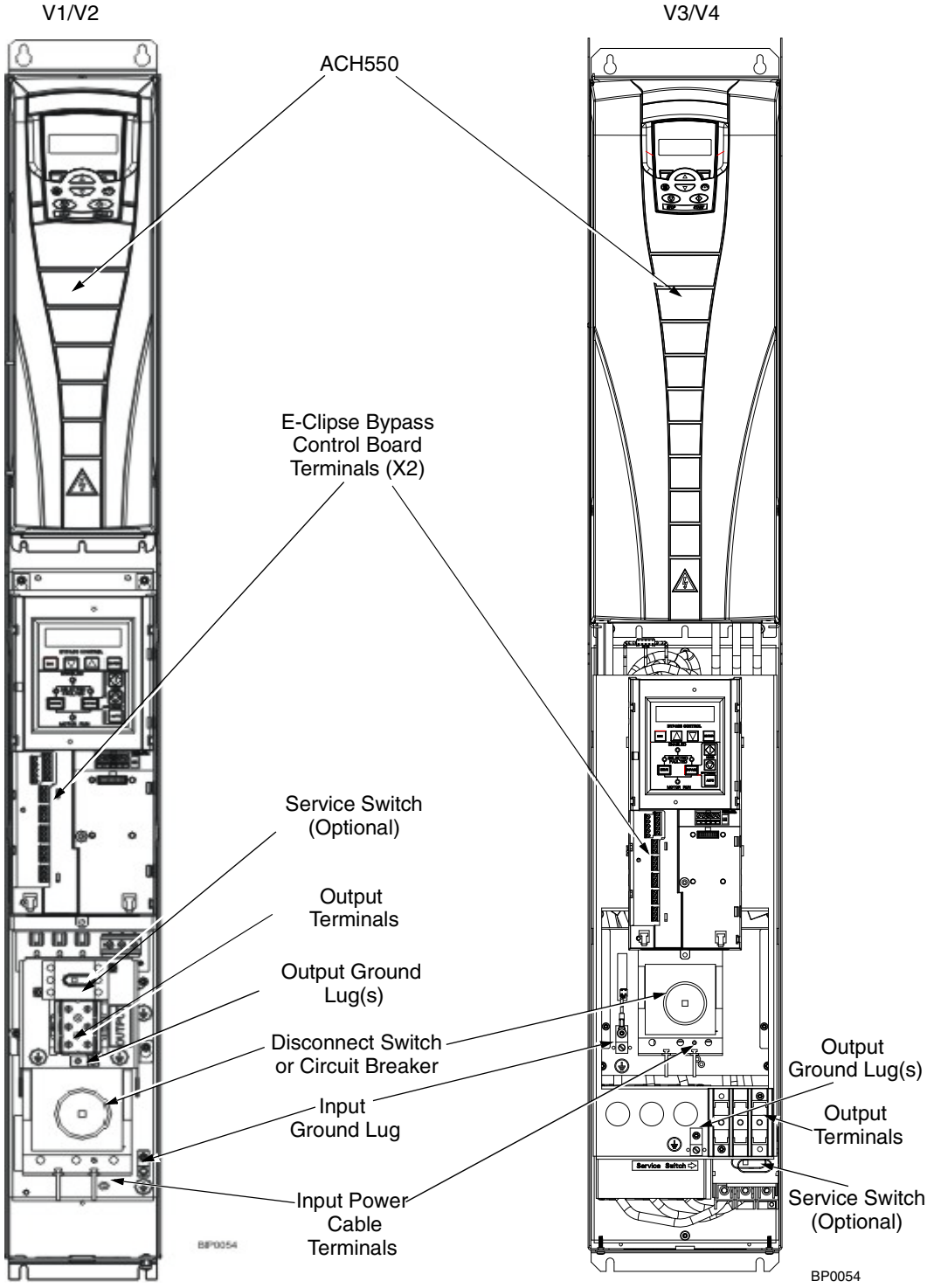
Refer to the *Wiring requirements* on page *1-18* in the ACH550-UH User's Manual. The requirements apply to all ACH550 drives. In particular:

- 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") spacing from power wiring.
- Use a separate motor conduit run for each drive.

Wiring overview (supplement to ACH550-UH User's Manual)

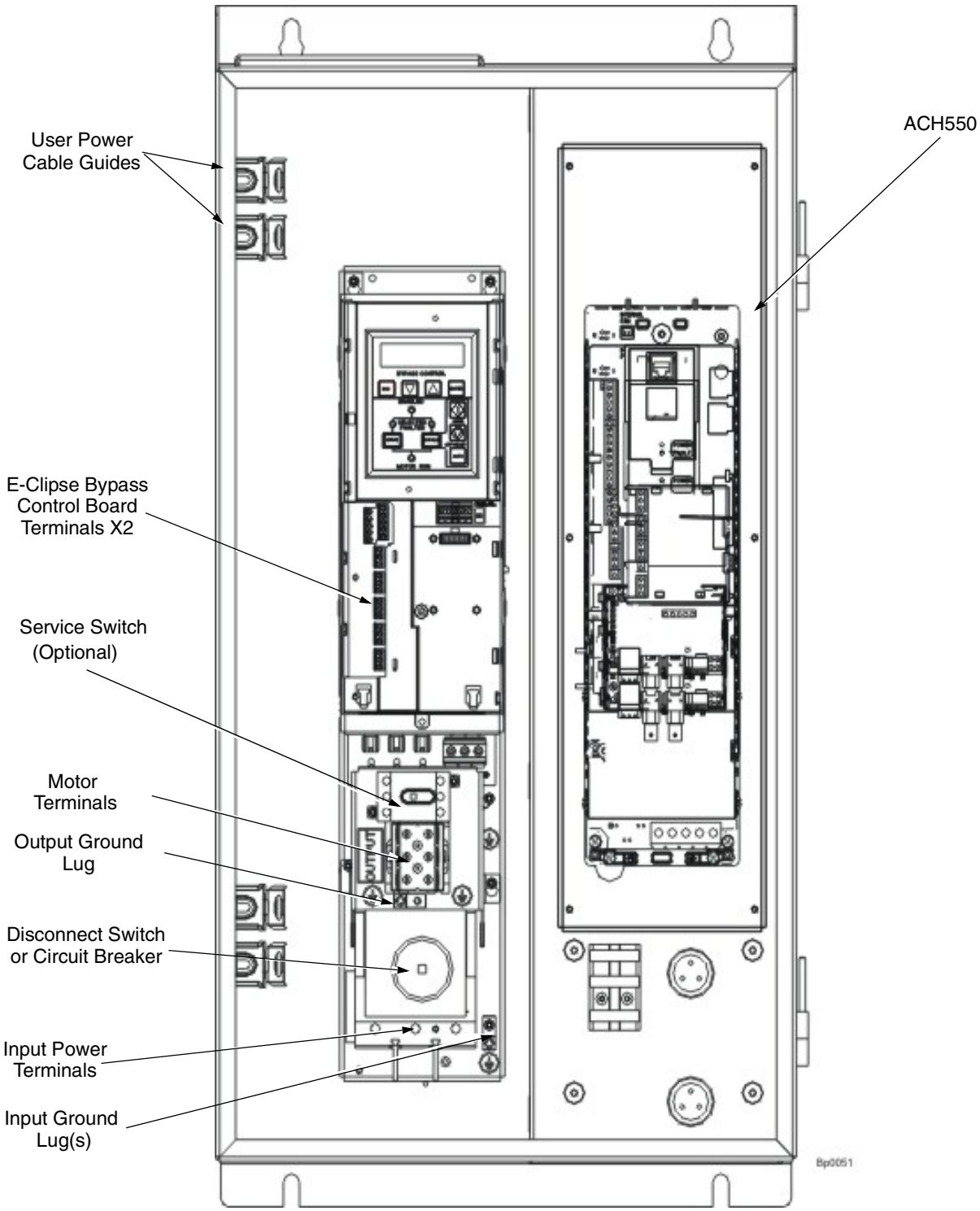
Connection diagrams – Vertical E-Clipse Bypass

ACH550 Vertical E-Clipse Bypass units are configured for wiring access from the bottom only. The following figure shows the Vertical E-Clipse Bypass wiring connection points. Refer to the ACH550-UH User's Manual on page *1-317* for control connections to the drive.

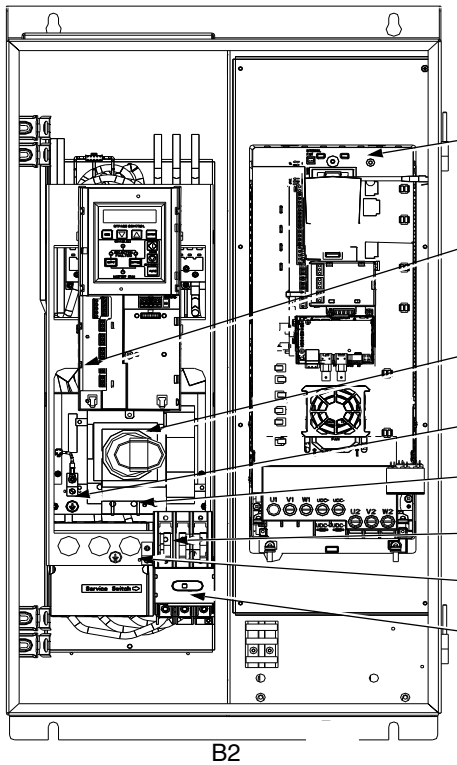


Connection diagrams – Standard E-Clipse Bypass (wall mounted)

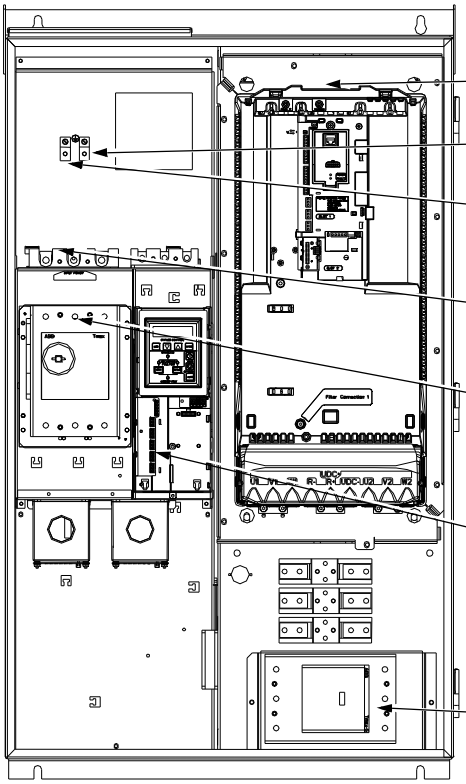
ACH550 Standard E-Clipse Bypass units are configured for wiring access from the top. The following figure shows the Standard E-Clipse Bypass (wall mounted) wiring connection points. Refer to the ACH550-UH User's Manual on page *1-317* for control connections to the drive.



B1


User Power Cable Guides
ACH550 Drive
E-Clipse Bypass Control Board Terminals (X2)
Disconnect Switch or Circuit Breaker
Input Ground Lug
Input Power Terminals
Motor Terminals
Output Ground Lug
Service Switch (optional)

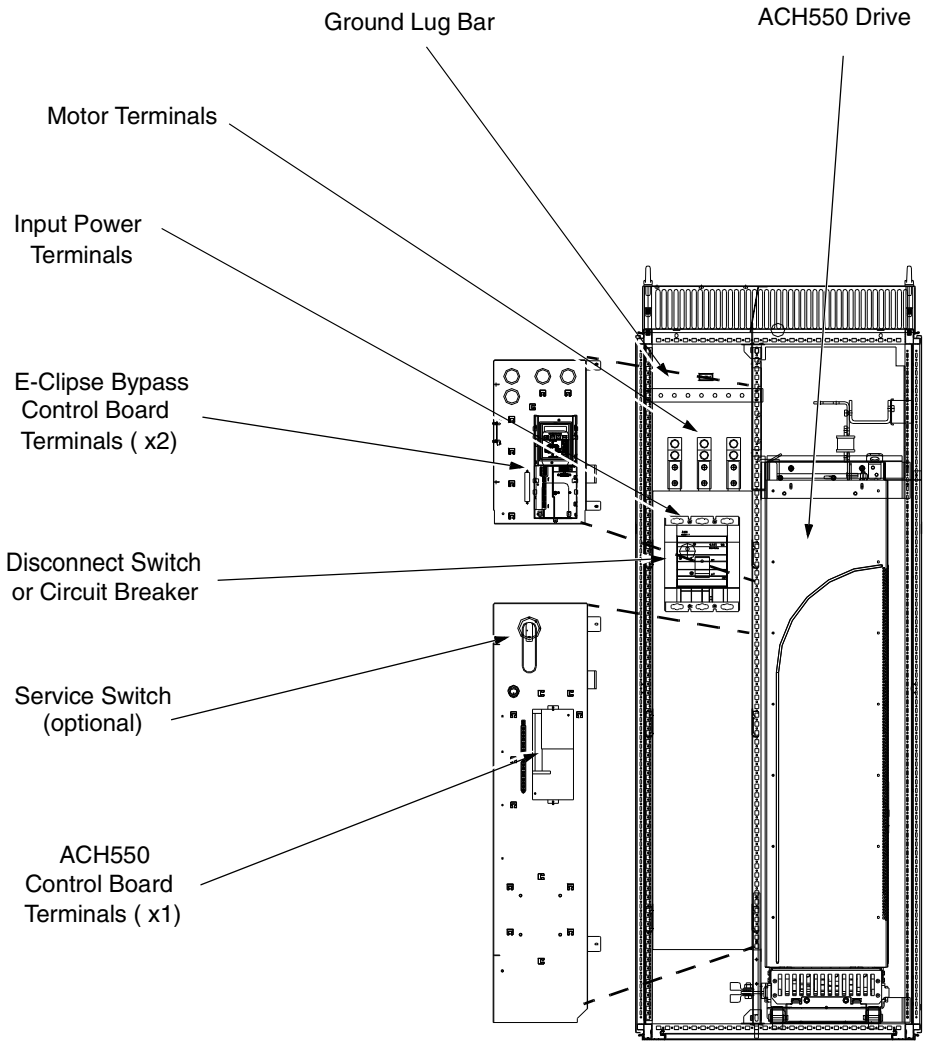
B2


ACH550 Drive
Output Ground Lug
Input Ground Lug
Motor Terminals
Input Power Terminals
E-Clipse Bypass Control Board Terminals (X2)
Service Switch (optional)

B3

Connection diagrams – Standard E-Clipse Bypass (R8, floor mounted)

ACH550 Standard E-Clipse Bypass units are configured for wiring access from the top. The following figure shows the Standard E-Clipse Bypass (floor mounted) wiring connection points. Refer to the ACH550-UH User's Manual on page *1-317* for control connections to the drive.

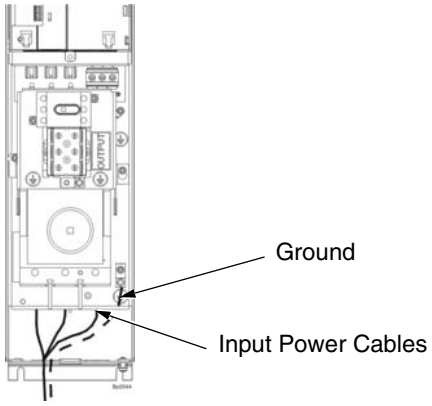


B4

Install the line input wiring (supplement to ACH550-UH User's Manual)

Line input connections – Vertical E-Clipse Bypass configurations

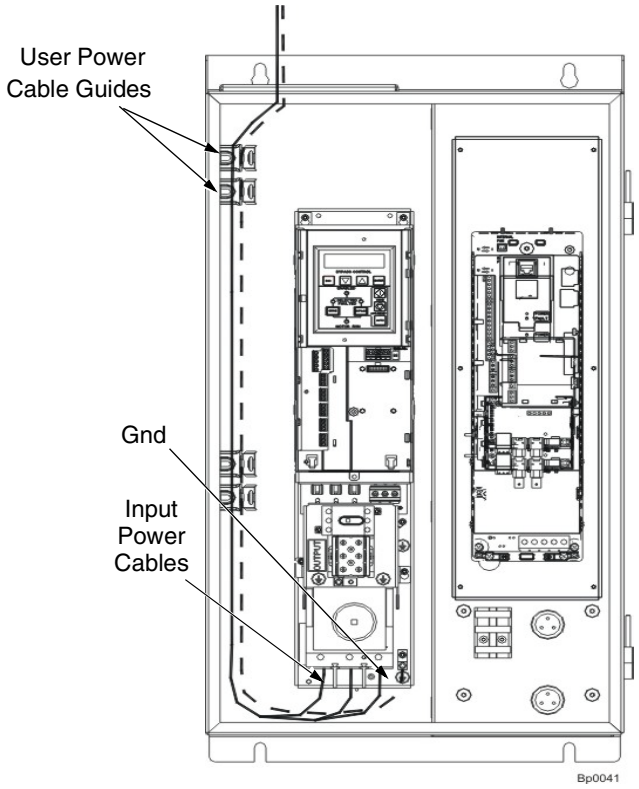
Connect the input power to the terminals at the bottom of the disconnect switch or circuit breaker as shown below. Also see *Connection diagrams – Vertical E-Clipse Bypass* on page *2-12*. Connect the equipment grounding conductor to the ground lug near the input power connection point.



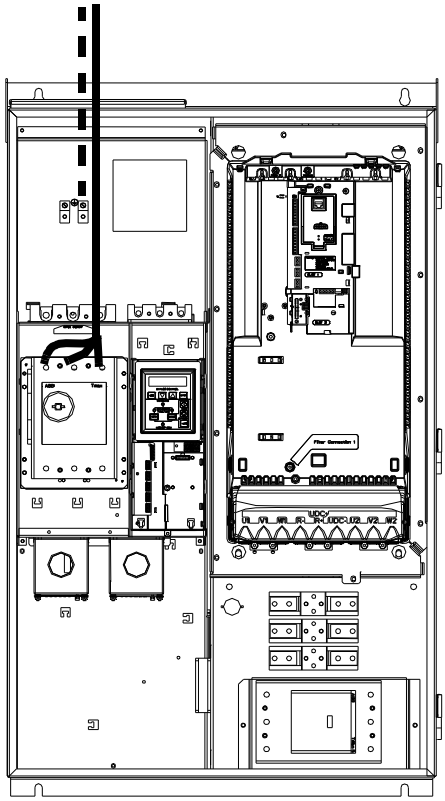
Line input connections – Standard E-Clipse Bypass configurations (wall mounted)

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. The figure below shows the connection points for Standard E-Clipse Bypass configurations. Also see *Connection diagrams – Standard E-Clipse Bypass (wall mounted)* on page *2-13* and *Connection diagrams – Standard E-Clipse Bypass (R8, floor mounted)* on page *2-15*.

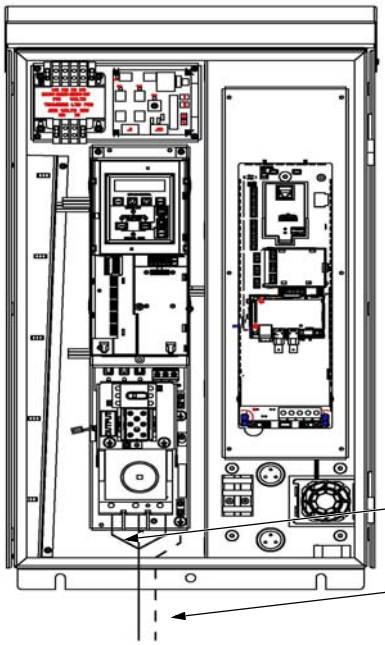
Note: Route cables through the cable guides on the left side of the enclosure. Use separate conduits for input power and motor cables. Follow the guides to separate the cables from each other.



Standard Configuration (B1/B2)



Standard Configuration (B3)



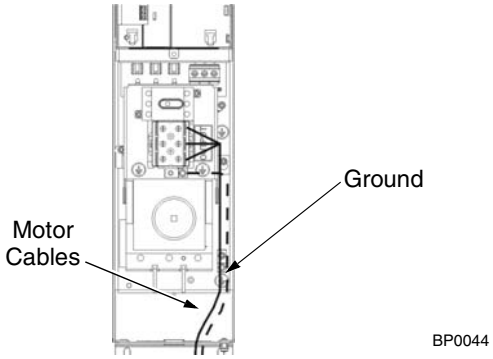
UL Type 3R Configuration (B1/B2)

WARNING! Check the motor and motor wiring insulation before connecting the ACH550 to line power. Follow the procedure in the ACH550-UH User's Manual on page *1-23*. Before proceeding with the insulation resistance measurements, check that the ACH550 is disconnected from incoming line power. Failure to disconnect line power could result in death or serious injury.

Install the motor wiring (supplement to ACH550-UH User's Manual)

Motor connections – Vertical E-Clipse Bypass configurations

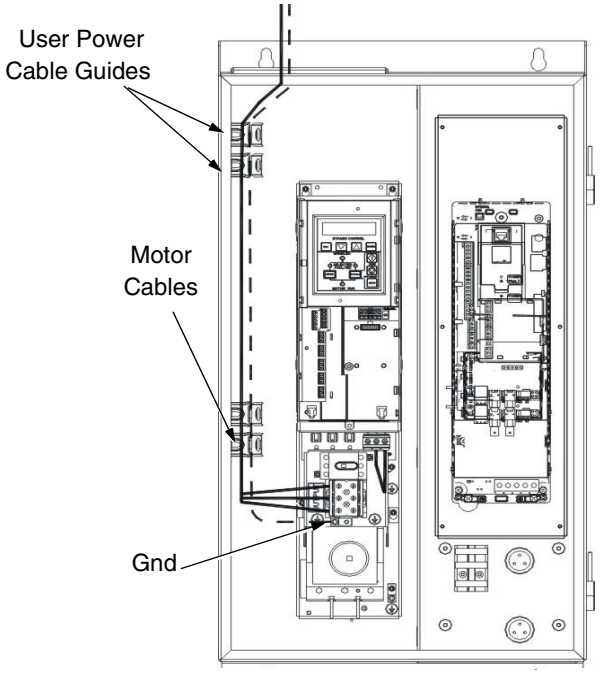
Connect the motor cables to the terminals at the bottom of the bypass section as shown in the figure below. Also see *Connection diagrams – Vertical E-Clipse Bypass* on page *2-12*. Connect the motor grounding conductor to the ground lug near the motor cable terminal block connection point.



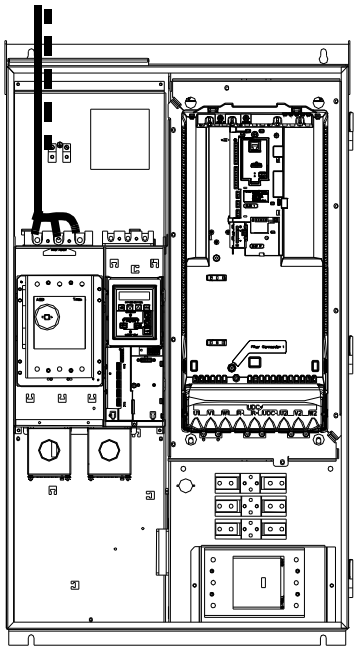
Motor connections – Standard E-Clipse Bypass configurations (wall mounted)

Connect the motor cables to the output terminal block as shown in the figure below. Also see *Connection diagrams – Standard E-Clipse Bypass (wall mounted)* on page *2-13* and *Connection diagrams – Standard E-Clipse Bypass (R8, floor mounted)* on page *2-15*. The motor grounding conductor can be connected to the ground lug near the terminal block.

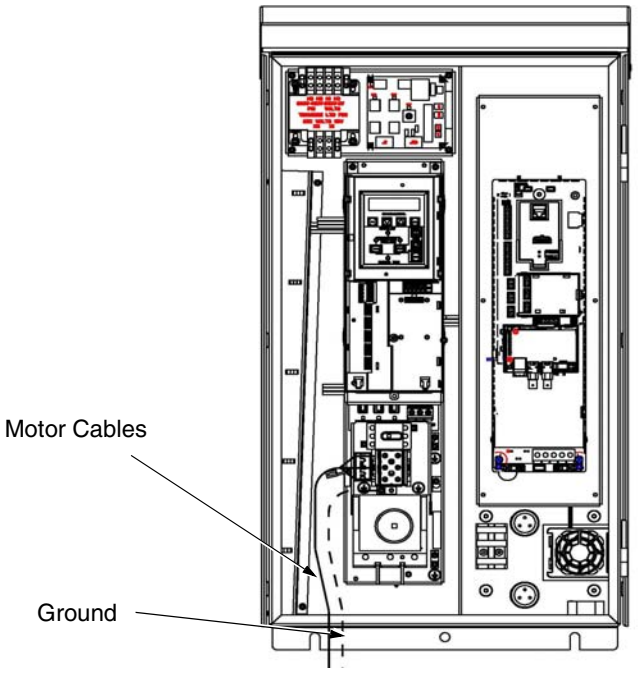
Note: Route cables through the cable guides on the left side of the enclosure. Use separate conduits for input power and motor cables. Follow the guides to separate the cables from each other.



Standard Configuration (B1/B2)



Standard Configuration (B3)



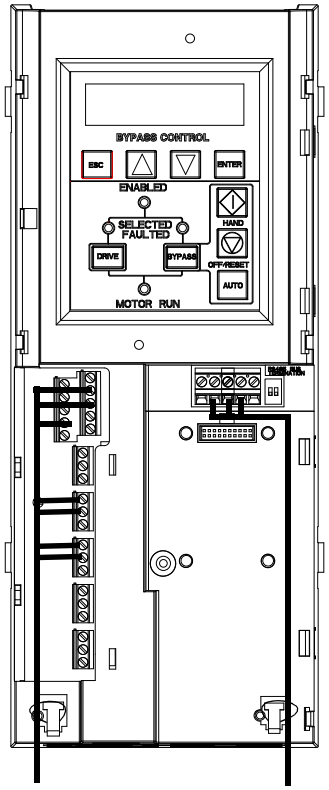
UL Type 3R Configuration (B1/B2)

Install the control wiring (supplement to ACH550-UH User's Manual)

Connect control wiring to terminal block X1 on the ACH550 control board and to terminal block X2 on the E-Clipse Bypass control board. For more information on these connections, refer to the following:

- X1 terminal block location and terminal data are defined in the ACH550-UH User's Manual on page *1-318*.
- X2 terminal block location is illustrated in the figures starting with *Connection diagrams – Vertical E-Clipse Bypass* on page *2-12*.
- X2 terminal data are provided in *Basic control connections for E-Clipse HVAC Default* on page *2-21*.
- Basic connections are described in the following paragraphs.
- Alternate configurations using the E-Clipse Bypass macro are described in *Application macros* on page *2-49*.
- On Terminal Block X1 inside the ACH550, 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. Refer to the *ACH550-UH User's Manual* for information about control connections on Terminal Block X1 on page *1-318*.

Note: The E-Clipse Bypass control circuitry uses serial communications connections (X1:28…X1:32) inside the ACH550. These connections are not available for any other purpose and must not be reconfigured.



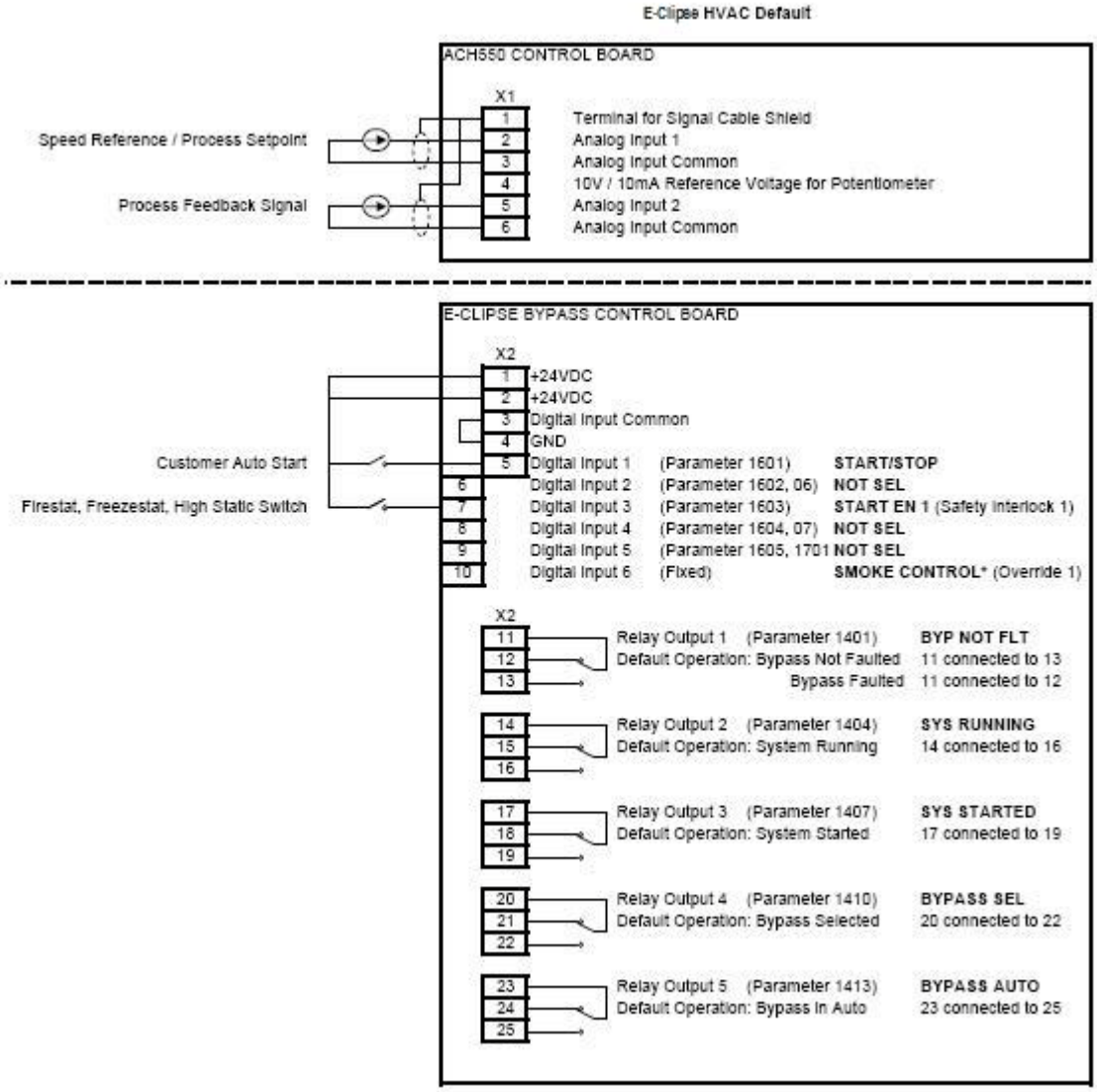
Basic connections

The figure on page *2-21* shows the basic control connections for use with the E-Clipse Bypass HVAC Default macro. These connections are described in the following paragraphs.

In typical installations, only analog input wires connect to the ACH550 terminal block, with other control connections made on the E-Clipse Bypass control board.

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

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.

Initial settings and checks

Control panel settings and checks

Apply power to the E-Clipse Bypass unit. The ACH550 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 V, 60 Hz motor connected to a 208 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 V or 460 V, 60 Hz, the MOTOR NOM VOLT and MOTOR NOM FREQ parameters will need to be properly set before proceeding. Refer to the ACH550-UH User's Manual and set the parameters as required.

Note: The settings for ALL external serial communication between the ACH550 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 serial communication connection using the ACH550 operator panel!

The settings for internal communication between the ACH550 and the E-Clipse Bypass are configured at the factory and require no adjustment.

Drive Link recovery procedure

If the ACH550 Drive communication settings are unintentionally changed during setup a "Drive Link Fault", "Drive Link Error" or "Drive Setup" alarm may be displayed. Should this occur, accomplish the following steps in order.

Using the ACH550 Drive Keypad

1. Set Parameter 9802 to "STD MODBUS"
2. Set Parameter 9902 to "E-CLIPSE"
3. Cycle Power

Following the above steps, in order, should restore proper communications between the ACH550 Drive and the E-Clipse Bypass. Should the E-Clipse Keypad continue to display a "Drive Link Fault", "Drive Link Error" or "Drive Setup" alarm, check the following parameter settings to ensure they have been recovered. If necessary, individually set the correct parameter settings as indicated below and cycle power.

The only ACH550 Drive macro that provides the proper configuration settings by default is the E-Clipse Bypass macro. If any other ACH550 Drive macro is used, that macro should be selected after completing the initial tests. When using any other macro the following ACH550 Drive parameter values must be set and power cycled or the E-Clipse Bypass will not function properly:

- Parameter 9802 must be set to "STD MODBUS"
- Parameter 1001 must be set to "Comm"
- Parameter 1002 must be set to "Comm"
- Parameter 1601 must be set to "Comm"

- Parameter 1608 must be set to "Comm"
- Parameter 5303 must be set to "76.8 kb/s"
- Parameter 5304 must be set to "8 EVEN 1"
- Parameter 5305 must be set to "DCU PROFILE"
- Parameter 5310 must be set to "103"
- Parameter 5311 must be set to "104"
- Power must be cycled

Refer to the *ACH550-UH User's Manual* for additional information.

Note: Run motor from drive before attempting bypass operation.

System check: motor connected to ACH550 with E-Clipse Bypass

After performing the control panel checks and setting the ACH550 Drive Start-up Data parameters, check the operation of the ACH550 Drive with E-Clipse Bypass with the motor connected as follows:

1. Disconnect and lock out power to the E-Clipse Bypass unit, wait at least five minutes before disconnecting power.
2. Connect the motor to the output terminals.

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

If the Safety Interlock and Run Enable 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, Safety Interlock and Run Enable 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, Safety Interlock and Run Enable 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 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.

In order to prevent the motor from running without disconnecting the motor, open the Run Enable and Safety 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.

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3. Apply power to the E-Clipse Bypass unit. The ACH550 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.
4. 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.
5. Press the Hand key on the ACH550 Control Panel. Press and hold the UP key until the motor just starts rotating.

Note: If the ACH550 Control Panel displays an OVERCURRENT or EARTH 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 ACH550 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.

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6. Increase the speed to 60 Hz or the highest safe operating speed.
7. 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 ACH550-UH User's Manual.

   If the drive operates according to these steps, your ACH550 with E-Clipse Bypass is ready to use with preset or modified macro settings.

Note: The settings for ALL external serial communication between the ACH550 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 serial communication connection using the ACH550 operator panel!

The settings for internal communication between the ACH550 and the E-Clipse Bypass are configured at the factory and require no adjustment.

Note: Both the ACH550 Drive and the E-Clipse Bypass include preset application macros. The only ACH550 Drive macro that provides the proper configuration settings by default is the *E-Clipse HVAC Default macro* (9902 = 15). If any other ACH550 drive macro or any modified setting of the *E-Clipse HVAC Default macro* is used the following ACH550 Drive parameter values must be set and power cycled or the E-Clipse Bypass will not function properly:

- Parameter 9802 must be set to "STD MODBUS"
- Parameter 1001 must be set to "Comm"
- Parameter 1002 must be set to "Comm"
- Parameter 1601 must be set to "Comm"
- Parameter 1608 must be set to "Comm"
- Parameter 5303 must be set to "76.8 kb/s"
- Parameter 5304 must be set to "8 EVEN 1"
- Parameter 5305 must be set to "DCU PROFILE"
- Parameter 5310 must be set to "103"
- Parameter 5311 must be set to "104"
- Power must be cycled

Refer to the ACH550-UH User's Manual for programming instructions.

Note: Run motor from drive before attempting bypass operation.

System check: motor disconnected from the ACH550 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 ACH550 Drive Start-up Data parameters, become familiar with the operation of the ACH550 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 ACH550 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, ACH550 Drive Parameter 9904 must be set to "Scalar: Freq". After successful completion of Step 13, Parameter 9904 may be set to "Vector: Speed" if very specific application requirements make it necessary to use this type of motor control. Operation using the "Vector: Speed" setting is unnecessary for control of almost all fan and pump applications. Refer to the ACH550-UH User's Manual on page *1-35* 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 "0.0% SP."
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 contol panel display indicates "Off."

If the ACH550 Drive and E-Clipse Bypass operate according to these steps, and you have familiarized yourself with their operation, disconnect and lock out power to prepare for the next test.

WARNING! Wait at least five minutes after disconnecting power from the drive before you attempt to service the drive. Bus capacitors in the intermediate DC circuit must discharge before servicing the drive. Using a meter rated for 1000 VDC, check for zero volts at:

- Terminals BRK+ to GND and BRK- to GND (frame size R1/R2)
- Terminals UC+ and UC- (frame size R3…R8).

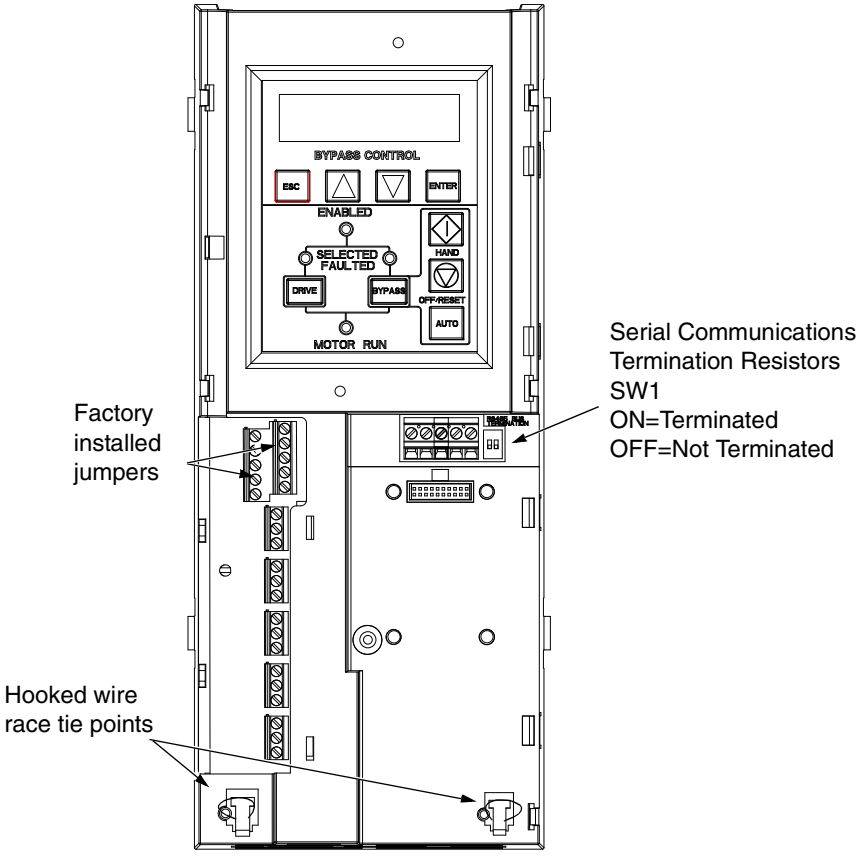
If the drive does not operate according to these steps, refer to the ACH550-UH User's Manual.

Check E-Clipse Bypass 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.

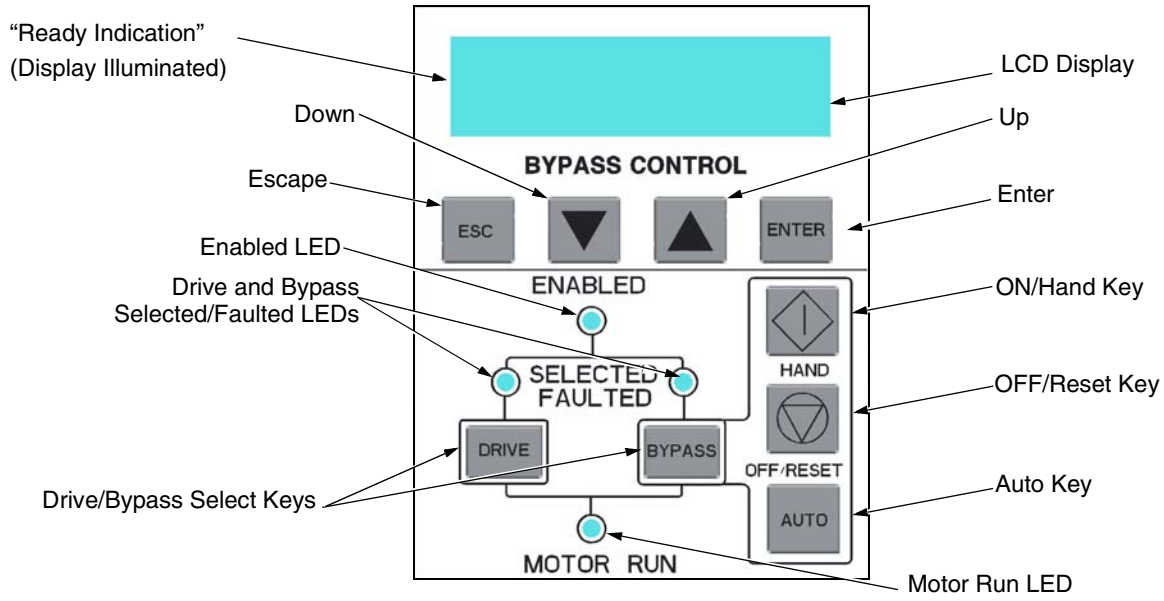
Circuit breaker settings

On some ACH550 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 panel features

The figure below shows the bypass control panel and identifies the keys and LED indicating lights. The functions of the various keys and LEDs are described in the following paragraphs.



Ready (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 Safety Interlock(s) and Run Enable contacts are closed.
- The Safety Interlock contact(s) are closed with no Start command present.

The Enabled LED flashes green if the Run Enable contact is open and when the Safety Interlock contact(s) are closed and a Start command is present.

The Enabled LED is illuminated red when the Safety 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 of this manual 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 *1-281* of the ACH550-UH User's Manual for more details.

Automatic Transfer

The *Automatic Transfer* indication is provided on the bypass control panel. The bypass control display will continuously flash an alarm 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 serial 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 serial communications as the means for starting and stopping the motor in the bypass mode.

Hand Key

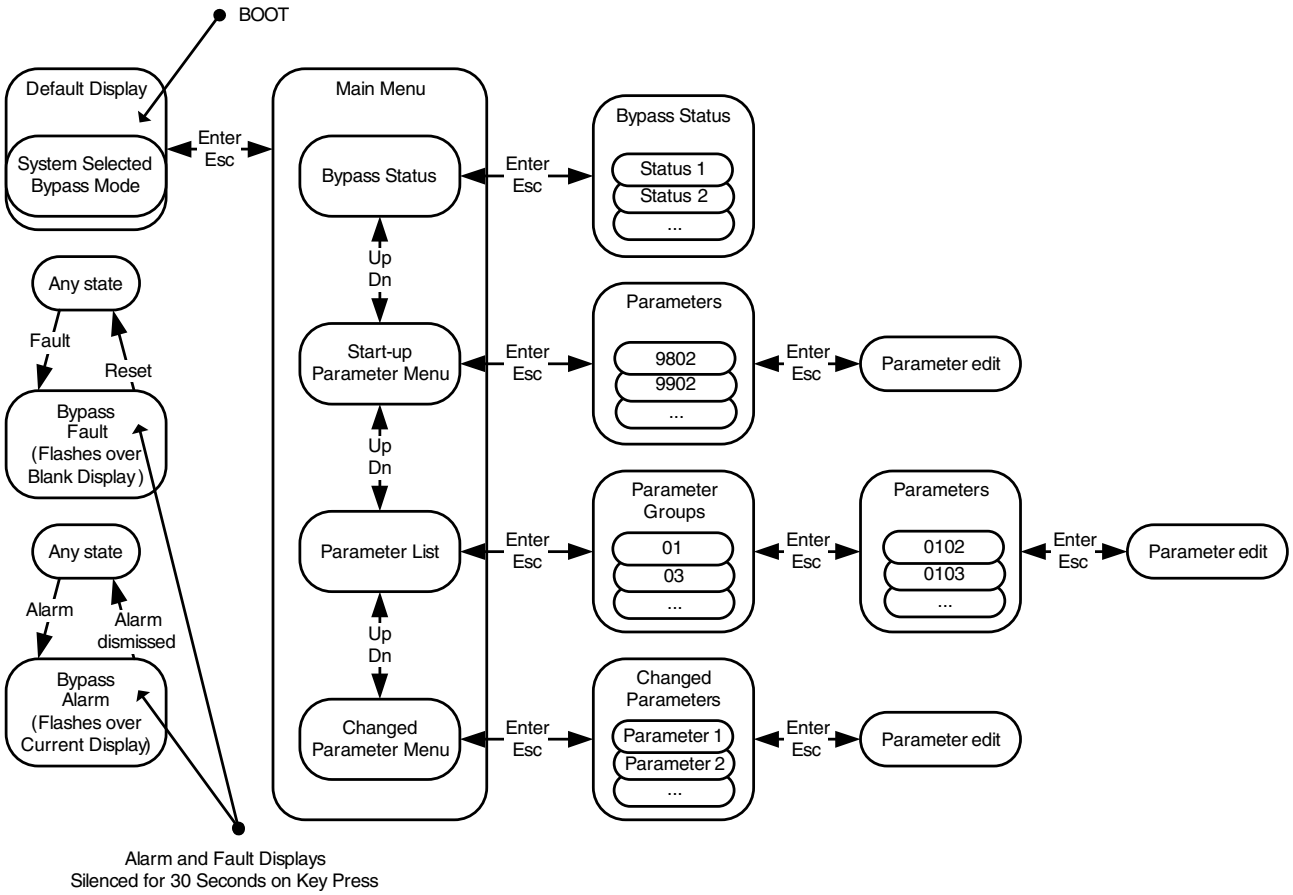
The *Hand Key* can be used to manually start the motor when the bypass has been selected as the power source for the motor.

Bypass control panel modes

The HVAC Bypass Control Panel has several different modes for configuring, operating and diagnosing the bypass. 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 Alarm Display mode – If there is an active bypass alarm, the control panel will flash the alarm number and alarm diagnostic indication in English.

The different modes are accessed through the HVAC Bypass Control Panel's menu structure illustrated on the following page.



Bypass Control Panel's Menu Structure

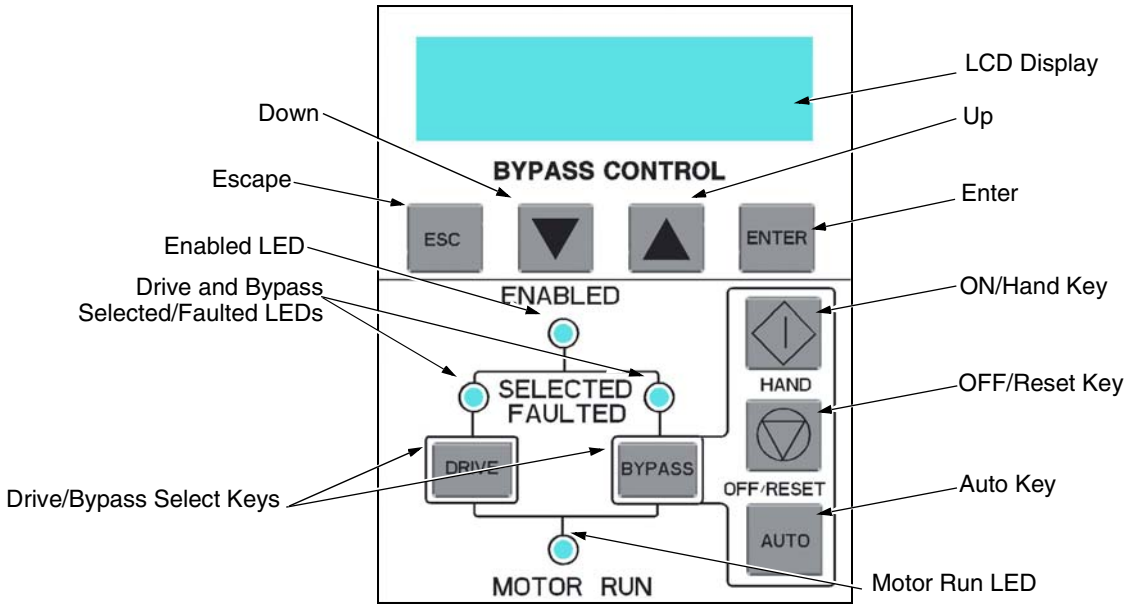
Start-up

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**.		*1601 START/STOP 1613 BP DISABLE
5	Press the **Up/Down** arrows to change the **Parameter Value**.		1601 START/STOP [1:DI1]
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	DRIVE SELECTED BYPASS IN OFF

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**.		STARTUP PARAMS *PARAMETER LIST
4	Select the appropriate **Parameter Group** with the **Up/Down** arrows and press **ENTER**.		14 RELAY OUT *16 SYSTEM CTRL
5	Select the appropriate **Parameter** in a group with the **Up/Down** arrows and press **ENTER**.		*1601 START/STOP 1602 RUN ENABLE
6	Press the **Up/Down** arrows to change the **Parameter Value**.		1601 START/STOP [1:DI1]
7	Press **ENTER** to store the modified value or press **ESC** to leave the **Parameter Edit** mode.	ENTER or ESC	*1601 START/STOP 1602 RUN ENABLE
8	Press **ESC** to return to the listing of **Parameter Groups**, and again to return to the **Main Menu**.	ESC ESC	*16 SYSTEM CTRL 17 OVERRIDE
9	Press **ESC** to return to the **Default Display** from the **Main Menu.**	ESC	DRIVE SELECTED BYPASS IN OFF

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.

Bypass functions overview

Operating modes

Note: For normal operation with the bypass, place the drive control panel in the Auto mode.

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 serial 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 (run and start enables) as Drive mode. When the Reverse Drive input contact is closed with the drive running, the drive 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 *2-68* 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 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 serial 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.

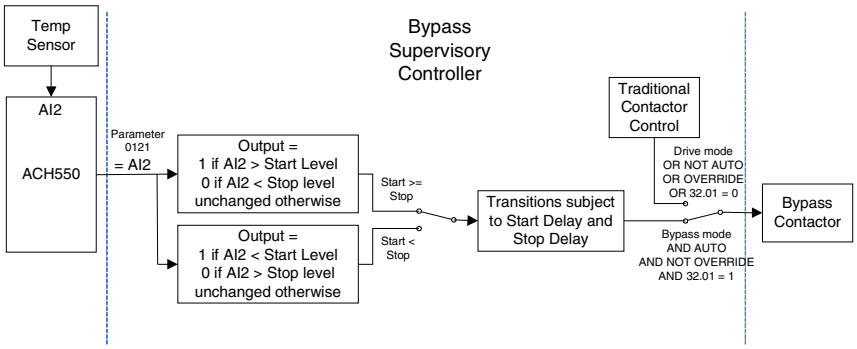
Smoke Control Mode

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 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. 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. The system will ignore low priority safeties such as 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 *2-54* for suggested wiring of typical customer inputs. One diagram is to be used for supply side fans and the other diagram is used for return / exhaust side fans.

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 Bypass Override (Override 2) input contact is closed, in which case the system switches to Bypass 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 ACH550 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 normally 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.



Bypass Override Mode

In the Bypass Override (Override 2) 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 user can switch to the Bypass Override mode by closing the Bypass Override input contact (DI5 - if programmed). When the Bypass Override input contact is closed, the system is forced to bypass and does not respond to the Drive and Bypass keys. The Motor Run LED flashes green when the system is in override. While in Bypass Override the system responds to bypass overloads and programmed faults. To satisfy the local AHJ (Authority Having Jurisdiction), the system can be custom programmed to acknowledge or disregard certain faults, safeties and enables. The unit is default programmed to ignore all external safeties and run enables. See Group 17 for programmability of the digital input and fault functions. Normally when the Bypass Override input contact is switched from closed to open, the system switches to the Drive mode and can be controlled using the Drive and Bypass keys. 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.

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 Safety Interlock(s) and Run Enable 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 serial 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, Safety Interlock(s) and Run Enable 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 Safety Interlock(s) and Run Enable 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 an alarm 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 *Installation* 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 serial communications to the building automation system.
3. "Comms", in which case the bypass system will react to the defined input function over serial 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 serial 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.

Run Enable (DI2)

The Run Enable 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 *2-37* 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.

Bypass Override (DI5) (Override 2)

The Bypass Override (Override 2) input can be connected to an external contact that is closed to select the Bypass Override mode. See *Bypass Override Mode* on page *2-39* 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* on page *2-38* 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 serial 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 No Fault (7) [BYP NOT FLT]

If configured for *Bypass No Fault,* the relay is energized during normal operation. The *Bypass No 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 Alarm (8) [BYPASS ALRM]

If configured for *Bypass Alarm,* the relay is energized when a bypass alarm is present. The specific nature of the alarm is indicated on the bypass control panel display. The *Bypass Alarm* 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 No Fault (10) [DRV NOT FLT]

If configured for *Drive No Fault*, the relay is energized during normal operation. The *Drive No 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 Alarm (11) [DRIVE ALARM]

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

Override (12) [OVERRIDE]

If configured for *Override*, the relay is energized when Smoke Control Override or Bypass 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 serial communications connection. The relay is de-energized when the appropriate OFF command is provided over the serial communications connection.

System Alarm (17) [SYS ALARM]

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

Bypass Fault/Alarm (18) [BYP FLT/ALM]

If configured for *Bypass Fault/Alarm*, the relay is energized when either a bypass fault has occurred, the bypass motor overload/underload protection has tripped or when a bypass alarm condition is present. The *Bypass Fault/Alarm* 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/Alarm (24) [SYS FLT/ALM]

If configured for *System Fault/Alarm,* 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 alarm condition is present. The *System Fault/Alarm* 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.

Systen 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.

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 CO_2 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. For an air conditioning application, if ambient conditions are hotter than normal when Learn Mode is activated; the calculations may estimate more energy savings than actual. Conversely, if Learn Mode is activated when ambient conditions are colder than normal; the calculations may estimate less energy savings than actual. 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 CO_2 Saved calculation is a constant (0.5 tons per megawatt-hour) times the energy saved. The CO_2 Saved estimate is displayed in tons of CO_2 (tn) in Parameter 0116 (CO_2 SAVED). Since the application uses less energy in drive mode, less CO_2 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
- **Drive** parameter 0115 (KWH COUNTER) is reset
- **Bypass** parameter 0114 (KWH SAVED) is reset

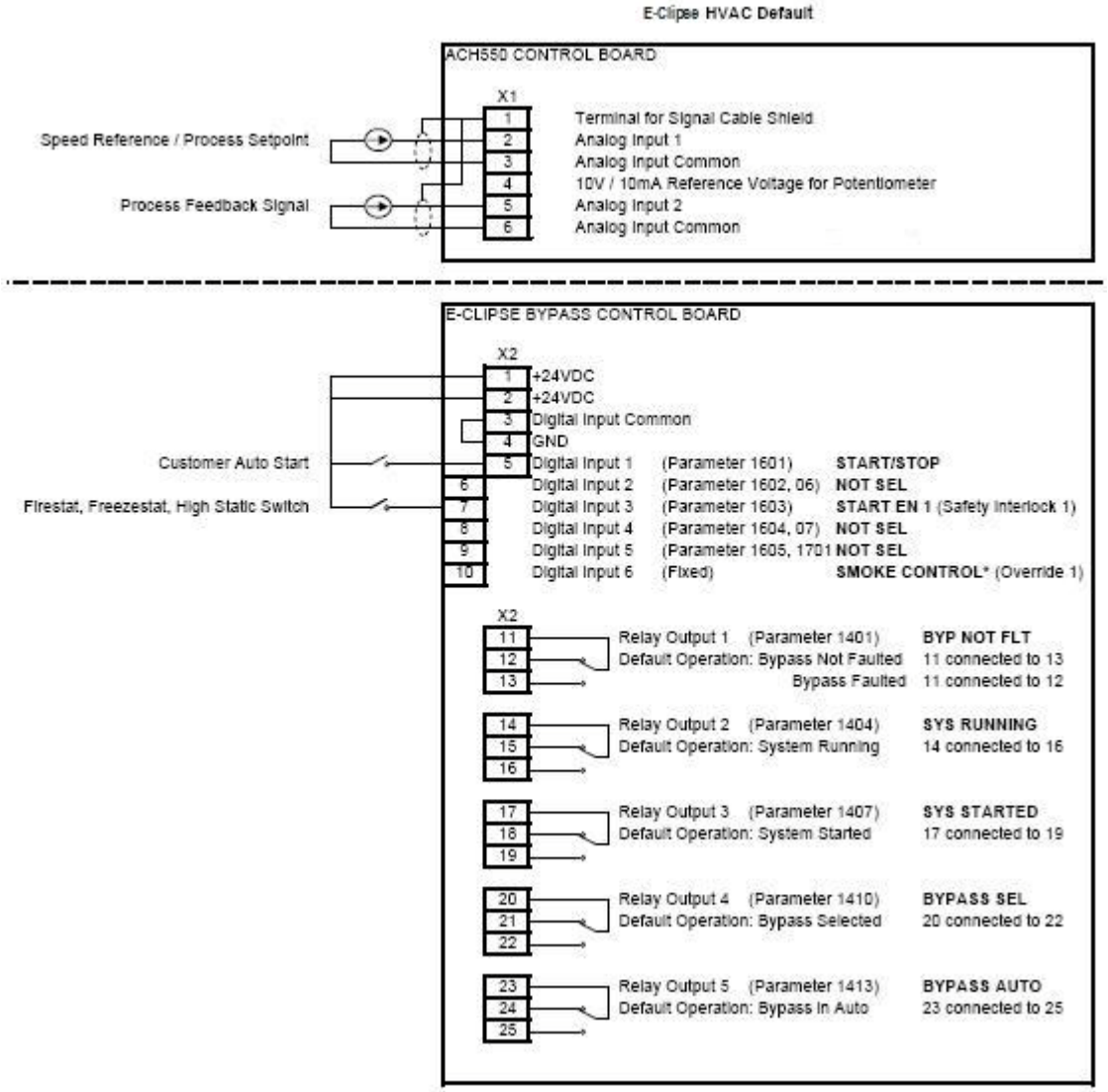
Application macros

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 ENABLES) and a run permissive (RUN ENABLE) along with override and automatic transfer capabilities provide unparalleled integration into real world HVAC applications and building automation systems.

E-Clipse HVAC Default macro

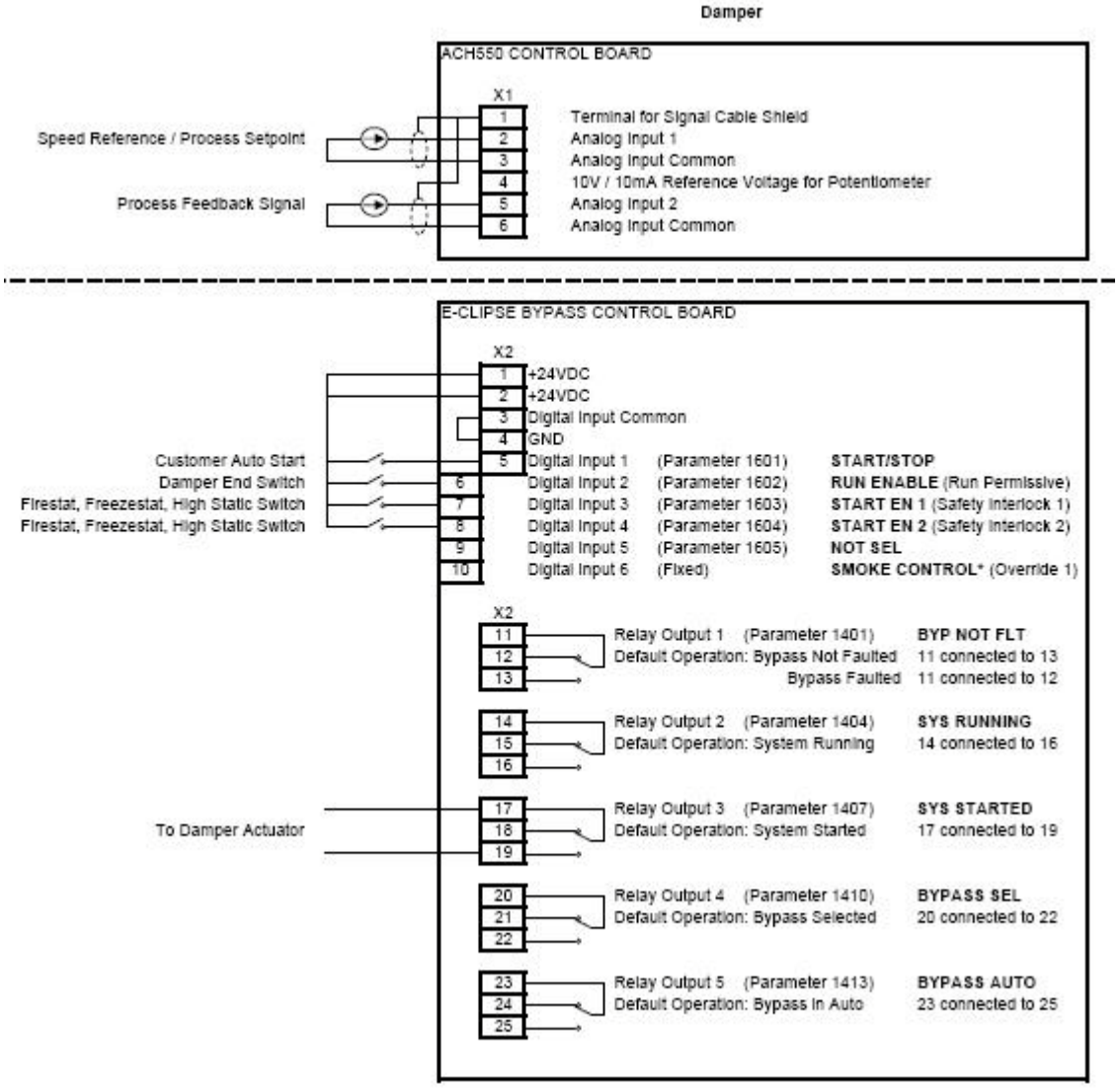


Parameters Changed Relative to E-Clipse HVAC Default

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

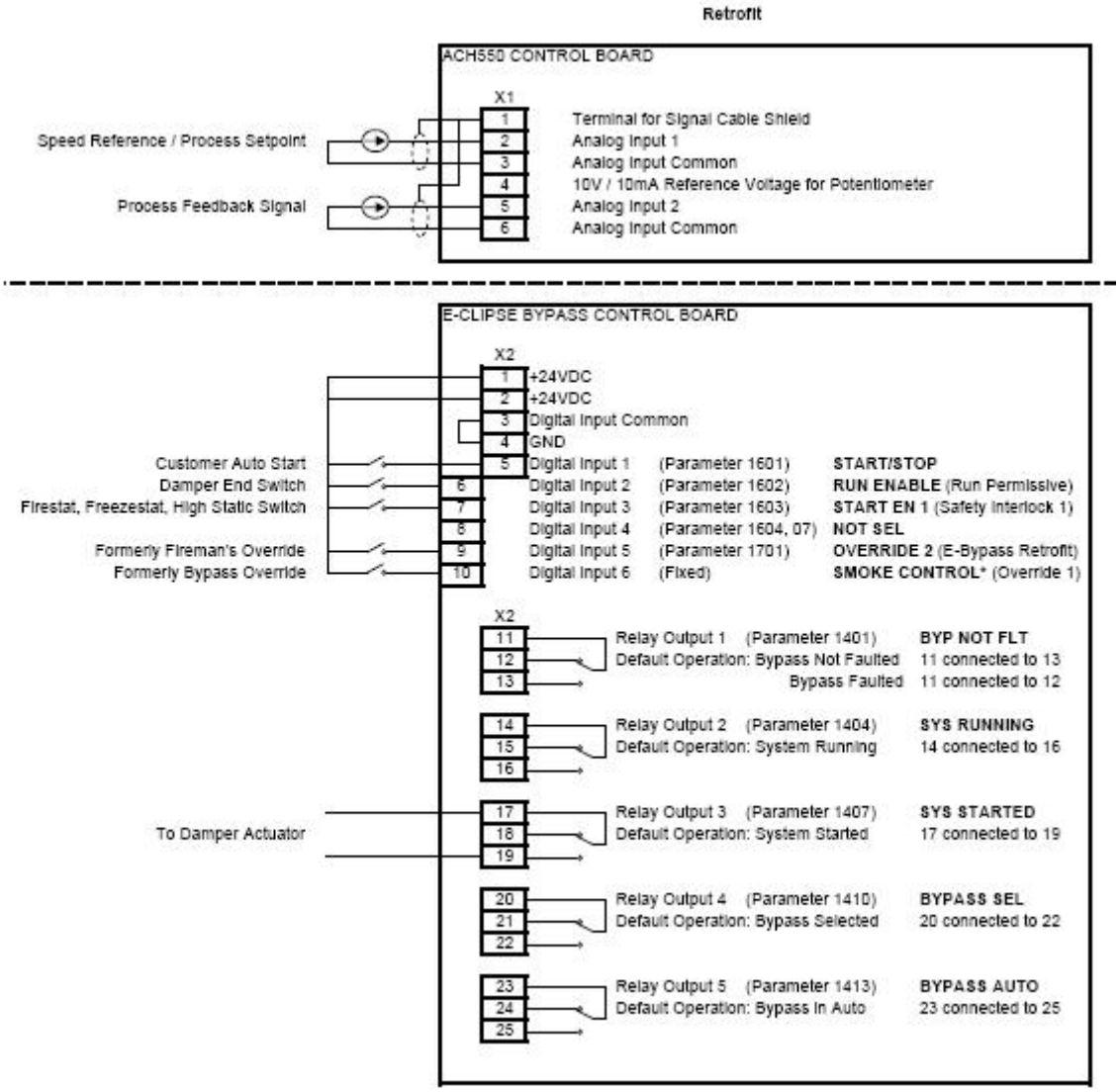


Parameters Changed Relative to HVAC Default

Parameter Number	Description	Setting
1602	Damper End Switch **RUN ENABLE** (Run Permissive)	DI2
1604	Firestat, Freezestat, High Static Switch **START EN 2** (Saftey 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

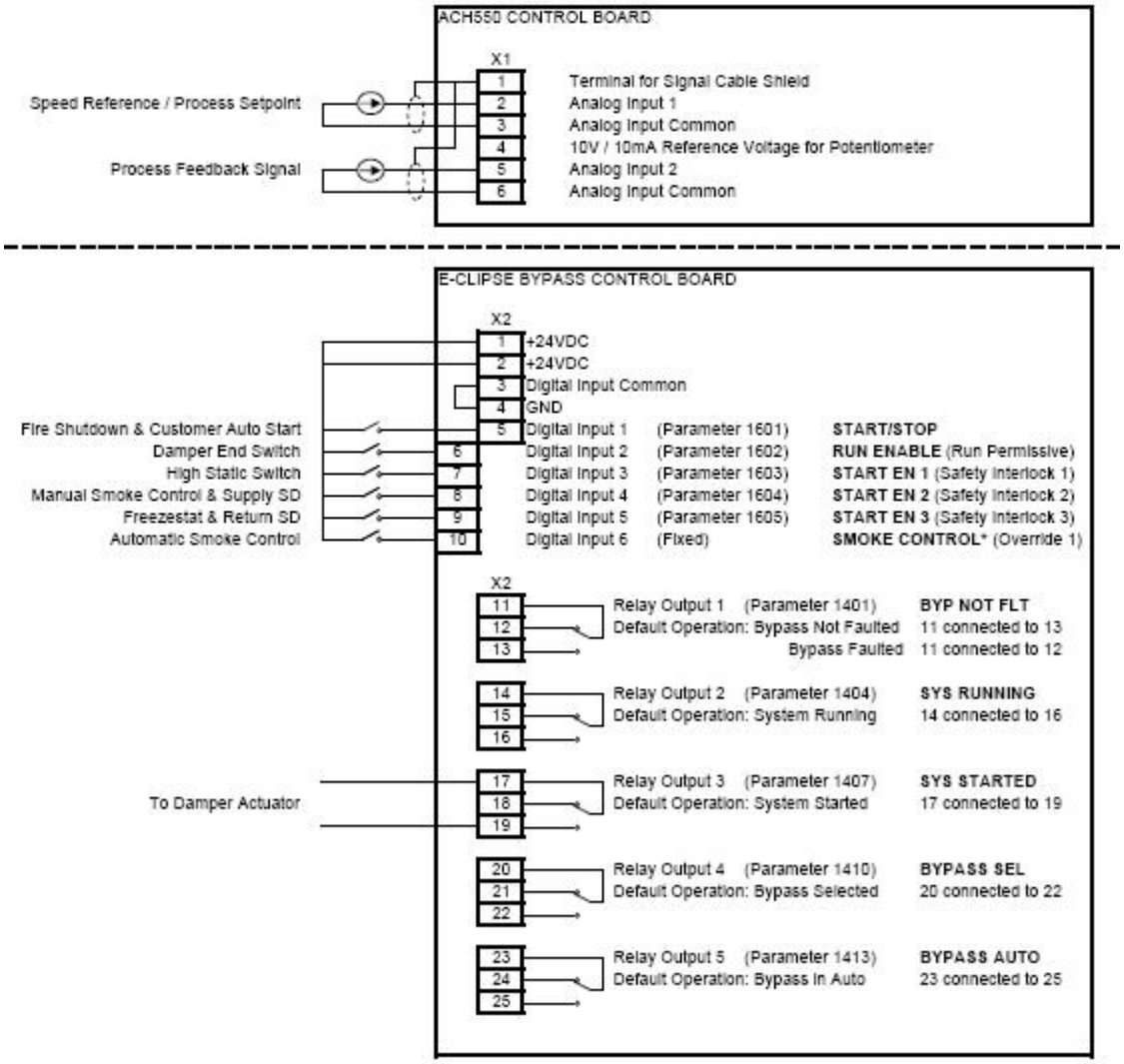


Parameters Changed Relative to HVAC Default

Parameter Number	Description	Setting
1602	Damper End Switch **RUN ENABLE** (Run Permissive)	DI2
1701	Refer to page *2-39* **OVERRIDE 2** (Bypass 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

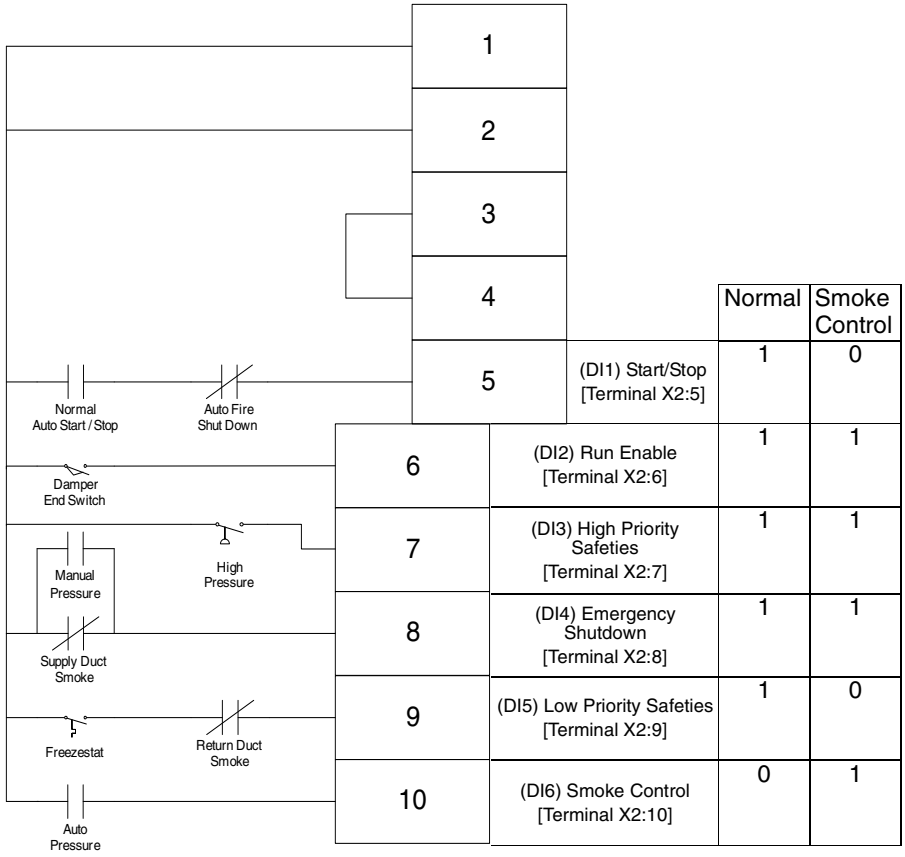


Parameter Number	Description	Setting
1602	Damper End Switch **RUN ENABLE** (Run Permissive)	DI2
1603	High Pressure Switch, High Priority Safties **START EN 1** (Safety Interlock 1)	DI3
1604	Supply Smoke Detector, Emergency Shutdown **START EN 2** (Saftey Interlock 2)	DI4
1605	Freezestat, Low Priority Safties **START EN 3** (Saftey Interlock 2)	DI5

* Smoke Control (Override1) is a fixed input. Closing Digital Input 6 **will** place the E-Clipse Bypass in Automatic Smoke Control mode. Refer to the Smoke Control (Override1) documentation.

Typical wiring diagrams showing a conventional starter wiring and use of the E-Clipse Bypass

Typical system wiring with use of E-Clipse Bypass:



Normal Operation:

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

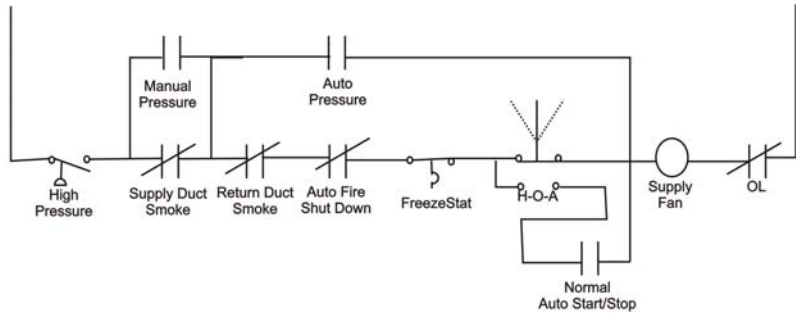
Emergency Shutdown:

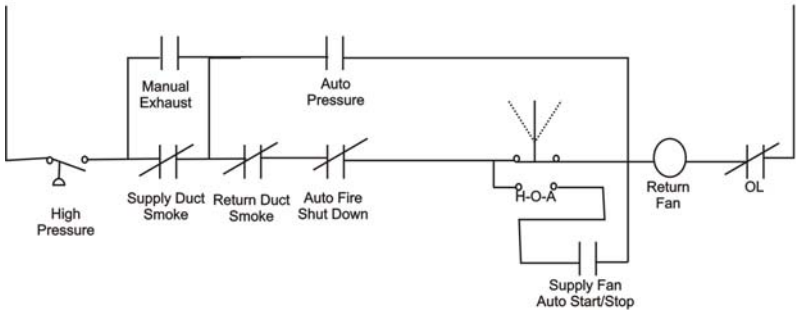
- Open auto fire shutdown, unit stops

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

Typical starter wiring for a smoke control listed system today:

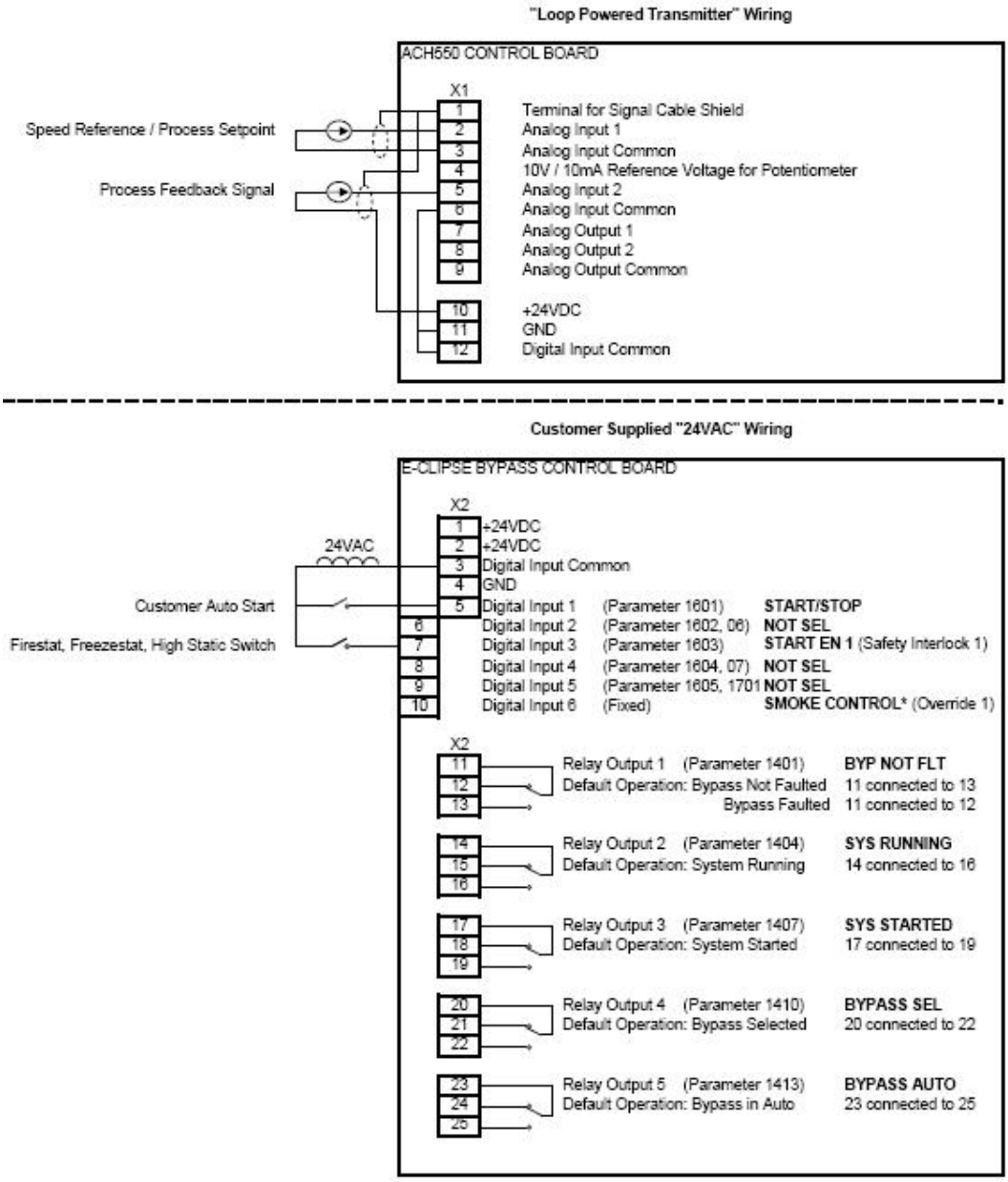




Notes:

1. Pressure cutouts, duct smoke detectors and auto shutdown are 2-pole.
2. Manual control also activates "auto control" relays.

Alternate wiring options



Parameters Changed Relative to E-Clipse HVAC Default

Parameter Number	Description	Setting

* Smoke Control (Override 1) 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 (Override 1) documentation.

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 ºC		—	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 x [parameter 0017 + parameter 0018])/256
0118	KWH SAVE H	1	0 - 65535	0	Calculated drive savings (kWh) = (65536 x [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 = Bypass override 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 = Alarm 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 12: 1 = Drive 1st start fault b13: 1 = coil power supply fault b14: not used b15: 1 = Earth fault	0	Bypass fault status, word 1

Group 03: Status					
Code	**Name**	**Resolution**	**Range**	**Default**	**Description**
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
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	ALR 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 = Run Enable 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 alarm status, word 1

Group 03: Status					
Code	**Name**	**Resolution**	**Range**	**Default**	**Description**
0309	ALR WORD 2	—	b0: not used b1: not used b2: Override 1 b3: Override 2 b4: 1 = Start Enable 1 b5: 1 = Start Enable 2 b6: 1 = Start Enable 3 b7: 1 = Start Enable 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 alarm 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
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

Group 04: Fault Log					
Code	**Name**	**Resolution**	**Range**	**Default**	**Description**
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 = Run Enable b3: 1 = Start b4: 1 = In Auto Transfer b5: 1 = Bypass Override b6: 1 = Fireman's Override 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

Group 05: Event Log					
Code	**Name**	**Resolution**	**Range**	**Default**	**Description**
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
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 ALRM 9 = DRIVE FAULT 10 = DRV NOT FLT 11 = DRIVE ALARM 12 = OVERRIDE 13 = BYPASS HAND 14 = BYPASS OFF 15 = BYPASS AUTO 16 = COMM CTRL 17 = SYS ALARM 18 = BYP FLT/ALM 19 = BYP OVERLD 20 = BYP UNDERLD 21 = PCB OVERTMP 22 = SYS UNDERLD 23 = SYSTEM FLT 24 = SYS FLT/ALM 25 = SYS EXT CTL 26 = SYS OVERLD 27 = CONTACT FLT 28 = SYS NOT FLT 29 = DRV LNK ERR 30 = EXT COMM LS	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.

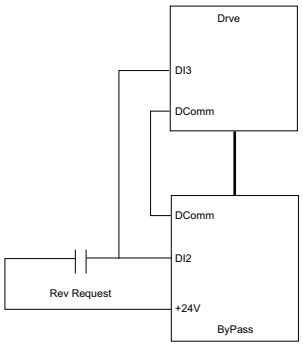
Group 14: Relay Outputs					
Code	**Name**	**Resolution**	**Range**	**Default**	**Description**
1410	RO4 SELECT	1	See RO 1 Select.	BYPASS SEL (4)	
1411	R4 ON DLY	0.1 sec	0-3600.0s	0s	Delay from active state to active output.
1412	R4 OFF DLY	0.1 sec	0-3600.0s	0s	Delay from inactive state to inactive output.
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	RUN ENABLE	1	0 = NOT SEL 1 = DI2 2 = COMM	NOT SEL (0)	Selects source for run enable command.
1603	START EN 1	1	0 = NOT SEL 1 = DI3 2 = COMM	DI 3 (1)	Selects source for start enable 1 command.
1604	START EN 2	1	0 = NOT SEL 1 = DI4 2 = COMM	NOT SEL (0)	Selects source for start enable 2 command.
1605	START EN 3	1	0 = NOT SEL 1 = DI5 2 = COMM	NOT SEL (0)	Selects source for start enable 3 command.
1606	START EN 4	1	0 = NOT SEL 1 = DI2 2 = COMM	NOT SEL (0)	Selects source for start enable 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.

Group 16: System Control					
Code	**Name**	**Resolution**	**Range**	**Default**	**Description**
1615	SAVE PARAM	1	0 = DONE 1 = SAVE	0	Save User Settings (SaveImm + SavePwrd).
1616	DISP ALRMS	1	0 = DISABLE 1 = ENABLE	ENABLE (1)	Enables alarms 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	0	Enter correct password to here in order to change value of the PAR LOCK. Default password value is "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	RUN EN TXT	1	0 = RUN ENABLE 1 = DAMPER END SWTCH 2 = VALVE OPENING 3 = PRE-LUBE CYCLE	RUN ENABLE (0)	Alternative text choices for alarm 4006.
1621	ST EN1 TXT	1	0 = START ENABLE 1 1 = VIBRATION SWITCH 2 = FIRESTAT 3 = FREEZESTAT 4 = OVERPRESSURE 5 = VIBRATION TRIP 6 = SMOKE ALARM 7 = SAFETY OPEN 8 = LOW SUCTION	START ENABLE 1 (0)	Alternative text choices for alarm 4021.
1622	ST EN2 TXT	1	0 = START ENABLE 2 ...	START ENABLE 2 (0)	Alternative text choices for alarm 4022. See parameter 1621 for range.
1623	ST EN3 TXT	1	0 = START ENABLE 3 ...	START ENABLE 3 (0)	Alternative text choices for alarm 4023. See parameter 1621 for range.

Group 16: System Control					
Code	**Name**	**Resolution**	**Range**	**Default**	**Description**
1624	ST EN4 TXT	1	0 = START ENABLE 4 ...	START ENABLE 4 (0)	Alternative text choices for alarm 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.
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

Group 16: System Control					
Code	**Name**	**Resolution**	**Range**	**Default**	**Description**
1630	START REV		0 = NOT SEL 1 = DI2	NOT SEL (0)	 Selects source for drive start reverse command • Reverse request can only be selected for DI2 on the Eclipse • Drive Param 1003 (Direction) needs to be set for REQUEST. • Drive Param 1201 (Const Speed Select) needs to be set for DI3. • Drive Param 1202 (Const Speed 1) needs to be set for reverse speed required. • When Eclipse input DI2 is energized the bypass sets drive reverse run request over comm's. • The same signal input for bypass DI2 goes to Drive DI3 and sets constant speed. • The Reverse request has priority over normal Run input, this means that if both are present the motor will run reverse at constant speed.

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	RUN EN OVR	1	0 = ACKNOWLEDGE 1 = DISREGARD	DISREGARD (1)	Acknowledge or disregard run enable during override 2.
1703	ST EN1 OVR	1	0 = ACKNOWLEDGE 1 = DISREGARD	DISREGARD (1)	Acknowledge or disregard start enable 1 during override 2.
1704	ST EN2 OVR	1	0 = ACKNOWLEDGE 1 = DISREGARD	DISREGARD (1)	Acknowledge or disregard start enable 2 during override 2.
1706	ST EN4 OVR	1	0 = ACKNOWLEDGE 1 = DISREGARD	DISREGARD (1)	Acknowledge or disregard start enable 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 overrode except: 3009, 3021, 3022, 3023, 30234, 3027, 3034, 3101, 3202, 3203, 3204, 3205, 3206

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 3018 in drive which specifies behavior if Modbus link goes down. Difference is that this parameter applies in drive and bypass modes and if drive node or bypass node detects a problem.
3005	COMM TIME	0.1s	0.0 - 600.0s	10.0s	Sets the communication fault time used with COMM LOSS parameter.

Group 30: Fault Function					
Code	**Name**	**Resolution**	**Range**	**Default**	**Description**
3006	PHASE LOSS	1	0 = DISABLE 1 = ENABLE	1	Disable for input phase loss.
3007	PHASE SEQ	1	0 = DISABLE 1 = ENABLE	1	Disable for input phase sequence fault.

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	—		—	
3306	DRIVE TYPE	—		—	Drive Type - copy of drive's parameter 33.04.
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. Tell sorder 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**
5001	BP PROT ID	hex	0x0000 - 0xFFFF	0x0000	Group 50 shall mimic Group 53 except settings shall apply to bypass node.
5002	BP MAC ID	1	0 - 65535	2	Bypass station ID (NODE ADDRESS)
5003	BAUD RATE	0.1 kbit/s	1.2, 2.4, 4.8, 9.6, 19.2, 38.4, 57.6, 76.8	9.6	Read-only copy from Group 53.
5004	EFB PARITY	1	0=8 NONE 1, 1=8 NONE 2, 2=8 EVEN 1, 3=8 ODD 1	0	Read-only copy from Group 53.

Group 50: Bypass EFB					
Code	**Name**	**Resolution**	**Range**	**Default**	**Description**
5005	PROFILE	1	0=ABB DRV LIM, 1=DCU PROFILE, 2=ABB DRV FULL	0	Read-only copy from Group 53.
5006	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.
5007	BP CRC ERR	1	0 - 65535	0	Contains a count of the messages with a CRC error received by the bypass.
5008	UART ERROR	1	0 - 65535	0	Read-only copy from Group 53.
5009	BP 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 staus of the bypass EFB protocol.
5010 ... 5018	BP PAR 10 ... BP PAR 18	1	0 - 65535	0	
5019 ... 5020	BP PAR 19 ... BP PAR 20	hex	0x0000 - 0xFFFF	0x0000	

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 32 = CANOpen 37 = DeviceNet	—	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 53: Drive EFB

Group 53: Drive EFB					
Code	**Name**	**Resolution**	**Range**	**Default**	**Description**
5301	DV PROT ID	hex	0x0000 - 0xFFFF	0x0000	All of drive's Group 53 must be replicated on bypass, since drive is configured for Modbus. All Group 53 functionality associated with selection by 98.02 shall be hosted on bypass controller for drive. Similar parameters shall be allocated for bypass.
5302	DV MAC ID	1	0 - 65535	1	Drive station ID (NODE ADDRESS)
5303	BAUD RATE	0.1 kbit/s	1.2, 2.4, 4.8, 9.6, 19.2, 38.4, 57.6, 76.8	9.6	Defines the communication speed of the RS485 link in kbits per second (kb/s).
5304	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.
5305	PROFILE	1	0=ABB DRV LIM, 1=DCU PROFILE, 2=ABB DRV FULL	—	Selects the communications profile used by the EFB protocol.
5306	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.
5307	DV CRC ERR	1	0 - 65535	0	Contains a count of the messages with a CRC error received by the drive.
5308	UART ERROR	1	0 - 65535	0	Contains a count of the messages with a character error received by the drive.
5309	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.
5310 ... 5318	DV PAR 10 ... DV PAR 18	1	0 - 65535	0	
5319 ... 5320	DV PAR 19 ... DV PAR 20	hex	0x0000 - 0xFFFF	0x0000	

Group 54: FBA Data In

Group 54: FBA Data In					
Code	**Name**	**Resolution**	**Range**	**Default**	**Description**
5401 ... 5410	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) 10001 - 19999 = Bypass parameter index +10000	—	Figure module support. Specifies addresses of parameters to be read from the drive (IN to network). Only for modules that support the cyclic low scanner function.

Group 55: FBA Data Out

Group 55: FBA Data Out					
Code	**Name**	**Resolution**	**Range**	**Default**	**Description**
5501 ... 5510	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) 10001 - 19999 = Bypass parameter index +10000	—	Figure module support. Specifies addresses of parameters to be read from the drive (OUT to network). Only for modules that support the cyclic low scanner function.

Group 98: Options

Group 98: Options					
Code	**Name**	**Resolution**	**Range**	**Default**	**Description**
9802	COMM PROT	1	0=NOT SEL 1=STD MODBUS 2=N2 3=FLN 4=EXT FBA 5=BACNET	0	This parameter functions in place of drive parameter 98.02 which must be set to Modbus in E-Clipse Bypass system. User fieldbus is set at E-Clipse panel.

Group 99: Startup Data

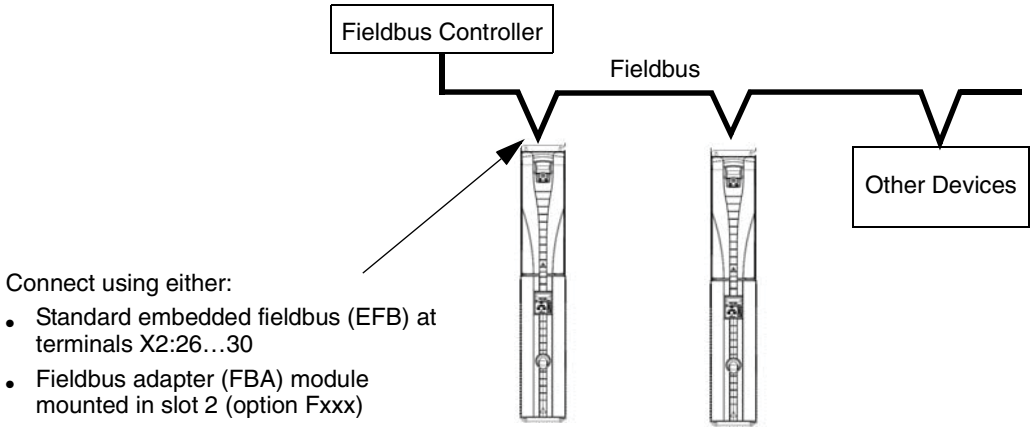
Group 99: Startup Data					
Code	**Name**	**Resolution**	**Range**	**Default**	**Description**
9902	B.P. MACRO	1	1 = HVAC DEFAULT 2 = DAMPER 3 = RETROFIT 4 = SMOKE CONTROL	1	Select bypass macro. Predifined set of parameter values for certain application is loaded in use.

Embedded fieldbus

Overview

The ABB E-Clipse bypass can be set up to accept control for the ACH550 drive and/or the E-Clipse Bypass from an external system using standard serial communication protocols. When using serial 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 serial 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
  - APOGEE® FLN
  - BACnet® MS/TP EIA 485
- Fieldbus adapter (FBA) – See *Fieldbus adapter* on page *2-195*.

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 ACH550 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 *BACnet analog value object instance summary – bypass* on page *2-169*
N2	• Binary output objects • Analog output objects • Binary input objects • Analog input objects	*N2 protocol technical data – system* on page *2-105* and *Bypass overview* on page *2-114*
FLN	• Binary output points • Analog output points • Binary input points • Analog input points	*FLN protocol technical data – system* on page *2-120* and *Bypass overview* on page *2-135*
BACnet	• Device management • Binary output objects • Analog output objects • Binary input objects • Analog input objects	*BACnet protocol technical data – system* on page *2-144*

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.

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 to the system (drive only or system)?
- What feedback information must be sent from the bypass system to the controlling system?

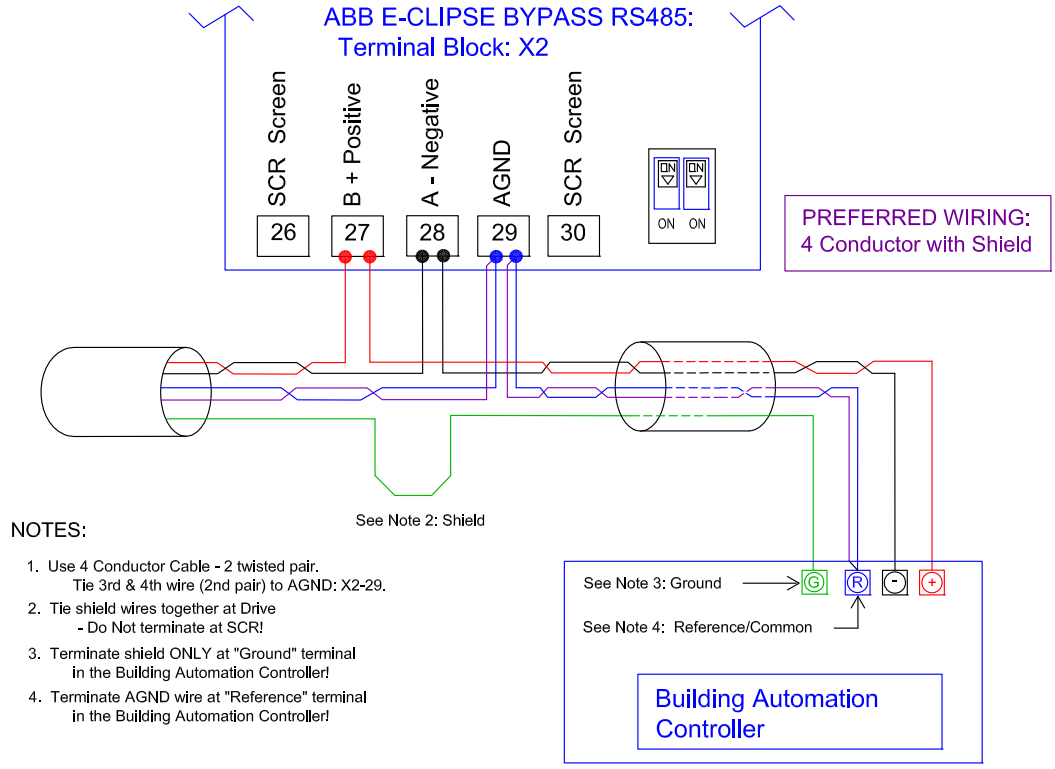
Mechanical and electrical installation – EFB

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. See following diagram and table (on next page).

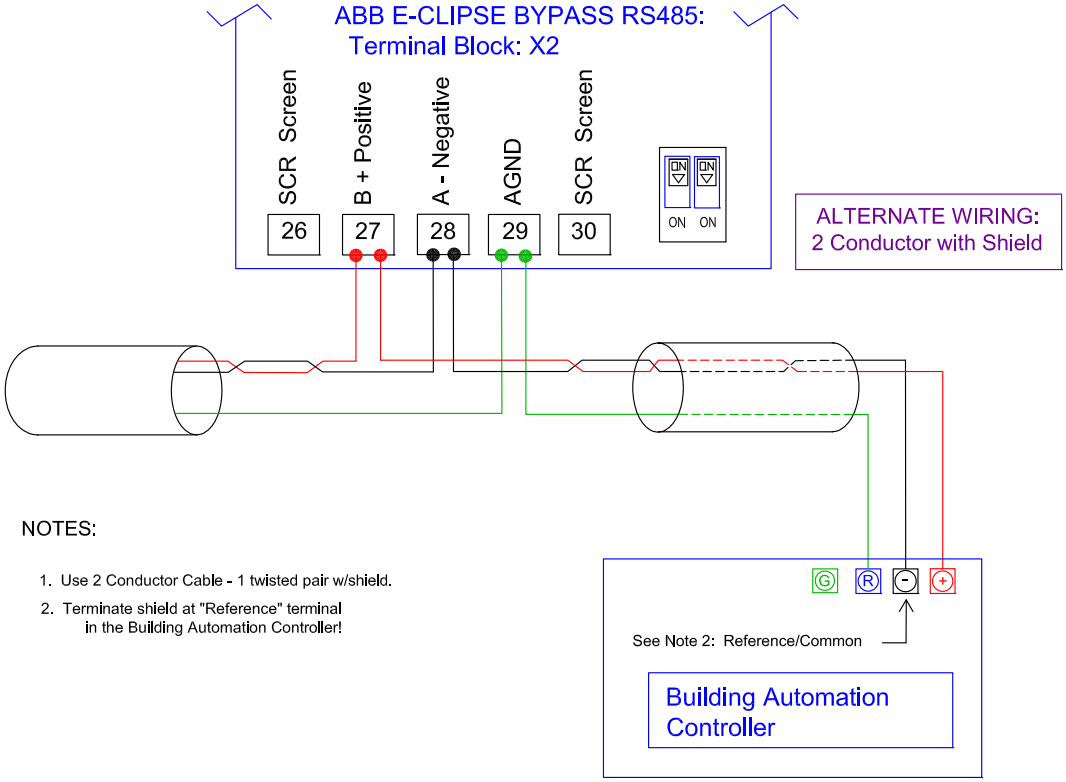
Preferred wiring diagram



NOTES:

1. Use 4 Conductor Cable - 2 twisted pair.
   Tie 3rd & 4th wire (2nd pair) to AGND: X2-29.
2. Tie shield wires together at Drive
   - Do Not terminate at SCR!
3. Terminate shield ONLY at "Ground" terminal
   in the Building Automation Controller!
4. Terminate AGND wire at "Reference" terminal
   in the Building Automation Controller!

Alternate wiring diagram



NOTES:

1. Use 2 Conductor Cable - 1 twisted pair w/shield.
2. Terminate shield at "Reference" terminal
   in the Building Automation Controller!

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 is illustrated in Figure 1.

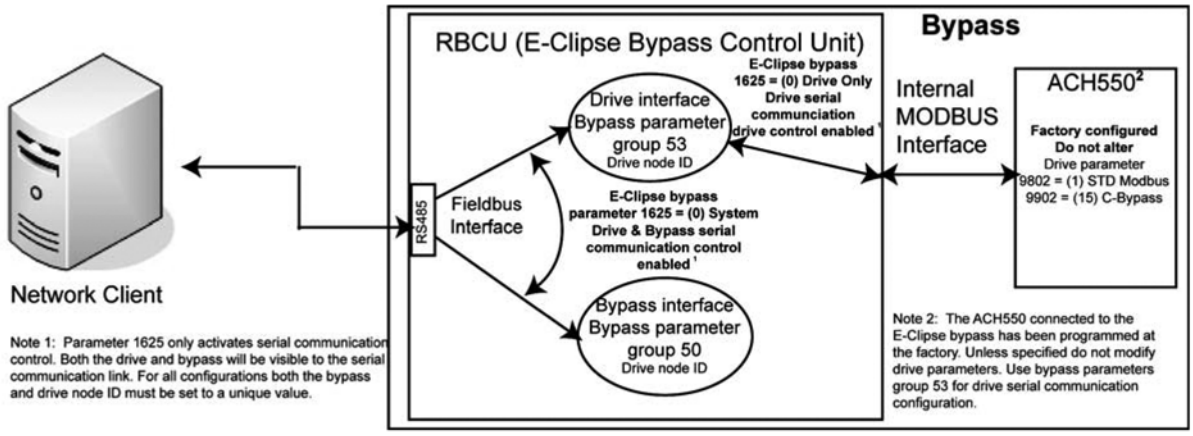


Figure 1 - Communications physical and logical connections

Setup of the drive logical connection is done in parameter Group 53 on the bypass keypad. This group contains, among other things, the Drive MAC ID. Group 53 on the drive must not be modified from the settings defined by the drive application macro, 15 (Eclipse Bypass) since this will render the Internal MODBUS Interface inoperable. Also, drive parameter 98.02, Protocol Sel must not be changed since this will also render the Internal MODBUS Interface inoperable.

Selection of the EFB protocol is done in bypass parameter 98.02. Setup of the bypass logical connection is done in parameter Group 50 on the bypass keypad. Certain parameters that control the network link are duplicated in Group 50 and Group 53 (e.g. BAUD RATE) and are presented as read only in Group 50.

The user can use bypass parameter 16.25, COMM CTRL to determine if control signals (start and enables) go to the drive or to the system. Parameter 16.25 = 0 (DRIVE ONLY) is intended for legacy applications where the network was only able to control the drive. Parameter 16.25 = 1 (SYSTEM) provides new functionality where control signals control both the drive and bypass depending on the the drive/ bypass mode selected on the bypass keypad. In both cases, non-control related points are visible on the bypass.

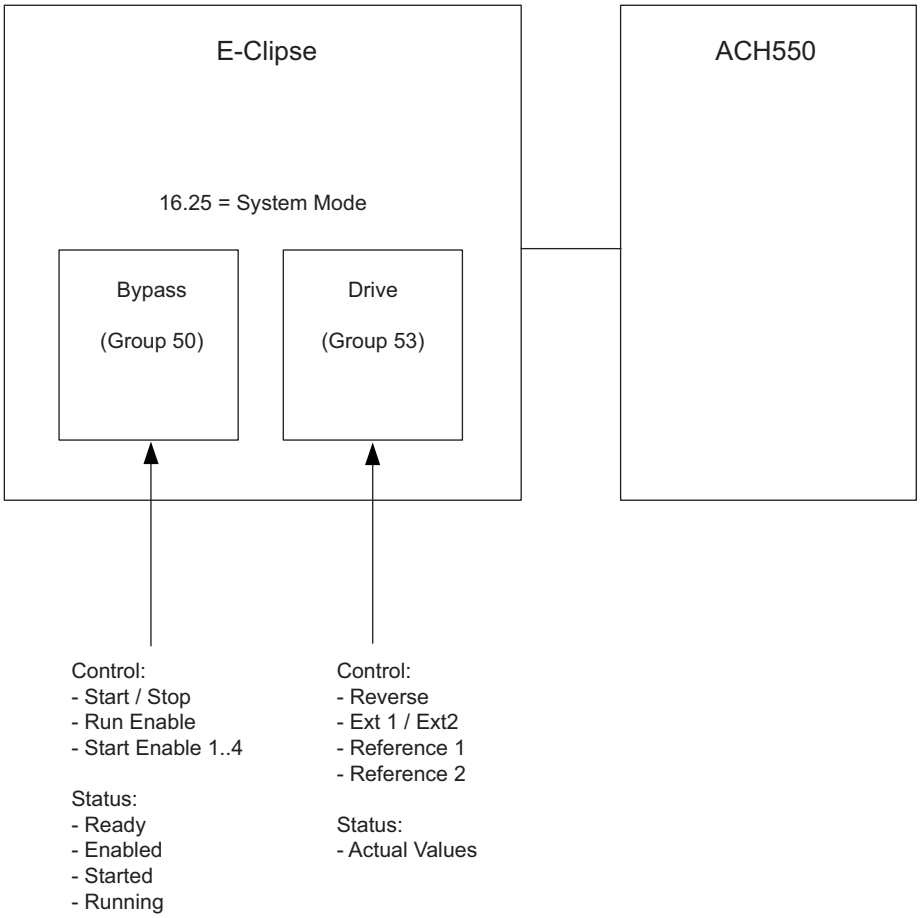


Figure 2 - System mode diagram

Serial communication selection

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

- 1 (STD MODBUS).
- 2 (N2)
- 3 (FLN)
- 4 (EXT FBA) - See *Fieldbus adapter* on page *2-195*
- 5 (BACNET)

Note: From the bypass keypad, settings in Group 53 are used for the fieldbus communications to the drive. From the bypass keypad, settings in Group 50 are used for the fieldbus communications to the bypass. When using serial communication diagnostics, refer to the appropriate OK message counter and error message counter for the drive (Group 53 on the bypass keypad) and for the bypass (Group 50 on the bypass keypad).

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**	**FLN**	**BACnet**
1625	COMM CONTROL	1625 = 0 (Drive Only) for control signals (Start/Stop & 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)			
5301	DV PROTOCOL 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.			
5302	DV 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. 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
5303	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 Do not edit for N2		Default: 4.8 Do not edit	Default: 38400

Bypass Parameter	Description	EFB Protocol Reference			
		Modbus	N2	FLN	BACnet
5304	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 = 8N1 – 8 data bits, No parity, one stop bit. 1 = 8N2 – 8 data bits, No parity, two stop bits. 2 = 8E1 – 8 data bits, Even parity, one stop bit. 3 = 8O1 – 8 data bits, Odd parity, one stop bit.	Default: 1	Default: 0		
5305	EFB CTRL 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 ACH400/550. 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 ACS600/800.	Default: 0	Default: 0		
5310	DV PAR10 Sets the response turnaround time in milliseconds.	Not used for Comm setup.	When this protocol is selected, the default value is:		
			3 ms	0 ms	5 ms

Bypass Parameter	Description	EFB Protocol Reference			
		Modbus	N2	FLN	BACnet
5311	DV PAR11	Not used for Comm setup.			This parameter, together with parameter 5317, DV PAR 17, sets BACnet Device Object Instance IDs: • For the range 1 to 65,535: This parameter sets the ID directly (5317 must be 0). For example, the following values set the ID to 49134: 5311 = 49134 and 5317 = 0. • For IDs > 65,335: The ID equals 5311's value plus 10,000 times 5317's value. For example, the following values set the ID to 71234: 5311 = 1234 and 5317 = 7.
5314...5315	DV PAR14...DV PAR15	Not used for Comm setup.			Not Used
5316	DV PAR16				This parameter indicates the count of MS/TP tokens passed to this unit.
5317	DV PAR17	0			This parameter works with parameter 5311 to set BACnet instance IDs. See parameter 5311.

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 (5302) 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	FLN	BACnet
5001	BP PROTOCOL 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.			

Bypass Parameter	Description	EFB Protocol Reference			
		Modbus	N2	FLN	BACnet
5002	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** 5002 must first be set to 0 before selecting a new address. Leaving 5002 = 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: 129
5003	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	(Read Only Copy, edit in 5303)			
5004	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 = 8N1 – 8 data bits, No parity, one stop bit. 1 = 8N2 – 8 data bits, No parity, two stop bits. 2 = 8E1 – 8 data bits, Even parity, one stop bit. 3 = 8O1 – 8 data bits, Odd parity, one stop bit.	(Read Only Copy, edit in 5304)			

Bypass Parameter	Description	EFB Protocol Reference			
		Modbus	N2	FLN	BACnet
5005	EFB CTRL 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 ACH400/550. 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 ACS600/800.	(Read Only Copy, edit in 5305)			
5010	BP PAR10 Sets the response turnaround time in milliseconds.	(Read Only Copy, edit in 5310)			
5011	BP PAR11	Not used for Comm setup.			This parameter, together with parameter 5017, BP PAR 17, sets BACnet Device Object Instance IDs: • For the range 1 to 65,535: This parameter sets the ID directly (5017 must be 0). For example, the following values set the ID to 49134: 5011 = 49134 and 5017 = 0. • For IDs > 65,335: The ID equals 5011's value plus 10,000 times 5017's value. For example, the following values set the ID to 71234: 5011 = 1234 and 5017 = 7.

Bypass Parameter	Description	EFB Protocol Reference			
		Modbus	N2	FLN	BACnet
5014	BP PAR14	Not used for Comm setup.			Not Used
5016	BP PAR16				This parameter indicates the count of MS/TP tokens passed to the unit.
5017	BP PAR17				This parameter works with parameter 5011 to set BACnet instance IDs. See parameter 5011.

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 *2-96*.

Bypass Parameter		Value	Description	Protocol Reference				
				Modbus[1]		N2	FLN	BACnet
				ABB DRV	DCU PROFILE			
1601	START/ STOP	2 (COMM)	Start/Stop by fieldbus with Ext1 or Ext2 selected.	40001 bits 0…3	40031 bits 0, 1	BO1	24	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 5305 = 0 (ABB DRV LIM) or 5305 = 2 (ABB DRV FULL). The other column refers to the DCU profile selected when parameter 5305 = 1 (DCU PROFILE). See *ABB control profiles technical data – drive* section on page *2-178*.

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.)

Drive Parameter		Value	Setting	Protocol Reference				
				Modbus		N2	FLN	BACnet
				ABB DRV	DCU PROFILE			
1102	EXT1/EXT2 SEL	8 (COMM)	Reference set selection by fieldbus.	40001 bit 11	40031 bit 5	BO5	26	BV13
1103	REF1 SEL	8 (COMM)	Input reference 1 by fieldbus.	40002		AO1	60	AV16
1106	REF2 SEL	8 (COMM)	Input reference 2 by fieldbus.	40003		AO2	61	AV17

Reference scaling

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

- Modbus Register *40002* in the *Modbus protocol technical data – system* section.
- *N2 analog output objects – drive* in the *N2 protocol technical data – system* section.
- The slope of points 60 and 61 in the *FLN protocol technical data – system* section.

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	FLN	BACnet
				ABB DRV	DCU PROFILE			
1401	RELAY OUTPUT 1	35 (COMM)	Relay Output 1 controlled by fieldbus.	40134 bit 0 or 00033		BO7	40	BO0
1402	RELAY OUTPUT 2	35 (COMM)	Relay Output 2 controlled by fieldbus.	40134 bit 1 or 00034		BO8	41	BO1
1403	RELAY OUTPUT 3	35 (COMM)	Relay Output 3 controlled by fieldbus.	40134 bit 2 or 00035		BO9	42	BO2
1410[1]	RELAY OUTPUT 4	35 (COMM)	Relay Output 4 controlled by fieldbus.	40134 bit 3 or 00036		BO10	43	BO3
1411[1]	RELAY OUTPUT 5	35 (COMM)	Relay Output 5 controlled by fieldbus.	40134 bit 4 or 00037		BO11	44	BO4
1412[1]	RELAY OUTPUT 6	35 (COMM)	Relay Output 6 controlled by fieldbus.	40134 bit 5 or 00038		BO12	45	BO5

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

For example: To control relays 1 and 2 using serial communication:
Set parameters 1401 RELAY OUTPUT 1 and 1402 RELAY OUTPUT 1 = 35 (COMM).

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	FLN	BACnet
				ABB DRV	DCU PROFILE			
0122	RO 1-3 STATUS	Relay 1…3 status.	N/A	40122 or 00033...35		BI4… BI6	76… 78	BI0… BI2
0123	RO 4-6 STATUS	Relay 4…6 status.	N/A	40123 or 00036...38		BI7… BI9	79… 81	BI3… BI5

Analog output control

Using the fieldbus for analog output control requires:

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

Drive Parameter		Value	Setting	Protocol Reference				
				Modbus		N2	FLN	BACnet
				ABB DRV	DCU PROFILE			
1501	AO1 CONTENT SEL	135 (COMM VALUE 1)	Analog Output 1 controlled by writing to parameter 0135.	–		–	–	–
0135	COMM VALUE 1	–		40135		AO14	46	AO0
1507	AO2 CONTENT SEL	136 (COMM VALUE 2)	Analog Output 2 controlled by writing to parameter 0136.	–		–	–	–
0136	COMM VALUE 2	–		40136		AO15	47	AO1

PID control setpoint source

Use the following settings to select the fieldbus as the setpoint source for PID loops:

Drive Parameter		Value	Setting	Protocol Reference				
				Modbus		N2	FLN	BACnet
				ABB DRV	DCU PROFILE			
4010	SET POINT SEL (Set 1)	8 (COMM VALUE 1) 9 (COMM + AI1) 10 (COMM*AI1)	Setpoint is either: • Input Reference 2 (+/-/* AI1). Control requires parameter 1106 value = comm. • Process PID setpoint. Control requires parameter 1106 value = pid1 out and parameter 4010 value = comm.	40003		AO2	61	AV17
4110	SET POINT SEL (Set 2)							
4210	SET POINT SEL (Ext/ Trim)							

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 *2-105*.

Drive Parameter		Protocol Reference			
		Modbus	N2	FLN	BACnet
0102	SPEED	40102	AI3	5	AV0
0103	FREQ OUTPUT	40103	AI1	2	AV1
0104	CURRENT	40104	AI4	6	AV4
0105	TORQUE	40105	AI5	7	AV5
0106	POWER	40106	AI6	8	AV6
0107	DC BUS VOLT	40107	AI11	13	AV2
0109	OUTPUT VOLTAGE	40109	AI12	14	AV3
0115	KWH COUNTER	40115	AI8	10	AV8
0118	DI1-3 STATUS – bit 1 (DI3)	40118	BI12	72	BI6
0122	RO1-3 STATUS	40122	BI4, BI5, BI6	76, 77, 78	BI0
0301	FB STATUS WORD – bit 0 (STOP)	40301 bit 0	BI1	23	BV0
0301	FB STATUS WORD – bit 2 (REV)	40301 bit 2	BI2	21	BV1

Note: With Modbus, any parameter can be accessed using the format: 4 followed by the parameter number.

Mailbox read/write

The ACH550 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	FLN	BACnet
Mailbox Parameter	Enter the number of the drive parameter to access.	Does not apply.	AO19	95	AV25
Mailbox Data	Contains the parameter value after a read, or enter the desired parameter value for a write.		AO20	96	AV26
Mailbox Read	A binary value triggers a read – the value of the "Mailbox Parameter" appears in "Mailbox data".		BO19	97	BV15
Mailbox Write	A binary value triggers a write – the drive value for the "Mailbox Parameter" changes to the value in "Mailbox data".		BO20	98	BV16

1. As noted above, Modbus provides direct access to all parameters using the format: 4 followed by the parameter number.

Actual value scaling

The scaling of actual values can be protocol dependent. In general, for Actual Values, scale the feedback integer using the parameter's resolution. (See *Complete parameter descriptions* section in ACH550-UH User's Manual for parameter resolutions.) For example:

Feedback Integer	Parameter Resolution	(Feedback Integer) * (Parameter Resolution) = Scaled Value
1	0.1 mA	1 * 0.1 mA = 0.1 mA
10	0.1%	10 * 0.1% = 1%

Where parameters are in percent, the *Complete parameter descriptions* section specifies what parameter corresponds to 100%. In such cases, to convert from percent to engineering units, multiply by the value of the parameter that defines 100% and divide by 100%. For example:

Feedback Integer	Parameter Resolution	Value of the Parameter that defines 100%	(Feedback Integer) * (Parameter Resolution) * (Value of 100% Ref.) / 100% = Scaled Value
10	0.1%	1500 rpm[1]	10 * 0.1% * 1500 RPM / 100% = 15 rpm
100	0.1%	500 Hz[2]	100 * 0.1% * 500 Hz / 100% = 50 Hz

1. Assuming, for the sake of this example, that the Actual Value uses parameter 9908 MOT NOM SPEED as the 100% reference, and that 9908 = 1500 rpm.
2. Assuming, for the sake of this example, that the Actual Value uses parameter 9907 MOT NOM FREQ as the 100% reference, and that 9907 = 500 Hz.

Although Actual Value scaling could differ from the above for the N2, FLN, and BACnet protocols, it currently does not. To confirm, see the following sections, as appropriate:

- *N2 analog input objects – drive* in the *N2 protocol technical data – system* section.
- *Scaling drive feedback values* in the *FLN protocol technical data – system* section.

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 *2-89*.

Bypass Parameter		Value	Description	Protocol Reference			
				Modbus	N2	FLN	BACnet
1601	START/STOP	2 (COMM)	Start/Stop by fieldbus with Ext1 or Ext2 selected.	40001 bit 0	BO1	24	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	FLN	BACnet
1602	RUN ENABLE	2 (COMM) (Not Recommended)	Run enable by fieldbus.	40001 bit 2	BO2	35	BV12
1603	START ENABLE 1	2 (COMM) (Not Recommended)	Source for start enable 1 is the fieldbus Command word.	40001 bit 4	BO10	50	BV15
1604	START ENABLE 2	2 (COMM) (Not Recommended)	Source for start enable 2 is the fieldbus Command word.	40001 bit 5	BO11	51	BV16
1605	START ENABLE 3	2 (COMM) (Not Recommended)		40001 bit 6	BO12	52	BV17
1606	START ENABLE 4	2 (COMM) (Not Recommended)		40001 bit 7	BO13	53	BV18
1607	RESET SRC	2 (COMM)	Fault reset by fieldbus	40001 bit 1	BO3	94	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	FLN	BACnet
1401	RELAY OUTPUT 1	16 (COMM CTRL)	Relay Output 1 controlled by fieldbus.	40107 bit 0 or 00033	BO5	40	BO0
1404	RELAY OUTPUT 2	16 (COMM CTRL)	Relay Output 2 controlled by fieldbus.	40107 bit 1 or 00034	BO6	41	BO1
1407	RELAY OUTPUT 3	16 (COMM CTRL)	Relay Output 3 controlled by fieldbus.	40107 bit 2 or 00035	BO7	42	BO2
1410	RELAY OUTPUT 4	16 (COMM CTRL)	Relay Output 4 controlled by fieldbus.	40107 bit 3 or 00036	BO8	43	BO3
1413	RELAY OUTPUT 5	16 (COMM CTRL)	Relay Output 5 controlled by fieldbus.	40107 bit 4 or 00037	BO9	44	BO4

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 configuration as defined below.

Bypass Parameter		Value	Setting	Protocol Reference			
				Modbus	N2	FLN	BACnet
0122	RO 1-3 STATUS	Relay 1…3 status.	N/A	40104 bit 0...2 or 00033...35	BI6… BI8	76… 78	BI0… BI2
0123	RO 4-5 STATUS	Relay 4…5 status.	N/A	40104 bit 3...4 or 00036...37	BI9… B20	79… 80	BI3… BI4

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 it's 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	FLN	BACnet
0101	MOTOR CURR	40101	AI1	6	AV0

Note: With Modbus, any parameter can be accessed using the format: 4 followed by the parameter number.

Type	Name	Description	N2	FLN	BACnet
DI	System Ready	System is ready to accept start command (either mode).	BI1	27	BV7
DI	System Enabled	System is enabled to start motor (either mode).	BI2	34	BV9
DI	System Started	System start enables are made and start command has been received (either mode). Motor runs if run enable is active.	BI3	28	BV1
DI	System Running	Motor is running (either mode).	BI4	23	BV0
DI	Fieldbus Local	System is under fieldbus local control (either mode).	BI5	36	N/A
DI	Bypass Fault	Bypass is faulted.	BI6	93	BV2
DI	Bypass Alarm	Bypass is alarming.	BI7	86	BV5
DI	Comm Control	System is configured for control in the comm channel	BI8	37	N/A
DI	Bypass Override	Bypass override 2 status	BI9	25	BV13
DI	DI1 Status	Bypass digital input 1 status	BI10	70	BI5
DI	DI2 Status	Bypass digital input 2 status	BI11	71	BI6

Type	Name	Description	N2	FLN	BACnet
DI	DI3 Status	Bypass digital input 3 status	BI12	72	BI7
DI	DI4 Status	Bypass digital input 4 status	BI13	73	BI8
DI	DI5 Status	Bypass digital input 5 status	BI14	74	BI9
DI	DI6 Status	Bypass digital input 6 status	BI15	75	BI10
DI	RO1 Status	Bypass relay output 1 status	BI16	76	BI0
DI	RO2 Status	Bypass relay output 2 status	BI17	77	BI1
DI	RO3 Status	Bypass relay output 3 status	BI18	78	BI2
DI	RO4 Status	Bypass relay output 4 status	BI19	79	BI3
DI	RO5 Status	Bypass relay output 5 status	BI20	80	BI4
DI	Bypass Select	1=Bypass mode, 0=Drive mode	BI21	32	BV4
DI	System Underload	Reports system underload status (either mode)	BI22	7	BV8
DI	System Fault	Reports system fault status (either mode)	BI23	93	BV3
DI	Bypass Run	Reports motor running status in bypass mode	BI24	33	BV6

Diagnostics – EFB

Fault queue for drive diagnostics

For general ACH550 diagnostics information, see *Diagnostics* section in the ACH550-UH User's Manual on page *1-281*. For specific ACH550 fault codes, see *Fault listing* on page *1-282*.

Type	Name	Description	Modbus	N2	FLN	BACnet
AI	Last Fault	Reports last drive fault	40401	AI17	90	AV18
AI	Previous Fault	Repots fault previous to last	40402	AI18	91	AV19
AI	Oldest Fault	Reports third-oldest fault	40403	AI19	92	AV20
AI	Alarm Word 1	Reports alarm word 1		N/A	88	N/A
AI	Alarm Word 2	Reports alarm word 2		N/A	89	N/A

Fault queue for bypass diagnostics

For general E-Clipse Bypass diagnostics information, see *Diagnostics* section on page *2-219*. For specific E-Clipse bypass fault codes, see *Fault listing* on page *2-221*.

Type	Name	Description	Modbus	N2	FLN	BACnet
AI	Last Fault	Reports last drive fault	40401	AI17	90	AV18
AI	Alarm Word 1	Reports alarm word 1	40308	AI3	88	AV4
AI	Alarm Word 2	Reports alarm word 2	40309	AI4	89	AV5

Serial communication diagnostics – drive

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 53 EFB Protocol parameters 5306…5309. The *Parameters* section on page *2-57* describes these parameters in detail. Group 53 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, 5306…5309 bypass parameter values act as follows at each bypass:

- 5306 DV OK MESSAGES advances (advances for each application message properly received and addressed to this drive).
- 5307 DV CRC ERRORS does not advance at all (advances when an invalid message CRC is received).
- 5308 UART ERRORS does not advance at all (advances when character format errors are detected, such as parity or framing errors).
- 5309 DV status value varies depending on network traffic.
- BACnet protocol: 5316 EFB PAR 16 (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 (5307 EFB CRC ERRORS and 5308 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 5307 EFB CRC ERRORS or 5308 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 5306 EFB OK MESSAGES does not advance.
- The values of 5307 EFB CRC ERRORS and 5308 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 (5308) 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 53xx and E-Clipse Bypass EFB 50xx. The factory default setting for E-Clipse Bypass EFB parameter 5002 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
5308 (5008) UART ERRORS	Rapidly Increasing Numeric Value [1]	1. Duplicate Addresses	1. Ensure Drive EFB parameters 5302 [also 5311 & 5317 when using BACnet] and Bypass EFB parameters 5002 [also 5011 & 5017 when using BACnet] are unique. 5302 & 5002 must be unique addresses on the **segment**. [5311, 5317 & 5011, 5017 must be unique addresses on the **network** when using BACnet].
		2. Swapped Wires	2. Swap wires B(+) & A(-).
		3. Incorrect Baud Rate	3. Adjust parameter 5303 & Cycle power.
		4. Incorrect Parity	4. Change parity using parameter 5304 & cycle power.
		5. Too many devices on wire	5. Limit to 31 unit loads on 1 segment.
		6. Noise on EIA-485 wire	6. Install EIA-485 (3 conductor shielded) data grade cable communications wire. See drawings on page *1-190*.
		7. Blown EIA-485 transceiver	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 retighten connections. c. Turn bus termination ON. d. Measure impedance between B(+) & A(-) ACH550 164 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
5307 (5007) 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 5308 (5008) 2. Limit to 31 unit loads on 1 segment (ACH550 = 1 unit load) 3. See Corrective Action 6. Parameter Number 5308 (5008)
5309 (5009) DV STATUS	IDLE	1. No network connection 2. Blown EIA-485 transceiver 3. Wrong application number (FLN only)	1. Land communication wires as shown in drawings on page *1-190*. Check Repeater (if installed onsite) 2. See Corrective Action 7. Parameter Number 5308 (5008) 3. Change application number in the Siemens field panel.
5316 (5016) DV PAR 16 (BACnet Only)	Not Increasing Numeric Value	1. Drive device address parameter 5302 is set to 128 or greater. 2. E-Clipse Bypass device address parameter 5002 is set to 128 or greater. 3. Max Masters is set too low on all drives.	1. Change parameter 5302 to a unique value below 128. 2. Change parameter 5002 to a unique value below 128. **Note:** The default value for parameter 5002 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.
5306 (5006) 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 & DOWN arrows simultaneously in edit mode. Save change by pressing ENTER.

N2 protocol technical data – system

System overview

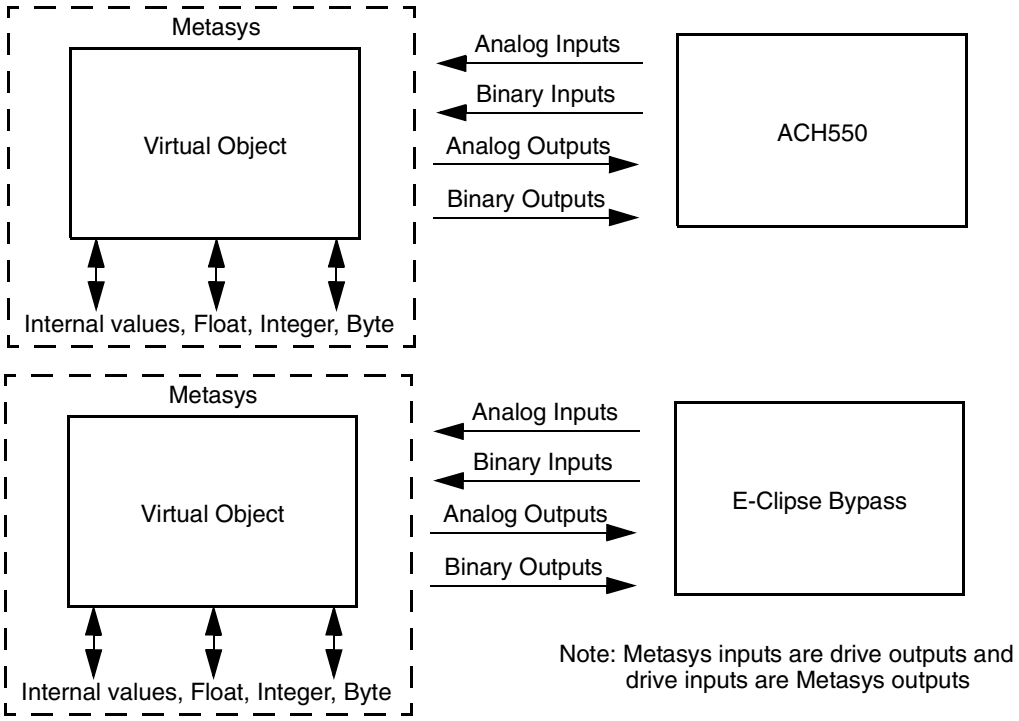
The N2 Fieldbus connection to the system is based on an industry standard RS-485 physical interface. The N2 Fieldbus protocol is a master-slave type, serial communication protocol, used by the Johnson Controls Metasys® system. In the Metasys architecture the N2 Fieldbus connects object interfaces and 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 ACH550 and E-Clipse Bypass may appear as a "virtual object".

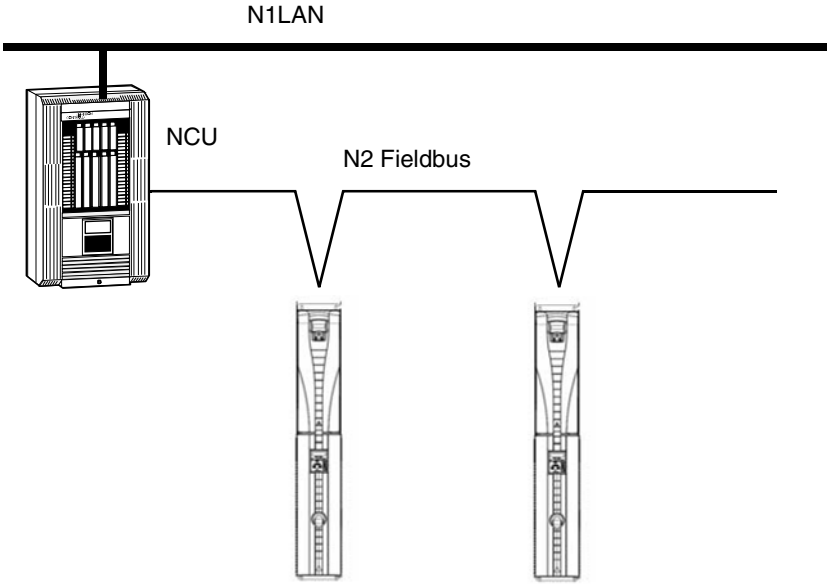


A virtual object is made up of:

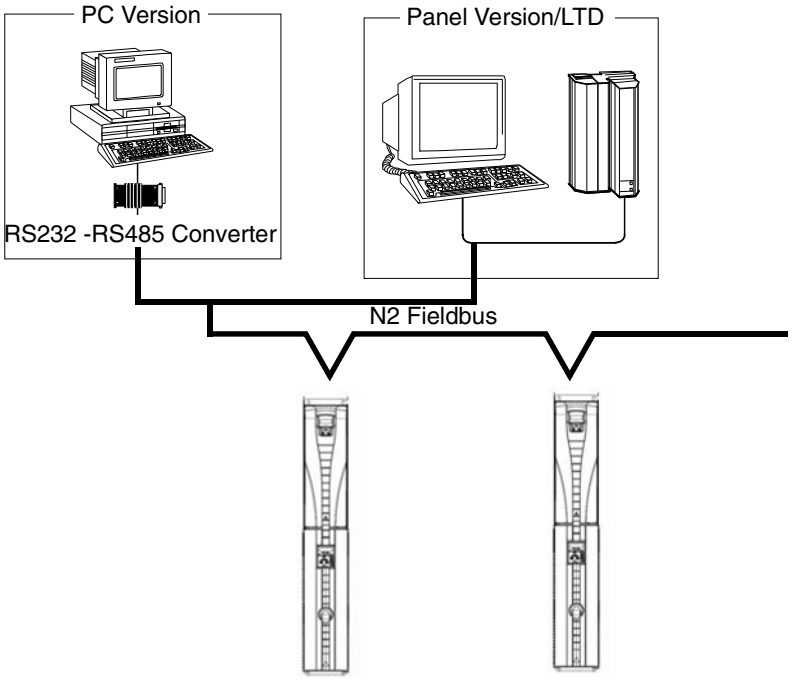
- Analog Inputs
- Binary Inputs
- Analog Outputs
- Binary Outputs
- Internal values for Floating point, Integer, and Byte values.

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, alarm 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 ACH550 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 *2-81*.

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 ENABLE 1	Command Word
B11	START ENABLE 2	Command Word
B12	START ENABLE 3	Command Word
B13	START ENABLE 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 Parmeter
BO1	START/STOP	Command Word
BO2	RUN ENABLE	Command Word
BO3	N2 LOCAL CTL	Command Word

Drive Overview

The ACH550 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 Alarm limit
- Low Warning limit
- High Warning limit
- High Alarm limit
- Differential value for the hysteresis of the Alarms and Warnings

- Change of State (COS) enabled
- Alarm 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 / Alarm state specification
- Alarm 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 ACH550 drive.

N2 Analog Inputs:					
Number	**Object**	**Drive Parameter**	**Scale Factor**	**Units**	**Range**
AI1	OUTPUT FREQUENCY	0103	10	Hz	0…250
AI2	RATED SPEED	Note 1	10	%	0 …100
AI3	SPEED	0102	1	rpm	0 …9999
AI4	CURRENT	0104	10	A	0…9999
AI5	TORQUE	0105	10	%	-200…200
AI6	POWER	0106	10	kW	0…65535
AI7	DRIVE TEMPERATURE	0110	10	°C	0 …125
AI8	KILOWATT HOURS	0115	1	kWh	0…65535
AI9	MEGAWATT HOURS	0141	1	MWh	0…65535
AI10	RUN TIME	0114	1	H	0…65535
AI11	DC BUS VOLTAGE	0107	1	V	0…999
AI12	OUTPUT VOLTAGE	0109	1	V	0…999
AI13	PRC PID FEEDBACK	0130	10	%	0…100

N2 Analog Inputs:					
Number	**Object**	**Drive Parameter**	**Scale Factor**	**Units**	**Range**
AI14	PRC PID DEVIATION	0132	10	%	0…100
AI15	EXT PID FEEDBACK	0131	10	%	0…100
AI16	EXT PID DEVIATION	0133	10	%	0…100
AI17	LAST FAULT	0401	1		fault code
AI18	PREV FAULT	0402	1		fault code
AI19	OLDEST FAULT	0403	1		fault code
AI20	AI 1 ACTUAL	0120	10	%	0…100
AI21	AI 2 ACTUAL	0121	10	%	0…100
AI22	AO 1 ACTUAL	0124	10	mA	0…20
AI23	AO 2 ACTUAL	0125	10	mA	0…20
AI24	MOTOR TEMP	0145	1	°C	0…200
AI25	REVOLUTION CNT	0142	1	MREV	0…32767

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 ACH550 drive.

N2 Binary Inputs:			
Number	**Object**	**Drive Parameter**	**Range**
BI1	STOP/RUN	Status Word	0 = Stop, 1 = Drive Running
BI2	FORWARD/REVERSE	Status Word	0 = Forward, 1 = Reverse
BI3	FAULT STATUS	Status Word	0 = OK, 1 = Drive Fault
BI4	RELAY 1 STATUS	0122 (bit mask 04)	0 = Off, 1 = On
BI5	RELAY 2 STATUS	0122 (bit mask 02)	0 = Off, 1 = On
BI6	RELAY 3 STATUS	0122 (bit mask 01)	0 = Off, 1 = On
BI7	RELAY 4 STATUS	0123 (bit mask 04)	0 = Off, 1 = On
BI8	RELAY 5 STATUS	0123 (bit mask 02)	0 = Off, 1 = On
BI9	RELAY 6 STATUS	0123 (bit mask 01)	0 = Off, 1 = On
BI10	INPUT 1 STATUS	0118 (bit mask 04)	0 = Off, 1 = On
BI11	INPUT 2 STATUS	0118 (bit mask 02)	0 = Off, 1 = On
BI12	INPUT 3 STATUS	0118 (bit mask 01)	0 = Off, 1 = On
BI13	INPUT 4 STATUS	0119 (bit mask 04)	0 = Off, 1 = On
BI14	INPUT 5 STATUS	0119 (bit mask 02)	0 = Off, 1 = On
BI15	INPUT 6 STATUS	0119 (bit mask 01)	0 = Off, 1 = On
BI16	EXTERNAL 2 SELECT	Status Word	0 = EXT1 = EXT2
BI17	HAND/AUTO	Status Word	0 = AUTO, 1 = HAND
BI18	ALARM	Status Word	0 = OK, 1 = ALARM
BI19	MAINTENANCE REQ	Status Word	0 = OK, 1 = MAINT REQ

N2 Binary Inputs:			
Number	**Object**	**Drive Parameter**	**Range**
BI20	DRIVE READY	Status Word	0 = Not Ready, 1 = Ready
BI21	AT SETPOINT	Status Word	0 = No, 1 = At Setpoint
BI22	RUN ENABLED	Status Word	0 = Not Enabled, 1 = Enabled
BI23	N2 LOCAL MODE	Status Word	0 = Auto, 1 = N2 Local
BI24	N2 CONTROL SRC	Status Word	0 = No, 1 = Yes
BI25	N2 REF1 SRC	Status Word	0 = No, 1 = Yes
BI26	N2 REF2 SRC	Status Word	0 = No, 1 = Yes

N2 analog output objects – drive

The following table lists the N2 Analog Output objects defined for the ACH550 drive.

N2 Analog Outputs:					
Number	**Object**	**Drive Parameter**	**Scale Factor**	**Units**	**Range**
AO1	REFERENCE 1	Reference 1	10	%	0…100
AO2	REFERENCE 2	Reference 2	10	%	0…100
AO3	ACCEL TIME 1	2202	10	s	0.1…1800
AO4	DECEL TIME 1	2203	10	s	0.1…1800
AO5	CURRENT LIMIT	2003	10	A	0…1.3•I_{2n}
AO6	PID1-CONT GAIN	4001	10	%	0.1…100
AO7	PID1-CONT I-TIME	4002	10	s	0.1…600
AO8	PID1-CONT D-TIME	4003	10	s	0…10
AO9	PID1-CONT D FILTER	4004	10	s	0…10
AO10	PID2-CONT GAIN	4101	10	%	0.1…100
AO11	PID2-CONT I-TIME	4102	10	s	0.1…600
AO12	PID2-CONT D-TIME	4103	10	s	0…10
AO13	PID2-CONT D FILTER	4104	10	s	0…10
AO14	COMMAND AO 1	135	10	%	0…100
AO15	COMMAND AO 2	136	10	%	0…100
AO16	EXT PID SETPOINT	4211	10	%	0…100
AO17	SPD OUT MIN	2001/2007	10	%	0…200
AO18	SPD OUT MAX	2002/2008	10	%	0…200
AO19	MAILBOX PARAMETER		1		0…65535
AO20	MAILBOX DATA		1		0…65535

N2 binary output objects – drive

The following table lists the N2 Binary Output objects defined for the ACH550 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 ENABLE	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	134 (bit mask 01)	0 = Off, 1 = On
BO8	COMMAND RO 2	134 (bit mask 02)	0 = Off, 1 = On
BO9	COMMAND RO 3	134 (bit mask 04)	0 = Off, 1 = On
BO10	COMMAND RO 4	134 (bit mask 08)	0 = Off, 1 = On
BO11	COMMAND RO 5	134 (bit mask 10)	0 = Off, 1 = On
BO12	COMMAND RO 6	134 (bit mask 20)	0 = Off, 1 = On
BO13	RESET RUN TIME	114 (indirectly)	0 = N/A, 1 = On (Reset Run Time)
BO14	RESET KWH COUNT	115 (indirectly)	0 = N/A, 1 = On (Reset kWh Count)
BO15	PRC PID SELECT	4027 (indirectly)	0 = SET2, 1 = SET2
BO16	N2 LOCAL CTL (Note 1)	Command Word	0 = Auto, 1 = N2
BO17	N2 LOCAL REF (Note 1)	Command Word	0 = Auto, 1 = N2
BO18	SAVE PARAMETERS	1607 (indirectly)	0 = N/A, 1 = On (Save Parameters)
BO19	READ MAILBOX		0 = No, 1 = Yes
BO20	WRITE MAILBOX		0 = No, 1 = Yes

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 ACH550 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 ACH550.DDL file listing.

```
*****************************************************************
*  ABB Drives, ACH 550 Variable Frequency Drive
*****************************************************************
CSMODEL "ACH_500", "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","°C"
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"
CSAI "AI25",N,N,"REVL_CNT",""

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,"RELAY_6","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","HAND","AUTO"
CSBI "BI18",N,N,"ALARM","OFF","ON"
CSBI "BI19",N,N,"MNTNCE_R","OFF","ON"
CSBI "BI20",N,N,"DRV_REDY","NO","YES"
CSBI "BI21",N,N,"AT_SETPT","NO","YES"
CSBI "BI22",N,N,"RUN_ENAB","NO","YES"
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","DISABLE","ENABLE"
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","EUTO","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 / Alarm state specification
- Alarm 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**	**Scale Factor**	**Units**	**Range**
AI1	CURRENT	0101	10	A	0…9999
AI2	LAST FAULT	0401	1		fault code
AI3	ALARM WORD 1	0308	1		Alarm mask (see bypass manual description of parameter 0308)

N2 Analog Inputs:					
Number	**Object**	**Bypass Parameter**	**Scale Factor**	**Units**	**Range**
AI4	ALARM WORD 2	0309	1		Alarm 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
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**	**Scale Factor**	**Units**	**Range**
AO1	BYP RUNDLY	1614	1	s	0…300
AO2	MB PARAM	NA	1	None	0…65535
AO3	MB DATA	NA	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

N2 Binary Inputs:			
Number	**Object**	**Drive Parameter**	**Range**
BI6	FAULT	Status Word	1 = Bypass Fault
BI7	ALARM	Status Word	1 = Bypass Alarm
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
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	SYSTEM ENABLE	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	SYSTEM ENABLE 1	Command Word	1 = Enable
BO11	SYSTEM ENABLE 2	Command Word	1 = Enable
BO12	SYSTEM ENABLE 3	Command Word	1 = Enable
BO13	SYSTEM ENABLE 4	Command Word	1 = Enable

N2 Binary Outputs:			
Number	**Object**	**Drive Parameter**	**Range**
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	NA	0 = NO, 1 = READ
BO19	WRITE MB	NA	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","DISABLE","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,"ALARM","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 ENAB","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,"ST ENA 1","DISABLE","ENABLE"
CSBO "BO11",Y,Y,"ST ENA 2","DISABLE","ENABLE"
CSBO "BO12",Y,Y,"ST ENA 3","DISABLE","ENABLE"
CSBO "BO13",Y,Y,"ST ENA 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"
```

FLN protocol technical data – system

System overview

The FLN fieldbus connection to the E-Clipse Bypass system is based on an industry standard RS-485 physical interface. The FLN (Floor Level Network) Fieldbus protocol is a serial communication protocol, used by the Siemens APOGEE® system. The system interface is specified in Siemens application 2734.

Supported features

The system supports all required FLN features.

When bypass parameter 1625 COMM CTL = (0) DRIVE ONLY, the drive's FLN points are all supported using the drive's device address. The bypass's FLN points related to the control word are no longer valid.

Bypass FLN points not valid

Point #	Name
24	RUN.STOP CMD
26	OVERRIDE CMD
35	RUN ENA CMD
50	START ENA 1
51	START ENA 2
52	START ENA 3
53	START ENA 4
94	RESET FAULT

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

Drive FLN objects not valid

Point #	Name
24	RUN.STOP CMD
35	ENA DIS CMD

Drive overview

Reports

The ACH550 provides seven pre-defined reports. Using a report request generated from the FLN fieldbus controller, select one of the following sets of points. By providing views of selected points, these reports are often easier to work with than views of the full point database.

ABB ACH 550

FLN ABB ACH 550 Report			
Point		Subpoint Name	Data
#	Type		
01	LAO	CTLR ADDRESS	Each host FLN application (e.g. CIS or Insight) controls both the particular data reported for each point, and the report format.
02	LAO	APPLICATION	
20	LAO	OVRD TIME	
29	LDO	DAY.NIGHT	

Drive startup

FLN Startup Report			
Point		Subpoint Name	Data
#	Type		
21	LDI	FWD.REV ACT	Each host FLN application (e.g. CIS or Insight) controls both the particular data reported for each point, and the report format.
22	LDO	FWD.REV CMD	
23	LDI	RUN.STOP ACT	
24	LDO	RUN.STOP CMD	
25	LDI	EXT1.2 ACT	
26	LDO	EXT1.2 CMD	
34	LDI	ENA.DIS ACT	
35	LDO	ENA.DIS CMD	
36	LDI	FLN LOC ACT	
60	LAO	INPUT REF1	
61	LAO	INPUT REF2	
68	LDO	FLN LOC CTL	
69	LDO	FLN LOC REF	
94	LDO	RESET FAULT	

Drive overview

FLN Overview Report			
Point		Subpoint Name	Data
#	Type		
03	LAI	FREQ OUTPUT	Each host FLN application (e.g. CIS or Insight) controls both the particular data reported for each point, and the report format.
04	LAI	PCT OUTPUT	
05	LAI	SPEED	
06	LAI	CURRENT	
07	LAI	TORQUE	
08	LAI	POWER	
09	LAI	DRIVE TEMP	
10	LAI	DRIVE KWH	
11	LAI	DRIVE MWH	
12	LAI	RUN TIME	
13	LAI	DC BUS VOLT	
14	LAI	OUTPUT VOLT	
17	LAI	MOTOR TEMP	
18	LAI	MREV COUNTER	
21	LDI	FWD.REV ACT	
23	LDI	RUN.STOP ACT	
25	LDI	EXT1.2 ACT	
27	LDI	DRIVE READY	
28	LDI	AT SETPOINT	
33	LDI	HANDAUTO ACT	
34	LDI	ENA.DIS ACT	
36	LDI	FLN LOC ACT	
37	LDI	FLN CTL SRC	
38	LDI	FLN REF1 SRC	
39	LDI	FLN REF2 SRC	
86	LDI	OK.ALARM	
87	LDI	OK.MAINT	
93	LDI	OK.FAULT	

Drive I/O

FLN Drive I/O Report			
Point		Subpoint Name	Data
#	Type		
40	LDO	RO 1 COMMAND	Each host FLN application (e.g. CIS or Insight) controls both the particular data reported for each point, and the report format.
41	LDO	RO 2 COMMAND	
42	LDO	RO 3 COMMAND	

FLN Drive I/O Report			
Point		Subpoint Name	Data
#	Type		
43	LDO	RO 4 COMMAND	
44	LDO	RO 5 COMMAND	
45	LDO	RO 6 COMMAND	
46	LAO	AO 1 COMMAND	
47	LAO	AO 2 COMMAND	
70	LDI	DI 1 ACTUAL	
71	LDI	DI 2 ACTUAL	
72	LDI	DI 3 ACTUAL	
73	LDI	DI 4 ACTUAL	
74	LDI	DI 5 ACTUAL	
75	LDI	DI 6 ACTUAL	
76	LDI	RO 1 ACTUAL	
77	LDI	RO 2 ACTUAL	
78	LDI	RO 3 ACTUAL	
79	LDI	RO 4 ACTUAL	
80	LDI	RO 5 ACTUAL	
81	LDI	RO 6 ACTUAL	
82	LAI	AI 1 ACTUAL	
83	LAI	AI 2 ACTUAL	
84	LAI	AO 1 ACTUAL	
85	LAI	AO 2 ACTUAL	

Drive Config

FLN Drive Config. Report			
Point		Subpoint Name	Data
#	Type		
30	LAO	CURRENT LIM	Each host FLN application (e.g. CIS or Insight) controls both the particular data reported for each point, and the report format.
31	LAO	ACCEL TIME 1	
32	LAO	DECEL TIME 1	
48	LDO	RST RUN TIME	
49	LDO	RESET KWH	
59	LDO	LOCK PANEL	
66	LDO	SPD OUT MIN	
67	LDO	SPD OUT MAX	
95	LAO	MBOX PARAM	
96	LAO	MBOX DATA	
97	LDO	MBOX READ	
98	LDO	MBOX WRITE	

Drive Process PID

FLN Process PID Report			
Point		**Subpoint Name**	**Data**
#	**Type**		
15	LAI	PRC PID FBCK	Each host FLN application (e.g. CIS or Insight) controls both the particular data reported for each point, and the report format.
16	LAI	PRC PID DEV	
50	LAO	PRC PID GAIN	
51	LAO	PRC PID ITIM	
52	LAO	PRC PID DTIM	
53	LAO	PRC PID DFIL	
54	LDO	PRC PID SEL	
60	LAO	INPUT REF 1	
61	LAO	INPUT REF 2	
82	LAI	AI 1 ACTUAL	
83	LAI	AI 2 ACTUAL	
84	LAI	AO 1 ACTUAL	
85	LAI	AO 2 ACTUAL	

Drive External PID

FLN External PID Report			
Point		**Subpoint Name**	**Data**
#	**Type**		
55	LAO	EXT PID GAIN	Each host FLN application (e.g. CIS or Insight) controls both the particular data reported for each point, and the report format.
56	LAO	EXT PID ITIM	
57	LAO	EXT PID DTIM	
58	LAO	EXT PID DFIL	
62	LAO	EXT PID STPT	
63	LAI	EXT PID FBCK	
64	LAI	EXT PID DEV	
82	LAI	AI 1 ACTUAL	
83	LAI	AI 2 ACTUAL	
84	LAI	AO 1 ACTUAL	
85	LAI	AO 2 ACTUAL	

Scaling drive feedback values

Feedback values are provided with units of percent, where 0% and 100% correspond to the range of the sensor being used to measure the control variable. These points have default units in Hz. If other units are required:

- Unbundle these points with appropriate slopes and intercepts.
- The new intercept equals the lowest value of the desired range.
- Calculate the new slope as follows:

$$\text{New Slope} = \frac{\text{(Desired Range, i.e. high - low values) x (Slope of Existing Point)}}{\text{Range of Existing Point}}$$

$$= \frac{\text{(60 Hz - 0 Hz) x (0.01)}}{\text{100\% - 0\%}} = 0.006$$

Example – You are controlling water temperature from a cooling tower using the ACH550 to control a fan. The temperature sensor has a range of 30 to 250 degrees Fahrenheit.

To unbundle the set point (INPUT REF 2), for commanding in degrees Fahrenheit, where 0…60 Hz is equal to 30…250° F:

New Intercept = 30 (the temperature that corresponds to 0%)

$$\text{New Slope} = \frac{\text{(Desired Range) x (Slope of Existing Point)}}{\text{Range of Existing Point}}$$

$$= \frac{\text{(250° F - 30° F) x (0.1)}}{\text{100\% - 0\%}} = 0.22$$

To unbundle the feedback (PRC PID FBCK) for monitoring in degrees Fahrenheit:

New Intercept = 30

$$\text{New Slope} = \frac{\text{(Desired Range) x (Slope of Existing Point)}}{\text{Range of Existing Point}}$$

$$= \frac{\text{(250° F - 30° F) x (0.01)}}{\text{100\% - 0\%}} = 0.022$$

Loop gains

PRC PID GAIN (Point 50) and PRC PID ITIM (Point 51) are PID parameters similar to the P and I gains in the APOGEE TECs. Because the ABB PI loop and the Siemens loop are structured differently, there is no a one-to-one correspondence between the gains. The following formulas allow translation from ABB gains to Siemens gains and vice versa:

- To convert from ABB PI gains to Siemens P and I gains:

$$\text{P GAIN}_{\text{Siemens}} = \text{PI GAIN}_{\text{ABB}} \times 0.0015$$

$$\text{I GAIN}_{\text{Siemens}} = \frac{\text{PI GAIN}_{\text{ABB}}}{\text{PI GAIN}_{\text{ABB}}} \times 0.0015$$

- To convert from Siemens P and I gains to ABB PI gains:

$$P\ GAIN_{ABB} = PI\ GAIN_{Siemens} \times 667$$

$$I\ GAIN_{ABB} = \frac{PI\ GAIN_{Siemens}}{PI\ GAIN_{Siemens}} \times 667$$

Point database drive

The following table lists the point database for FLN / ACH550 (Application 2734).

FLN Point Database								
Point		Subpoint Name	Factory Default	Engr. Units	Slope	Intercept	On Text	Off Text
#	Type		(SI Units)					
01	LAO	CTLR ADDRESS	99	-	1	0	-	-
02	LAO	APPLICATION	2734	-	1		-	-
{03}	LAI	FREQ OUTPUT	0	Hz	0.1	0	-	-
{04}	LAI	PCT OUTPUT	0	PCT	0.1	0	-	-
{05}	LAI	SPEED	0	RPM	1	0	-	-
{06}	LAI	CURRENT	0	A	0.1		-	-
{07}	LAI	TORQUE	0	PCT	0.1	-200	-	-
{08}	LAI	POWER	0 (0)	HP (KW)	0.134 0.1	0 0	-	-
{09}	LAI	DRIVE TEMP	77 (25)	° F (° C)	0.18 (0.1)	32 0	-	-
{10}	LAI	DRIVE KWH	0	KWH	1		-	-
{11}	LAI	DRIVE MWH	0	MWH	1		-	-
{12}	LAI	RUN TIME	0	HRS	1		-	-
{13}	LAI	DC BUS VOLT	0	V	1		-	-
{14}	LAI	OUTPUT VOLT	0	V	1		-	-
{15}	LAI	PRC PID FBCK	0	PCT	0.1		-	-
{16}	LAI	PRC PID DEV	0	PCT	0.1		-	-
{17}	LAI	MOTOR TEMP	77(25)	° F (° C)	1.8 (1)	32 0	-	-
{18}	LAI	MREV COUNTER	0	MREV	1	0	-	-
20	LAO	OVRD TIME	1	hrs	1	0	-	-
{21}	LDI	FWD.REV ACT	FWD	-	1	0	REV	FWD
{22}	LDO	FWD.REV CMD	FWD	-	1	0	REV	FWD
{23}	LDI	RUN.STOP ACT	STOP	-	1	0	RUN	STOP
{24}	LDO	RUN.STOP CMD	STOP	-	1	0	RUN	STOP
{25}	LDI	EXT1.2 ACT	EXT1	-	1	0	EXT2	EXT1
{26}	LDO	EXT1.2 CMD	EXT1	-	1	0	EXT2	EXT1
{27}	LDI	DRIVE READY	NOTRDY	-	1	0	READY	NOTRDY
{28}	LDI	AT SETPOINT	NO	-	1	0	YES	NO

FLN Point Database								
Point		Subpoint Name	Factory Default	Engr. Units	Slope	Intercept	On Text	Off Text
#	Type		(SI Units)					
{29}	LDO	DAY.NIGHT	DAY	-	1	0	NIGHT	DAY
30	LAO	CURRENT LIM	0	A	0.1	0	-	-
31	LAO	ACCEL TIME 1	300	sec	0.1	0	-	-
32	LAO	DECEL TIME 1	300	sec	0.1	0	-	-
{33}	LDI	HANDAUTO ACT	AUTO	-	1	0	HAND	AUTO
{34}	LDI	ENA.DIS ACT	DISABL	-	1	0	ENABLE	DISABL
{35}	LDO	ENA.DIS CMD	DISABL	-	1	0	ENABLE	DISABL
{36}	LDI	FLN LOC ACT	AUTO	-	1	0	FLN	AUTO
{37}	LDI	FLN CTL SRC	NO	-	1	0	YES	NO
{38}	LDI	FLN REF1 SRC	NO	-	1	0	YES	NO
{39}	LDI	FLN REF2 SRC	NO	-	1	0	YES	NO
{40}	LDO	RO 1 COMMAND	OFF	-	1	0	ON	OFF
{41}	LDO	RO 2 COMMAND	OFF	-	1	0	ON	OFF
{42}	LDO	RO 3 COMMAND	OFF	-	1	0	ON	OFF
{43}	LDO	RO 4 COMMAND	OFF	-	1	0	ON	OFF
{44}	LDO	RO 5 COMMAND	OFF	-	1	0	ON	OFF
{45}	LDO	RO 6 COMMAND	OFF	-	1	0	ON	OFF
{46}	LAO	AO 1 COMMAND	PCT	PCT	0.1	0	-	-
{47}	LAO	AO 2 COMMAND	PCT	PCT	0.1	0	-	-
48	LDO	RST RUN TIME	NO	-	1	0	RESET	NO
49	LDO	RESET KWH	NO	-	1	0	RESET	NO
50	LAO	PRC PID GAIN	10	PCT	0.1	0	-	-
51	LAO	PRC PID ITIM	600	SEC	0.1	0	-	-
52	LAO	PRC PID DTIM	0	SEC	0.1	0	-	-
53	LAO	PRC PID DFIL	10	SEC	0.1	0	-	-
54	LDO	PRC PID SEL	SET1	-	1	0	SET2	SET1
55	LAO	EXT PID GAIN	10	PCT	0.1	0	-	-
56	LAO	EXT PID ITIM	600	SEC	0.1	0	-	-
57	LAO	EXT PID DTIM	0	SEC	0.1	0	-	-
58	LAO	EXT PID DFIL	10	SEC	0.1	0	-	-
59	LDO	LOCK PANEL	UNLOCK	-	1	0	LOCK	UNLOCK

FLN Point Database								
Point		Subpoint Name	Factory Default	Engr. Units	Slope	Intercept	On Text	Off Text
#	Type		(SI Units)					
{60}	LAO	INPUT REF 1	0	PCT	0.1	0	-	-
{61}	LAO	INPUT REF 2	0	PCT	0.1	0	-	-
{62}	LAO	EXT PID STPT	0	PCT	0.1	0	-	-
{63}	LAI	EXT PID FBCK	0	PCT	0.1	0	-	-
{64}	LAI	EXT PID DEV	0	PCT	0.1	0	-	-
66	LDO	SPD OUT MIN	0	PCT	0.1	0	-	-
67	LDO	SPD OUT MAX	1000	PCT	0.1	0	-	-
{68}	LDO	FLN LOC CTL	AUTO	-	1	0	FLN	AUTO
{69}	LDO	FLN LOC REF	AUTO	-	1	0	FLN	AUTO
{70}	LDI	DI 1 ACTUAL	OFF	-	1	0	ON	OFF
{71}	LDI	DI 2 ACTUAL	OFF	-	1	0	ON	OFF
{72}	LDI	DI 3 ACTUAL	OFF	-	1	0	ON	OFF
{73}	LDI	DI 4 ACTUAL	OFF	-	1	0	ON	OFF
{74}	LDI	DI 5 ACTUAL	OFF	-	1	0	ON	OFF
{75}	LDI	DI 6 ACTUAL	OFF	-	1	0	ON	OFF
{76}	LDI	RO 1 ACTUAL	OFF	-	1	0	ON	OFF
{77}	LDI	RO 2 ACTUAL	OFF	-	1	0	ON	OFF
{78}	LDI	RO 3 ACTUAL	OFF	-	1	0	ON	OFF
{79}	LDI	RO 4 ACTUAL	OFF	-	1	0	ON	OFF
{80}	LDI	RO 5 ACTUAL	OFF	-	1	0	ON	OFF
{81}	LDI	RO 6 ACTUAL	OFF	-	1	0	ON	OFF
{82}	LAI	AI 1 ACTUAL	0	PCT	0.1	0	-	-
{83}	LAI	AI 2 ACTUAL	0	PCT	0.1	0	-	-
{84}	LAI	AO 1 ACTUAL	0	MA	0.1	0	-	-
{85}	LAI	AO 2 ACTUAL	0	MA	0.1	0	-	-
{86}	LDI	OK.ALARM	OK	-	1	0	ALARM	OK
{87}	LDI	OK.MAINT	OK	-	1	0	MAINT	OK
{88}	LAI	ALARM WORD 1	-	-	1	0	-	-
{89}	LAI	ALARM WORD 2	-	-	1	0	-	-
{90}	LAI	LAST FAULT	-	-	1	0	-	-
{91}	LAI	PREV FAULT 1	-	-	1	0	-	-
{92}	LAI	PREV FAULT 2	-	-	1	0	-	-
{93}	LDI	OK.FAULT	OK	-	1	0	FAULT	OK
{94}	LDO	RESET FAULT	NO	-	1	0	RESET	NO
{95}	LAO	MBOX PARAM	-	-	1	0	-	-
{96}	LAO	MBOX DATA	-	-	1	0	-	-

FLN Point Database								
Point		**Subpoint Name**	**Factory Default**	**Engr. Units**	**Slope**	**Intercept**	**On Text**	**Off Text**
#	**Type**		**(SI Units)**					
{97}	LDO	MBOX READ	DONE	-	1	0	READ	DONE
{98}	LDO	MBOX WRITE	DONE	-	1	0	WRITE	DONE
{99}	LAO	ERROR STATUS	-	-	1	0	-	-

a. Points not listed are not used in this application.

b. A single value in a column means that the value is the same in English units and in SI units.

c. Point numbers that appear in brackets { } may be unbundled at the field panel.

Detailed point descriptions – drive

FLN Detailed Point Descriptions			
Point		**Description**	**Drive Parameter**
1	CTRL ADDRESS	The FLN address of the drive. It can be set by FLN and by the panel.	5302
2	APPLICATION	The Application ID for FLN on the ACH550. This ID is assigned by Siemens for each unique application. It correlates directly to a particular point list approved at the time of release. Therefore, this point list shall remain fixed once approval is granted. Any changes to the point list shall require a new Application ID and re-approval by Siemens. The Application ID assigned to ACH550 is 2934.	
3	FREQ OUTPUT	The output frequency applied to the motor, in Hertz.	0103
4	PCT OUTPUT	The ratio of output frequency or speed to the corresponding maximum rating, depending on control mode. • For scalar mode, it is the ratio of Output Frequency (parameter 0103) to Maximum Frequency (parameter 2008). • For speed mode, it is the ratio Speed (parameter 0102) to Maximum Speed (2002).	None. This ratio is calculated by the FLN application.
5	SPEED	The calculated speed of the motor, in RPM.	0102
6	CURRENT	The measured output current.	0104
7	TORQUE	The calculated output torque of the motor as a percentage of nominal torque.	0105
8	POWER	The measured output power in KW. The FLN point definition also supports horsepower by selecting English units.	0106
9	DRIVE TEMP	The measured heatsink temperature, in ° C. The FLN point definition also supports ° F by selecting English units.	0110
10	DRIVE KWH	The drive's cumulative power consumption in kilowatt-hours. This value may be reset by commanding FLN point 49, RESET KWH.	0115
11	DRIVE MWH	The drive's cumulative power consumption in megawatt hours. This value cannot be reset.	0141
12	RUN TIME	The drive's cumulative run time in hours. This value may be reset by commanding FLN point 48, RESET RUN TIME.	0114
13	DC BUS VOLT	The DC bus voltage level of the drive.	0107
14	OUTPUT VOLT	The AC output voltage applied to the motor.	0109
15	PRC PID FBCK	The Process PID feedback signal.	0130
16	PRC PID DEV	The deviation of the Process PID output signal from its setpoint.	0132
17	MOTOR TEMP	The measured motor temperature as set up in Group 35.	0145
18	ROTATION CNT	The motor's cumulative revolution count, in mega-revolutions.	0142
19	N/A		
20	OVRD TIME	1 of the 5 mandatory FLN points required for compatibility with Siemens control systems. It has no functionality in the drive application.	None

FLN Detailed Point Descriptions			
Point		**Description**	**Drive Parameter**
21	FWD.REV ACT	Indicates the rotational direction of the motor, regardless of control source (1 = REV, 0 = FWD).	
22	FWD.REV CMD	Commanded by FLN to change the rotational direction of the drive. • Parameter 1001 must be set to COMM for FLN to control the direction of the motor by EXT1. • Parameter 1002 must be set to COMM for FLN to control the direction of the motor by EXT2.	
23	RUN.STOP ACT	Indicates the drive's run status, regardless of control source (1 = RUN, 0 = STOP).	
24	RUN.STOP CMD	Commanded by FLN to start the drive. • Parameter 1001 must be set to COMM for FLN to control the run state of the drive by EXT1. • Parameter 1002 must be set to COMM for FLN to have this control.	
25	EXT1.2 ACT	Indicates whether External 1 or External 2 is the active control source (1 = EXT2, 0 = EXT1).	
26	EXT1.2 CMD	Commanded by FLN to select External 1 or External 2 as the active control source (1 = EXT2, 0 = EXT1). Parameter 1102 must be set to COMM for FLN to have this control.	
27	DRIVE READY	Indicates the drive is ready to accept a run command (1 = READY, 0 = NOTRDY).	
28	AT SETPOINT	Indicates the drive has reached its commanded setpoint (1 = YES, 0 = NO)	
29	DAY.NIGHT	1 of the 5 mandatory FLN points required for compatibility with Siemens control systems. It has no functionality in the drive application.	None
30	CURRENT LIM	Sets the output current limit of the drive.	2003
31	ACCEL TIME 1	Sets the acceleration time for Ramp 1.	2202
32	DECEL TIME 1	Sets the deceleration time for Ramp 1.	2203
33	HANDAUTO ACT	Indicates whether the drive is in Hand or Auto control (1 = HAND, 0 = AUTO).	
34	ENA.DIS ACT	Indicates the status of the Run Enable command, regardless of its source (1 = ENABLE, 0 = DISABL).	
35	ENA.DIS CMD	Commanded by FLN to assert the Run Enable command (1 = ENABLE, 0 = DISABL). Parameter 1601 must be set to COMM for FLN to have this control.	
36	FLN LOC ACT	Indicates if the drive has been placed in "FLN LOCAL" mode by commanding either point 68 (FLN LOC CTL) or point 69 (FLN LOC REF). Commanding either of these points to FLN (1) "steals" control from its normal source and places in under FLN control. Note that the HAND mode of the panel has priority over FLN local control.	

FLN Detailed Point Descriptions			
Point		**Description**	**Drive Parameter**
37	FLN CTL SRC	Indicates if FLN is a source for control inputs (1 = YES, 0 = NO). Note that this status point is true if any of the following control inputs are from FLN: Run/Stop, Ext1/2 Select or Run Enable.	
38	FLN REF1 SRC	Indicates if FLN is the source for speed reference 1 (1 = YES, 0 = NO).	
39	FLN REF2 SRC	Indicates if FLN is the source for speed reference 2 (1 = YES, 0 = NO).	
40	RO1 COMMAND	Controls the output state of Relay 1. Parameter 1401 must be set to COMM for FLN to have this control (1 = ON, 0 = OFF).	0134, bit 0
41	RO2 COMMAND	Controls the output state of Relay 2. Parameter 1402 must be set to COMM for FLN to have this control (1 = ON, 0 = OFF).	0134, bit 1
42	RO3 COMMAND	Controls the output state of Relay 3. Parameter 1403 must be set to COMM for FLN to have this control (1 = ON, 0 = OFF).	0134, bit 2
43	RO4 COMMAND	Controls the output state of Relay 4. Access to relay 4 require ACH550 option OREL. Parameter 1410 must be set to COMM for FLN to have this control (1 = ON, 0 = OFF).	0134, bit 3
44	RO5 COMMAND	Controls the output state of Relay 5. Access to relay 5 require ACH550 option OREL. Parameter 1411 must be set to COMM for FLN to have this control (1 = ON, 0 = OFF).	0134, bit 4
45	RO6 COMMAND	Controls the output state of Relay 6. Access to relay 6 require ACH550 option OREL. Parameter 1412 must be set to COMM for FLN to have this control (1 = ON, 0 = OFF).	0134, bit 5
46	AO1 COMMAND	Controls Analog Output 1. Parameter 1501 must be set to this value for FLN to have this control.	0135 (COMM VALUE 1)
47	AO2 COMMAND	Controls Analog Output 2. Parameter 1507 must be set to this value for FLN to have this control.	0136 (COMM VALUE 2)
48	RESET RUN TIME	Commanded by FLN to reset the cumulative run timer (1 = RESET, 0 = NO). The control input is rising-edge sensitive, so, once the command is issued, this point automatically returns to its inactive state. This "momentary" operation avoids any need for an explicit command to clear the point before a subsequent reset can be issued.	
49	RESET KWH	Commanded by FLN to reset the cumulative kilowatt-hour counter (1 = RESET, 0 = NO). The control input is rising-edge sensitive, so, once the command is issued, this point automatically returns to its inactive state. This "momentary" operation avoids any need for an explicit command to clear the point before a subsequent reset can be issued.	

FLN Detailed Point Descriptions			
Point		**Description**	**Drive Parameter**
50	PRC PID GAIN	Sets the proportional gain of the active Process PID set, as selected by Point 54, PRC PID SEL (1 = SET2, 0 = SET1).	4001 (SET1) 4101 (SET2)
51	PRC PID ITIM	Sets the integration time of the active Process PID set, as selected by Point 54, PRC PID SEL (1 = SET2, 0 = SET1).	4002 (SET1) 4102 (SET2)
52	PRC PID DTIM	Sets the derivation time of the active Process PID set, as selected by Point 54, PRC PID SEL (1 = SET2, 0 = SET1).	4001 (SET1) 4101 (SET2)
53	PRC PID DFIL	Sets the time constant for the error-derivative of the active Process PID set, as selected by Point 54, PRC PID SEL (1 = SET2, 0 = SET1).	4004 (SET1) 4104 (SET2)
54	PRC PID SEL	Selects the active Process PID set (1 = SET2, 0 = SET1).	4027
55	EXT PID GAIN	Sets the proportional gain of the External PID controller.	4201
56	EXT PID ITIM	Sets the integration time of the External PID controller.	4202
57	EXT PID DTIM	Sets the derivation time of the External PID controller.	4203
58	EXT PID DFIL	Sets the time constant for the error-derivative of the External PID controller.	4204
59	LOCK PANEL	Command by FLN to lock the panel and prevent parameter changes (1 = LOCK, 0 = UNLOCK).	1602
60	INPUT REF 1	Sets Input Reference 1. Parameter 1102 must be set to COMM for FLN to control this value.	
61	INPUT REF 2	Sets Input Reference 2. Parameter 1106 must be set to COMM for FLN to control this value.	
62	EXT PID STPT	The setpoint for the External PID controller. The function of this point requires parameter 4210, PID Setpoint Select, to be set to 19 (Internal).	4211
63	EXT PID FBCK	The External PID feedback signal.	0131
64	EXT PID DEV	The deviation of the External PID output signal from its setpoint.	0133
65	N/A		
66	SPD OUT MIN	Sets the minimum output speed of the drive as a percentage of the motor nominal rating.	2007 (SCALAR) 2001 (SPEED)
67	SPD OUT MAX	Sets the maximum output speed of the drive as a percentage of the motor nominal rating.	2008 (SCALAR) 2002 (SPEED)
68	FLN LOC CTL	Commanded by FLN to temporarily "steal" start/stop control of the drive from its normal source and place it under FLN control. This functionality is analogous to placing the drive in HAND mode at the panel, with the control being taken by FLN instead. HAND mode at the panel has priority over this point. Thus, this point is only effective in temporarily taking control from the digital inputs or some other internal control functionality.	

FLN Detailed Point Descriptions			
Point		**Description**	**Drive Parameter**
69	FLN LOC REF	Commanded by FLN to temporarily "steal" input reference control of the drive from its normal source and place it under FLN control. This functionality is analogous to placing the drive in HAND mode at the panel, with the reference control being taken by FLN instead. HAND mode at the panel has priority over this point. Thus, this point is only effective in temporarily taking control from the analog inputs or some other internal control functionality.	
70	DI 1 ACTUAL	Indicates the status of Digital Input 1 (1 = ON, 0 = OFF).	0118, bit 2
71	DI 2 ACTUAL	Indicates the status of Digital Input 2 (1 = ON, 0 = OFF).	0118, bit 1
72	DI 3 ACTUAL	Indicates the status of Digital Input 3 (1 = ON, 0 = OFF).	0118, bit 0
73	DI 4 ACTUAL	Indicates the status of Digital Input 4 (1 = ON, 0 = OFF).	0119, bit 2
74	DI 5 ACTUAL	Indicates the status of Digital Input 5 (1 = ON, 0 = OFF).	0119, bit 1
75	DI 6 ACTUAL	Indicates the status of Digital Input 6 (1 = ON, 0 = OFF).	0119, bit 0
76	RO 1 ACTUAL	Indicates the status of Relay Output 1 (1 = ON, 0 = OFF).	0122, bit 2
77	RO 2 ACTUAL	Indicates the status of Relay Output 2 (1 = ON, 0 = OFF).	0122, bit 1
78	RO 3 ACTUAL	Indicates the status of Relay Output 3 (1 = ON, 0 = OFF).	0122, bit 0
79	RO 4 ACTUAL	Indicates the status of Relay Output 4 (1 = ON, 0 = OFF).	0123, bit 2
80	RO 5 ACTUAL	Indicates the status of Relay Output 5 (1 = ON, 0 = OFF).	0123, bit 1
81	RO 6 ACTUAL	Indicates the status of Relay Output 6 (1 = ON, 0 = OFF).	0123, bit 0
82	AI 1 ACTUAL	Indicates the input level of Analog Input 1.	0120
83	AI 2 ACTUAL	Indicates the input level of Analog Input 2.	0121
84	AO 1 ACTUAL	Indicates the output level of Analog Output 1.	0124
85	AO 2 ACTUAL	Indicates the output level of Analog Output 2.	0125
86	OK.ALARM	Indicates the current alarm state of the drive (1 = ALARM, 0 = OK).	
87	OK.MAINT	Indicates the current maintenance state of the drive (1 = MAINT, 0 = OK). Maintenance triggers are configured in drive parameter Group 29.	
88	ALARM WORD1	This point is a bit-field indicating active alarms in the drive.	0308
89	ALARM WORD2	This point is a bit-field indicating active alarms in the drive.	0309
90	LAST FAULT	This point is first in the drive's fault log and indicates the most recent fault declared.	0401
91	PREV FAULT 1	This point is second in the drive's fault log and indicates the previous fault declared.	0412
92	PREV FAULT 2	This point is last in the drive's fault log and indicates the oldest fault in the log.	0413
93	OK.FAULT	Indicates the current fault state of the drive (1 = FAULT, 0 = OK).	

FLN Detailed Point Descriptions			
Point		**Description**	**Drive Parameter**
94	RESET FAULT	Command by FLN to reset a faulted drive (1 = RESET, 0 = NO). Parameter 1604 must be set to COMM for FLN to control this state. The control input is rising-edge sensitive, so, once the command is issued, this point automatically returns to its inactive state. This "momentary" operation avoids any need for an explicit command to clear the point before a subsequent reset can be issued.	
95	MBOX PARAM	Sets the parameter to be used by the mailbox function.	
96	MBOX DATA	Sets or indicates the data value of the mailbox function.	
97	MBOX READ	Command by FLN to read the parameter value specified by Point 95, MBOX PARAM. The parameter value is returned in Point 96, MBOX DATA. The control input is rising-edge sensitive, so, once the command is issued, this point automatically returns to its inactive state. This "momentary" operation avoids any need for an explicit command to clear the point before a subsequent reset can be issued.	
98	MBOX WRITE	Command by FLN to write the data value specified by Point 96, MBOX DATA, to the parameter value specified by Point 95, MBOX PARAM. The control input is rising-edge sensitive, so, once the command is issued, this point automatically returns to its inactive state. This "momentary" operation avoids any need for an explicit command to clear the point before a subsequent reset can be issued.	
99	ERROR STATUS	1 of the 5 mandatory FLN points required for compatibility with Siemens control systems. It has no functionality in the drive application.	None

Bypass overview

The FLN fieldbus connection to the ABB E-Clipse bypass is based on an industry standard EIA 485 physical interface. The FLN (Floor Level Network) Fieldbus protocol is a serial communication protocol, used by the Siemens APOGEE® system. The ABB E-Clipse bypass interface is specified in Siemens application 2737.

Supported features

The ABB E-Clipse bypass supports all required FLN features.

Reports

The ABB E-Clipse bypass provides seven pre-defined reports. Using a report request generated from the FLN fieldbus controller, select one of the following sets of points. By providing views of selected points, these reports are often easier to work with than views of the full point database.

ABB E-Clipse Bypass

FLN E-Clipse bypass Report			
Point		**Subpoint Name**	**Data**
#	**Type**		
01	LAO	CTLR ADDRESS	Each host FLN application (e.g. CIS or Insight) controls both the particular data reported for each point, and the report format.
02	LAO	APPLICATION	
20	LAO	OVRD TIME	
29	LDO	DAY.NIGHT	

Bypass startup

FLN Report #1 (STARTUP)		
Point		**Subpoint Name**
#	**Type**	
23	LDI	MTR RUNNING
24	LDO	RUN.STOP CMD
27	LDI	SYSTEM READY
28	LDI	SYS STARTED
32	LDI	DRIVE.BYPASS
33	LDI	BYP RUNNING
34	LDI	RUN ENA ACT
35	LDO	RUN ENA CMD
50	LDO	START ENA 1
51	LDO	START ENA 2
52	LDO	START ENA 3
53	LDO	START ENA 4
94	LCO	RESET FAULT

Bypass overview

FLN Overview Report			
Point		Subpoint Name	Data
#	Type		
05	LAI	INPUT VOLTS	Each host FLN application (e.g. CIS or Insight) controls both the particular data reported for each point, and the report format.
06	LAI	CURRENT	
09	LAI	BYPASS PCB TEMP	
10	LAI	KW HOURS	
12	LAI	RUN TIME	
13	LAI	PHASE A - PHASE B VOLTAGE	
14	LAI	PHASE B - PHASE C VOLTAGE	
15	LAI	PHASE C - PHASE A VOLTAGE	
86	LDI	BYPASS ALARM	
90	LAI	LAST FAULT	
93	LDI	OK FAULT BYP	

Bypass I/O

FLN Bypass I/O Report			
Point		Subpoint Name	Data
#	Type		
40	LDO	RO 1 COMMAND	Each host FLN application (e.g. CIS or Insight) controls both the particular data reported for each point, and the report format.
41	LDO	RO 2 COMMAND	
42	LDO	RO 3 COMMAND	
43	LDO	RO 4 COMMAND	
44	LDO	RO 5 COMMAND	
70	LDI	DI 1 ACTUAL	
71	LDI	DI 2 ACTUAL	
72	LDI	DI 3 ACTUAL	
73	LDI	DI 4 ACTUAL	
74	LDI	DI 5 ACTUAL	
75	LDI	DI 6 ACTUAL	
76	LDI	RO 1 ACTUAL	
77	LDI	RO 2 ACTUAL	
78	LDI	RO 3 ACTUAL	
79	LDI	RO 4 ACTUAL	
80	LDI	RO 5 ACTUAL	

Point database – bypass

The following table lists the point database for FLN / ABB E-Clipse bypass (Application 2737).

FLN Point Database								
Point		Subpoint Name	Factory Default	Engr. Units	Slope	Intercept	On Text	Off Text
#	Type		(SI Units)					
01	LAO	CTLR ADDRESS	2	-	1	0	-	-
02	LAO	APPLICATION	2737	-	1	0	-	-
05	LAI	INPUT VOLT	0	V	1	0	-	-
{06}	LAI	CURRENT	0	A	0.1	0	-	-
{07}	LAI	SYS UNDRLOAD	NO	-	1	0	[YES]	[NO]
09	LAI	PCB TEMP	77 (25)	°F (°C)	0.18 (0.1)	33 (0)	-	-
10	LAI	KW HOURS	0	KWH	1	0	-	-
12	LAI	RUN TIME	0	HRS	1	0	-	-
13	LAI	A.B. VOLT	0	V	1	0	-	-
14	LAI	B.C. VOLT	0	V	1	0	-	-
15	LAI	C.A. VOLT	0	V	1	0	-	-
20	LAO	OVRD TIME	1	HRS	1	0	-	-
{23}	LDI	MTR RUNNING	STOP	-	1	0	[RUN]	[STOP]
{24}	LDO	RUN.STOP CMD	STOP	-	1	0	[RUN]	[STOP]
{25}	LDI	OVERRIDE ACT	OFF	-	1	0	[ON]	[OFF]
{26}	LDO	OVERRIDE CMD	OFF	-	1	0	[ON]	[OFF]
{27}	LDI	SYSTEM READY	NOT READY	-	1	0	[READY]	[NOT READY]
{28}	LDI	SYS STARTED	NO	-	1	0	[YES]	[NO]
{29}	LDO	DAY.NIGHT	DAY	-	1	0	[NIGHT]	[DAY]
30	LAO	BYP RUN DLY	0	SEC	1	0	-	-
{31}	LAI	BYPASS MODE	0	-	1	0	-	-
{32}	LDI	DRIVE.BYPASS	DRIVE	-	1	0	[BYPASS]	[DRIVE]
{33}	LDI	BYP RUNNING	NO	-	1	0	[YES]	[NO]
{34}	LDI	RUN ENA ACT	DISABL	-	1	0	[ENABLE]	[DISABL]
{35}	LDO	RUN ENA CMD	DISABL	-	1	0	[ENABLE]	[DISABL]
{36}	LDI	FLN LOC ACT	AUTO	-	1	0	[FLN]	[AUTO]
{37}	LDI	FLN CTL SRC	NO	-	1	0	[YES]	[NO]
{40}	LDO	RO 1 COMMAND	OFF	-	1	0	[ON]	[OFF]
{41}	LDO	RO 2 COMMAND	OFF	-	1	0	[ON]	[OFF]
{42}	LDO	RO 3 COMMAND	OFF	-	1	0	[ON]	[OFF]

FLN Point Database								
Point		**Subpoint Name**	**Factory Default**	**Engr. Units**	**Slope**	**Intercept**	**On Text**	**Off Text**
#	**Type**		**(SI Units)**					
{43}	LDO	RO 4 COMMAND	OFF	-	1	0	[ON]	[OFF]
{44}	LDO	RO 5 COMMAND	OFF	-	1	0	[ON]	[OFF]
{48}	LDO	RST RUN TIME	0	-	-	-	-	-
{49}	LDO	RESET KWH	0	-	1	0	-	-
{50}	LDO	START ENA 1	DISABL	-	1	0	[ENABLE]	[DISABL]
{51}	LDO	START ENA 2	DISABL	-	1	0	[ENABLE]	[DISABL]
{52}	LDO	START ENA 3	DISABL	-	1	0	[ENABLE]	[DISABL]
{53}	LDO	START ENA 4	DISABL	-	1	0	[ENABLE]	[DISABL]
{59}	LDO	LOCK PANEL	OPEN	-	1	0	[LOCK]	[UNLOCK]
{68}	LDO	FLN LOC CTL	AUTO	-	1	0	[FLN]	[AUTO]
{70}	LDI	DI 1 ACTUAL	OFF	-	1	0	[ON]	[OFF]
{71}	LDI	DI 2 ACTUAL	OFF	-	1	0	[ON]	[OFF]
{72}	LDI	DI 3 ACTUAL	OFF	-	1	0	[ON]	[OFF]
{73}	LDI	DI 4 ACTUAL	OFF	-	1	0	[ON]	[OFF]
{74}	LDI	DI 5 ACTUAL	OFF	-	1	0	[ON]	[OFF]
{75}	LDI	DI 6 ACTUAL	OFF	-	1	0	[ON]	[OFF]
{76}	LDI	RO 1 ACTUAL	OFF	-	1	0	[ON]	[OFF]
{77}	LDI	RO 2 ACTUAL	OFF	-	1	0	[ON]	[OFF]
{78}	LDI	RO 3 ACTUAL	OFF	-	1	0	[ON]	[OFF]
{79}	LDI	RO 4 ACTUAL	OFF	-	1	0	[ON]	[OFF]
{80}	LDI	RO 5 ACTUAL	OFF	-	1	0	[ON]	[OFF]
{86}	LDI	BYPASS ALARM	OK	-	1	0	[ALARM]	[OK]
{88}	LAI	ALARM WORD 1	0	-	1	0	-	-
{89}	LAI	ALARM WORD 2	0	-	1	0	-	-
{90}	LAI	LAST FAULT	-	-	1	0	-	-
{93}	LDI	OK.FAULTBYP	OK	-	1	0	[FAULT]	[OK]
{94}	LDO	RESET FAULT	NO	-	1	0	[RESET]	[NO]
{99}	LAO	ERROR STATUS	-	-	1	0	-	-

a. Points not listed are not used in this application.

b. A single value in a column means that the value is the same in English units and in SI units.

c. Point numbers that appear in brackets { } may be unbundled at the field panel.

Detailed point descriptions – bypass

FLN Detailed Point Descriptions			
Point		**Description**	**Drive Parameter**
1	CTRL ADDRESS	The FLN address of the bypass. It can be set by FLN and by the panel.	5002
2	APPLICATION	This is the Application ID for FLN on the E-Clipse Bypass. This ID is assigned by Siemens for each unique application. It correlates directly to a particular point list approved at the time of release. Therefore, this point list shall remain fixed once approval is granted. Any changes to the point list shall require a new Application ID and re-approval by Siemens. The Application ID assigned to the E-Clipse bypass is 2737.	
{5}	INPUT VOLT	Average of line-line input voltage	0102
{6}	CURRENT	Measured output current.	0101
{7}	SYS UNDRLOAD	This point indicates if the system is in an underload condition. Detection of this condition is done with bypass parameters 3001-3003.	
{9}	PCB TEMP	DEG C of bypass board	0105
10	KW HOURS	Bypass-mode kilowatt hours	0106
12	RUN TIME	Bypass mode run hours	0108
13	A-B VOLT	Phase A - Phase B voltage	0111
14	B-C VOLT	Phase B - Phase C voltage	0112
15	C-A VOLT	Phase C - Phase A voltage	0113
20	OVRD TIME	This is 1 of 5 mandatory FLN points required for compatibility with Siemens control systems. It has no functionality in the bypass application.	
{23}	MTR RUNNING	This point indicates the system's run status, regardless of control source (1 = RUN, 0 = STOP).	
{24}	RUN.STOP CMD	This point is commanded by FLN to start the system. Bypass parameter 1601 must be set to COMM for FLN to control the run state of the system.	
{25}	OVERRIDE ACT	This point indicates if the bypass is in override 1 or override 2.	
{26}	OVERRID CMD	This point is commanded by FLN to select bypass override 2. Override 2 is configured by parameters in bypass group 17.	
{27}	SYSTEM READY	This point indicates the system is ready to accept a run command (1 = READY, 0 = NOTRDY).	
{28}	SYS STARTED	This point the system has received a run command and is started. It may or may not be running based on the RUN ENABLE status.	
{29}	DAY.NIGHT	This is 1 of 5 mandatory FLN points required for compatibility with Siemens control systems. It has no functionality in the bypass application.	
30	BYP RUN DLY	This allows FLN to delay running of the system after a run command has been issued.	1614
{31}	BYPASS MODE	This point indicates the Hand/Off/Auto status of the bypass. 0=OFF; 1=HAND; 2=AUTO.	

FLN Detailed Point Descriptions			
Point		**Description**	**Drive Parameter**
{32}	DRIVE.BYPASS	This point indicates if the system is selected to operate the motor from the drive or from the bypass.	
{33}	BYP RUNNING	This point indicates the bypass's run status. It differs from the system running status in that it only applies to the bypass's status not the logical OR of the drive and bypass status.	
{34}	RUN ENA ACT	This point indicates the status of the system Run Enable command, regardless of its source (1 = ENABLE, 0 = DISABL).	
{35}	RUN ENA CMD	This point is commanded by FLN to assert the system Run Enable command (1 = ENABLE, 0 = DISABL). Bypass parameter 1602 must be set to COMM for FLN to have this control.	
{36}	FLN LOC ACT	This point indicates if the bypass has been placed in "FLN LOCAL" mode by commanding point 68 (FLN LOCAL). Commanding this point to FLN (1) "steals" control from its normal source and places it in FLN control. Note that the HAND mode of the panel has priority over FLN local control.	
{37}	FLN CTL SRC	This point indicates if FLN is a source for control inputs (1 = YES, 0 = NO). Note that this status point is true if any of the following control inputs are from FLN: Run/ Stop, Run Enable, Start Enable 1, Start Enable 2, Start Enable 3 or Start Enable 4.	
{40}	RO 1 COMMAND	This point controls the output state of bypass Relay 1. Bypass parameter 1401 must be set to COMM for FLN to have this control (1 = ON, 0 = OFF).	0107, bit 0
{41}	RO 2 COMMAND	This point controls the output state of bypass Relay 2. Bypass parameter 1401 must be set to COMM for FLN to have this control (1 = ON, 0 = OFF).	0107, bit 1
{42}	RO 3 COMMAND	This point controls the output state of bypass Relay 3. Bypass parameter 1401 must be set to COMM for FLN to have this control (1 = ON, 0 = OFF).	0107, bit 2
{43}	RO 4 COMMAND	This point controls the output state of bypass Relay 4. Bypass parameter 1401 must be set to COMM for FLN to have this control (1 = ON, 0 = OFF).	0107, bit 3
{44}	RO 5 COMMAND	This point controls the output state of bypass Relay 5. Bypass parameter 1401 must be set to COMM for FLN to have this control (1 = ON, 0 = OFF).	0107, bit 4
{48}	RESET RUN TIME	Run Time reset	0108
{49}	RESET KW HOURS	Kilowatt hours reset	0106
{50}	START ENA 1	This point is commanded by FLN to assert the system Start Enable 1 command (1 = ENABLE, 0 = DISABL). Bypass parameter 1603 must be set to COMM for FLN to have this control.	
{51}	START ENA 2	This point is commanded by FLN to assert the system Start Enable 1 command (1 = ENABLE, 0 = DISABL). Bypass parameter 1604 must be set to COMM for FLN to have this control.	

FLN Detailed Point Descriptions			
Point		**Description**	**Drive Parameter**
{52}	START ENA 3	This point is commanded by FLN to assert the system Start Enable 1 command (1 = ENABLE, 0 = DISABL). Bypass parameter 1605 must be set to COMM for FLN to have this control.	
{53}	START ENA 4	This point is commanded by FLN to assert the system Start Enable 1 command (1 = ENABLE, 0 = DISABL). Bypass parameter 1606 must be set to COMM for FLN to have this control.	
{59}	PAR LOCK	When switched to locked prevents parameter changes from the panel.	1619
{68}	FLN LOC CTL	Commands the bypass into FLN Local Control. In this mode, FLN takes the bypass control from the normal source. However, the panel's HAND mode still has priority.	
{70}	DI 1 ACTUAL	This point indicates the status of bypass Digital Input 1 (1 = ON, 0 = OFF).	0103, bit 5
{71}	DI 2 ACTUAL	This point indicates the status of bypass Digital Input 2 (1 = ON, 0 = OFF).	0103, bit 4
{72}	DI 3 ACTUAL	This point indicates the status of bypass Digital Input 3 (1 = ON, 0 = OFF).	0103, bit 3
{73}	DI 4 ACTUAL	This point indicates the status of bypass Digital Input 4 (1 = ON, 0 = OFF).	0103, bit 2
{74}	DI 5 ACTUAL	This point indicates the status of bypass Digital Input 5 (1 = ON, 0 = OFF).	0103, bit 1
{75}	DI 6 ACTUAL	This point indicates the status of bypass Digital Input 6 (1 = ON, 0 = OFF).	0103, bit 0
{76}	RO 1 ACTUAL	This point indicates the status of bypass Relay Output 1 (1 = ON, 0 = OFF).	0104, bit 4
{77}	RO 2 ACTUAL	This point indicates the status of bypass Relay Output 2 (1 = ON, 0 = OFF).	0104, bit 3
{78}	RO 3 ACTUAL	This point indicates the status of bypass Relay Output 3 (1 = ON, 0 = OFF).	0104, bit 2
{79}	RO 4 ACTUAL	This point indicates the status of bypass Relay Output 4 (1 = ON, 0 = OFF).	0104, bit 1
{80}	RO 5 ACTUAL	This point indicates the status of bypass Relay Output 5 (1 = ON, 0 = OFF).	0104, bit 0
86	BYPASS ALARM	This point indicates the current alarm state of the bypass (1 = ALARM, 0 = OK).	
88	ALARM WORD1	This point is a bit-field indicating active alarms in the bypass.	0308
89	ALARM WORD2	This point is a bit-field indicating active alarms in the bypass.	0309
90	LAST FAULT	This point is first in the bypass's fault log and indicates the most recent fault declared.	0401
93	OK.FAULT BYP	This point indicates the current fault state of the bypass (1 = FAULT, 0 = OK).	

FLN Detailed Point Descriptions			
Point		**Description**	**Drive Parameter**
94	RESET FAULT	This point is commanded by FLN to reset a faulted bypass (1 = RESET, 0 = NO). Bypass parameter 1607 must be set to COMM for FLN to control this state. This point is "momentary", i.e. it will automatically return to its inactive state once the command is issued. This is a convenience for the user, since this control input is rising-edge sensitive and would otherwise require an explicit command to clear it before a subsequent reset could be issued.	
99	ERROR STATUS	This is 1 of 5 mandatory FLN points required for compatibility with Siemens control systems. It has no functionality in the bypass application.	

BACnet protocol technical data – system

System overview -

When bypass parameter 1625 COMM CTL = (0) DRIVE ONLY, the drive's BACnet objects are all 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 *2-81*.

Bypass BACnet objects not valid

Point #	Name
BV10	RUN/STOP CMD
BV11	OVERRIDE CMD
BV12	RUN ENA CMD
BV14	FAULT RESET
BV15	START ENA 1
BV16	START ENA 2
BV17	START ENA 3
BV18	START ENA 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 ENA CMD
BV20	START ENABLE 1
BV21	START ENABLE 2

Drive overview

Bypass parameter Group 53 defines features unique to BACnet, as described below:

Parameter		Default Value	BACnet-specific Description
5301	EFB PROTOCOL ID	x5xx	This parameter indicates the active protocol and its revision. It should read x50xx if BACnet is properly loaded. If this is not the case, confirm that bypass parameter 9802 = BACNET (5).
5302	EFB STATION ID	128	This parameter sets the drive's BACnet MS/TP MAC ID. A temporary value of 0 places the protocol channel in reset.[1]
5303	EFB BAUD RATE	38400	This parameter sets the BACnet MS/TP baud rate.

Parameter		Default Value	BACnet-specific Description
5304	EFB PARITY	0	This parameter sets the BACnet MS/TP character format as follows: 0 = 8N1 1 = 8N2 2 = 8E1 3 = 8O1.
5305	EFB CTRL PROFILE	-	This parameter indicates the active control profile. This parameter has no affect on BACnet behavior.
5306	EFB OK MESSAGES	-	This parameter indicates the number of valid application messages received at this drive. This count does not include MS/TP token passing and polling messages. (For such messages, see 5316).
5307	EFB CRC ERRORS	-	This parameter indicates the number of CRC errors detected, in either the header or data CRCs.
5308	EFB UART ERRORS	-	This parameter indicates the number of UART-related errors (framing, parity) detected.
5309	EFB STATUS	-	This parameter indicates the internal status of the BACnet channel as follows: • IDLE – BACnet channel is configured but not receiving messages. • TIMEOUT – Time between valid messages has exceeded the interval set by parameter 3019. • OFFLINE – BACnet channel is receiving messages NOT addressed to this drive. • ONLINE – BACnet channel is receiving messages addressed to this drive. • RESET – BACnet channel is in reset. • LISTEN ONLY – BACnet channel is in listen-only mode.
5310	EFB PAR 10	5	This parameter sets the BACnet MS/TP response turn-around time, in milliseconds.
5311	EFB PAR 11	0	This parameter, together with parameter 5317, EFB PAR 17, sets BACnet object instance IDs: • For the range 1 to 65,535: This parameter sets the ID directly (5317 must be 0). For example, the following values set the ID to 49134: 5311 = 49134 and 5317 = 0. • For IDs > 65,535: The ID equales 5311's value plus 10,000 times 5317's value. For example, the following values set the ID to 71234: 5311 = 1234 and 5317 =7/
5312	EFB PAR 12	1	This parameter sets the BACnet Device Object Max Info Frames property.
5313	EFB PAR 13	127	This parameter sets the BACnet Device Object Max Master property.
5314	EFB PAR 14	0	N/A Not supported with BACnet Protocol Version 0506 and higher
5315	EFB PAR 15		N/A Not supported with BACnet Protocol Version 0506 and higher

Parameter		Default Value	BACnet-specific Description
5316	EFB PAR 16	0	This parameter indicates the count of MS/TP tokens passed to this drive.
5317	EFB PAR 17	0	This parameter works with paramter 5311 to set BACnet instance IDs. See parameter 5311.
5318 … 5320	EFB PAR 18…20		N/A - Not supported with BACnet protocol.

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 53, EFB Protocol, do not take affect until you perform one of the following:

- Cycle the bypass power OFF and ON, or
- Set bypass parameter 5302 to 0, and then back to a unique MAC ID, or
- Use the ReinitializeDevice service.

Quick-start sequence - drive communications

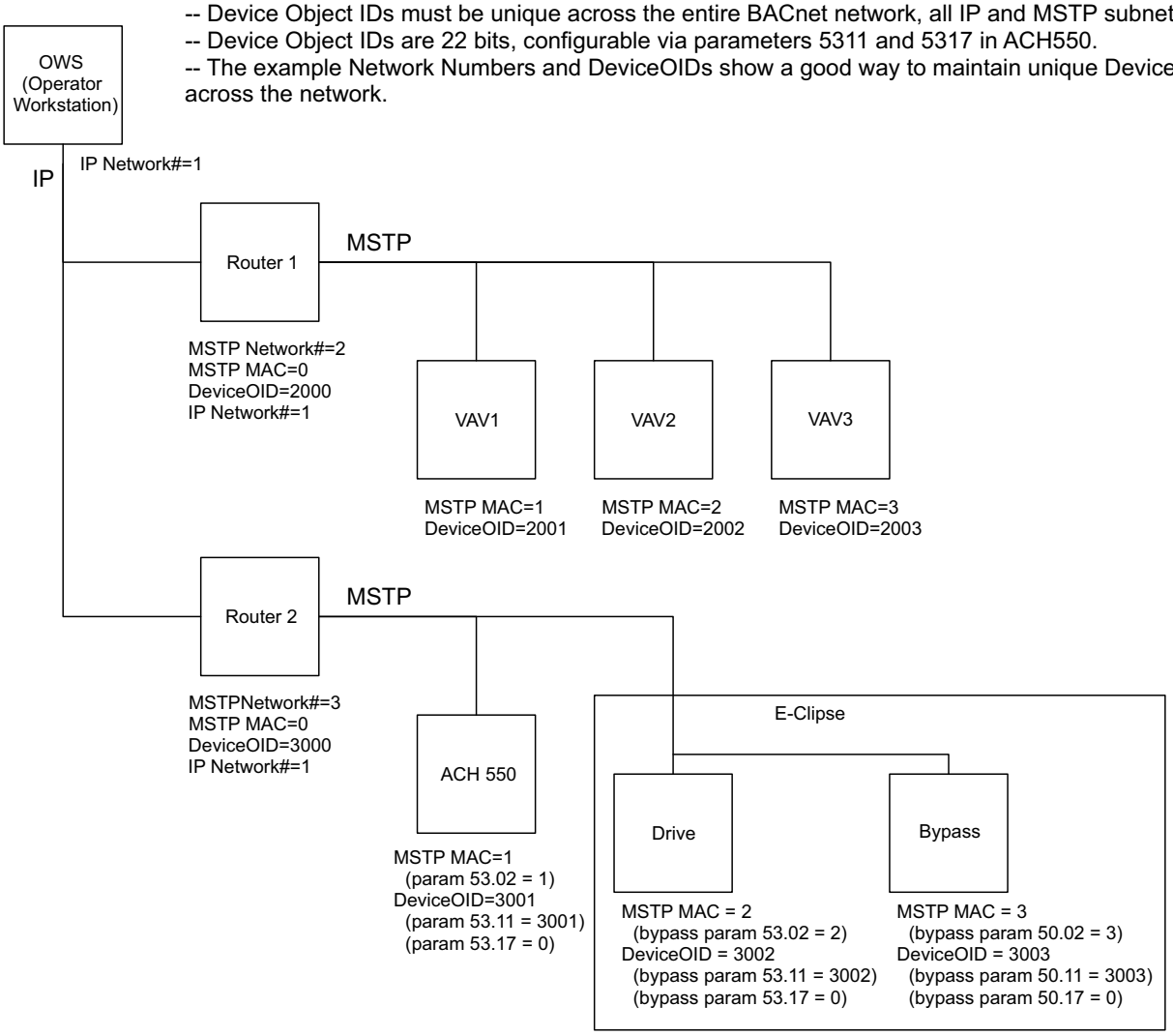
The following steps summarize the process for enabling and configuring BACnet on the ABB E-Clipse Bypass:

1. Enable BACnet protocol: Set bypass parameter 9802, COMM PROTOCOL SEL BACNET (5).
   - To confirm this selection, read bypass parameter 5301, EFB PROTOCOL ID. It should read x5xx (where "x" is any value).
2. Place the BACnet channel in "reset": Set bypass parameter 5302, 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 5303, EFB BAUD RATE = appropriate value
4. Define the Device Object instance.
   - To define a specific device object instance value, use bypass parameters 5311 and 5317 (object instance values must be unique and in the range 1 to 4,194,303).
   - To use the bypass' MS/TP MAC ID as the device object instance value, set bypass parameter 5311 and 5317 = 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 5302, 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 5316, EFB PAR 16 (the MS/TP token counter), should be continually increasing.
   - Bypass parameter 5306, 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. We do 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 5302 in ACH550.
1..127 = range of supported Master addresses for ACH550
-- 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 5311 and 5317 in ACH550.
-- 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[2] 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

Note: [2] 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.

Drive Parameter		Value	Description	BACnet Access Point
1102	EXT1/EXT2 SEL[2]	COMM (8)	Reference set selection by fieldbus.	BV13
1103	REF1 SEL	COMM (8)	Input reference 1 by fieldbus.	AV16
1106	REF2 SEL	COMM (8)	Input reference 2 by fieldbus.	AV17

Note: [2] Ext1 = Ref 1
Ext 2 = Ref 2; Ref 2 normally used for PID setpoint commands.

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	Description	BACnet Access Point
1401	RELAY OUTPUT 1	COMM (35)	Relay Output 1 controlled by fieldbus.	BO0
1402	RELAY OUTPUT 2	COMM (35)	Relay Output 2 controlled by fieldbus.	BO1
1403	RELAY OUTPUT 3	COMM (35)	Relay Output 3 controlled by fieldbus.	BO2
1410[3]	RELAY OUTPUT 4	COMM (35)	Relay Output 4 controlled by fieldbus.	BO3
1411[3]	RELAY OUTPUT 5	COMM (35)	Relay Output 5 controlled by fieldbus.	BO4
1412[3]	RELAY OUTPUT 6	COMM (35)	Relay Output 6 controlled by fieldbus.	BO5

Note: [3] 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	Description	BACnet Access Point
1501	AO1 CONTENT SEL	135 (COMM VALUE 1)	Analog Output 1 controlled by writing to parameter 0135.	AO0
1507	AO2 CONTENT SEL	136 (COMM VALUE 2)	Analog Output 2 controlled by writing to parameter 0136.	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 Access Point
0102	SPEED AV0	AV0
0103	SPEED AV0	AV1
0104	CURRENT AV4	AV4
0105	TORQUE AV5	AV5
0106	POWER AV6	AV6
0107	DC BUS VOLT	AV2
0109	OUTPUT VOLTAGE	AV3
0115	KWH COUNTER	AV8
0118	DI1-3 STATUS	B16, B17, B18
0122	RO1-3 STATUS	B10, B11, B12

Mailbox read/write

The ACH550 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.

Drive Parameter		BACnet Access Point
Mailbox Parameter	Enter the number of the drive parameter to access.	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: You must read and write mailbox values using the drive's internal scaling. For example, the parameter 2202, ACCEL TIME1, 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 *Complete parameter list* in the ACH550-UH User's Manual for each parameter's resolution and units of measure.

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

Drive Parameter		Value	BACnet Access Point
0122	RO 1-3 STATUS	Relay 1…3 status.	BI0, BI1, BI2
0123	RO 4-6 STATUS	Relay 4…6 status.	BI3, BI4, BI5

Protocol Implementation Conformance Statement (PICS) - Drive

PICS summary

BACnet Standard Device Profile. This version of ACH550 BACnet fully conforms to the 'Application-Specific Controller' standard device profile (B-ASC).

Services Supported. The following services are supported by the ACH550:

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

Data Link Layer. The ACH550 implements MS/TP (Master) Data Link Layer. All standard MS/TP baud rates are supported (9600, 19200, 38400 & 76800).

MAC ID / Device Object Instance. The ACH550 supports separate MAC ID and Device Object Instance parameters:

- Set the MAC ID using drive parameter 5302. Default: 5302 = 1.
- Set the Device Object Instance using drive parameters 5311 and 5317. Default: Both 5311 and 5317 = 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 5311 and 5317 = 0.
  - For IDs in the range of 1 to 65,535: Parameter 5311 sets the ID directly (5317 must be 0). For example, the following values set the ID to 49134: 5311 = 49134 and 5317 = 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: 5311 = 1234 and 5317 = 7.

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

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

MS/TP token counter

Parameter 5316 stores the count of MS/TP tokens passed to this drive.

Statement

This statement is part of this Standard and is required for its use.

BACnet Protocol Implementation Conformance Statement	
Date:	November 1, 2006
Vendor Name:	ABB, Inc
Product Name:	Low Voltage AC Motor Drive
Product Model Number:	ACH550
Applications Software Version:	050F
Firmware Revision:	312B
BACnet Protocol Revision:	4
Product Description:	The ACH550 is a high-performance adjustable frequency drive specifically designed for commercial automation applications. This product supports native BACnet, connecting directly to the MS/TP LAN. All standard MS/TP baud rates are supported, as well as master mode functionality. Over BACnet, the drive can be fully controlled as a standard adjustable frequency drive. In addition, up to 16 configurable I/O ports are available over BACnet for user applications.
BACnet Standardized Device Profile (Annex L):	☐ BACnet Operator Workstation (B-OWS) ☐ BACnet Building Controller (B-BC) ☐ BACnet Advanced Application Controller (B-AAC) ☒ BACnet Application Specific Controller (B-ASC) ☐ BACnet Smart Sensor (B-SS) ☐ BACnet Smart Actuator (B-SA)
List all BACnet Interoperability Building Blocks Supported (Annex K):	DS-RP-B, DS-WP-B, DM-DDB-B, DM-DOB-B, DM-DCC-B, DM-RD-B.
Segmentation Capability:	☐ Segmented requests supported. Window Size ____ ☐ Segmented responses supported. Window Size ____
Standard Object Types Supported: An object type is supported if it may be present in the device. For each standard Object Type supported provide the following data: 1) Whether objects of this type are dynamically creatable using the CreateObject service 2) Whether objects of this type are dynamically detectable using the DeleteObject service 3) List of the optional properties supported 4) List of all properties that are writable where not otherwise required by this standard 5) List of proprietary properties and for each its property identifier, datatype, and meaning 6) List of any property range restrictions	See table at *Object/property support matrix* on page *2-155*.

BACnet Protocol Implementation Conformance Statement	
Data Link Layer Options:	☐ BACnet IP, (Annex J) ☐ BACnet IP, (Annex J), Foreign Device ☐ ISO 8802-3, Ethernet (Clause 7) ☐ ANSI/ATA 878.1, 2.5 Mb. ARCNET (Clause 8) ☐ ANSI/ATA 878.1, EIA-485 ARCNET (Clause 8), baud rate(s) ___ ☒ MS/TP master (Clause 9), baud rate(s): 9600, 19200, 38400, 76800 ☐ MS/TP slave (Clause 9), baud rate(s): ___ ☐ Point-To-Point, EIA 232 (Clause 10), baud rate(s): ___ ☐ Point-To-Point, modem, (Clause 10), baud rate(s): ___ ☐ LonTalk, (Clause 11), medium: _____ ☐ Other: _____
Device Address Binding: Is static device binding supported? (This is currently necessary for two-way communication with MS/TP slaves and certain other devices.)	☐ Yes ☒ No
Networking Options:	☐ Router, Clause 6 - List all routing configurations, e.g., ARCNET-Ethernet, Ethernet-MS/TP, etc. ☐ Annex H, BACnet Tunneling Router over IP ☐ BACnet/IP Broadcast Management Device (BBMD)
Does the BBMD support registrations by Foreign Devices?	☐ Yes ☐ No
Character Sets Supported: Indicating support for multiple character sets does not imply that they can all be supported simultaneously.	☒ ANSI X3.4 ☐ IBM™/Microsoft™ DBCS ☐ ISO 8859-1 ☐ ISO 10646 (UCS-2) ☐ ISO 10646 (UCS-4) ☐ JIS C 6226
If this product is a communication gateway, describe the types of non-BACnet equipment/network(s) that the gateway supports:	

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
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			✓	✓ *		✓	✓ *
Relinquish Default			✓	✓ *		✓	✓ *
Polarity		✓	✓				
Active Text		✓	✓	✓			
Inactive Text		✓	✓	✓			

* For commandable values only.

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 OREL-01 option).	ON/OFF	R
BI4	RO 5 ACT	This object indicates the status of Relay Output 5 (requires OREL-01 option)	ON/OFF	R
BI5	RO 6 ACT	This object indicates the status of Relay Output 6 (requires OREL-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 & 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 COMMAND	This object controls the output state of Relay 1. This control requires that parameter 1401 value = COMM.	ON/OFF	C
BO1	RO2 COMMAND	This object controls the output state of Relay 2. This control requires that parameter 1402 value = COMM.	ON/OFF	C
BO2	RO3 COMMAND	This object controls the output state of Relay 3. This control requires that parameter 1403 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 Relay 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 Relay 5. This control requires that parameter 1411 value = COMM (also requires OREL-01 option).	ON/OFF	C
BO5	RO6 COMMAND	This object controls the output state of Relay 6. This control requires that parameter 1412 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 & 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	ALARM ACT	This object indicates the drive's alarm status.	ALARM/OK	R
BV6	MAINT REQ	This object indicates the drive's maintenance status. Refer to Group 29 in the drive's parameter descriptions.	MAINT/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

Instance ID	Object Name	Description	Active/Inactive Text	Present Value Access Type
BV9	RUN ENA ACT	This object indicates the Run Enable command status, regardless of the control source.	ENABLE/ DISABLE	R
BV10	RUN/STOP CMD	This object commands a drive start. Control requires either: • Parameter 1001 value = COMM for control by EXT1 or • Parameter 1002 value = COMM for control by EXT2.	RUN/STOP	C
BV11	FWD/REV CMD	This object commands a motor rotation direction change. Control requires 1003 = REQUEST and either: • Parameter 1001 value = COMM for control by EXT1 or • Parameter 1002 value = COMM for control by EXT2.	REV/FWD	C
BV12	RUN ENA CMD	This object commands Run Enable. 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 1102 value = COMM.	EXT2/EXT1	C
BV14	FAULT RESET	This object resets a faulted drive. The command is rising-edge triggered. Control requires parameter 1604 value = COMM.	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 1602.	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

Instance ID	Object Name	Description	Active/Inactive Text	Present Value Access Type
BV19	CTL OVERRIDE ACT	This object indicates whether the drive is in BACnet Control Override. (See BV18.)	ON/OFF	R
BV20	START ENABLE 1	This object commands start enable1. Control requires param 1608 value = COMM.	ENABLE/ DISABLE	C
BV21	START ENABLE 2	This object commands start enable1. Control requires param 1609 value = COMM.	ENABLE/ DISABLE	C

Note: For Present Value Access Types, R = Read-only, W = Writeable, C = Commandable. Commandable values support priority arrays & 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 0120.	Percent	R
AI1	ANALOG INPUT 2	This object indicates the value of Analog Input 2. The corresponding drive parameter is 0121.	Percent	R

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

Analog output object instance summary – drive

The following table summarizes the Analog Output Objects supported:

Instance ID	Object Name	Description	Units	Present Value Access Type
AO0	AO 1 COMMAND	This object controls Analog Output 1. The corresponding drive parameter is 0135, COMM VALUE 1. Control requires parameter 1501 value = 135.	Percent	C
AO1	AO 2 COMMAND	This object controls Analog Output 2. The corresponding drive parameter is 0136, COMM VALUE 2. Control requires parameter 1507 value = 136.	Percent	C

Note: For Present Value Access Types, R = Read-only, W = Writeable, C = Commandable. Commandable values support priority arrays & 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 0102.	RPM	R
AV1	OUTPUT FREQ	This object indicates the output frequency applied to the motor in Hz. The corresponding drive parameter is 0103.	Hertz	R
AV2	DC BUS VOLT	This object indicates the drive's DC bus voltage level. The corresponding drive parameter is 0107.	Volts	R
AV3	OUTPUT VOLT	This object indicates the AC output voltage applied to the motor. The corresponding drive parameter is 0109.	Volts	R
AV4	CURRENT	This object indicates the measured output current. The corresponding drive parameter is 0104.	Amps	R
AV5	TORQUE	This object indicates the calculated motor output torque as a percentage of nominal torque. The corresponding drive parameter is 0105.	Percent	R
AV6	POWER	This object indicates the measured output power in kW. The corresponding drive parameter is 0106.	Kilowatts	R
AV7	DRIVE TEMP	This object indicates the measured heatsink temperature in °C. The corresponding drive parameter is 0110.	°C	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 0115.	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 0130.	Percent	R
AV11	PRC PID DEV	This object is the Process PID output signal's deviation from its setpoint. The corresponding drive parameter is 0132.	Percent	R
AV12	EXT PID FBCK	This object is the External PID feedback signal. The corresponding drive parameter is 0131.	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. The corresponding drive parameter is 0133.	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 0114.	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 0145.	°C	R
AV16	INPUT REF 1	This object sets Input Reference 1. Control requires parameter 1103 value = COMM.	Percent	C
AV17	INPUT REF 2	This object sets either: • Input Reference 2. Control requires parameter 1106 value = COMM. • Process PID setpoint. Control requires parameter 1106 value = PID1 OUT and parameter 4010 value = COMM.	Percent	C
AV18	LAST FLT	This object indicates the most recent fault entered in the drive's fault log. The corresponding drive parameter is 0401.	None	R
AV19	PREV FLT 1	This object indicates the second most recent fault entered in the drive's fault log. The corresponding drive parameter is 0412.	None	R
AV20	PREV FLT 2	This object indicates the third most recent fault entered in the drive's fault log. The corresponding drive parameter is 0413.	None	R
AV21	AO 1 ACT	This object indicates Analog Output 1's level. The corresponding drive parameter is 0124.	Milliamps	R
AV22	AO 2 ACT	This object indicates Analog Output 2's level. The corresponding drive parameter is 0125.	Milliamps	R
AV23	ACCEL1 TIME	This object sets the Ramp1 acceleration time. The corresponding drive parameter is 2202.	Seconds	W
AV24	DECEL1 TIME	This object sets the Ramp1 deceleration time. The corresponding drive parameter is 2203.	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

Instance ID	Object Name	Description	Units	Present Value Access Type
AV27	EXT PID STPT	This object sets the External PID controller setpoint. The corresponding drive parameter is 4211. Control requires parameter 4210, PID SETPOINT SEL, value = 19 (INTERNAL).	Percent	C

BACnet Protocol Implementation Conformance Statement	
Date:	March 1, 2008
Vendor Name:	ABB, Inc
Product Name:	ABB E-Clipse Bypass
Product Model Number:	VCR, VDR, BCR, and BDR
Applications Software Version:	0.92
Firmware Revision:	1501
BACnet Protocol Revision:	4
Product Description:	The ABB E-Clipse Bypass is an optional feature to the ACH550 high-performance adjustable frequency drive specifically designed for commercial automation applications. This product supports native BACnet, connecting directly to the MS/TP LAN. All standard MS/TP baud rates are supported, as well as master mode functionality. Over BACnet, the drive and bypass can be fully controlled as a standard adjustable frequency drive and a constant speed drive bypass. In addition, up to 24 configurable I/O are available over BACnet to the user application.
BACnet Standardized Device Profile (Annex L):	☐ BACnet Operator Workstation (B-OWS) ☐ BACnet Building Controller (B-BC) ☐ BACnet Advanced Application Controller (B-AAC) ☒ BACnet Application Specific Controller (B-ASC) ☐ BACnet Smart Sensor (B-SS) ☐ BACnet Smart Actuator (B-SA)
List all BACnet Interoperability Building Blocks Supported (Annex K):	DS-RP-B, DS-WP-B, DM-DDB-B, DM-DOB-B, DM-DCC-B, DM-RD-B
Segmentation Capability:	☐ Segmented requests supported. Window Size ____ ☐ Segmented responses supported. Window Size ____
Standard Object Types Supported:	Object instantiation is static, i.e. objects cannot be created or deleted. Refer to tables at end of this document for object details
Data Link Layer Options:	☐ BACnet IP, (Annex J) ☐ BACnet IP, (Annex J), Foreign Device ☐ ISO 8802-3, Ethernet (Clause 7) ☐ ANSI/ATA 878.1, 2.5 Mb. ARCNET (Clause 8) ☐ ANSI/ATA 878.1, EIA-485 ARCNET (Clause 8), baud rate(s) ___ ☒ MS/TP master (Clause 9), baud rate(s): 9600, 19200, 38400, 76800 ☐ MS/TP slave (Clause 9), baud rate(s): ___ ☐ Point-To-Point, EIA 232 (Clause 10), baud rate(s): ___ ☐ Point-To-Point, modem, (Clause 10), baud rate(s): ___ ☐ LonTalk, (Clause 11), medium: _____ ☐ Other: _____
Device Address Binding: Is static device binding supported? (This is currently necessary for two-way communication with MS/TP slaves and certain other devices.)	☐ Yes ☒ No
Networking Options:	☐ Router, Clause 6 - List all routing configurations, e.g., ARCNET-Ethernet, Ethernet-MS/TP, etc. ☐ Annex H, BACnet Tunneling Router over IP ☐ BACnet/IP Broadcast Management Device (BBMD)

BACnet Protocol Implementation Conformance Statement	
Does the BBMD support registrations by Foreign Devices?	☐ Yes ☐ No
Character Sets Supported: Indicating support for multiple character sets does not imply that they can all be supported simultaneously.	☒ ANSI X3.4 ☐ IBM™/Microsoft™ DBCS ☐ ISO 8859-1 ☐ ISO 10646 (UCS-2) ☐ ISO 10646 (UCS-4) ☐ JIS C 6226
If this product is a communication gateway, describe the types of non-BACnet equipment/network(s) that the gateway supports:	

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		✓	✓	✓			

* 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 & 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 & 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 staus 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 dirve is controlling the motor.	BYPASS/ DRIVE	R
BV5	ALARM ACT	This Object indicates the bypass run status regardless of the control source.	ALARM/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	RUN ENA ACT	This Object indicates if the Run Enable status 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 16.01 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 17.01 value = COMM for BACnet to control.	YES/NO	C
BV12	RUN ENA CMD	This Object commands the system Run Enable. This requires bypass parameter 16.02 value = COMM for BACnet to control.	ENABLE/ DISABLE	C
BV13	OVERRIDE ACT	This Object indicates if bypass override 1 or bypass 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 16.07 value = COMM for BACnet to control.	RESET/ NO	C
BV15	START ENABLE 1	This Object commands the system Start Enable 1. This requires bypass parameter 16.03 value = COMM for BACnet to control.	ENABLE/ DISABLE	C
BV16	START ENABLE 2	This Object commands the system Start Enable 2. This requires bypass parameter 16.04 value = COMM for BACnet to control.	ENABLE/ DISABLE	C
BV17	START ENABLE 3	This Object commands the system Start Enable 3. This requires bypass parameter 16.05 value = COMM for BACnet to control.	ENABLE/ DISABLE	C
BV18	START ENABLE 4	This Object commands the system Start Enable 4. This requires bypass parameter 16.06 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 & 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	ALARM WORD 1	This Object indicates the first alarm status word of the bypass. The corresponding bypass parameter is 0308	None	R
AV5	ALARM WORD 2	This Object indicates the first alarm 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 – system

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 & 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) & 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/0) and Modbus reference space. For details, see *Modbus addressing* below.

ACH550	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 5305 (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 ACH400 and ACH550 drive. 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 ACS600 and ACS800 drive. 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 40002 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 bypass maps the following information to the 0xxxx Modbus set called Modbus Coils:

- Bit-wise map of the CONTROL WORD (selected using bypass parameter 5305 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 (5305 = 0)**	DCU PROFILE **BP Param (5305 = 1)**	ABB DRV FULL **BP Param (5305 = 2)**
00001	CONTROL WORD – Bit 0	OFF1*	STOP	OFF1*
00002	CONTROL WORD – Bit 1	OFF2*	START	OFF2*
00003	CONTROL WORD – Bit 2	OFF3*	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… **0**0032	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

* = 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 5305 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 (5305 = 0 or 2)**	DCU PROFILE **BP Param (5305 = 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*	ZERO_SPEED
10006	STATUS WORD – Bit 5	OFF_3_STA*	ACCELERATE
10007	STATUS WORD – Bit 6	SWC_ON_INHIB	DECELERATE
10008	STATUS WORD – Bit 7	ALARM	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	FIELDBUS_LOCAL
10015	STATUS WORD – Bit 14	N/A	EXT2_ACT
10016	STATUS WORD – Bit 15	N/A	FAULT
10017	STATUS WORD – Bit 16	Reserved	ALARM
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 (5305 = 0 or 2)	DCU PROFILE BP Param (5305 = 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

* = 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 ACH550 supports the following Modbus function codes for 3xxxx registers:

Function Code	Description
04	Read 3xxxx input status

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

- 40001…40099 map to drive control and actual values. These registers are described in the table below.
- 40101…49999 map to drive parameters 0101…9999. 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.

The following table summarizes the 4xxxx drive control registers 40001…40099 (for 4xxxx registers above 40099, see the drive parameter list, e.g. 40102 is parameter 0102):

Modbus Register		Access	Remarks
40001	ABB DRIVES PROFILE CONTROL WORD	R/W	Maps directly to the profile's CONTROL WORD. Supported only if bypass parameter 5305 = 0 or 2 (ABB drive profile). Bypass parameter 5319 holds a copy in hex format.
40002	Reference 1	R/W	Range = 0…+20000 (scaled to 0…1105 REF1 MAX), or -20000…0 (scaled to 1105 REF1 MAX…0).
40003	Reference 2	R/W	Range = 0…+10000 (scaled to 0…1108 REF2 MAX), or -10000…0 (scaled to 1108 REF2 MAX…0).
40004	ABB DRIVES PROFILE STATUS WORD	R	Maps directly to the profile'S STATUS WORD. Supported only if bypass parameter 5305 = 0 or 2 (ABB bypass profile). Bypass parameter 5320 holds a copy in hex format.
40005	Actual 1 (select using 5310)	R	By default, stores a copy of 0103 OUTPUT FREQ. Use parameter 5310 to select a different actual value for this register.
40006	Actual 2 (select using 5311)	R	By default, stores a copy of 0104 CURRENT. Use parameter 5311 to select a different actual value for this register.
40007	Actual 3 (select using 5312)	R	By default, stores nothing. Use bypass parameter 5312 to select an actual value for this register.
40008	Actual 4 (select by 5313)	R	By default, stores nothing. Use bypass parameter 5313 to select an actual value for this register.
40009	Actual 5 (select using 5314)	R	By default, stores nothing. Use bypass parameter 5314 to select an actual value for this register.
40010	Actual 6 (select using 5315)	R	By default, stores nothing. Use bypass parameter 5315 to select an actual value for this register.
40011	Actual 7 (select using 5316)	R	By default, stores nothing. Use bypass parameter 5316 to select an actual value for this register.
40012	Actual 8 (select using 5317)	R	By default, stores nothing. Use bypass parameter 5317 to select an actual value for this register.
40031	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 5305 = 1. See bypass parameter 0301.
40032	DCU CONTROL WORD MSW	R	Maps directly to the Most Significant Word of the DCU profile's CONTROL WORD. Supported only if BP Param 5305 = 1. See bypass parameter 0302.
40033	DCU STATUS WORD LSW	R	Maps directly to the Least Significant Word of the DCU profile's CONTROL WORD. Supported only if BP Param 5305 = 1. See bypass parameter 0303.
40034	DCU STATUS WORD MSW	R	Maps directly to the Most Significant Word of the DCU profile's CONTROL WORD. Supported only if BP Param 5305 = 1. See bypass parameter 0304.

For the Modbus protocol, drive parameters in group 53 report the parameter mapping to 4xxxx Registers.

BP Param	Description
5310	EFB PAR 10 Specifies the parameter mapped to Modbus register 40005.
5311	EFB PAR 11 Specifies the parameter mapped to Modbus register 40006.
5312	EFB PAR 12 Specifies the parameter mapped to Modbus register 40007.
5313	EFB PAR 13 Specifies the parameter mapped to Modbus register 40008.
5314	EFB PAR 14 Specifies the parameter mapped to Modbus register 40009.
5315	EFB PAR 15 Specifies the parameter mapped to Modbus register 40010.
5316	EFB PAR 16 Specifies the parameter mapped to Modbus register 40011.
5317	EFB PAR 17 Specifies the parameter mapped to Modbus register 40012.
5318	Reserved.
5319	EFB PAR 19 Holds a copy (in hex) of the ABB DRIVES PROFILE CONTROL WORD, Modbus register 40001.
5320	EFB PAR 20 Holds a copy (in hex) of the ABB DRIVES PROFILE STATUS WORD, Modbus register 40004.

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 4xxxx registers:

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

Actual values

The contents of the register addresses 40005…40012 are ACTUAL VALUES and are:

- Specified using bypass parameters 5310…5317.
- 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 ACH550, because it is one of the following: • Outside min. or max. 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 on multiple protocols, including Modbus and the protocols available on the FBA module. Two implementations of the ABB drives profile are available:

- ABB DRV FULL – This implementation standardizes the control interface with ACS600 and ACS800 drives.
- ABB DRV LIM – This implementation standardizes the control interface with ACH400 and ACH550 drives. This implementation does not support two control word bits supported by ABB DRV FULL.

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 5305 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 (2203 or 2205) 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 2208. 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 enable signal must be active. See bypass parameter 1601. If 1601 is set to COMM, this bit also actives the Run Enable 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 1102 = COMM.
		0	EXT1 SELECT	Select external control location 1 (EXT1). Effective if 1102 = COMM.
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). Simultaneous STOP and START commands result in a stop command.
		0	(no op)	
1	START	1	Start	
		0	(no op)	
2	REVERSE	1	Reverse direction	This bit XOR'd with the sign of the reference defines direction.
		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 enable.
		0	Run enable on	
7	STPMODE_R	1	Normal ramp stop mode	
		0	(no op)	
8	STPMODE_EM	1	Emergency ramp stop mode	
		0	(no op)	
9	STPMODE_C	1	Coast stop mode	
		0	(no op)	

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

DCU Profile CONTROL WORD				
Bit	**Name**	**Value**	**Function**	**Comments**
16…26	Reserved			
27	REF_CONST	1	Constant speed ref.	These bits are only for supervision purposes.
		0	(no op)	
28	REF_AVE	1	Average speed ref.	
		0	(no op)	
29	LINK_ON	1	Master is detected in link	
		0	Link is down	

DCU Profile CONTROL WORD				
Bit	**Name**	**Value**	**Function**	**Comments**
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	ALARM	1	Warning/alarm (See *Alarm listing* in the *Diagnostics* section for details on alarms.)
		0	No warning/alarm
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 ≥ 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 ENABLE	1	External Run Enable signal received
		0	No External Run Enable 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 enable signal received.
		0	No external run enable 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 20 settings.
		0	Operation is within Group 20 settings.
9	SUPERVISION	1	A supervised parameter (Group 32) is outside its limits.
		0	All supervised parameters are 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	FIELDBUS_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	ALARM	1	An alarm is on.
		0	No alarms 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

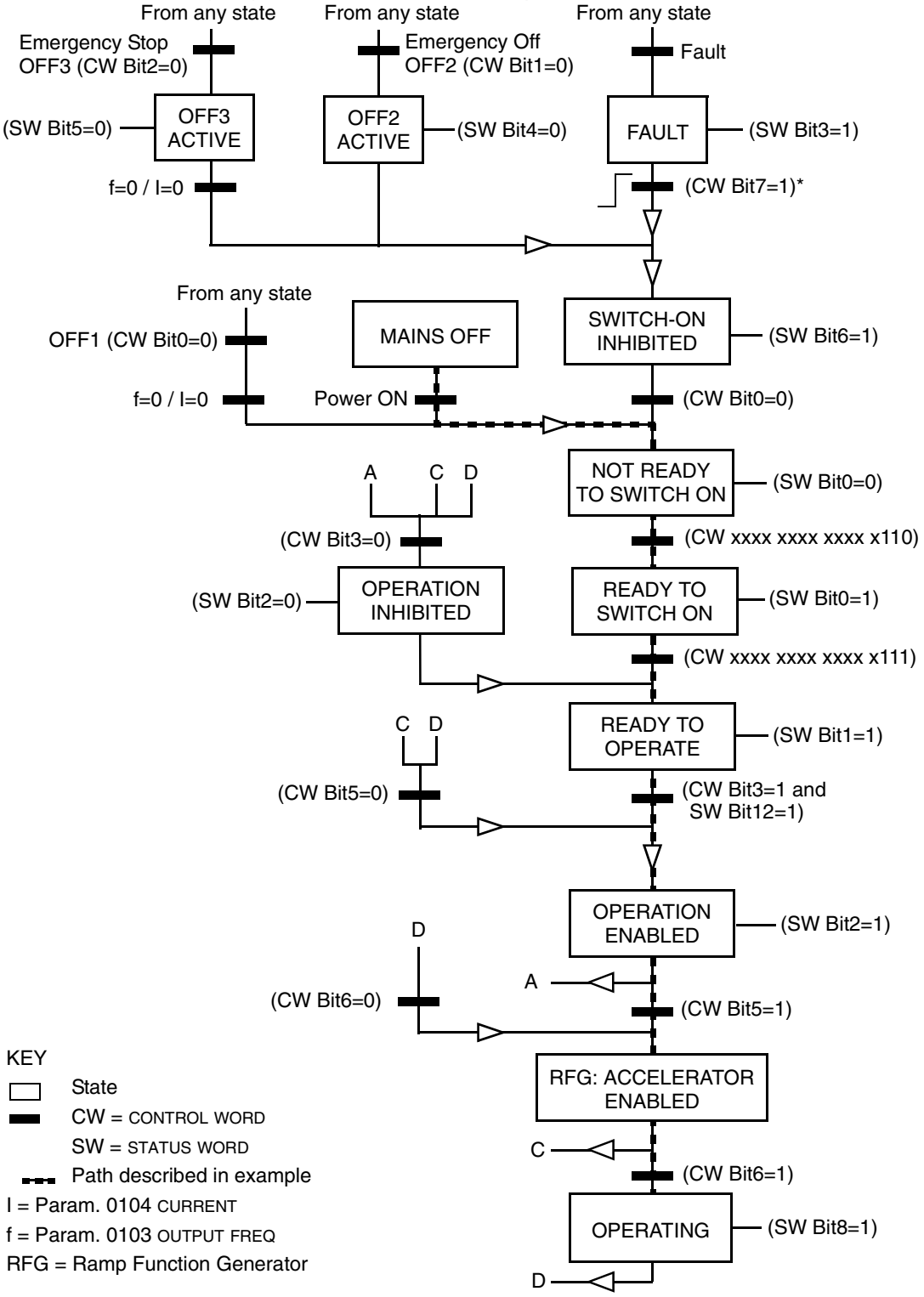
ABB drives profile

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. See above.
- 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).

Bypass overview

The new mode that is available on the E-Clipse bypass is selected by setting bypass parameter 16.25 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 53.05, 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 Enable. The STARTED status bit may be set even when Run Enable is missing.
		0	Run enable 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 Enables. When Start Enable is missing, the drive doesn't set STARTED status bit.
		0	Start enable 1 on	
5	START_DISABLE2	1	Start disabled 2	
		0	Start enable 2 on	
6	START_DISABLE3	1	Start disabled 3	
		0	Start enable 3 on	
7	START_DISABLE4	1	Start disabled 4	
		0	Start enable 4 on	
8	OVERRIDE	1	Override selected	The 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	
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 enable and start enable signals received	
		0	External run enable or start enable signals missing	
2	STARTED	1	Bypass has received start command	
		0	Bypass has not received start command	
3	RUNNING	1	Motor is running	
		0	Motor is not modulating	
4	FIELDBUS_LOCAL	1	Bypass is in fieldbus local mode	Field bus is controlling all inputs that can have COMM setting.
		0	Bypass is not in fieldbus local mode	
5	FAULT	1	Bypass is in fault state	
		0	No faults	
6	ALARM	1	Alarm is on	
		0	No alarms	
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	

BYPASS STATUS WORD				
Bit	**NAME**	**Value**	**Description**	**Comments**
13...15	Reserved			

MODBUS addressing – bypass

0xxxx Registers

MODBUS addressing of 0xxxx registers maps the profile control words shown in the following table, to the first 32 coils when using the drive device ID. The Bypass Control Word defined in the ABB Bypass Profile control word table is mapped to the first 16 coils when using the bypass device ID. For both device IDs, the coil number is the bit number plus 1. In other words, bits 0 – 31 are mapped to coils 1 – 32.

Relay output control is possible on the drive by using the drive device ID and possible on the bypass by using the bypass device ID.

These registers are summarized in **Error! Reference source not found..** Reminder: stop and enable related bits are valid at only one device subject to the status of bypass parameter 16.25, 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...**0**0032	20-31	N/A

MODBUS Registers (0xxxx)		
MODBUS Ref.	Bit	Bypass Device ID
		BCU PROFILE
00033		Bypas Relay Output 1
00034		Bypas Relay Output 2
00035		Bypas Relay Output 3
00036		Bypas Relay Output 4
00037		Bypas Relay Output 5
00038		N/A

1xxxx Registers – Bypass

MODBUS addressing of 1xxxx registers maps the profile status words to the first 32 MODBUS discrete inputs when using the drive device ID. The bypass status word is mapped to the first 16 MODBUS discrete inputs when using the bypass device ID.

For both device IDs, the discrete input is the bit number plus 1. In other words, bits 0 – 31 are mapped to inputs 1 – 32.

These registers are summarized in the following table.

1.1.1 MODBUS Registers (1xxxx)		
MODBUS Ref.	Bit	Bypass Device ID
		BCU PROFILE
10001	0	READY
10002	1	ENABLED
10003	2	STARTED
10004	3	RUNNING
10005	4	FIELDBUS_LOCAL
10006	5	FAULT
10007	6	ALARM
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

1.1.1 MODBUS Registers (1xxxx)		
MODBUS Ref.	**Bit**	**Bypass Device ID**
		BCU PROFILE
10020	19	N/A
10021	20	
10022	21	
10023	22	
10024	23	
10025	24	
10026	25	
10027	26	
10028	27	
10029	28	
10030	29	
10031	30	
10032	31	
10033		Bypass DI1
10034		Bypass DI2
10035		Bypass DI3
10036		Bypass DI4
10037		Bypass DI5
10038		Bypass DI6

4xxxx Registers – Bypass

MODBUS addressing of 4xxxx 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 40001 … 40099 - Bypass

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

40001...40099 map to bypass control and actual values. These registers are descibed in the table below.

40101...49999 map to bypass parameters 0101...9999. 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.

The following table summarizes the 4xxxx bypass control registers 40001...40099 (for 4xxxx registers above 40099, see the drive parameter list, e.g. 40102 is parameter 0102):

MODBUS Registers (40001 to 40099)		
MODBUS Ref.	**Internal location (All profiles)**	**Bypass Device ID**
40001	Control Word	Maps directly to BCU profile control word.
40004	Status Word	Maps directly to BCU profile status word.

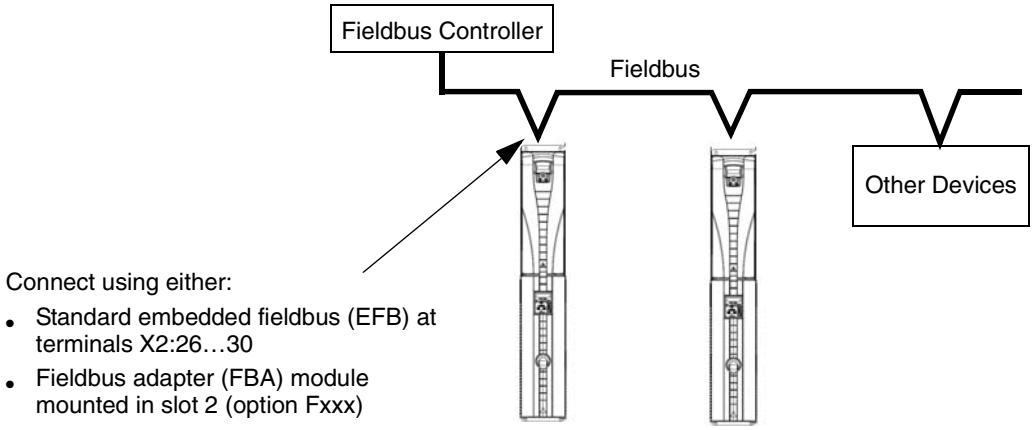
Note: All parameters referenced are bypass parameters.

Fieldbus adapter

Overview

The ACH550 can be set up to accept control from an external system using standard serial communication protocols. When using serial communication, the ACH550 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 serial communications configurations are available:

- Embedded fieldbus (EFB) – See *Embedded fieldbus* on page *2-77*.
- 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 *2-208*.

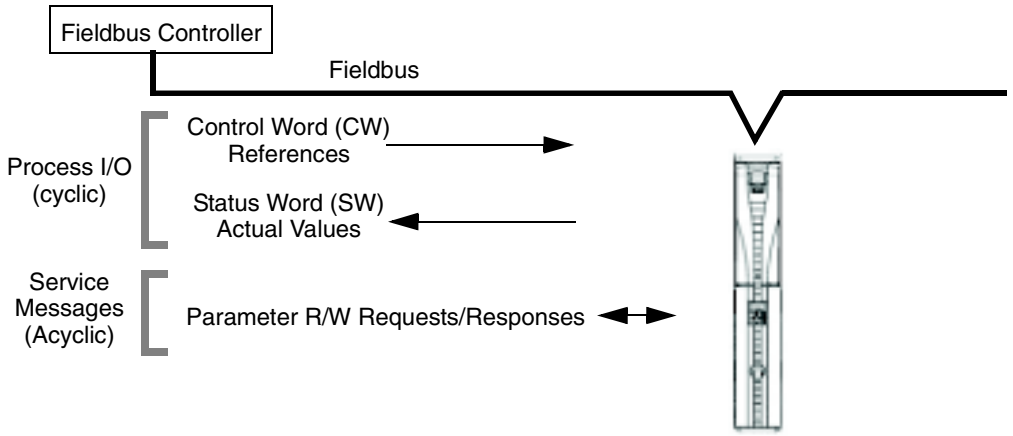
Control interface

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 ACH550. 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 remote (REM) control.
- The serial communication channel is defined as the source for controlling commands from EXT1 (set using parameters 1001 EXT1 COMMANDS and 1102 EXT1/EXT2 SEL).
- The external plug-in fieldbus adapter is activated:
  - Parameter 9802 COMM PROT SEL = 4 (EXT FBA).
  - 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.

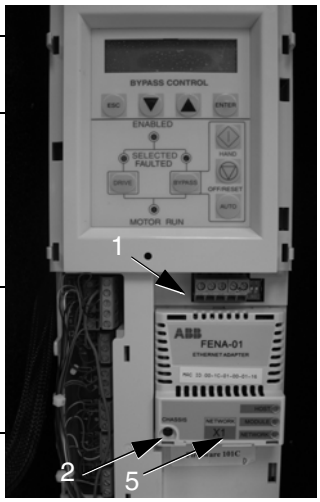
Overview

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 two screws. 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 drive control functions – FBA* on page *2-199*.
   - The protocol specific documentation provided with the module.

Communication setup – FBA

Protocol selection

To activate the serial 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 5401…5410 provide parameter mapping data from E-Clipse Bypass to field controller.
- Parameters 5501…5510 provide parameter mapping data from fieldbus controller to E-Clipse Bypass.
- To map ACH550 parameters in groups 54 or 55 program parameters 5401…5410 or 5501…5510 with the actual ACH550 parameter value. For example to read ACH550 parameter 0106 (Power), program parameter 5401 to 0106.
- To map E-Clipse Bypass parameters in groups 54 or 55 program parameters 5401…5410 or 5501…5510 add 10,000 to the E-Clipse Bypass parameter value. For example to read E-Clipse Bypass parameter 0106 (KW Hours), program parameter 5401 to 10106.

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
1601	START/STOP	2 (COMM)	Selects Source for system start command.	
1625	COMM CTRL	0 (DRIVE ONLY)	Enable drive only control.	

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.)

Drive Parameter		Value	Description	Protocol Reference
1102	EXT1/EXT2 SEL	8 (COMM)	Ref. selected by fieldbus. (Required only if 2 references used.)	
1103	REF1 SEL	8 (COMM) 9 (COMM+AI1) 10 (COMM*AI1)	Input reference 1supplied by fieldbus.	
1106	REF2 SEL	8 (COMM) 9 (COMM+AI) 10 (COMM*AI)	Input reference 2 supplied by fieldbus. (Required only if 2 references used.)	

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
1401	RELAY OUTPUT 1	35 (COMM) 36 (COMM(-1))	Relay Output 1 controlled by fieldbus.	
1402	RELAY OUTPUT 2		Relay Output 2 controlled by fieldbus.	
1403	RELAY OUTPUT 3		Relay Output 3 controlled by fieldbus.	
1410[1]	RELAY OUTPUT 4		Relay Output 4 controlled by fieldbus.	
1411[1]	RELAY OUTPUT 5		Relay Output 5 controlled by fieldbus.	
1412[1]	RELAY OUTPUT 6		Relay Output 6 controlled by fieldbus.	

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

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

Drive Parameter		Value	Protocol Reference
0122	RO 1-3 STATUS	Relay 1…3 status.	
0123	RO 4-6 STATUS	Relay 4…6 status.	

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
1501	AO1 CONTENT SEL	135 (COMM VALUE 1)	Analog Output 1 controlled by writing to parameter 0135.	–
0135	COMM VALUE 1	–		
1502 … 1505	AO1 CONTENT MIN … MAXIMUM AO1	Set appropriate values.	Used for scaling	–
1506	FILTER AO1		Filter time constant for AO1.	–
1507	AO2 CONTENT SEL	136 (COMM VALUE 2)	Analog Output 2 controlled by writing to parameter 0136.	–
0136	COMM VALUE 2	–		
1508 … 1511	AO2 CONTENT MIN … MAXIMUM AO2	Set appropriate values.	Used for scaling	–
1512	FILTER AO2		Filter time constant for AO2.	–

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* above.)

Drive Parameter		Value	Description	Protocol Reference
4010	SETPOINT SEL	8 (COMM VALUE 1) 9 (COMM + AI1) 10 (COMM*AI1)	Setpoint is 0135 value (+/-/* AI1)	–

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 *Complete parameter descriptions*.

Drive Parameter		Protocol Reference
0102	SPEED	
0103	FREQ OUTPUT	
0104	CURRENT	
0105	TORQUE	
0106	POWER	
0107	DC BUS VOLT	
0109	OUTPUT VOLTAGE	
0301	FB STATUS WORD – bit 0 (STOP)	
0301	FB STATUS WORD – bit 2 (REV)	
0118	DI1-3 STATUS – bit 1 (DI3)	

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
1601	START/STOP	2 (COMM)	Start/Stop by fieldbus with Ext1 or Ext2 selected.	
1625	COMM CTRL	1 (SYSTEM)	Enable system control.	

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
1602	RUN ENABLE	2 (COMM) (Not Recommended)	Run enable by fieldbus.	
1603	START ENABLE 1	2 (COMM) (Not Recommended)	Source for start enable 1 is the fieldbus Command word.	
1604	START ENABLE 2	2 (COMM) (Not Recommended)	Source for start enable 2 is the fieldbus Command word.	
1605	START ENABLE 3	2 (COMM) (Not Recommended)		
1606	START ENABLE 4	2 (COMM) (Not Recommended)		
1607	START RESET SEL	2 (COMM)	Fault reset by fieldbus	
1625	COMM CTROL	1 (SYSTEM)	Enable System Control.	

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
1401	RELAY OUTPUT 1	16 (COMM CTRL)	Relay Output 1 controlled by fieldbus.	
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.	
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.	
0123	RO 4-5 STATUS	Relay 4…5 status.	

Communication fault

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

Drive Parameter		Value	Description	Protocol Reference
3004	COMM LOSS	0 (NOT SEL) 1 (FAULT) 2 (CONST SP7) 3 (LAST SPEED)	Set for appropriate drive response.	–
3005	COMM FAULT TIME	Set time delay before acting on a communication loss.		–

Feedback from the ABB E-Clipse Bypass – FBA

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	Description	Protocol Reference
System Ready	System is ready to accept start command (either mode).	
System Enabled	System is enabled to start motor (either mode).	
System Started	System start enables are made and start command has been received (either mode). Motor runs if run enable is active.	
System Running	Motor is running (either mode).	
Fieldbus Local	System is under fieldbus local control (either mode).	
Bypass Fault	Bypass is faulted.	
Bypass Alarm	Bypass is alarming.	
Comm Control	System is configured for control in the comm channel	
Bypass Override	Bypass override 2 status	
DI1 Status	Bypass digital input 1 status	
DI2 Status	Bypass digital input 2 status	

Bypass Parameter	Description	Protocol Reference
DI3 Status	Bypass digital input 3 status	
DI4 Status	Bypass digital input 4 status	
DI5 Status	Bypass digital input 5 status	
DI6 Status	Bypass digital input 6 status	
RO1 Status	Bypass relay output 1 status	
RO2 Status	Bypass relay output 2 status	
RO3 Status	Bypass relay output 3 status	
RO4 Status	Bypass relay output 4 status	
RO5 Status	Bypass relay output 5 status	
Bypass Select	1=Bypass mode, 0=Drive mode	
System Underload	Reports system underload status (either mode)	
System Fault	Reports system fault status (either mode)	
Bypass Run	Reports motor running status in bypass mode	

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*

Diagnostics – FBA

Fault Handling

The ACH550 or E-Clipse provides fault information as follows:

- The control panel display shows a fault code and text. See *Diagnostics* starting on page *2-219* 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

Drive Fault Code		Fieldbus Fault Code (DRIVECOM specification)
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
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

Drive Fault Code		Fieldbus Fault Code (DRIVECOM specification)
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

Serial 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

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

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
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 enable signal must be active. See 1601. If 1601 is set to COMM, this bit also actives the Run Enable 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.

ABB Drives Profile (FBA) CONTROL WORD				
Bit	**Name**	**Value**	**Commanded State**	**Comments**
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			

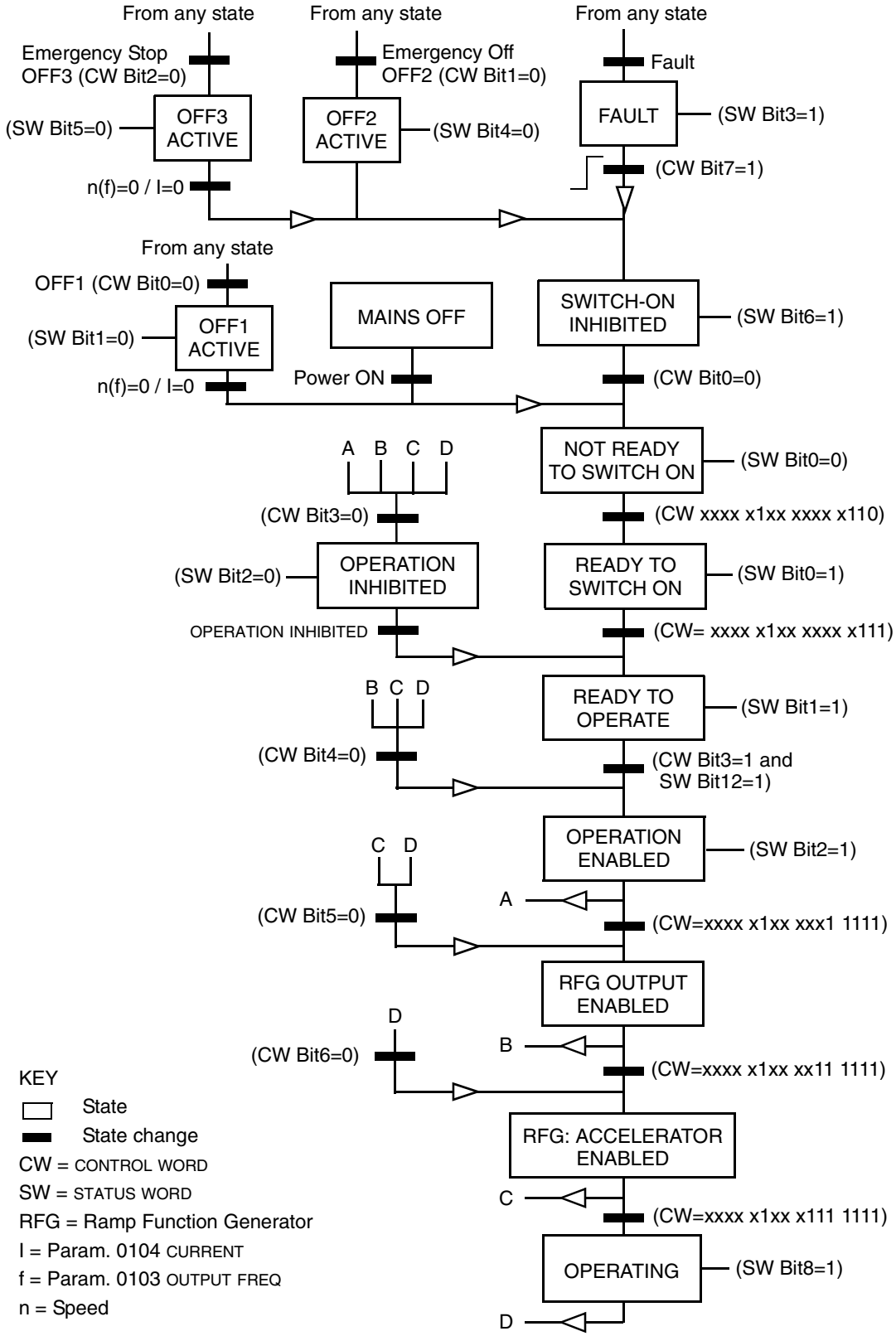
Status Word

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	ALARM	1	Warning/alarm (See *Alarm listing* in the *Diagnostics* section for details on alarms.)
		0	No warning/alarm

ABB Drives Profile (FBA) STATUS WORD			
Bit	**Name**	**Value**	**Description (Correspond to states/boxes in the state diagram)**
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 ≥ 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 ENABLE	1	External Run Enable signal received
		0	No External Run Enable 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**	**Scaling**	**Remarks**
REF1	-32767… +32767	Speed or frequency	-20000 = -**(par. 1105)** 0 = 0 +20000 = **(par. 1105)** (20000 corresponds to 100%)	Final reference limited by 1104/1105. Actual motor speed limited by 2001/2002 (speed) or 2007/2008 (frequency).
REF2	-32767… +32767	Speed or frequency	-10000 = -**(par. 1108)** 0 = 0 +10000 = **(par. 1108)** (10000 corresponds to 100%)	Final reference limited by 1107/1108. Actual motor speed limited by 2001/2002 (speed) or 2007/2008 (frequency).
		Torque	-10000 = -**(par. 1108)** 0 = 0 +10000 = **(par. 1108)** (10000 corresponds to 100%)	Final reference limited by 2015/2017 (torque1) or 2016/2018 (torque2).
		PID Reference	-10000 = -**(par. 1108)** 0 = 0 +10000 = **(par. 1108)** (10000 corresponds to 100%)	Final reference limited by 4012/4013 (PID set1) or 4112/4113 (PID set2).

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

When parameter 1103 REF1 SELECT or 1106 REF2 SELECT is set to COMM+AI1 or COMM*AI1, the reference is scaled as follows:

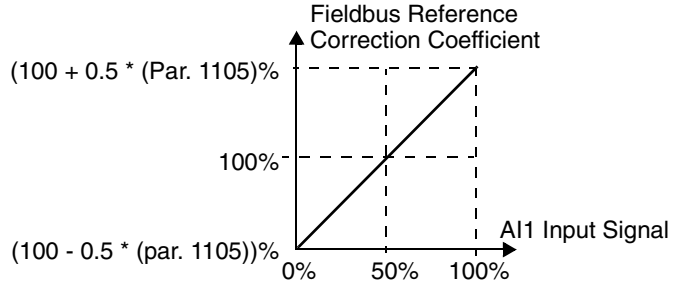
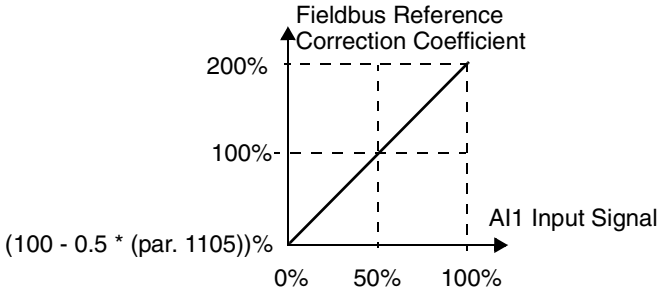
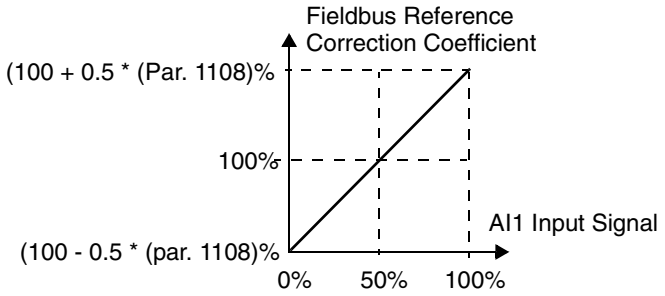
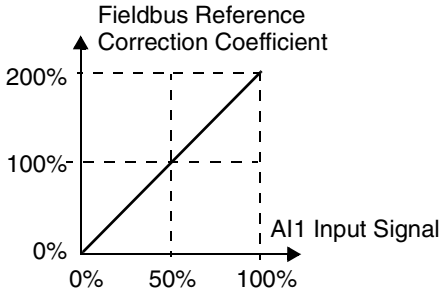
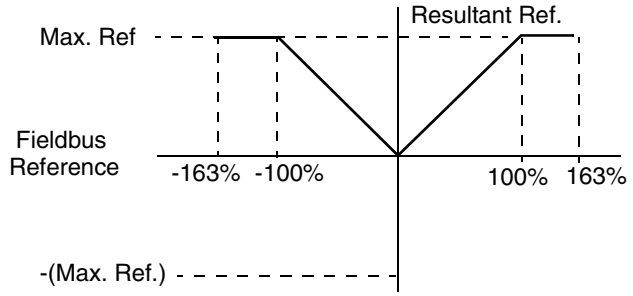
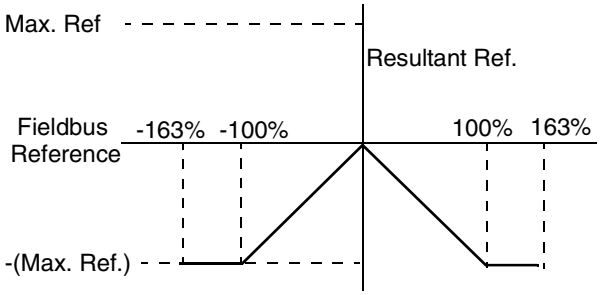
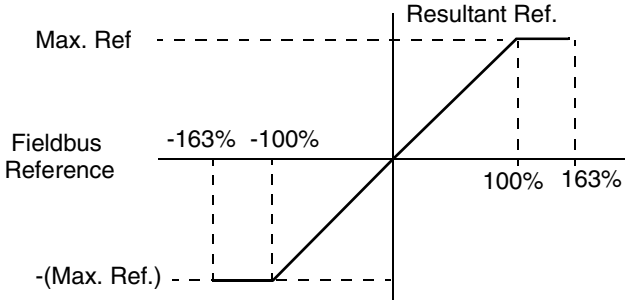
ABB Drives Profile (FBA)		
Reference	**Value Setting**	**AI Reference Scaling**
REF1	COMM+AI1	COMM (%) +(AI (%) - 0.5*REF1 MAX (%)) 

ABB Drives Profile (FBA)		
Reference	**Value Setting**	**AI Reference Scaling**
REF1	COMM*AI1	COMM (%) * (AI (%) / 0.5*REF1 MAX (%)) 
REF2	COMM+AI1	COMM (%) + (AI (%) - 0.5*REF2 MAX (%)) 
REF2	COMM*AI1	COMM (%) * (AI (%) / 0.5*REF2 MAX (%)) 

Reference handling

Use group 10 parameters to configure for control of rotation direction for each control location (EXT1 and EXT2). The following diagrams illustrate how group 10 parameters and the sign of the fieldbus reference interact to produce REFERENCE values (REF1 and REF2). Note, fieldbus references are bipolar, that is they can be positive or negative.

ABB Drives Profile		
Parameter	**Value Setting**	**AI Reference Scaling**
1003 DIRECTION	1 (FORWARD)	
1003 DIRECTION	2 (REVERSE)	
1003 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 *Parameters* section. For example:

Feedback Integer	Parameter Resolution	Scaled Value
1	0.1 mA	1 * 0.1 mA = 0.1 mA
10	0.1%	10 * 0.1% = 1%

Data words 5 and 6 are scaled as follows:

ABB Drives Profile		
Data Word	**Contents**	**Scaling**
5	ACTUAL SPEED	-20000 … +20000 = -(par. 1105) … +(par. 1105)
6	TORQUE	-10000 … +10000 = -100% … +100%

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.

Generic Profile				
Reference	**Range**	**Reference Type**	**Scaling**	**Remarks**
REF	Fieldbus specific	Speed	-100% = -**(par. 9908)** 0 = 0 +100 = **(par. 9908)**	Final reference limited by 1104/1105. Actual motor speed limited by 2001/2002 (speed).
		Frequency	-100% = -**(par. 9907)** 0 = 0 +100 = **(par. 9907)**	Final reference limited by 1104/1105. Actual motor speed limited by 2007/2008 (frequency).

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 *Parameters* section for parameter resolutions.) For example:

Feedback Integer	Parameter Resolution	(Feedback Integer) * (Parameter Resolution) = Scaled Value
1	0.1 mA	1 * 0.1 mA = 0.1 mA
10	0.1%	10 * 0.1% = 1%

Where parameters are in percent, the *Parameters* section specifies what parameter corresponds to 100%. In such cases, to convert from percent to engineering units, multiply by the value of the parameter that defines 100% and divide by 100%. For example:

Feedback Integer	Parameter Resolution	Value of the Parameter that defines 100%	(Feedback Integer) * (Parameter Resolution) * (Value of 100% Ref.) / 100% = Scaled Value
10	0.1%	1500 rpm[1]	10 * 0.1% * 1500 RPM / 100% = 15 rpm
100	0.1%	500 Hz[2]	100 * 0.1% * 500 Hz / 100% = 50 Hz

1. Assuming, for the sake of this example, that the Actual Value uses parameter 9908 MOT NOM SPEED as the 100% reference, and that 9908 = 1500 rpm.
2. Assuming, for the sake of this example, that the Actual Value uses parameter 9907 MOT NOM FREQ as the 100% reference, and that 9907 = 500 Hz.

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 an alarm.
- 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 – alarms

For less severe errors, called alarms, 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 an alarm code and/or name.

The alarm code on the display flashes over the current display. Pressing any key silences the alarm message. The message reappears after 30 seconds if the control panel is not touched and the alarm 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	UNDERVOLTAGE	Message only occurs if drive is controlling the motor and the power to the bypass is removed before the drive phases back. Message will appear in the fault log. This message will only appear when drive contactor opens when drive is operating	Loose J7 connector on RBCU unit Loose input wiring Incoming power problems	Check that J7 connector is firmly seated in RBCU 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 ACH550 manual for AI2 loss	Check ACH550 manual for AI2 loss
3009	MTR OVERLOAD	Bypass opens on motor overload conditions defined in the drive	Drive Mode: Bad Motor Bad CT's Bad RBCU Bypass mode: Bad motor Bad CT's Bad RBCU Either mode: low input voltage	Check if overload condition exists Drive Mode: Refer to 550 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 only when trying to close the bypass contactor and the RBCU does not sense voltage on Phase A	Loose J7 connector Loose wiring on Contactor assembly. Blown upstream fuse	Check J7 connector Check yellow wire on input block Check incoming voltage, phase to ground
3011	INP PHASE B LOSS	Fault will be generated only when trying to close the bypass contactor and the RBCU does not sense voltage on Phase B	Loose J7 connector Loose wiring on Contactor assembly. Blown upstream fuse	Check J7 connector Check black wire on input block Check incoming voltage, phase to ground
3012	INP PHASE C LOSS	Fault will be generated only when trying to close the bypass contactor and the RBCU does not senses voltage on Phase C	Loose J7 connector Loose wiring on Contactor assembly. Blown upstream fuse	Check J7 connector Check red on input block Check incoming voltage, phase to ground

Fault Code	Fault Name In Panel	Fault	Possible Cause	Corrective Action
3013	DRIVE 1ST START	Fault generated if attempting to close the bypass contactor with out running the bypass in drive mode first.	NA	Run bypass unit in drive mode before attempting bypass mode
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 ACH550 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 ACH550 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. Communication improperly set in drive Parameter 9802. Application Macro improperly set in drive parameter 9902. Check *Application macros* section.	Proper seating of cable in drive and RBCU(connector J3) Check drive parameter 9802 (Modbus) and 9902 (E-Clipse) Check drive Group 53 Follow DriveLink recovery procedure

Fault Code	Fault Name In Panel	Fault	Possible Cause	Corrective Action
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
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-HELP-365 Option 4
3028	EXT COMM LOSS	Time between fieldbus messages has exceeded timeout interval set with parameter 3005	Incorrect Communication settings in Group 51 & 53. Poor Connections Noise on Communication Line	Check Group 51 & 53 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

Fault Code	Fault Name In Panel	Fault	Possible Cause	Corrective Action
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 paramters 5011 5017 and or 5311 5317 respectively	Check Parameters 5011, 5017 and/or 5311, 5317
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
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. Communication improperly set in drive Parameter 9802. Application Macro improperly set in drive parameter 9902. Check *Application macros* section.	Proper seating of cable in drive and RBCU (connector J3) Check drive parameter 9802 (Modbus) and 9902 (E-Clipse) Check drive Group 53 Follow DriveLink recovery procedure then cycle power to bypass.
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	NA	Cycle power Replace RBCU Upgrade firmware
3102	PMAP FILE	Parameter file is corrupt		Cycle Power Contact ABB with information that preceeded fault
3201	T1 OVERLOAD	T1 program cycle is overloaded	NA	Contact ABB with information that proceeded fault Cycle Power Replace RBCU

Fault Code	Fault Name In Panel	Fault	Possible Cause	Corrective Action
3202	T2 OVERLOAD	T2 program cycle is overloaded	NA	Contact ABB with information that proceeded fault Cycle Power Replace RBCU
3203	T3 OVERLOAD	T3 program cycle is overloaded	NA	Contact ABB with information that proceeded fault Cycle Power Replace RBCU
3204	STACK OVERFLOW	Program cycle is overloaded	NA	Contact ABB with information that proceeded fault Cycle Power Replace RBCU
3205	UNKNOWN CB	Bypass control board type is unknown.	Firmware is not compatible with control board in RBCU.	Firmware 93F and greater compatible with all RCBU hardware. Firmware 93D and earlier can only be loaded in RBCU Rev D and earlier.
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	NA	NA	Replace RBCU or load most current firmware Contact ABB at 1-800-HELP-365 option 4 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
- Serial 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 parameters 0402…0409 and 0411…00418 respectively) to aid in troubleshooting a problem. For example, parameter 0405 stores the motor current at the time of the fault.

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 alarms

The recommended corrective action for alarms is:

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

Alarm listing

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

Alarm Code	Alarm Name In Panel	Alarm	Possible Cause	Corrective Action
4001	INP PHASE A LOSS	Alarm will occur in drive mode. In bypass, alarm 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	Alarm will occur in drive mode. In bypass, alarm 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	Alarm will occur in drive mode. In bypass, alarm 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 & 53. Poor Connections Noise on Communication Line	Check Group 51& 53 Tighten Connections Check Communication Cable Grounding
4006	Selected by PAR 1620: RUN ENABLE DAMPER END SWITCH VALVE OPENING PRE-LUBE CYCLE	Alarm will occur when start order is given and the "RUN Enable" is not present	Run Enable 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

Alarm Code	Alarm Name In Panel	Alarm	Possible Cause	Corrective Action
4008	DRIVE SETUP	Alarm generated when configuration of drive is such that bypass can not properly control the drive. Specifically, drive parameters 1001,1002,1601, 1608	Incorrect parameters settings	Set Parameter 1001 to "COMM" Set Parameter 1002 to "COMM" Set Parameter 1601 to "COMM" Set Parameter 1608 to "COMM"
4009	BYPASS RUN DELAY	Alarm is generated when a bypass start command is issued and there is non zero time value in bypass parameter 1614	NA	NA
4010	MTR OVERLOAD	Bypass warning if motor overload conditions exist as defined in the drive	Drive Mode: Bad Motor Bad Ct's Bad RBCU Bypass mode: Bad motor Bad CT's Bad RBCU Either mode: low input voltage	Drive Mode: Refer to 550 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	Alarm comes at half the time of a mtr underload fault. See fault 3017 for further text	NA	Parameter 3002 is the time Parameter 3003 is the level
4012	BYPASS DISABLED	Alarm will be generated if parameter 1613 is set to "Disable"	NA	NA
4013	DRIVE LINK ERROR	Same as Fault 3019 however will occur when not in supervisory mode	Bad cable between drive and bypass Communication improperly set in drive Parameter 98.02(Modbus) Application Macro in 99.02 set to 15 (text) Check *Application macros* section.	Proper seating of cable in drive and RBCU(connector J3) Check drive parameter 98.02 and 99.02 Check drive Group 53 Follow DriveLink recovery procedure
4014	DRIVE TEST	Alarm is generated when bypass parameter 1617 is set to "enable"	NA	NA
4015	START DRIVE 1ST	Message displayed on initial "out of box" power up sequence	NA	Run drive in Hand

Alarm Code	Alarm Name In Panel	Alarm	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	NA	Loose J7 connector Low input voltage. Incoming voltage has not reached at least 155 VAC within a few seconds of powerup
4019	OVERRIDE 1	Alarm is generated when Smoke Control is active	NA	Check Parameter 0103 and 0104 for digital input status
4020	OVERRIDE 2	Alarm is generated when Fireman's Override is active	NA	Check Parameter 0103 and 0104 for digital input status
4021	Selected by PAR 1621 START ENABLE 1 VIBRATION SWITCH FIRESTAT FREEZESTAT OVERPRESSURE VIBRATION TRIP SMOKE ALARM SAFETY OPEN LOW SUCTION PRES	Alarm will occur when start order is given and the "RUN Enable" is not present	Run Enable 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
4022	Selected by PAR 1622 START ENABLE 2 VIBRATION SWITCH ... LOW SUCTION PRES	Alarm will occur when start order is given and the "RUN Enable" is not present	Run Enable 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 ENABLE 3 VIBRATION SWITCH ... LOW SUCTION PRES	Alarm will occur when start order is given and the "RUN Enable" is not present	Run Enable 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

Alarm Code	Alarm Name In Panel	Alarm	Possible Cause	Corrective Action
4024	Selected by PAR 1624 START ENABLE 4 VIBRATION SWITCH ... LOW SUCTION PRES	Alarm will occur when start order is given and the "RUN Enable" is not present	Run Enable 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
4025	LOCAL DISABLED	Alarm is displayed if MODE LOCK (16.29) is set to AUTO MODE and the Hand or Off key is pressed		
4026	AUTO DISABLED	This alarm is displayed if MODE LOCK (1629) is set to LOCAL MODE and the Auto key is pressed.		
4027	COMM CONFIG ERR	Alarm is displayed if the drive and bypass MAC addresses are equal or invalid.	E-Clipse parameters 5002(BP MAC ID) & 5302 (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

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 ENABLE 1 and/or START ENABLE 2) have been applied, or if they are missing
RUN PERMISSIVES?	OPEN CLOSED	Displays if RUN ENABLE 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 ALARM ACTIVE	Displays if there is an active alarm(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 ENABLE
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 simultaneoulsy 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.

Technical data

Input power connections (supplement to ACH550-UH User's Manual)

Branch circuit protection

Input power is connected to the ACH550 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 ACH550 with E-Clipse Bypass must include appropriate motor branch circuit protective devices to provide short circuit and ground fault protection for the motor in the bypass mode.

When connected to a 480 VAC power source, the ACH550 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 240 VAC power source, the ACH550 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.

Fuses

NOTE: Although fuses listed are similar in function to fuses listed in the ACH550-UH User's Manual, physical characteristics may differ. Fuses from other manufacturers can be used if they meet the ratings given in the table. The fuses recommended in the table are UL recognized.

Drive input fuses are provided to disconnect the drive from power in the event that a component fails in the drive's power circuitry. Since fast-acting fuses are provided, the branch circuit protection will not clear when the drive input fuses blow. If the drive input fuses blow, the motor can be switched to Bypass without replacing fuses or resetting a circuit breaker. The drive's electronic protection circuitry is designed to clear drive output short circuits and ground faults without blowing the drive input fuses. Drive input fuse specifications are listed in the following tables.

208…240 volt fuses

208… 240 Volt		Frame Size	Drive Input Fuse Ratings	
HP	Identification		Amps (600V)	Bussmann Type
1	ACH550-xxR-04A6-2	R1	15	KTK-R-15
1.5	ACH550-xxR-06A6-2	R1	15	KTK-R-15
2	ACH550-xxR-07A5-2	R1	15	KTK-R-15
3	ACH550-xxR-012A-2	R1	15	KTK-R-15
5	ACH550-xxR-017A-2	R1	30	KTK-R-30
7.5	ACH550-xxR-024A-2	R2	30	KTK-R-30
10	ACH550-xxR-031A-2	R2	60	JJS-60

208… 240 Volt		Frame Size	Drive Input Fuse Ratings	
HP	Identification		Amps (600V)	Bussmann Type
15	ACH550-xxR-046A-2	R3	100	JJS-100
20	ACH550-xxR-059A-2	R3	100	JJS-100
25	ACH550-xxR-075A-2	R4	100	JJS-100
30	ACH550-xxR-088A-2	R4	200	170M1370 or 170M2617
40	ACH550-xxR-114A-2	R4	200	
50	ACH550-xxR-143A-2	R6	200	
60	ACH550-xxR-178A-2	R6	315	170M1372 or 170M2619
75	ACH550-xxR-221A-2	R6	315	
100	ACH550-xxR-248A-2	R6	315	

380…480 volt fuses

380… 480 Volt		Frame Size	Drive Input Fuse Ratings	
HP	Identification		Amps (600V)	Bussmann Type
1/1.5	ACH550-xxR-03A3-4	R1	15	KTK-R-15
2	ACH550-xxR-04A1-4	R1	15	KTK-R-15
3	ACH550-xxR-06A9-4	R1	15	KTK-R-15
5	ACH550-xxR-08A8-4	R1	15	KTK-R-15
7.5	ACH550-xxR-012A-4	R1	15	KTK-R-15
10	ACH550-xxR-015A-4	R2	30	KTK-R-30
15	ACH550-xxR-023A-4	R2	30	KTK-R-30
20	ACH550-xxR-031A-4	R3	60	JJS-60
25	ACH550-xxR-038A-4	R3	60	JJS-60
30	ACH550-xxR-045A-4	R3	60	JJS-60
40	ACH550-xxR-059A-4	R4	100	JJS-100
50	ACH550-xxR-072A-4	R4	100	JJS-100
60	ACH550-xxR-078A-4	R4	100	JJS-100
75	ACH550-xxR-097A-4	R4	200	170M1370 or 170M2617
100	ACH550-xxR-125A-4	R5	200	
125	ACH550-xxR-157A-4	R6	200	
150	ACH550-xxR-180A-4	R6	315	170M1372 or 170M2619
200	ACH550-xxR-246A-4	R6	315	
250	ACH550-xxR-316A-4	R8	400	JJS-400
300	ACH550-xxR-368A-4	R8	400	JJS-400
350	ACH550-xxR-414A-4	R8	600	JJS-600
400	ACH550-xxR-486A-4	R8	600	JJS-600

Fuses, 500...600 volt, fuses

500…600 Volt		Frame Size	Drive Input Fuse Ratings	
HP	Identification		Amps (600V)	Bussmann Type
2	ACH550-xxR-02A7-6	R2	30	KTK-R-30
3	ACH550-xxR-03A9-6	R2	30	KTK-R-30
5	ACH550-xxR-06A1-6	R2	30	KTK-R-30
7.5	ACH550-xxR-09A0-6	R2	30	KTK-R-30
10	ACH550-xxR-011A-6	R2	30	KTK-R-30
15	ACH550-xxR-017A-6	R2	30	KTK-R-30
20	ACH550-xxR-022A-6	R3	60	JJS-60
25	ACH550-xxR-027A-6	R3	60	JJS-60
30	ACH550-xxR-032A-6	R4	100	JJS-100
40	ACH550-xxR-041A-6	R4	100	JJS-100
50	ACH550-xxR-052A-6	R4	100	JJS-100
60	ACH550-xxR-062A-6	R4	100	JJS-100
75	ACH550-xxR-077A-6	R6	200	170M1370 or 170M2619
100	ACH550-xxR-099A-6	R6	200	
125	ACH550-xxR-125A-6	R6	200	
150	ACH550-xxR-144A-6	R6	200	

Line reactor

The ACH550 E-Clipse Bypass may contain optional input line reactors to provide additional input impedance on the VAC line. This impedance is in addition to the approximately 5% equivalent input impedance provided by internal reactors that are standard in the drive.

Drive's power connection terminals

The following tables list 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.

Vertical enclosure terminals, 208...240 volt units

208…240 Volt		Frame Size	Maximum Wire Size Capacities of Power Terminals			
HP	Identification		Circuit Breaker	Disconnect Switch	Motor Termination	Ground Lugs
1	ACH550-VxR-04A6-2	R1	#10 35 in-lbs	#10 7 in-lbs	#6 30 in-lbs	#4 35 in-lbs
1.5	ACH550-VxR-06A6-2	R1				
2	ACH550-VxR-07A5-2	R1				
3	ACH550-VxR-012A-2	R1				
5	ACH550-VxR-017A-2	R1				
7.5	ACH550-VxR-024A-2	R2	#8 40 in-lbs	#8 7 in-lbs		
10	ACH550-VxR-031A-2	R2	#2 50 in-lbs		#2 50 in-lbs	#2 50 in-lbs
15	ACH550-VxR-046A-2	R3		#4 18 in-lbs	#2/0 120 in-lbs	
20	ACH550-VxR-059A-2	R3				
25	ACH550-VxR-075A-2	R4	#1 50 in-lbs	#1 55 in-lbs		

Vertical enclosure terminals, 380...480 volt units

380…480 Volt		Frame Size	Maximum Wire Size Capacities of Power Terminals			
HP	Identification		Circuit Breaker	Disconnect Switch	Motor Termination	Ground Lugs
1/1.5	ACH550-VxR-03A3-4	R1	#10 35 in-lbs	#10 7 in-lbs	#6 30 in-lbs	#4 35 in-lbs
2	ACH550-VxR-04A1-4	R1				
3	ACH550-VxR-06A9-4	R1				
5	ACH550-VxR-08A8-4	R1				
7.5	ACH550-VxR-012A-4	R1				
10	ACH550-VxR-015A-4	R2	#8 40 in-lbs	#8 7 in-lbs		
15	ACH550-VxR-023A-4	R2				
20	ACH550-VxR-031A-4	R3	#3 50 in-lbs		#2 50 in-lbs	#2 50 in-lbs
25	ACH550-VxR-038A-4	R3		#4 18 in-lbs		
30	ACH550-VxR-045A-4	R3				
40	ACH550-VxR-059A-4	R4	#1 50 in-lbs		#2/0 120 in-lbs	
50	ACH550-VxR-072A-4	R4		#1 55 in-lbs		
60	ACH550-VxR-078A-4	R4		#1 70 in-lbs		

Vertical enclosure terminals, 500...600 volt units

500…600 Volt		Frame Size	Maximum Wire Size Capacities of Power Terminals			
HP	Identification		Circuit Breaker	Disconnect Switch	Motor Termination	Ground Lugs
2	ACH550-VxR-02A7-6	R2	#8 62 in-lbs	#8 7 in-lbs	#6 30 in-lbs	#4 35 in-lbs
3	ACH550-VxR-03A9-6	R2				
5	ACH550-VxR-06A1-6	R2				
7.5	ACH550-VxR-09A0-6	R2				
10	ACH550-VxR-011A-6	R2				
15	ACH550-VxR-017A-6	R2				
20	ACH550-VxR-022A-6	R3	#4 62 in-lbs		#2 50 in-lbs	#2 50 in-lbs
25	ACH550-VxR-027A-6	R3				
30	ACH550-VxR-032A-6	R4	#1 62 in-lbs	#4 18 in-lbs	#2/0 120 in-lbs	
40	ACH550-VxR-041A-6	R4				
50	ACH550-VxR-052A-6	R4		#1 55 in-lbs		
60	ACH550-VxR-062A-6	R4		#1 70 in-lbs		

Standard enclosure terminals, 208...240 volt units

208…240 Volt		Frame Size	Maximum Wire Size Capacities of Power Terminals			
HP	Identification		Circuit Breaker	Disconnect Switch	Motor Termination	Ground Lugs
1	ACH550-BxR-04A6-2	R1	#8 40 in-lbs	#8 7 in-lbs	#6 30 in-lbs	#4 35 in-lbs
1.5	ACH550-BxR-06A6-2	R1				
2	ACH550-BxR-07A5-2	R1				
3	ACH550-BxR-012A-2	R1				
5	ACH550-BxR-017A-2	R1				
7.5	ACH550-BxR-024A-2	R2				
10	ACH550-BxR-031A-2	R2/R3	#1 50 in-lbs		#2 50 in-lbs	#2 50 in-lbs
15	ACH550-BxR-046A-2	R3		#4 18 in-lbs	#2 120 in-lbs	
20	ACH550-BxR-059A-2	R3				
25	ACH550-BxR-075A-2	R4		#1 55 in-lbs		

208…240 Volt		Frame Size	Maximum Wire Size Capacities of Power Terminals			
HP	Identification		Circuit Breaker	Disconnect Switch	Motor Termination	Ground Lugs
30	ACH550-BxR-088A-2	R4	350 MCM 274 in-lbs	#1/0 70 in-lbs	#1 53 in-lbs	3 x #3/0 250 in-lbs
40	ACH550-BxR-114A-2	R4		300 MCM 275 in-lbs	250 MCM 300 in-lbs	
50	ACH550-BxR-143A-2	R6				
60	ACH550-BxR-178A-2	R6			400 MCM 375 in-lbs	
75	ACH550-BxR-221A-2	R6	2 x 250 MCM 274 in-lbs	2 x 250 MCM 274 in-lbs	2 x 500 MCM 375 in-lbs	
100	ACH550-BxR-248A-2	R6				

Standard enclosure terminals, 380...480 volt units

<table>
<tr><th colspan="2">380…480 Volt</th><th rowspan="2">Frame Size</th><th colspan="4">Maximum Wire Size Capacities of Power Terminals</th></tr>
<tr><th>HP</th><th>Identification</th><th>Circuit Breaker</th><th>Disconnect Switch</th><th>Motor Termination</th><th>Ground Lugs</th></tr>
<tr><td>1/1.5</td><td>ACH550-BxR-03A3-4</td><td>R1</td><td rowspan="7">#8
40 in-lbs</td><td rowspan="7">#8
7 in-lbs</td><td rowspan="7">#6
30 in-lbs</td><td rowspan="7">#4
35 in-lbs</td></tr>
<tr><td>2</td><td>ACH550-BxR-04A1-4</td><td>R1</td></tr>
<tr><td>3</td><td>ACH550-BxR-06A9-4</td><td>R1</td></tr>
<tr><td>5</td><td>ACH550-BxR-08A8-4</td><td>R1</td></tr>
<tr><td>7.5</td><td>ACH550-BxR-012A-4</td><td>R1</td></tr>
<tr><td>10</td><td>ACH550-BxR-015A-4</td><td>R2</td></tr>
<tr><td>15</td><td>ACH550-BxR-023A-4</td><td>R2</td></tr>
<tr><td>20</td><td>ACH550-BxR-031A-4</td><td>R3</td><td rowspan="6">#1
50 in-lbs</td><td rowspan="3">#2
50 in-lbs</td><td rowspan="6">#2
50 in-lbs</td></tr>
<tr><td>25</td><td>ACH550-BxR-038A-4</td><td>R3</td><td rowspan="3">#4
18 in-lbs</td></tr>
<tr><td>30</td><td>ACH550-BxR-045A-4</td><td>R3</td></tr>
<tr><td>40</td><td>ACH550-BxR-059A-4</td><td>R4</td><td rowspan="3">#2/0
120 in-lbs</td></tr>
<tr><td>50</td><td>ACH550-BxR-072A-4</td><td>R4</td><td>#1
55 in-lbs</td></tr>
<tr><td>60</td><td>ACH550-BxR-078A-4</td><td>R4</td><td>#1
70 in-lbs</td></tr>
<tr><td>75</td><td>ACH550-BxR-097A-4</td><td>R4</td><td rowspan="4">350 MCM
274 in-lbs</td><td>#1/0
70 in-lbs</td><td>#1
53 in-lbs</td><td rowspan="5">3 x #3/0
250 in-lbs</td></tr>
<tr><td>100</td><td>ACH550-BxR-125A-4</td><td>R5</td><td rowspan="3">300 MCM
275 in-lbs</td><td>250 MCM
300 in-lbs</td></tr>
<tr><td>125</td><td>ACH550-BxR-157A-4</td><td>R6</td></tr>
<tr><td>150</td><td>ACH550-BxR-180A-4</td><td>R6</td><td>400 MCM
375 in-lbs</td></tr>
<tr><td>200</td><td>ACH550-BxR-246A-4</td><td>R6</td><td>2 x 250 MCM
274 in-lbs</td><td>2 x 250 MCM
274 in-lbs</td><td>2 x 500 MCM
375 in-lbs</td></tr>
<tr><td>250</td><td>ACH550-BxR-316A-4</td><td>R8</td><td rowspan="4">2 x 500 MCM
274 in-lbs</td><td rowspan="4">2 x 500 MCM
275 in-lbs</td><td rowspan="4">2 x 600 MCM
500 in-lbs</td><td rowspan="4">5 Bus bar holes
(13/32" bolts)</td></tr>
<tr><td>300</td><td>ACH550-BxR-368A-4</td><td>R8</td></tr>
<tr><td>350</td><td>ACH550-BxR-414A-4</td><td>R8</td></tr>
<tr><td>400</td><td>ACH550-BxR-486A-4</td><td>R8</td></tr>
</table>

Standard enclosure terminals, 500...600 volt units

500…600 Volt		Frame Size	Maximum Wire Size Capacities of Power Terminals			
HP	Identification		Circuit Breaker	Disconnect Switch	Motor Termination	Ground Lugs
2	ACH550-BxR-02A7-6	R2	#8 62 in-lbs	#8 7 in-lbs	#6 30 in-lbs	#4 35 in-lbs
3	ACH550-BxR-03A9-6	R2				
5	ACH550-BxR-06A1-6	R2				
7.5	ACH550-BxR-09A0-6	R2				
10	ACH550-BxR-011A-6	R2				
15	ACH550-BxR-017A-6	R2				
20	ACH550-BxR-022A-6	R3	#1 62 in-lbs		#2 50 in-lbs	#2 50 in-lbs
25	ACH550-BxR-027A-6	R3				
30	ACH550-BxR-032A-6	R4		#4 18 in-lbs	#2 120 in-lbs	
40	ACH550-BxR-041A-6	R4				
50	ACH550-BxR-052A-6	R4		#1 55 in-lbs		
60	ACH550-BxR-062A-6	R4		#1 75 in-lbs		
75	ACH550-BxR-077A-6	R6	300 MCM 274 in-lbs	#1/0 70 in-lbs	#1 53 in-lbs	3 x #3/0 250 in-lbs
100	ACH550-BxR-099A-6	R6				
125	ACH550-BxR-125A-6	R6		300 MCM 275 in-lbs	250 MCM 300 in-lbs	
150	ACH550-Bx-R144A-6	R6				

Motor connections (supplement to ACH550-UH User's Manual)

Motor Terminals

See *Drive's power connection terminals* above.

Bypass Contactors

The bypass circuit available with the ACH550 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 ACH550 is out of service. The other contactor is the ACH550 output contactor (1M) that disconnects the ACH550 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 ACH550 output terminals.

Motor Overload Protection

Motor overload protection is set using the ACH550 drive control panel. (Refer to ACH550-UH User's manual.) The overload protection parameters set on the ACH550 drive are used by both the drive and the bypass.

In the *Drive* mode, motor overload protection is provided by the ACH550.

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.

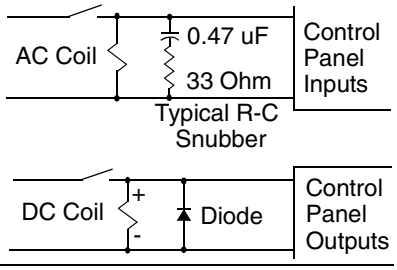
E-Clipse Bypass control unit connections (RBCU) (supplement to ACH550-UH User's Manual)

Control cable requirements for connections to the E-Clipse Bypass (RBCU) (X2) are the same as those described for the ACH550 control panel (X1). Refer to *Control terminal descriptions* on page *1-318* of the ACH550-UH User's Manual.

Bypass control unit connection specifications

Control Connection Specifications	
Digital Inputs	Digital input impedance 1.5 kΩ. Maximum voltage for digital inputs is 30 V AC/DC
Relays (Digital Outputs)	• 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 . = 1), 1 A rms (cos . = 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.

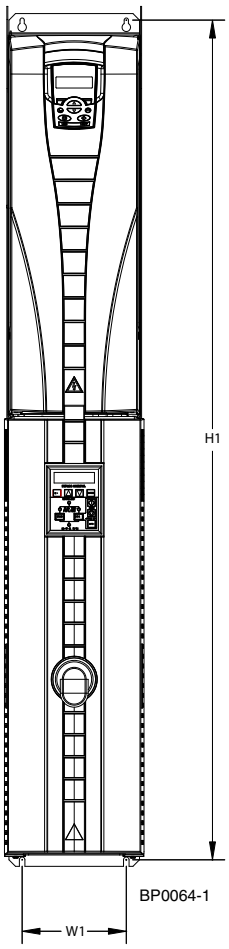
Frame Size	Control			
	Maximum Wire Size		Torque	
	mm^2	AWG	Nm	lb-ft
All	0.12…2.5	26…14	0.4	0.3

Dimensions and weights (supplement to ACH550-UH User's Manual)

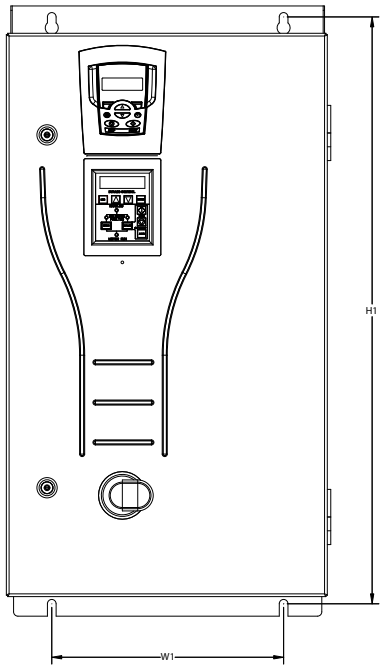
Mounting dimensions

The following diagram and tables provide mounting point dimensions for wall mounted cabinets.

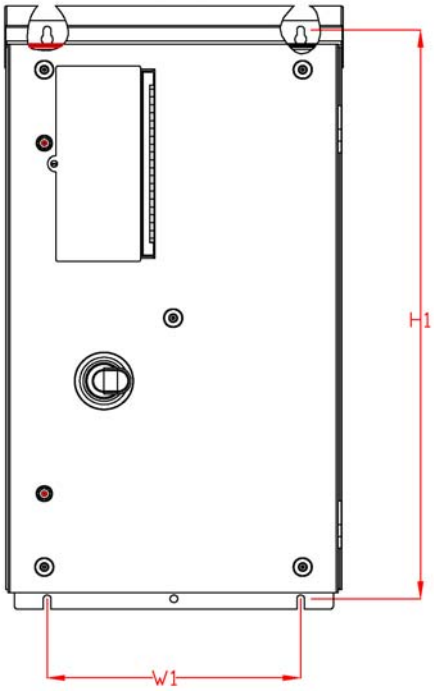
Vertical E-Clipse Bypass



Standard E-Clipse Bypass



UL TYPE 3R E-Clipse Bypass



Vertical enclosure, V1…V4

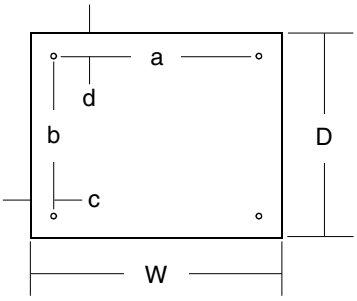
IP 21 / UL type 1 – Mounting Dimensions for each Frame Size								
Ref.	**V1**		**V2**		**V3**		**V4**	
	mm	**in**	**mm**	**in**	**mm**	**in**	**mm**	**in**
W1*	136	5.4	136	5.4	214	8.4	214	8.4
H1*	1004	40	1103	43.4	1180	47	1285	51
Mounting Hardware								
	M6	1/4	M6	1/4	M6	1/4	M6	1/4

Standard enclosure, B1…B3

Dimensions for Each Frame Size										
IP 21 / UL type 1 and IP 54 / UL type 12 – Mounting							UL Type 3R			
Ref.	B1		B2		B3		B1		B2	
	mm	in	mm	in	mm	in	mm	in	mm	in
W1*	44.3	17.4	400	15.7	600	23.6	320	12.6	400.0	15.7
H1*	810	31.9	918	36.1	1175	46.3	810	31.9	917.9	36.1
Mounting Hardware										
	M10	3/8	M10	3/8	M10	3/8	M10	3/8	M10	3/8

* Measurements are center to center.

Standard enclosure, B4

IP 21 / UL type 1 and IP 54 / UL type 12 – Dimensions for each Frame Size			
Ref.	B4		Top View
	mm	in	
W	806	31.7	
D	659	25.9	
a	675	26.6	
b	474.5	18.7	
c	55.5	2.2	
d	65.5	2.6	
Mounting Hardware			
	11 mm	13/32	

Weights

The following table lists typical maximum weights for each frame size. Variations within each frame size (due to components associated with voltage/current ratings, and options) are minor.

Vertical enclosure, V1...V4

Enclosure	Weight							
	V1		V2		V3		V4	
	kg	lb.	kg	lb.	kg	lb.	kg	lb.
IP 21 / UL type 1	18	40	23	50	51	112	59	131

Standard enclosure, B1...B3

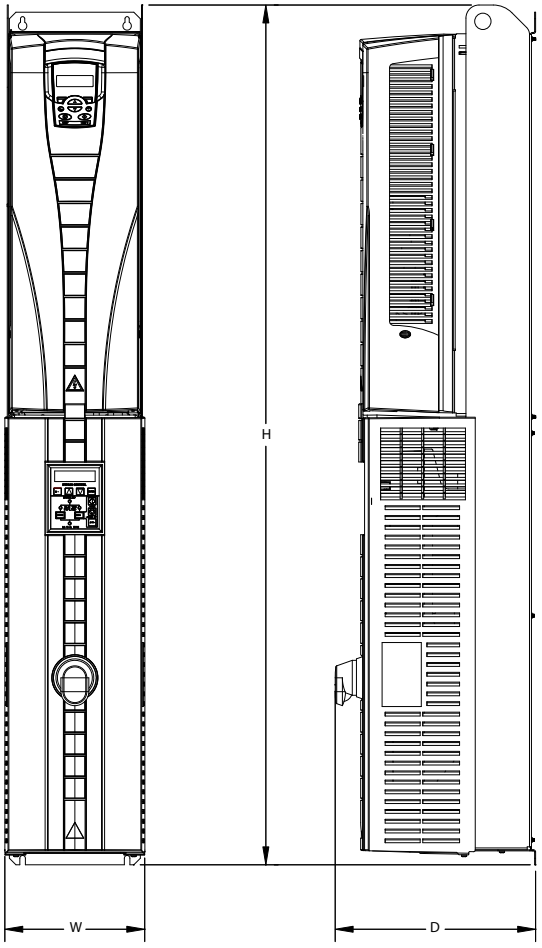
Enclosure	Weight											
	B1/R1		B1/R2		B2/R3		B2/R4		B3/R5		B3/R6	
	kg	lb.	kg	lb.	kg	lb.	kg	lb.	kg	lb.	kg	lb.
IP 21 / UL type 1	35	78	38	84	54	120	63	138	121	266	163	360
IP 54 / UL type 12	35	78	38	84	56	123	64	141	123	271	166	365
IP / UL type 3R	58	128	61	134	80	175	88	193	Consult Factory			

Standard enclosure, B4

Enclosure	Weight	
	B4	
	kg	lb.
IP 21 / UL type 1	454	1000
IP 54 / UL type 12	474	1045

Outside dimensions (V1...V4 and B1...B3, wall mounted units)

*Vertical E-Clipse Bypass, **UL type 1**, V1…V4*



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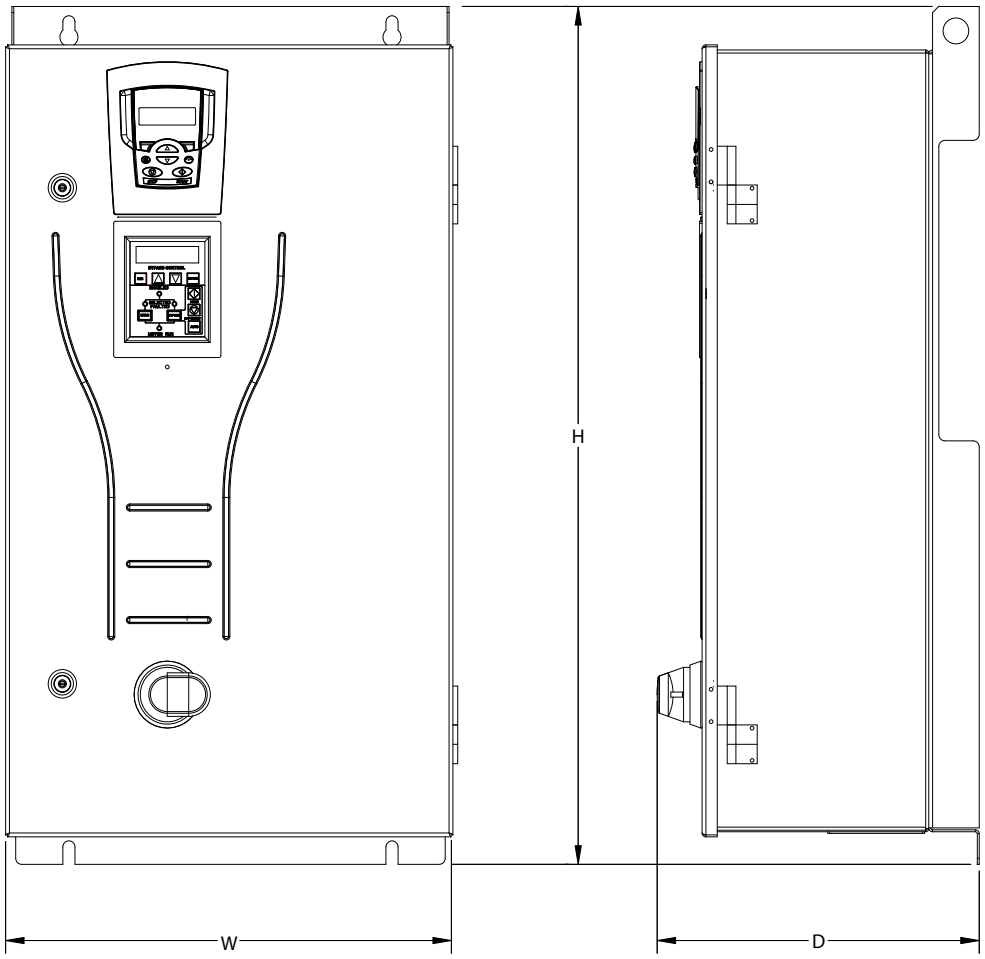
Vertical E-Clipse Bypass, UL type 1								
Dimensions Ref.	V1		V2		V3		V4	
	mm	in.	mm	in.	mm	in.	mm	in.
W*	136	5.4	136	5.4	214	8.5	215	8.5
H*	1020	40.2	1120	44.1	1211	47.7	1316	51.8
D*	220	8.7	231	9.1	241.6	9.5	271	10.7

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

*Standard E-Clipse Bypass, **UL type 1**, B1…B3*



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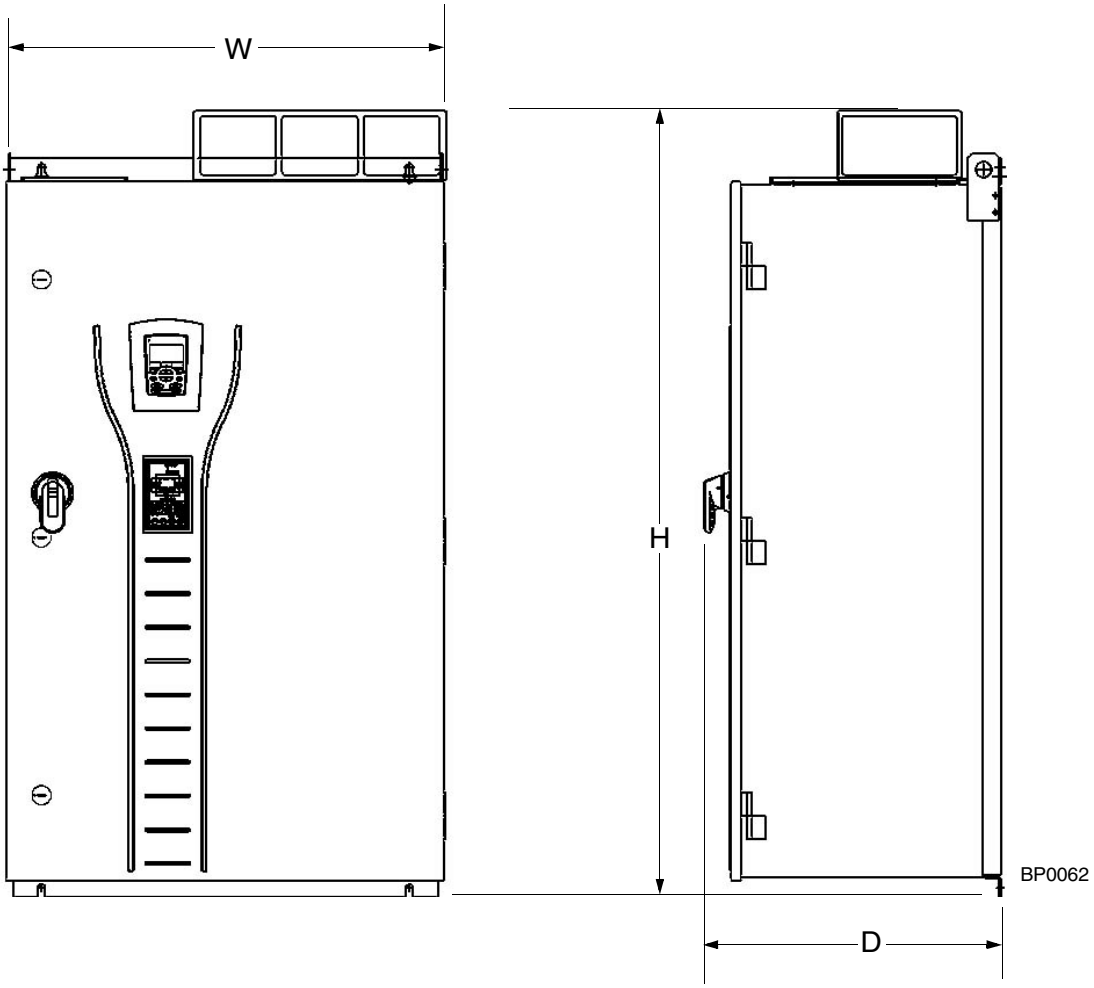
Standard E-Clipse Bypass, UL type 1, B1...B3						
Dimensions Ref.	B1		B2		B3	
	mm	in.	mm	in.	mm	in.
W	443	17.4	521	20.5	713	28.1
H	849	33.4	957	37.7	1212	47.7
D	344	13.5	389	15.3	485	19.1

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

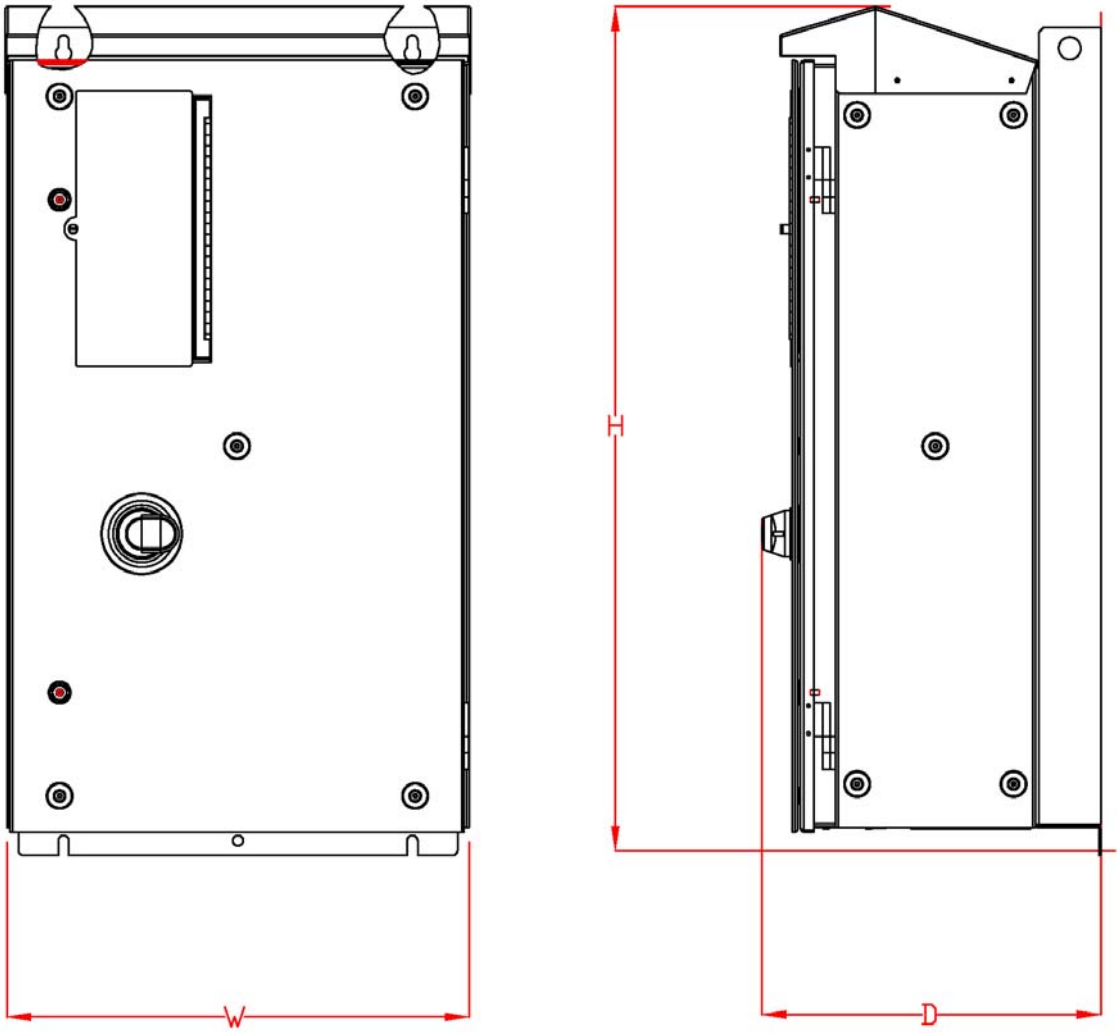
*Standard E-Clipse Bypass, **UL type 12**, B1…B3*



Standard E-Clipse Bypass, UL type 12, B1...B3						
Dimensions Ref.	B1		B2		B3	
	mm	in.	mm	in.	mm	in.
W	443	17.4	521	20.5	734	28.9
H	849	33.4	957	37.7	1371	54.0
D	344	13.5	389	15.3	485	19.1

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

*Standard E-Clipse Bypass, **UL type 3R**, B1…B2*



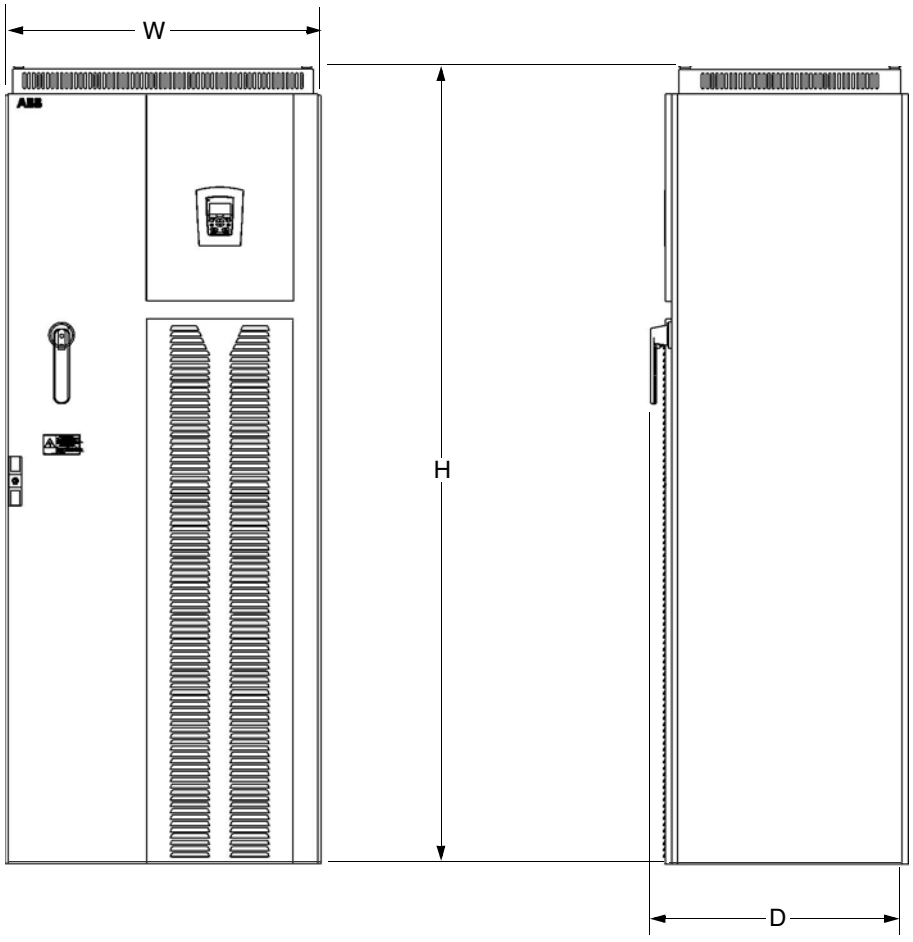
Standard E-Clipse Bypass, UL type 3R, B1...B2				
Dimensions Ref.	B1		B2	
	mm	in.	mm	in.
W	452	17.8	530	21.0
H	865	34.0	968	38.0
D	343	13.5	389	15.0

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

Note: Type 3R enclosures are designed to be mounted on a wall. For 3R enclosure back plates which maintain 3R integrity when the enclosure is mounted on an open rack system, contact your ABB HVAC Drives Distributor.

Outside dimensions – B4

Outside dimensions for the B4 cabinet are defined below.



Outside Dimensions by Frame Size			
Enclosure	**Ref.**	**B4**	
		mm	**in**
IP 21 / UL type 1	**W**	806	31.7
	H	2065	81.3
	D	659	25.9
IP 54 / UL type 12	**W**	806	31.7
	H	2377	93.6
	D	659	25.9

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

Applicable standards

The E-Clipse Bypass configuration conforms to all standards listed for the ACH550-UH.

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3ACH550-EB_UM (3AUA0000016461) Rev D EN
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