

User's Manual

E-Bypass Configurations (BC, BD, VC, or VD) for ACH550 Drives (1...400 HP)



ABB

ACH550 Drive Manuals

GENERAL MANUALS

ACH550-UH HVAC User's Manual (1...550 HP)

- Safety
- Installation
- Start-Up
- Embedded Fieldbus
- Fieldbus Adapter
- Diagnostics
- Maintenance
- Technical Data

Input Disconnect Configurations (PC or PD) for ACH550 Drives (1...550 HP)

- Safety
- Installation
- Start-Up
- Technical Data

E-Bypass Configurations (BC, BD, VC or VD) for ACH550 Drives (1...400 HP)

- Safety
- Installation
- Start-Up
- Technical Data

Safety



WARNING! The ACH550 adjustable speed AC drive with E-Bypass 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 and U2, V2, W2 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 removed 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 drive units 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 units or an external supply.



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



WARNING! When the ACH550 with E-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-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.

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

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:



Dangerous voltage warning warns of high voltage 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.

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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 1.



WARNING! When the ACH550 with E-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-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

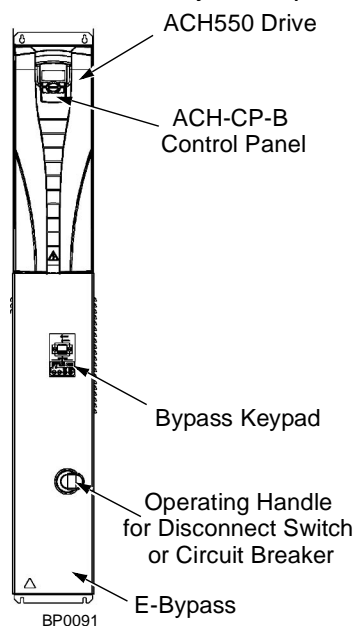
This manual is a supplement to the ACH550-UH User's Manual and documents E-Bypass configurations.

E-Bypass Features and Functions

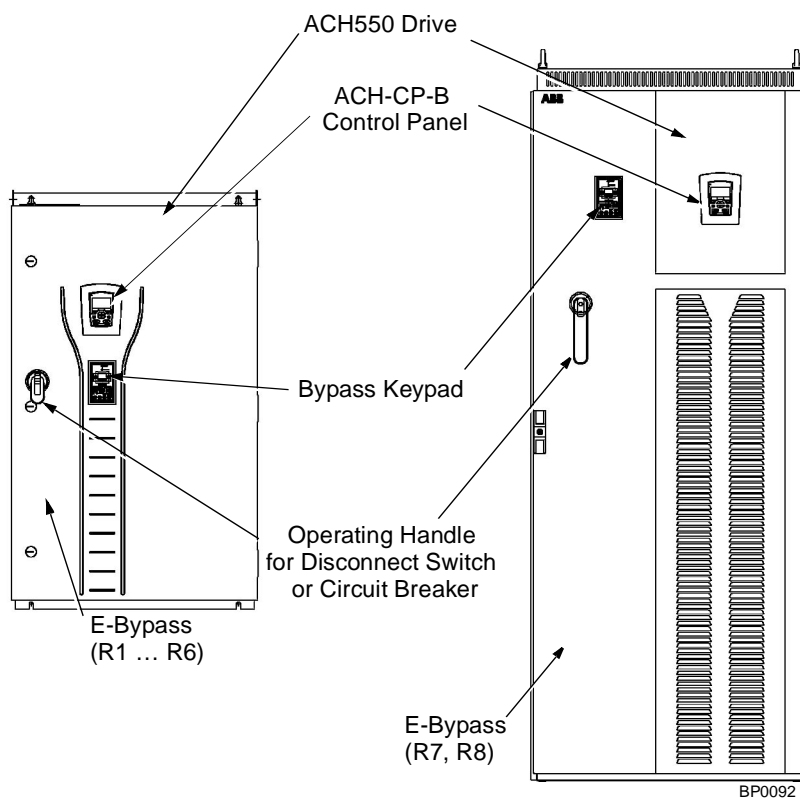
The ACH550 with E-Bypass is an ACH550 AC adjustable frequency drive in an integrated UL type 1 or UL type 12 package with a bypass motor starter. The ACH550 with E-Bypass provides:

- 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 keypad with indicating lights.
- Provisions for external control connections.
- Optional drive service switch (drive input disconnect), the functional equivalent of a three-contactor bypass arrangement.

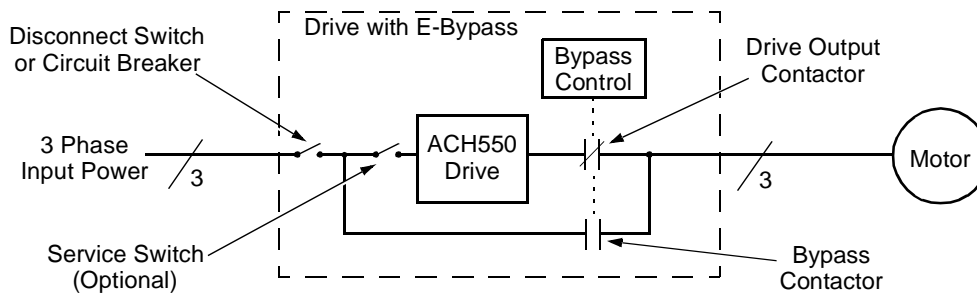
The following shows the front view of the ACH550 E-Bypass vertical configuration, and identifies the major components.



The following shows the front view of the ACH550 E-Bypass standard configurations, and identifies the major components.



The following is a typical power diagram.



Installation Flow Chart

The installation of E-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 7. "Suitable Mounting Location (Supplement to ACH550-UH User's Manual)" on page 8
PREPARE the Mounting Location	"Prepare the Mounting Location"	--
REMOVE the front cover	"Remove Front Cover"	--
MOUNT the drive	"Mount the Drive"	--
INSTALL wiring	"Wiring Overview" and "Install the Wiring"	"Installing the Wiring (Supplement to ACH550-UH User's Manual)" starting on page 8.
CHECK jumpers, switches and pots	--	"Check E-Bypass Jumpers, Switches and Pots" on page 19.
CHECK installation	"Check Installation"	"Keypad Control Tests" on page 16.
RE-INSTALL the cover	"Re-install Cover"	--
APPLY power	"Apply Power"	--
START-UP	"Start-Up"	"Start-up" on page 24.

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.

ACH550-BC-316A-4		
U1	3~ 200...280 V	 Ser. no.*2030700001*
I2N	100 A	
PN	400	

Input Voltage (U1) Current (I1ND)	3 Phase 48...63 Hz 200...240 V 100 A	1 Phase 48...63 Hz 200...240 V 100 A	ABB Inc. Made in USA with foreign parts   Mfg. Date: June 10, 2004 Org. Firmware: V.2.03B
Output Voltage (U2) Current (I2ND)	3 Phase 48...63 Hz 0...Input Voltage (U1) 100 A	1 Phase 48...63 Hz 0...Input Voltage (U1) 100 A	
Nominal Motor Power (PND)	400 HP	15 HP	
Short Circuit Rating 100 kAIC	100 kAIC		
UL Type 12 / IP54			
OEM Part Number			 2042500001
 ACH550-BC-100A-2+K454+L502+L503+N661+P301			

Type Code

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

	ACH550-BC-316A-4+...+...
AC, HVAC Drive – 550 product series	
Construction	
UH = Base drive	
BC = E-Bypass with circuit breaker	
BD = E-Bypass with disconnect switch	
PC = Drive with circuit breaker	
PD = Drive with disconnect switch	
VC = Vertical E-Bypass with circuit breaker	
VD = Vertical E-Bypass with disconnect switch	
Output current rating (See Ratings chart for details)	
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	
Line reactor	
+E213 = Line Reactor	
Service Switch	
+F267 = Service switch	
Fieldbus Adapters	
+K451 = DeviceNet Adapter	
+K452 = LonWorks Adapter	
+K454 = Profibus Adapter	

Ratings and Frame Size

The chart in the “Ratings” section of the ACH550-UH User’s Manual 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 two 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-Bypass configurations, refer to the Technical Data 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

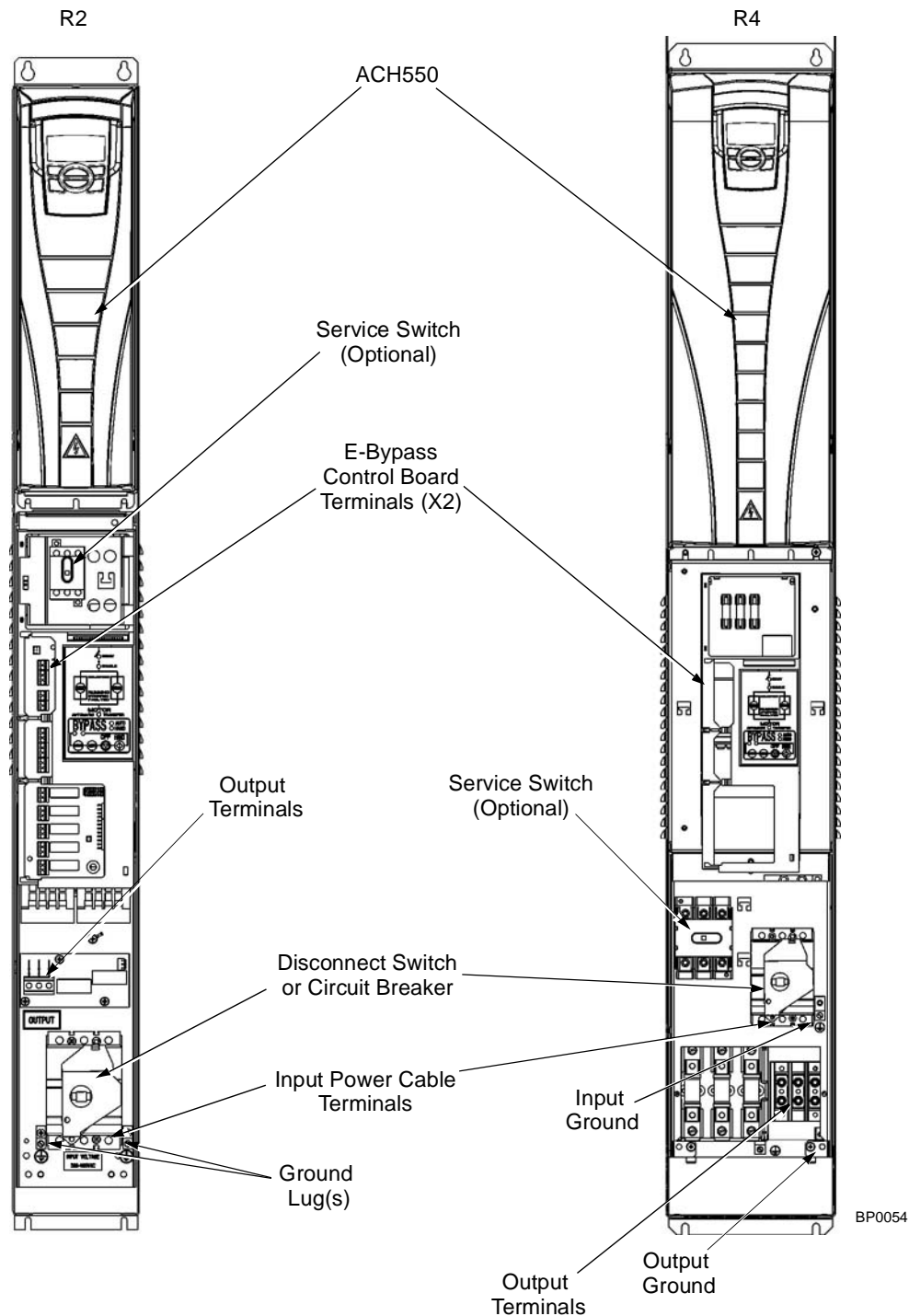
Refer to the “Wiring Requirements” Section in the ACH550 User’s Manual. The requirements apply to all ACH550 drives. In particular:

- 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.

Wiring Overview (Supplement to ACH550-UH User's Manual)

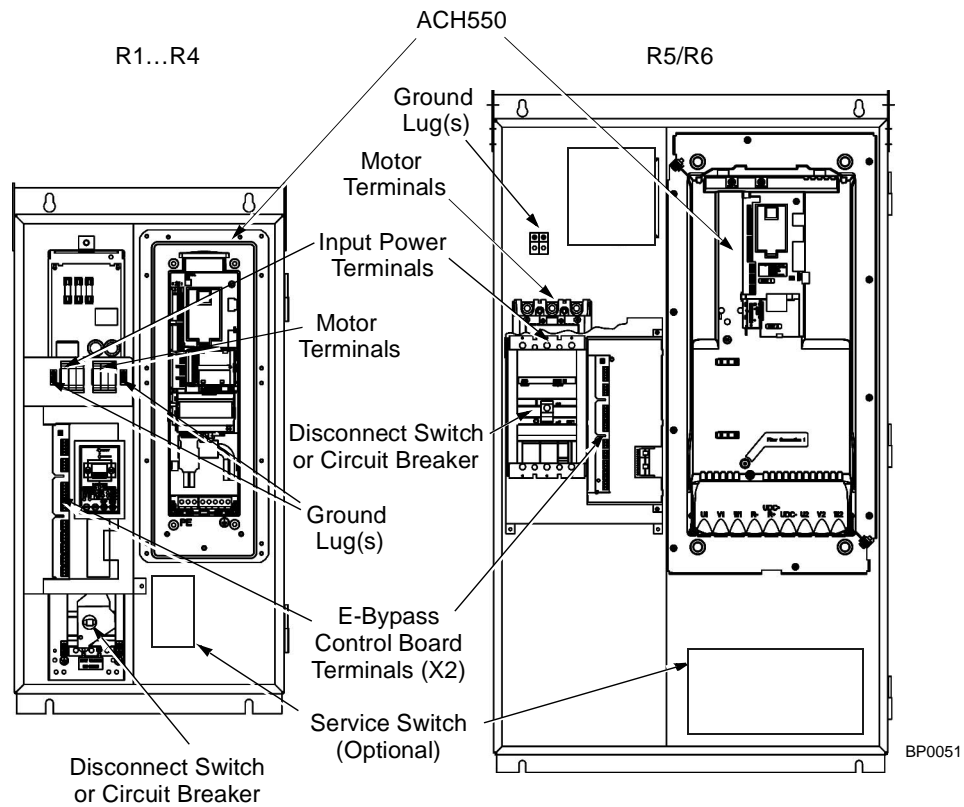
Connection Diagrams – Vertical E-Bypass

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



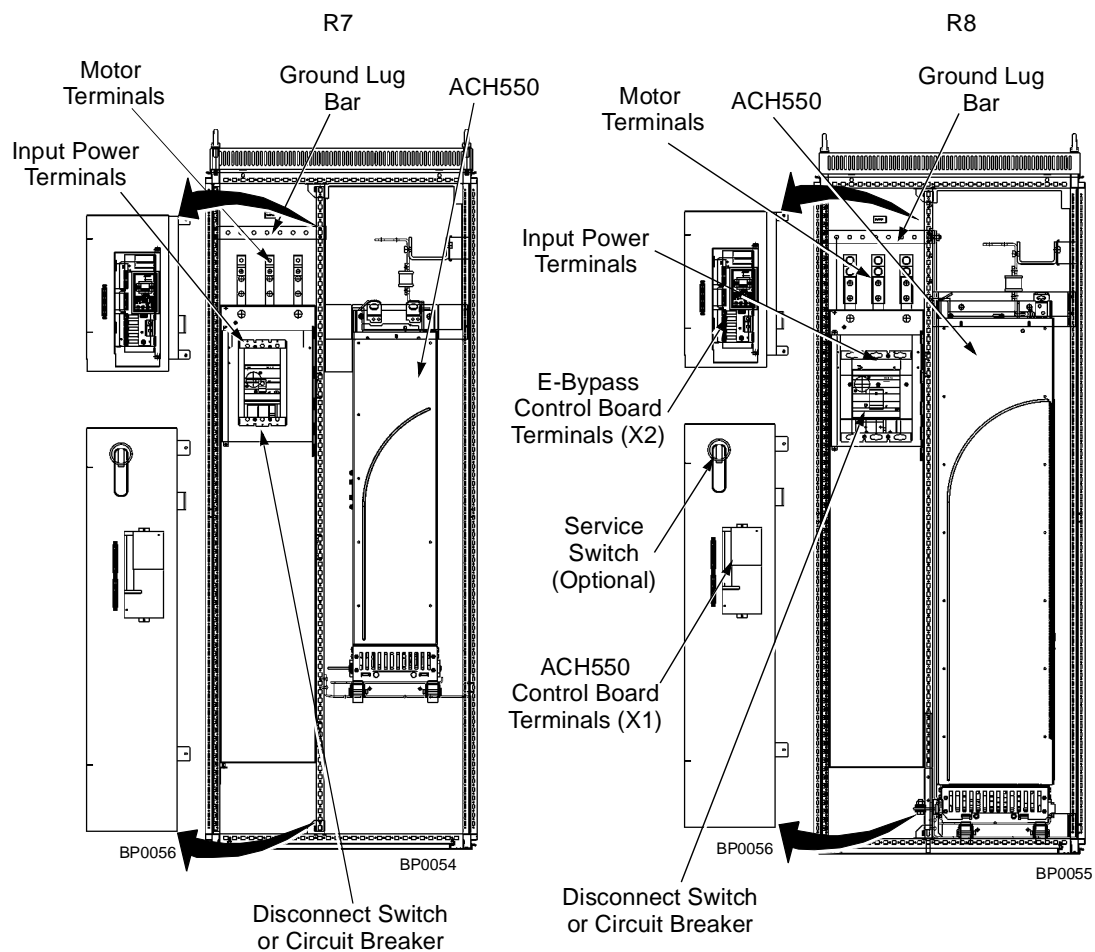
Connection Diagrams – Standard E-Bypass (Wall Mounted)

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



Connection Diagrams – Standard E-Bypass (R7/R8, Floor Mounted)

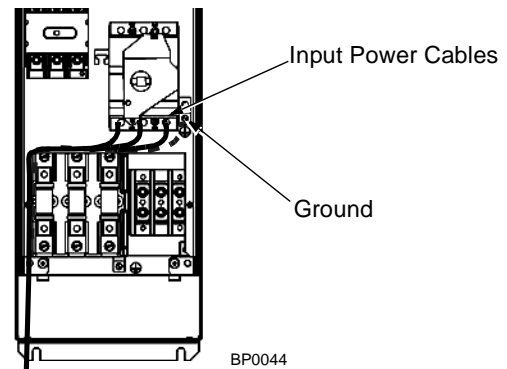
ACH550 Standard E-Bypass units are configured for wiring access from the top. The following figure shows the Standard E-Bypass (floor mounted) wiring connection points. Refer to the ACH550-UH User's Manual for control connections to the drive.



Install the Line Input Wiring (Supplement to ACH550-UH User's Manual)

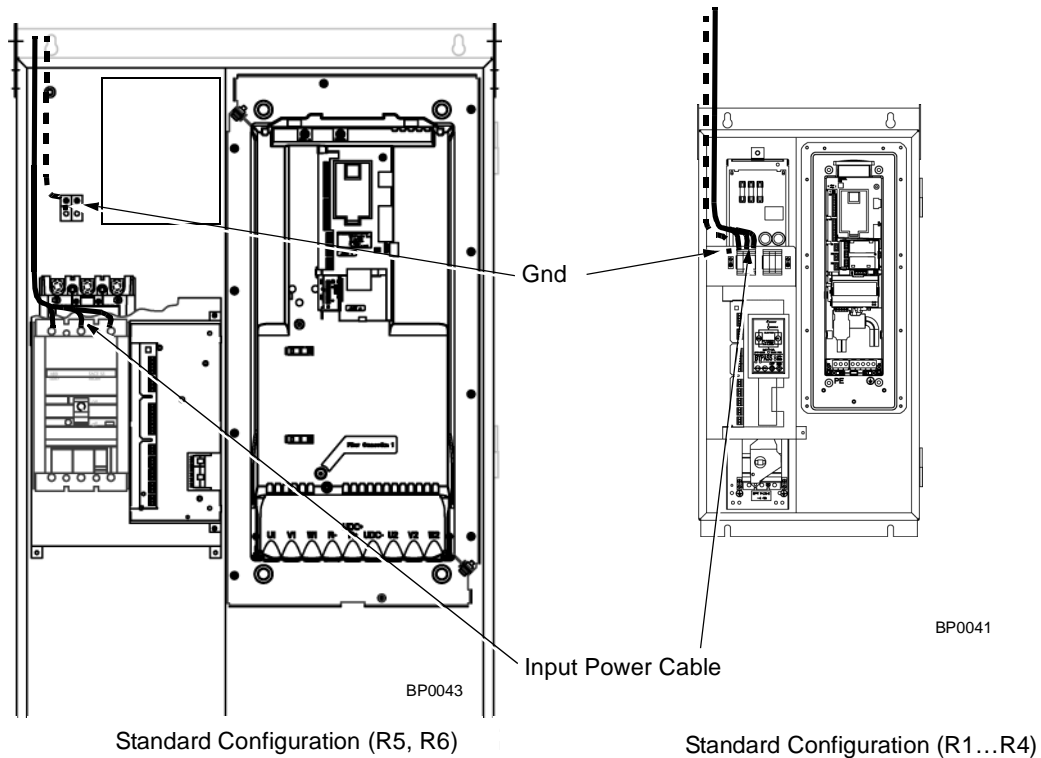
Line Input Connections – Vertical E-Bypass Configurations

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-Bypass" on page 9. Connect the equipment grounding conductor to the ground lug near the input power connection point.



Line Input Connections – Standard E-Bypass Configurations

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-Bypass configurations. Also see "Connection Diagrams – Standard E-Bypass (R7/R8, Floor Mounted)" on page 11 for R7 or R8.

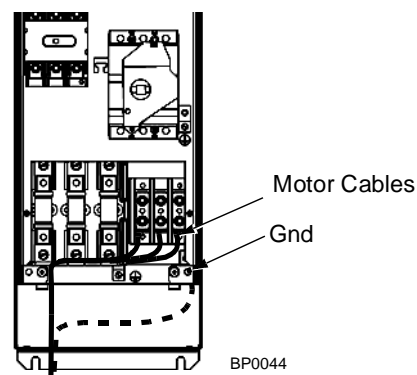


WARNING! Check the motor and motor wiring insulation before connecting the ACH550 to line power. Follow the procedure in the ACH550-UH User's Manual. Before proceeding with the insulation resistance measurements, check that the ACH550 is disconnected from incoming line power. Failure to disconnect line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

Install the Motor Wiring (Supplement to ACH550-UH User's Manual)

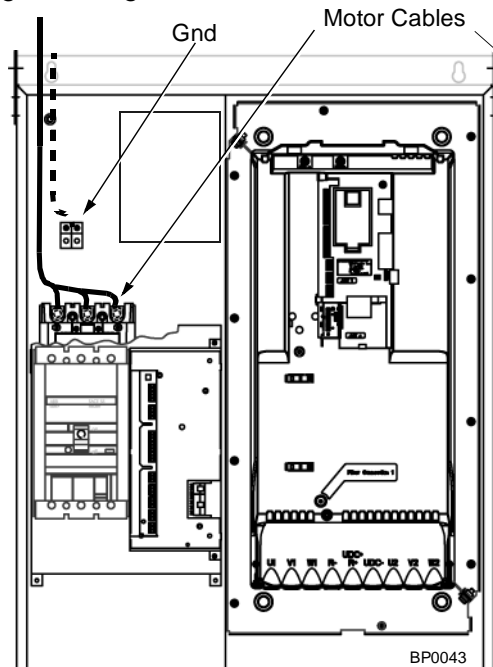
Motor Connections – Vertical E-Bypass Configurations

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-Bypass" on page 9. Connect the motor grounding conductor to the ground lug near the motor cable terminal block connection point.

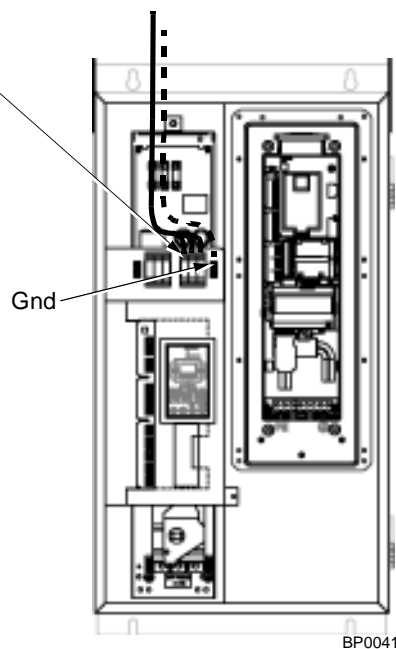


Motor Connections – Standard E-Bypass Configurations

Connect the motor cables to the output terminal block as shown in the figure below. Also see "Connection Diagrams – Standard E-Bypass (R7/R8, Floor Mounted)" on page 11 for R7 or R8. The motor grounding conductor can be connected to the ground lug near the terminal block.



Standard Configuration (R5, R6)



Standard Configuration (R1...R4)

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-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.
- X2 terminal block location is illustrated in the figures starting with "Connection Diagrams – Vertical E-Bypass" on page 9.

- X2 terminal data are provided in "Basic Control Connections for Separate Drive Run & Bypass Run Commands" on page 15.
- Basic connections are described in the following paragraphs.
- Alternate configurations using the E-Bypass macro are described in "The Bypass Application Macro" on page 32.
- On Terminal Block X1 inside the ACH550, analog inputs and outputs and additional digital input and relay output connections (AI1, AI2, AO1, AO2, DI3, DI4, DI5, DI6 and RO2) are available for use. Refer to the *ACH550-UH User's Manual* for information about control connections on Terminal Block X1.

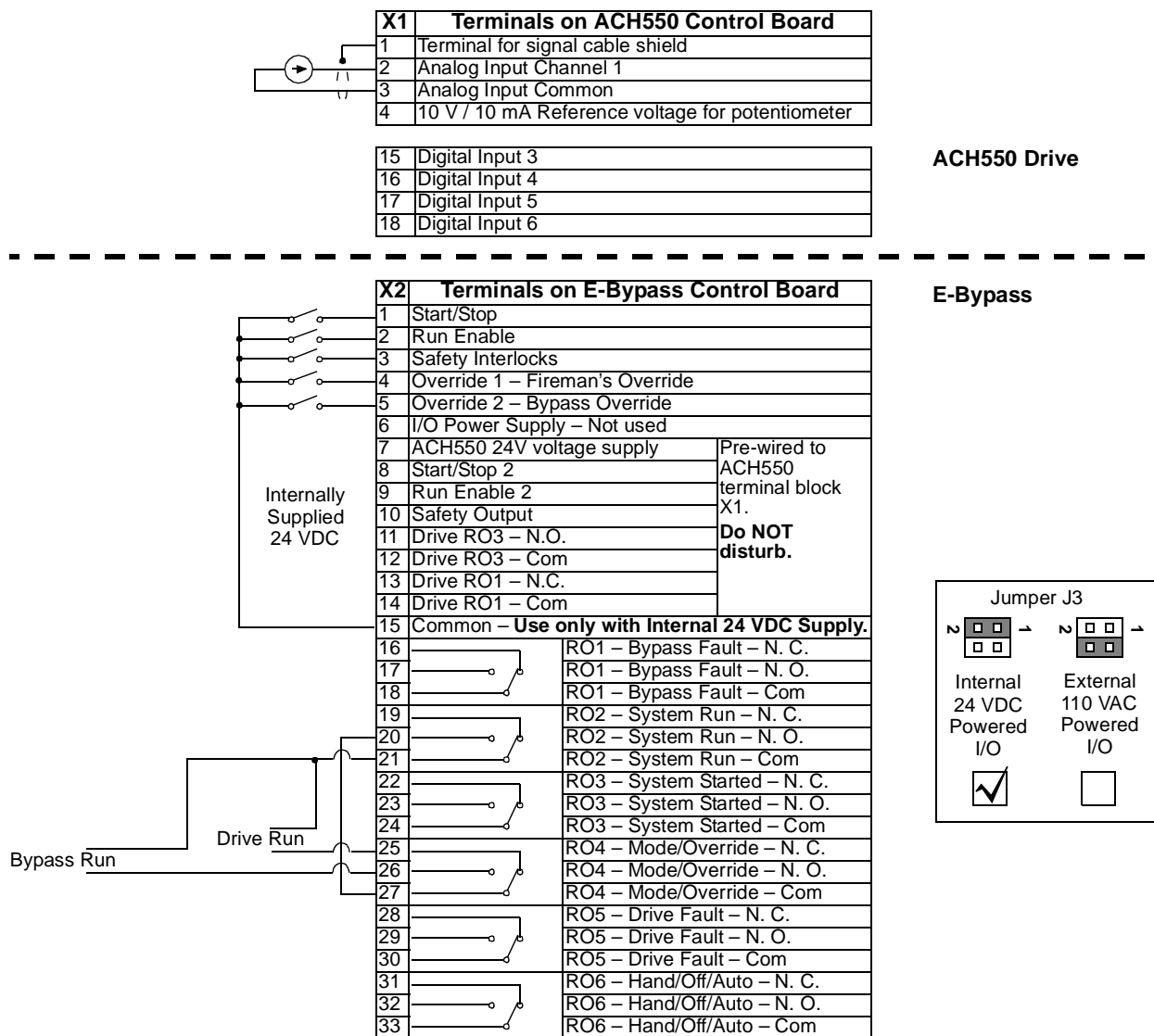
Note! The E-Bypass control circuitry uses inputs and outputs DI1, DI2, RO1 and RO3 (X2:7...X2:14). These inputs and outputs are not available for any other purpose and must not be reconfigured.

Basic Connections

The figure below shows the basic control connections for use with the E-Bypass macro. These connections are described in the following paragraphs.

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

Basic Control Connections for Separate Drive Run & Bypass Run Commands



Parameter Number	Description	Setting
1001	EXTERNAL 1 COMMANDS	1 (DI1)
1002	EXTERNAL 2 COMMANDS	1 (DI1)
1601	RUN ENABLE	2 (DI2)
1401	RELAY OUTPUT 1	7 (STARTED)
1403	RELAY OUTPUT 3	3 (FAULT (-1))

Keypad Control Tests

Apply power to the E-Bypass unit. The display should show the operating status of the drive. If the motor is a standard 208 V, 60 Hz motor connected to a 208 V drive or a 480 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 480 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.

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

- Parameter 1001 must be set to "DI1"
- Parameter 1002 must be set to "DI1"
- Parameter 1601 must be set to "DI2"
- Parameter 1401 (RO1) must be set to "Started"
- Parameter 1403 (RO3) must be set to "Fault (-1)"

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

Test: Motor Disconnected from the ACH550 with E-Bypass

After setting the Start-up Data parameters, test and become familiar with the operation of the ACH550 Drive with E-Bypass without the motor connected as follows:

1. Disconnect and lock out power to the E-Bypass unit, wait at least five minutes after disconnecting power.
2. Disconnect the motor from the E-Bypass unit.
3. Apply power to the E-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 bypass keypad, the *Ready* LED and *Enable* LED should be illuminated. If the *Enable* LED is not illuminated, check to see that closed contacts or jumpers connect terminal X2:2 and X2:3, on the bypass control board, to terminal X2:15.
5. 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 keypad 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 keypad causes the *Auto* LED to be illuminated, pressing the *Hand* key causes the *Hand* LED to be illuminated and pressing the *OFF* key causes either the *Hand* or *Auto* LED to go off. Leave the *Hand* and *Auto* LEDs off when proceeding to the next step.
7. For Steps 8 through 13 Parameter 9904 must be set to "Scalar: Freq". After successful completion of Step 12, 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 for details on setting parameters.

8. Press the *Drive Select* key on the bypass keypad. The *Drive Select* LED should be illuminated.
9. Press the *HAND* key on the ACH550 keypad. Note that the bottom line of the display indicates “HAND” and “RUN” and a Right Arrow. The *Drive Run* LED on the Bypass keypad should be illuminated.
10. Press the *UP* arrow. Note that the reference frequency indication in the top line of the display increases from “0.0 Hz.” The large actual output frequency indication in the center line of the display should also increase from “0.0 Hz.”
11. In the top line of the display, the output current indication should indicate “0.0 A” and the torque indication should indicate “0%.”
12. Press the *DOWN* arrow until the frequency indications return to “0.0 Hz.”
13. Press the *OFF* key. Note that the bottom line of the display indicates “Off.”

If the ACH550 Drive and E-Bypass operate according to these steps, 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+ and BRK- (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.

Test: Motor Connected to the E-Bypass

After successfully testing the drive with the motor disconnected, continue testing the drive as follows:

1. Disconnect and lock out power to the E-Bypass unit.
2. Connect the motor to the output terminals.



CAUTION: If the Fireman's Override (Override 1) 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 Bypass Override (Override 2) 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 tests with the motor disconnected.

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**.

3. Apply power to the E-Bypass unit.
4. Press the *Hand* key on the ACH550 control panel.



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.

5. Slowly increase the output frequency by pressing the *UP ARROW* key. Verify that motor speed varies as frequency varies.
6. Increase the speed to 60 Hz or the highest safe operating speed.
7. Measure the output current in all three phases. The current should be balanced, and should not exceed the motor or drive rating.
8. Press the *OFF* key on the ACH550 control panel. The motor should stop.



CAUTION: Check the motor rotation direction in bypass.

Press the **OFF** key and then the **Bypass Select** key on the bypass keypad. Press the **Hand** key and then quickly press the **OFF** key to “bump” the motor. If the motor turns in the wrong direction, tag out/lock out, then swap any two input power leads at the disconnect switch. Do not swap the motor leads.

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-Bypass is ready to use with preset or modified macro settings. Refer to the ACH550-UH User's Manual for programming instructions.

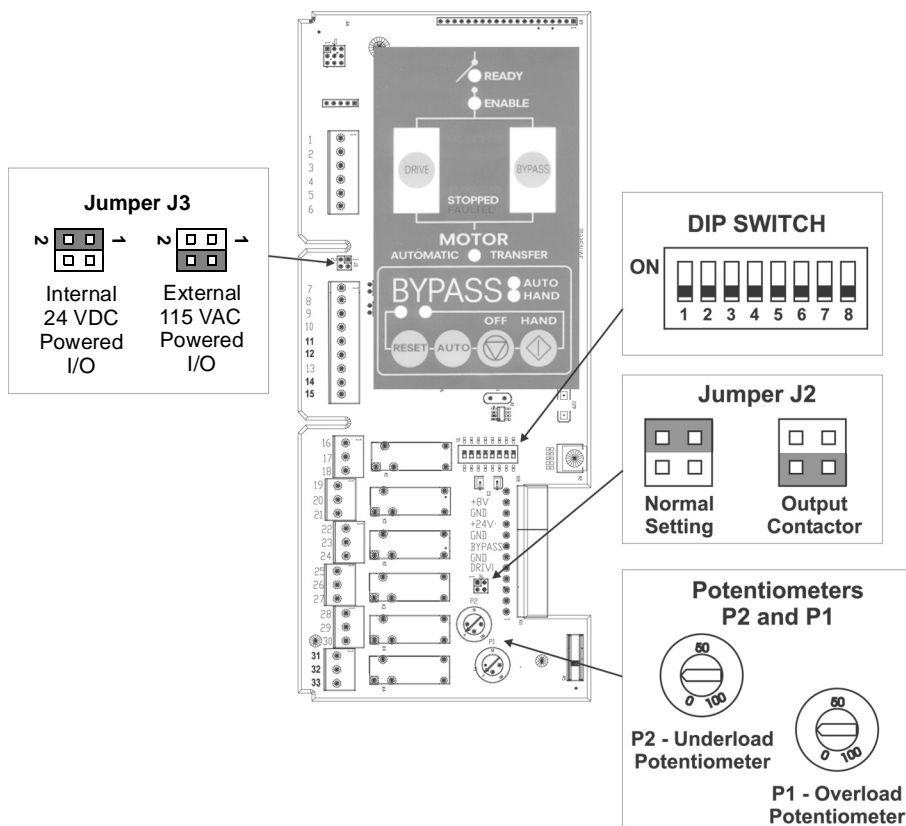
9. Perform the Keypad Control Test before connecting the motor. Refer to "Keypad Control Tests" on page 16.

Check E-Bypass Jumpers, Switches and Pots

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.

Adjustment Locations

The figure below shows the locations of the jumpers, DIP switch and potentiometers on the E-Bypass control board. The functions and settings of these items are explained in the following paragraphs.



DIP Switch Settings

The DIP switch is used to configure the bypass overload protection, select the *Mode / Override* relay's function and enable the automatic bypass feature. Match the DIP Switch Codes to your drive model using the following tables, as appropriate.

208...240 Settings

208 - 240 Volt, Codes for Overload Trip Current DIP Switch			
HP	Identification	Frame Size	Switch Code
1	ACH550-xx-04A6-2	R1	A
1.5	ACH550-xx-06A6-2	R1	A
2	ACH550-xx-07A5-2	R1	A
3	ACH550-xx-012A-2	R1	A
5	ACH550-xx-017A-2	R1	B
7.5	ACH550-xx-024A-2	R2	B
10	ACH550-xx-031A-2	R2	C
15	ACH550-xx-046A-2	R3	D
20	ACH550-xx-059A-2	R3	D
25	ACH550-xx-075A-2	R4	D
30	ACH550-xx-088A-2	R4	F
40	ACH550-xx-114A-2	R4	F
50	ACH550-xx-143A-2	R6	G
60	ACH550-xx-178A-2	R6	G
75	ACH550-xx-221A-2	R6	G
100	ACH550-xx-248A-2	R6	G

380...480 Settings

380 - 480 Volt, Codes for Overload Trip Current DIP Switch			
HP	Identification	Frame Size	Switch Code
1/1.5	ACH550-xx-03A3-4	R1	A
2	ACH550-xx-04A1-4	R1	A
3	ACH550-xx-06A9-4	R1	A
5	ACH550-xx-08A8-4	R1	A
7.5	ACH550-xx-012A-4	R1	A
10	ACH550-xx-015A-4	R2	B
15	ACH550-xx-023A-4	R2	B
20	ACH550-xx-031A-4	R3	C
25	ACH550-xx-038A-4	R3	C
30	ACH550-xx-044A-4	R4	D
40	ACH550-xx-059A-4	R4	D
50	ACH550-xx-072A-4	R4	D
60	ACH550-xx-078A-4	R4	E
60	ACH550-xx-077A-4	R5	E
75	ACH550-xx-096A-4	R5	E
100	ACH550-xx-124A-4	R6	F
125	ACH550-xx-157A-4	R6	G
150	ACH550-xx-180A-4	R6	G
200	ACH550-xx-245A-4	R7	H
250	ACH550-xx-316A-4	R8	H
300	ACH550-xx-368A-4	R8	H
350	ACH550-xx-414A-4	R8	H
400	ACH550-xx-486A-4	R8	H

500...600 Settings

500...600 Volt, Codes for Overload Trip Current DIP Switch			
HP	Identification	Frame Size	Switch Code
2	ACH550-xx-02A7-6	R2	A
3	ACH550-xx-03A9-6	R2	A
5	ACH550-xx-06A1-6	R2	A
7.5	ACH550-xx-09A0-6	R2	A
10	ACH550-xx-011A-6	R2	A
15	ACH550-xx-017A-6	R2	B
20	ACH550-xx-022A-6	R3	B
25	ACH550-xx-027A-6	R3	C
30	ACH550-xx-032A-6	R4	C
40	ACH550-xx-041A-6	R4	D
50	ACH550-xx-052A-6	R4	D
60	ACH550-xx-062A-6	R4	D
75	ACH550-xx-077A-6	R6	E
100	ACH550-xx-099A-6	R6	E
125	ACH550-xx-125A-6	R6	F
150	ACH550-xx-144A-6	R6	F

Switch Code

Switch Position	Switch Setting Configurations							
	Switch Code							
	A	B	C	D	E	F	G	H
1	(OFF) / ON = Automatic Transfer Bypass Feature (OFF) / ON							
2	(OFF) / ON = Mode / Override Relay RO4 (Mode) / Override							
3	RESERVED (OFF)							
4	OFF / (ON) = NEMA Class 30 / (NEMA Class 20) overload trip curve							
5	RESERVED (OFF)							
6	OFF	OFF	OFF	OFF	ON	ON	ON	ON
7	OFF	OFF	ON	ON	OFF	OFF	ON	ON
8	OFF	ON	OFF	ON	OFF	ON	OFF	ON

Default settings in (parentheses).

Output Contactor Control

In the unlikely event of failure in the bypass control electronics, the user can engage the drive output contactor without the control electronics by moving jumper J2 to the *Output Contactor* position – see "Adjustment Locations" on page 19. When the jumper is in the *Output Contactor* position, the *Drive* contactor is energized and the *Bypass* contactor is de-energized. The contactors, and therefore the system, are not controlled by the bypass electronics when jumper J2 is in the *Output Contactor*

position. The system is incapable of Bypass or Override operation in this configuration.

Overload Trip Current Adjustment Potentiometer

The overload protection trip current must be adjusted to the motor nameplate current using the P1 adjustment potentiometer located in the lower right hand area of the bypass control board – see "Adjustment Locations" on page 19. The following table shows the trip currents for the various frame sizes for potentiometer settings of 10 to 100.

Potentiometer Setting	Overload Trip Current (Values in Amps)							
	Switch Code							
	A	B	C	D	E	F	G	H
10	1.2	2.5	3.8	7.5	10.4	15.5	30.0	48.8
20	2.4	5.0	7.6	15.0	20.8	31.0	60.0	97.6
30	3.6	7.5	11.4	22.5	31.2	46.5	90.0	146.4
40	4.8	10.0	15.2	30.0	41.6	62.0	120.0	195.2
50	6.0	12.5	19.0	37.5	52.0	77.5	150.0	244.0
60	7.2	15.0	22.8	45.0	62.4	93.0	180.0	292.8
70	8.4	17.5	26.6	52.5	72.8	108.5	210.0	341.6
80	9.6	20.0	30.4	60.0	83.2	124.0	240.0	390.4
90	10.8	22.5	34.2	67.5	93.6	139.5	270.0	439.2
100	12.0	25.0	38.0	75.0	104.0	155.0	300.0	488.0

Underload Trip Current Adjustment Potentiometer

The underload protection trip current must be adjusted to a percentage of the motor nameplate current using the P2 adjustment potentiometer located in the lower right hand area of the bypass control board – see "Adjustment Locations" on page 19. Potentiometer settings are adjustable from 0 to 100% of the P1 (overload trip) setting. The default setting is 0% which effectively removes the underload protection trip feature from the system.

Circuit Breaker Settings

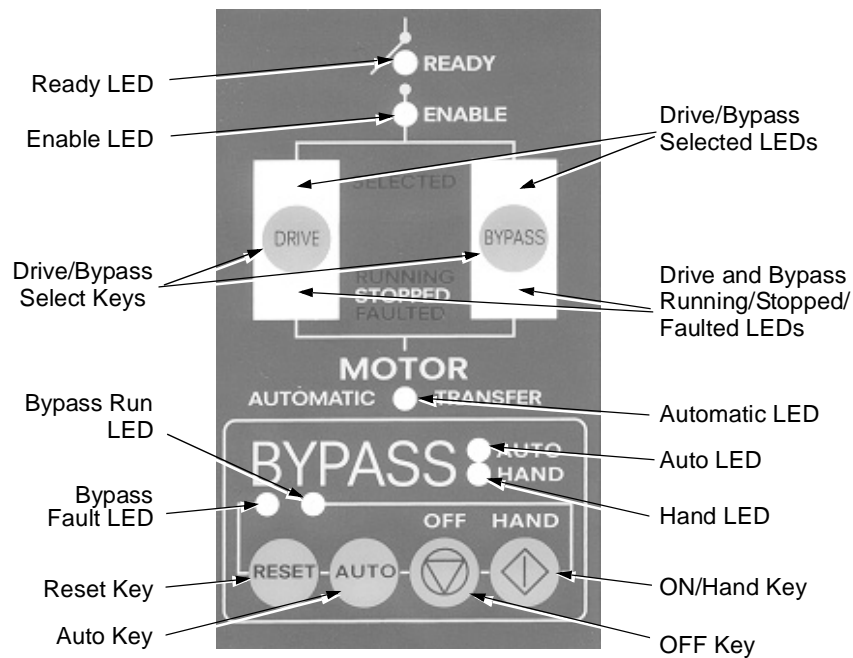
On an ACH550 E-Bypass with output ratings above 120 amps, the circuit breaker has adjustable switch settings for instantaneous and overload current protection. The factory default settings are practical for most applications. Refer to the "ABB SACE Instruction Sheet" (supplied with floor mounted units) for additional information on the adjustment of these settings.

Start-up

Bypass Control Panel Features

Note! For normal operation with the E-Bypass, place the ACH550 control panel in the Auto mode.

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



Ready LED

The *Ready* LED is illuminated when the disconnect switch or circuit breaker is closed and power is applied to the ACH550 and bypass.

Enable LED

The *Enable* LED is illuminated under the following conditions:

- Both the Safety Interlock and Run Enable contacts are closed.
- The Safety Interlock contact is closed with no Start command present.

The *Enable* LED flashes, if the Run Enable contact is open and when the Safety Interlock contact is closed and a Start command is present.

The *Enable* LED is not illuminated when the Safety Interlock contact is open.

Drive Run LED

The *Drive Run* LED is illuminated green when the ACH550 drive is running.

Bypass Fault LED

The *Bypass Fault* LED indicates the status of the bypass overload/underload protection. The LED is red when the bypass has tripped on an overload/underload or the bypass control board has faulted.

Drive Selected LED

The *Drive Selected* LED is illuminated green when the ACH550 drive has been selected as the power source for the motor.

Bypass Selected LED

The *Bypass Selected* LED is illuminated green when the E-Bypass has been selected as the power source for the motor.

Drive Fault LED

The *Drive Fault* LED is illuminated red when the motor or drive protection functions have shut down the ACH550.

Bypass Run LED

The *Bypass Run* LED is illuminated green when the motor is running in bypass.

Automatic Transfer LED

The *Automatic Transfer* LED is illuminated green to indicate the system has automatically transferred to Bypass after a Drive fault.

The *Automatic Transfer* LED flashes green to indicate the system has been placed in an Override condition.

Auto LED

The *Auto* LED is illuminated green when the *Auto Start* contact has been selected as the means for starting and stopping the motor in the bypass mode.

Hand LED

The *Hand* LED is illuminated green when the motor has been started manually in the bypass mode.

Drive Select Key

The *Drive Select* key selects the ACH550 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.

Reset Key

The *Reset* key resets the bypass fault. It may take several minutes before the bypass can be reset after an overload trip.

Auto Key

The *Auto* key selects the *Auto Start* contact 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.

OFF Key

The *OFF* key can be used to manually stop the motor if the motor has been running on bypass power.

Operating Modes

Drive Mode

Under normal conditions the system is in the *Drive* mode. The ACH550 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 keypad. Commands come from the control terminals (or serial communication) when the *Auto* mode has been selected or from the drive keypad when the *Hand* mode has been selected. The user can normally switch to the *Drive* mode by pressing the *Drive* key on the bypass keypad.

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' keypad. Commands come from the control terminals when the *Auto* mode has been selected or from the bypass keypad when the *Hand* mode has been selected. The user can normally switch to the *Bypass* mode by pressing the *Bypass* key on the bypass keypad. Alternative methods of bypass control called *Overrides* are also available. Refer to the following descriptions of the *Override* modes.

Fireman's Override Mode

In the *Fireman's Override (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 user can switch to the *Fireman's Override* mode by closing the *Fireman's Override* input contact. When the *Fireman's Override* input contact is closed, the system is forced to bypass and runs the motor. The Automatic Transfer LED flashes green when the system is in override. While in *Fireman's Override* the system does not respond to any other inputs including overloads, faults, safeties and enables. *Fireman's Override* is designed for "**Run to Destruction**" operation. Normally when the *Fireman's Override* input contact is switched from closed to open, the system returns to the operating mode that existed prior to entering *Override* and can 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.

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. 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 Automatic Transfer LED flashes green when the system is in override. While in *Bypass Override* the system responds to bypass overloads, faults, safeties and enables. 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 *Fireman's Override (Override 1)* input contact is closed, in which case the system remains in *Fireman's Override* 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 keypad. The motor will run and the *Hand* LED will be illuminated green. In order to run the motor, the *Safety Interlock* and *Run Enable* contacts must be closed (green *Enable* 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. The *Auto* mode is selected by pressing the *Auto* key on the bypass keypad. The *Auto* LED is illuminated green 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* 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* key. The *Hand* or *Auto* LED will go out. 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* 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 ACH550 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* and *Run Enable Input* contacts are closed 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 Option

When the *Automatic Transfer* option is selected, 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* option is selected by setting a configuration switch on the bypass control board. See "Check E-Bypass Jumpers, Switches and Pots" on page 19. The *Automatic Transfer* LED is illuminated green once the system has automatically transferred to bypass operation.

Output Contactor Control

In the unlikely event of failure in the bypass control electronics, the user can engage the drive output contactor without the control electronics by using a configuration jumper on the bypass control board. See "Output Contactor Control" on page 22.

Bypass Control Board Inputs and Outputs

The E-Bypass control board has five relay contact (digital) inputs, six relay outputs and one digital output that are available for connection to external control circuits. The internal 24VDC supply is normally used in conjunction with the relay contact inputs. Use of an external 110 VAC power supply requires re-configuring Jumper J3. Care should be taken when using external supply voltages so as not to damage the drive and bypass electronics. The input and output functions are described below. Refer to "Installation" for additional information and connection instructions.

Relay Contact Inputs

Start/Stop

The *Start/Stop* input is connected to a normally open contact that starts and stops the system. When the E-Bypass is in the *Drive* mode and the ACH550 is in the *Auto* mode, the *Start/Stop* input contact controls the motor by starting and stopping the ACH550 drive. When the E-Bypass is in the *Bypass* mode and the *Auto* LED is illuminated green, the *Start/Stop* input contact controls the motor by controlling the bypass contactor.

Run Enable

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 *Enable* LED will flash and the motor is prevented from running.

Safety Interlock

The *Safety Interlock* input is 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 *Enable* LED is not illuminated, the drive output contactor, bypass contactor, and *System Started* relay are de-energized preventing the motor from running.

Fireman's Override (Override 1)

The *Fireman's Override (Override 1)* input can be connected to an external contact that is closed to select the *Fireman's Override* mode. See "Fireman's Override Mode" on page 26 for a description of this mode.

Bypass Override (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 26 for a description of this mode.

Relay Contact Outputs

Bypass Fault

The *Bypass Fault* relay is energized during normal operation. The *Bypass Fault* relay is de-energized when a bypass fault has occurred or when the bypass motor overload/underload protection has tripped.

System Run

The *System Run* relay is energized when the E-Bypass System is running. The *System Run* relay provides an output when the motor is running whether powered by the ACH550 drive or the bypass.

Separate *Drive Run* and *Bypass Run* contacts can be created by using the common (C) contact of the *System Run* relay and connecting the normally open (NO) contact of the *System Run* relay to the common (C) contact of the *Mode / Override* relay. To do this the *Mode / Override* relay must be configured for *Mode* relay operation. See "Check E-Bypass Jumpers, Switches and Pots" on page 19. The normally closed (NC) contact of the *Mode* relay becomes the *Drive Run* contact and the normally open (NO) contact of the *Mode* relay becomes the *Bypass Run* contact. This configuration provides outputs that are closed when the motor is running. See "The Bypass Application Macro" starting on page 32.

System Started

The *System Started* relay is energized when the E-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 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 ACH550 keypad, the bypass keypad, 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.

Mode/Override

The *Mode / Override* relay is a configurable relay. The function of the relay is selectable between *Mode* and *Override* operation. If the *Mode / Override* relay is configured for *Mode* operation (Default), the relay is energized when the *Bypass* mode is selected and de-energized when the *Drive* mode is selected. If the *Mode / Override* relay is configured for *Override* operation, the relay is energized when the *Override* mode is selected and de-energized in all other modes. See "Check E-Bypass Jumpers, Switches and Pots" on page 19.

Drive Fault

The *Drive Fault* relay is energized during normal operation. The *Drive Fault* relay is de-energized when an ACH550 drive fault has occurred.

Hand/Off/Auto

The *Hand/Off/Auto* relay is energized when the bypass is in the *Auto* mode and de-energized in the *Hand* mode and when the bypass is *Off*. In the *Auto* mode the bypass start/stop command comes from the *Start/Stop* input terminal on the bypass control board.

Digital Output

Safety Interlock

The *Safety Interlock* output is active when the *Safety Interlock Input* contact is closed. The *Safety Interlock* output is available for customer connection and routing through the ACH550 drive. Users can select from a variety of optional communication protocols to monitor the *Safety Interlock* status through the ACH550 digital inputs. Refer to the ACH550-UH User's Manual and the appropriate communications manual for additional information about monitoring ACH550 digital inputs.

ACH550 Drive Inputs and Outputs

Some of the ACH550 inputs and outputs are pre-wired to the bypass control board and not available for external use. The inputs and outputs that are not pre-wired are available for external use by connecting directly to the terminals in the ACH550. The pre-wired and available inputs and outputs are described below. Refer to the ACH550-UH User's Manual for additional information about the inputs and outputs. See also "Installation" for additional information and connection instructions.

The ACH550 has two relay outputs that are pre-wired to the bypass control board. These two relay outputs are used to provide the *System (Drive) Started* and *Drive Fault* outputs that are described above.

Two of the ACH550's digital inputs, the *Auto Mode Start/Stop* input and the *Run Enable* input are also pre-wired to the bypass control board. These two digital inputs are coordinated with the *Start/Stop* and *Run Enable* inputs that control the motor in both the Drive and Bypass modes of operation.



Note! The E-Bypass will not work properly if the Drive relay outputs RO1 and RO3 or the Drive digital inputs DI1 and DI2 are reassigned by changing ACH550 configuration settings. The only macro that, by default, provides the proper configuration settings is the E-Bypass macro. If any other macro will be used, see "The Bypass Application Macro" on page 32.

Four of the digital inputs of the ACH550 are available for routing E-Bypass outputs (digital and relay outputs) through the ACH550 drive. Users can select from a variety of communication protocols to monitor the E-Bypass status through the ACH550 digital inputs. The digital inputs of the ACH550 are also available for selecting constant speeds or providing *Speed Increase* and *Speed Decrease* inputs. The

functions of these inputs is determined by the ACH550 macro selection. Refer to the ACH550-UH User's Manual for additional information.

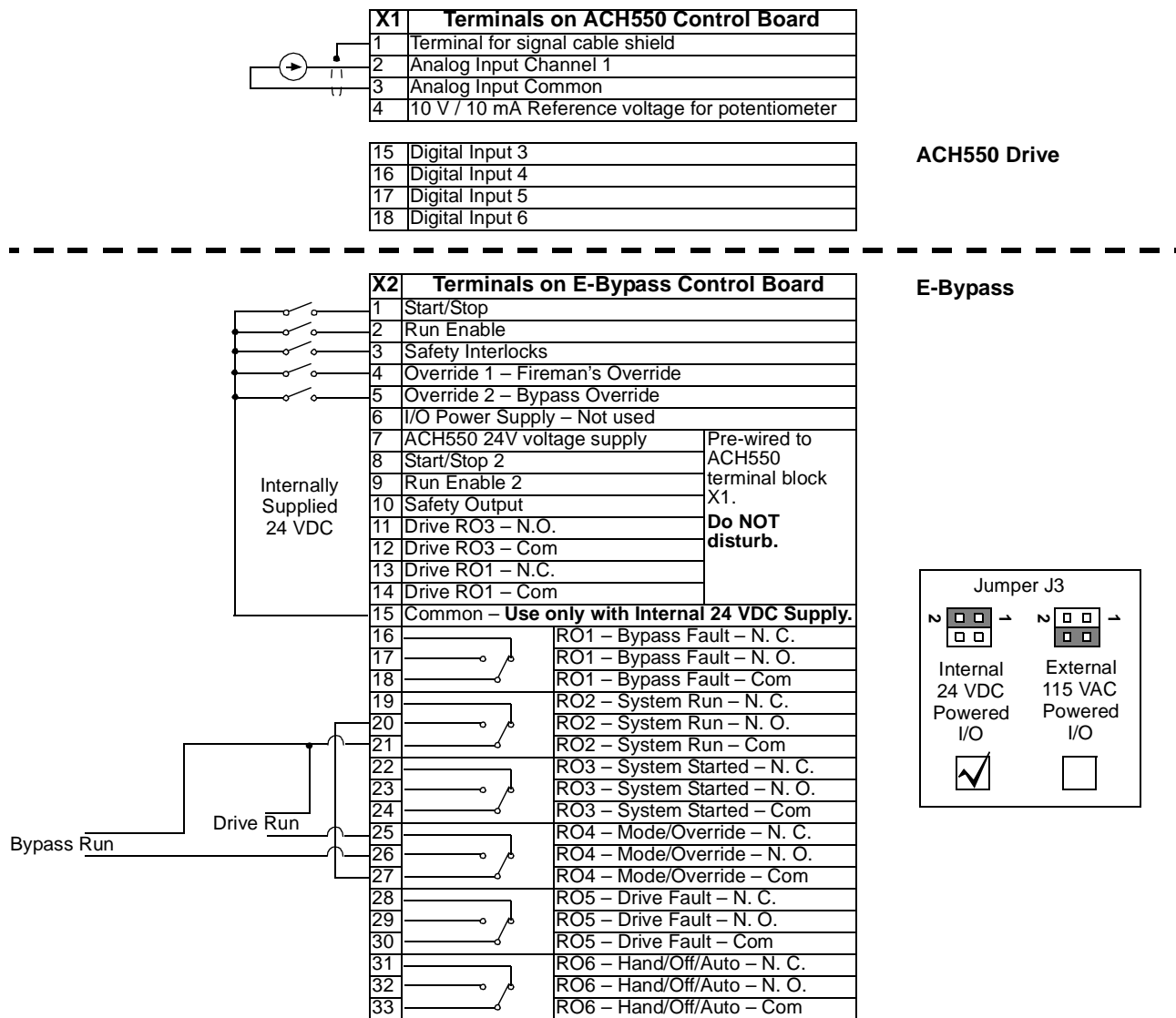
The ACH550 *Auto Mode External Reference* input is an analog input that sets the operating speed when the ACH550 *HVAC* macro is selected and the drive is in the *Auto* mode. When HVAC PID Control is selected, analog inputs are used for receiving the transducer feedback “actual” signal. Refer to the ACH550-UH User's Manual for additional information.

The *Output Frequency* analog output of the ACH550 provides a 4 to 20 mA signal proportional to the drive output frequency or motor speed.

The Bypass Application Macro

The following figures show a variety of configurations and connections using the Bypass Macro.

Basic Control Connections for Separate Drive Run & Bypass Run Commands



Parameter Number	Description	Setting
1001	EXTERNAL 1 COMMANDS	1 (DI1)
1002	EXTERNAL 2 COMMANDS	1 (DI1)
1601	RUN ENABLE	2 (DI2)
1401	RELAY OUTPUT 1	7 (STARTED)
1403	RELAY OUTPUT 3	3 (FAULT (-1))

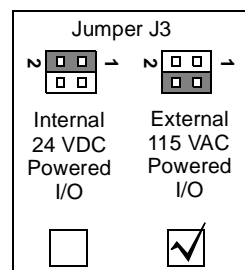
Basic Control Connections for Externally Supplied 115 VAC Power

X1 Terminals on ACH550 Control Board	
1	Terminal for signal cable shield
2	Analog Input Channel 1
3	Analog Input Common
4	10 V / 10 mA Reference voltage for potentiometer
15	Digital Input 3
16	Digital Input 4
17	Digital Input 5
18	Digital Input 6

ACH550 Drive

X2 Terminals on E-Bypass Control Board	
1	Start/Stop
2	Run Enable
3	Safety Interlocks
4	Override 1 – Fireman's Override
5	Override 2 – Bypass Override
6	I/O Power Supply – Not used
7	ACH550 24V voltage supply
8	Start/Stop 2
9	Run Enable 2
10	Safety Output
11	Drive RO3 – N.O.
12	Drive RO3 – Com
13	Drive RO1 – N.C.
14	Drive RO1 – Com
15	Common – Use only with Internal 24 VDC Supply.
16	RO1 – Bypass Fault – N. C.
17	RO1 – Bypass Fault – N. O.
18	RO1 – Bypass Fault – Com
19	RO2 – System Run – N. C.
20	RO2 – System Run – N. O.
21	RO2 – System Run – Com
22	RO3 – System Started – N. C.
23	RO3 – System Started – N. O.
24	RO3 – System Started – Com
25	RO4 – Mode/Override – N. C.
26	RO4 – Mode/Override – N. O.
27	RO4 – Mode/Override – Com
28	RO5 – Drive Fault – N. C.
29	RO5 – Drive Fault – N. O.
30	RO5 – Drive Fault – Com
31	RO6 – Hand/Off/Auto – N. C.
32	RO6 – Hand/Off/Auto – N. O.
33	RO6 – Hand/Off/Auto – Com

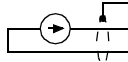
E-Bypass



Parameter Number	Description	Setting
1001	EXTERNAL 1 COMMANDS	1 (DI1)
1002	EXTERNAL 2 COMMANDS	1 (DI1)
1601	RUN ENABLE	2 (DI2)
1401	RELAY OUTPUT 1	7 (STARTED)
1403	RELAY OUTPUT 3	3 (FAULT (-1))

Basic Control Connections for Damper Actuator Control

X1 Terminals on ACH550 Control Board	
1	Terminal for signal cable shield
2	Analog Input Channel 1
3	Analog Input Common
4	10 V / 10 mA Reference voltage for potentiometer



15	Digital Input 3
16	Digital Input 4
17	Digital Input 5
18	Digital Input 6

ACH550 Drive

X2 Terminals on E-Bypass Control Board	
1	Start/Stop
2	Run Enable
3	Safety Interlocks
4	Override 1 – Fireman's Override
5	Override 2 – Bypass Override
6	I/O Power Supply – Not used
7	ACH550 24V voltage supply
8	Start/Stop 2
9	Run Enable 2
10	Safety Output
11	Drive RO3 – N.O.
12	Drive RO3 – Com
13	Drive RO1 – N.C.
14	Drive RO1 – Com
15	Common – Use only with Internal 24 VDC Supply.
16	RO1 – Bypass Fault – N. C.
17	RO1 – Bypass Fault – N. O.
18	RO1 – Bypass Fault – Com
19	RO2 – System Run – N. C.
20	RO2 – System Run – N. O.
21	RO2 – System Run – Com
22	RO3 – System Started – N. C.
23	RO3 – System Started – N. O.
24	RO3 – System Started – Com
25	RO4 – Mode/Override – N. C.
26	RO4 – Mode/Override – N. O.
27	RO4 – Mode/Override – Com
28	RO5 – Drive Fault – N. C.
29	RO5 – Drive Fault – N. O.
30	RO5 – Drive Fault – Com
31	RO6 – Hand/Off/Auto – N. C.
32	RO6 – Hand/Off/Auto – N. O.
33	RO6 – Hand/Off/Auto – Com

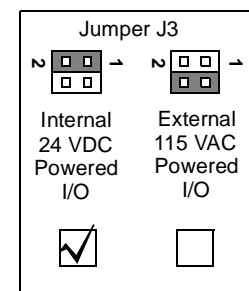
E-Bypass

Auto Start
Damper End Switch
Firestat, Freezestat, High
Static Switch

Internally
Supplied
24 VDC

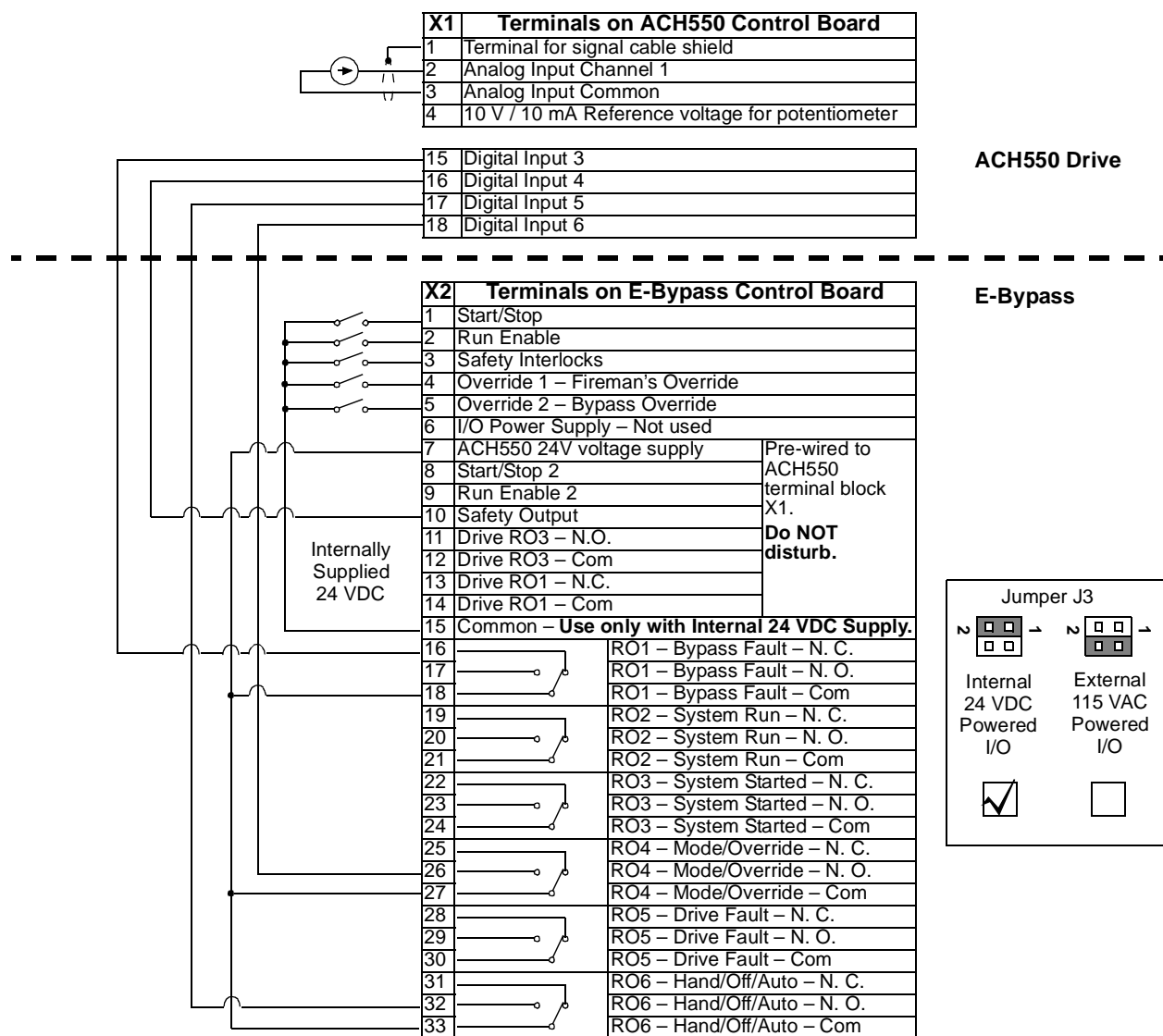
To Damper Actuator

Pre-wired to
ACH550
terminal block
X1.
**Do NOT
disturb.**



Parameter Number	Description	Setting
1001	EXTERNAL 1 COMMANDS	1 (DI1)
1002	EXTERNAL 2 COMMANDS	1 (DI1)
1601	RUN ENABLE	2 (DI2)
1401	RELAY OUTPUT 1	7 (STARTED)
1403	RELAY OUTPUT 3	3 (FAULT (-1))

Basic Control Connections for Routing Output Through the ACH550



Parameter Number	Description	Setting
1001	EXTERNAL 1 COMMANDS	1 (DI1)
1002	EXTERNAL 2 COMMANDS	1 (DI1)
1201	CONST SPEED SEL	0 (NOT SEL)
1601	RUN ENABLE	2 (DI2)
1401	RELAY OUTPUT 1	7 (STARTED)
1403	RELAY OUTPUT 3	3 (FAULT (-1))

Worksheet

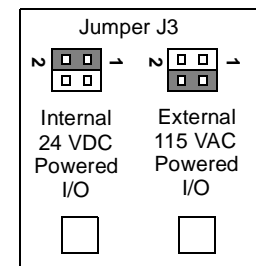
X1 Terminals on ACH550 Control Board	
1	Terminal for signal cable shield
2	Analog Input Channel 1
3	Analog Input Common
4	10 V / 10 mA Reference voltage for potentiometer

15	Digital Input 3
16	Digital Input 4
17	Digital Input 5
18	Digital Input 6

ACH550 Drive

X2 Terminals on E-Bypass Control Board	
1	Start/Stop
2	Run Enable
3	Safety Interlocks
4	Override 1 – Fireman's Override
5	Override 2 – Bypass Override
6	I/O Power Supply – Not used
7	ACH550 24V voltage supply
8	Start/Stop 2
9	Run Enable 2
10	Safety Output
11	Drive RO3 – N.O.
12	Drive RO3 – Com
13	Drive RO1 – N.C.
14	Drive RO1 – Com
15	Common – Use only with Internal 24 VDC Supply.
16	RO1 – Bypass Fault – N. C.
17	RO1 – Bypass Fault – N. O.
18	RO1 – Bypass Fault – Com
19	RO2 – System Run – N. C.
20	RO2 – System Run – N. O.
21	RO2 – System Run – Com
22	RO3 – System Started – N. C.
23	RO3 – System Started – N. O.
24	RO3 – System Started – Com
25	RO4 – Mode/Override – N. C.
26	RO4 – Mode/Override – N. O.
27	RO4 – Mode/Override – Com
28	RO5 – Drive Fault – N. C.
29	RO5 – Drive Fault – N. O.
30	RO5 – Drive Fault – Com
31	RO6 – Hand/Off/Auto – N. C.
32	RO6 – Hand/Off/Auto – N. O.
33	RO6 – Hand/Off/Auto – Com

E-Bypass



Parameter Number	Description	Setting
1001	EXTERNAL 1 COMMANDS	1 (DI1)
1002	EXTERNAL 2 COMMANDS	1 (DI1)
1601	RUN ENABLE	2 (DI2)
1401	RELAY OUTPUT 1	7 (STARTED)
1403	RELAY OUTPUT 3	3 (FAULT (-1))

Technical Data

Input Power Connections (Supplement to ACH550-UH User's Manual)

Branch Circuit Protection

Input power is connected to the ACH550 with E-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-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-Bypass with the circuit breaker option is suitable for use on a circuit capable of delivering not more than 20,000 RMS symmetrical amperes (14,000 RMS symmetrical amperes for the 3 and 5 HP models). When connected to a 240 VAC power source, the ACH550 with E-Bypass with the circuit breaker option is suitable for use on a circuit capable of delivering not more than 50,000 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-xx-04A6-2	R1	15	KTK-R-15
1.5	ACH550-xx-06A6-2	R1	15	KTK-R-15
2	ACH550-xx-07A5-2	R1	15	KTK-R-15
3	ACH550-xx-012A-2	R1	15	KTK-R-15
5	ACH550-xx-017A-2	R1	30	KTK-R-30
7.5	ACH550-xx-024A-2	R2	30	KTK-R-30
10	ACH550-xx-031A-2	R2/R3	50	JJS-50

208... 240 Volt		Frame Size	Drive Input Fuse Ratings	
HP	Identification		Amps (600V)	Bussmann Type
15	ACH550-xx-046A-2	R3	80	JJS-80
20	ACH550-xx-059A-2	R3	80	JJS-80
25	ACH550-xx-075A-2	R4	100	JJS-100
30	ACH550-xx-088A-2	R4/R5	125	170M1368
40	ACH550-xx-114A-2	R4/R5	160	170M1369
50	ACH550-xx-143A-2	R6	200	170M1370
60	ACH550-xx-178A-2	R6	225	170M1371
75	ACH550-xx-221A-2	R6	315	170M1372
100	ACH550-xx-248A-2	R6	315	170M1372

380...480 Volt Fuses

380... 480 Volt		Frame Size	Drive Input Fuse Ratings	
HP	Identification		Amps (600V)	Bussmann Type
1/1.5	ACH550-xx-03A3-4	R1	15	KTK-R-15
2	ACH550-xx-04A1-4	R1	15	KTK-R-15
3	ACH550-xx-06A9-4	R1	15	KTK-R-15
5	ACH550-xx-08A8-4	R1	15	KTK-R-15
7.5	ACH550-xx-012A-4	R1	15	KTK-R-15
10	ACH550-xx-015A-4	R2	30	KTK-R-30
15	ACH550-xx-023A-4	R2	30	KTK-R-30
20	ACH550-xx-031A-4	R3	50	JJS-50
25	ACH550-xx-038A-4	R3	50	JJS-50
30	ACH550-xx-044A-4	R4	100	JJS-100
40	ACH550-xx-059A-4	R4	100	JJS-100
50	ACH550-xx-072A-4	R4	100	JJS-100
60	ACH550-xx-078A-4	R4	100	JJS-100
60	ACH550-xx-077A-4	R5	125	170M1368
75	ACH550-xx-096A-4	R5	125	170M1368
100	ACH550-xx-124A-4	R6	160	170M1369
125	ACH550-xx-157A-4	R6	200	170M1370
150	ACH550-xx-180A-4	R6	225	170M1371
200	ACH550-xx-245A-4	R7	400	JJS-400
250	ACH550-xx-316A-4	R8	400	JJS-400
300	ACH550-xx-368A-4	R8	400	JJS-400
350	ACH550-xx-414A-4	R8	600	JJS-600
400	ACH550-xx-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-xx-02A7-6	R2	15	KTK-R-15
3	ACH550-xx-03A9-6	R2	15	KTK-R-15
5	ACH550-xx-06A1-6	R2	15	KTK-R-15
7.5	ACH550-xx-09A0-6	R2	15	KTK-R-15
10	ACH550-xx-011A-6	R2	30	KTK-R-30
15	ACH550-xx-017A-6	R2	30	KTK-R-30
20	ACH550-xx-022A-6	R3	40	JJS-40
25	ACH550-xx-027A-6	R3	40	JJS-40
30	ACH550-xx-032A-6	R4	100	JJS-100
40	ACH550-xx-041A-6	R4	100	JJS-100
50	ACH550-xx-052A-6	R4	100	JJS-100
60	ACH550-xx-062A-6	R4	100	JJS-100
75	ACH550-xx-077A-6	R6	125	170M1368
100	ACH550-xx-099A-6	R6	125	170M1368
125	ACH550-xx-125A-6	R6	160	170M1369
150	ACH550-xx-144A-6	R6	200	170M1370

Line Reactor

The ACH550 E-Bypass may contain optional input line reactors to provide additional input impedance on the VAC line. This impedance is in addition to the approximate 5% 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 Terminal Block	Ground Lugs
1	ACH550-Vx-04A6-2	R1	#3 44 in-lbs	#8 7 in-lbs	#6 13 in-lbs	#4 35 in-lbs
1.5	ACH550-Vx-06A6-2	R1				
2	ACH550-Vx-07A5-2	R1				
3	ACH550-Vx-012A-2	R1				
5	ACH550-Vx-017A-2	R1				
7.5	ACH550-Vx-024A-2	R2				
10	ACH550-Vx-031A-2	R2/R3		#4 18 in-lbs	#2/0 120 in-lbs	#2 50 in-lbs
15	ACH550-Vx-046A-2	R3				
20	ACH550-Vx-059A-2	R3				
25	ACH550-Vx-075A-2	R4		#1/0 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 Terminal Block	Ground Lugs
1/1.5	ACH550-Vx-03A3-4	R1	#3 44 in-lbs	#8 7 in-lbs	#6 13 in-lbs	#4 35 in-lbs
2	ACH550-Vx-04A1-4	R1				
3	ACH550-Vx-06A9-4	R1				
5	ACH550-Vx-08A8-4	R1				
7.5	ACH550-Vx-012A-4	R1				
10	ACH550-Vx-015A-4	R2				
15	ACH550-Vx-023A-4	R2		#4 18 in-lbs	#2/0 120 in-lbs	#2 50 in-lbs
20	ACH550-Vx-031A-4	R3				
25	ACH550-Vx-038A-4	R3				
30	ACH550-Vx-044A-4	R4				
40	ACH550-Vx-059A-4	R4				
50	ACH550-Vx-072A-4	R4				
60	ACH550-Vx-078A-4	R4				
			#3 44 in-lb			

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 Terminal Block	Ground Lugs
2	ACH550-Vx-02A7-6	R2	#3 44 in-lb	#8 7 in-lb	#6 13 in-lb	#4 35 in-lb
3	ACH550-Vx-03A9-6	R2				
5	ACH550-Vx-06A1-6	R2				
7.5	ACH550-Vx-09A0-6	R2				
10	ACH550-Vx-011A-6	R2				
15	ACH550-Vx-017A-6	R2				
20	ACH550-Vx-022A-6	R3		#4 18 in-lb	#2/0 120 in-lb	#2 50 in-lb
25	ACH550-Vx-027A-6	R3				
30	ACH550-Vx-032A-6	R4				
40	ACH550-Vx-041A-6	R4				
50	ACH550-Vx-052A-6	R4				
60	ACH550-Vx-062A-6	R4		#3 44 in-lb		

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 Terminal Block	Ground Lugs
1	ACH550-Bx-04A6-2	R1	#6 13 in-lbs	#6 13 in-lbs	#6 13 in-lbs	#4 35 in-lbs
1.5	ACH550-Bx-06A6-2	R1				
2	ACH550-Bx-07A5-2	R1				
3	ACH550-Bx-012A-2	R1				
5	ACH550-Bx-017A-2	R1				
7.5	ACH550-Bx-024A-2	R2				
10	ACH550-Bx-031A-2	R2/R3	#2/0 120 in-lbs	#2/0 120 in-lbs	#2/0 120 in-lbs	#2 50 in-lbs
15	ACH550-Bx-046A-2	R3				
20	ACH550-Bx-059A-2	R3				
25	ACH550-Bx-075A-2	R4				
30	ACH550-Bx-088A-2	R4	300 MCM 275 in-lbs	#1/0 70 in-lbs	250 MCM 275 in-lbs	3 x #3/0 250 in-lbs
40	ACH550-Bx-114A-2	R4				
50	ACH550-Bx-143A-2	R6				
60	ACH550-Bx-178A-2	R6	350 MCM 200 in-lbs	400 MCM 375 in-lbs		
75	ACH550-Bx-221A-2	R6				
100	ACH550-Bx-248A-2	R6				

Standard 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 Terminal Block	Ground Lugs
1/1.5	ACH550-Bx-03A3-4	R1	#6 13 in-lbs	#6 13 in-lbs	#6 13 in-lbs	#4 35 in-lbs
2	ACH550-Bx-04A1-4	R1				
3	ACH550-Bx-06A9-4	R1				
5	ACH550-Bx-08A8-4	R1				
7.5	ACH550-Bx-012A-4	R1				
10	ACH550-Bx-015A-4	R2				
15	ACH550-Bx-023A-4	R2				
20	ACH550-Bx-031A-4	R3	#2/0 120 in-lbs	#2/0 120 in-lbs	#2/0 120 in-lbs	#2 50 in-lbs
25	ACH550-Bx-038A-4	R3				
30	ACH550-Bx-044A-4	R4				
40	ACH550-Bx-059A-4	R4				
50	ACH550-Bx-072A-4	R4				
60	ACH550-Vx-078A-4	R4				
60	ACH550-Bx-077A-4	R5	300 MCM 275 in-lbs	#1/0 70 in-lbs	250 MCM 275 in-lbs	3 x #3/0 250 in-lbs
75	ACH550-Bx-096A-4	R5				
100	ACH550-Bx-124A-4	R6				
125	ACH550-Bx-157A-4	R6				
150	ACH550-Bx-180A-4	R6				
200	ACH550-Bx-245A-4	R7	2 x 250 MCM 275 in-lbs	2 x 250MCM 275 in-lbs	350 MCM 350 in-lbs	5 Bus Bar holes (13/32" bolts)
250	ACH550-Bx-316A-4	R8			2 x 500 MCM 275 in-lbs	
300	ACH550-Bx-368A-4	R8				
350	ACH550-Bx-414A-4	R8				
400	ACH550-Bx-486A-4	R8				

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 Terminal Block	Ground Lugs	
2	ACH550-Bx-02A7-6	R2	#6 13 in-lb	#6 13 in-lb	#6 13 in-lb	#4 35 in-lb	
3	ACH550-Bx-03A9-6	R2					
5	ACH550-Bx-06A1-6	R2					
7.5	ACH550-Bx-09A0-6	R2					
10	ACH550-Bx-011A-6	R2					
15	ACH550-Bx-017A-6	R2					
20	ACH550-Bx-022A-6	R3	#2/0 120 in-lb	#2/0 120 in-lb	#2/0 120 in-lb	#2 50 in-lb	
25	ACH550-Bx-027A-6	R3					
30	ACH550-Bx-032A-6	R4					
40	ACH550-Bx-041A-6	R4					
50	ACH550-Bx-052A-6	R4					
60	ACH550-Bx-062A-6	R4					
75	ACH550-Bx-077A-6	R6	300 MCM 275 in-lb	#10 70 in-lb	#2/0 53 in-lb	3 x #3/0 250 in-lb	
100	ACH550-Bx-099A-6	R6		300 MCM 275 in-lb	250 MCM 275 in-lb		
125	ACH550-Bx-125A-6	R6					
150	ACH550-Bx-144A-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-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

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- Bypass Control Panel Connections (Supplement to ACH550-UH User's Manual)

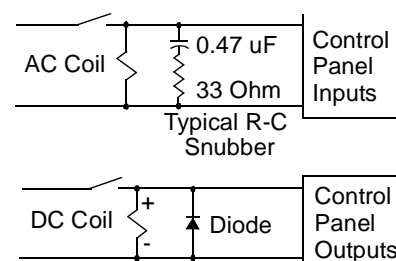
Control cable requirements for connections to the E-Bypass control panel (X2) are the same as those described for the ACH550 control panel (X1). Refer to the ACH550 User's Manual.

Control Panel Connection Specifications

Control Connection Specifications	
Digital Inputs	Digital input impedance 1.5 k Ω . Maximum voltage for digital inputs is 30 V.
Relays (Digital Outputs)	<ul style="list-style-type: none"> Max. contact voltage: 30 V DC, 125 V AC Max. switching current: 8 A, 24 V DC; 0.4 A at 125 V AC Max. continuous current: 2 A rms



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.



Control Panel Terminals

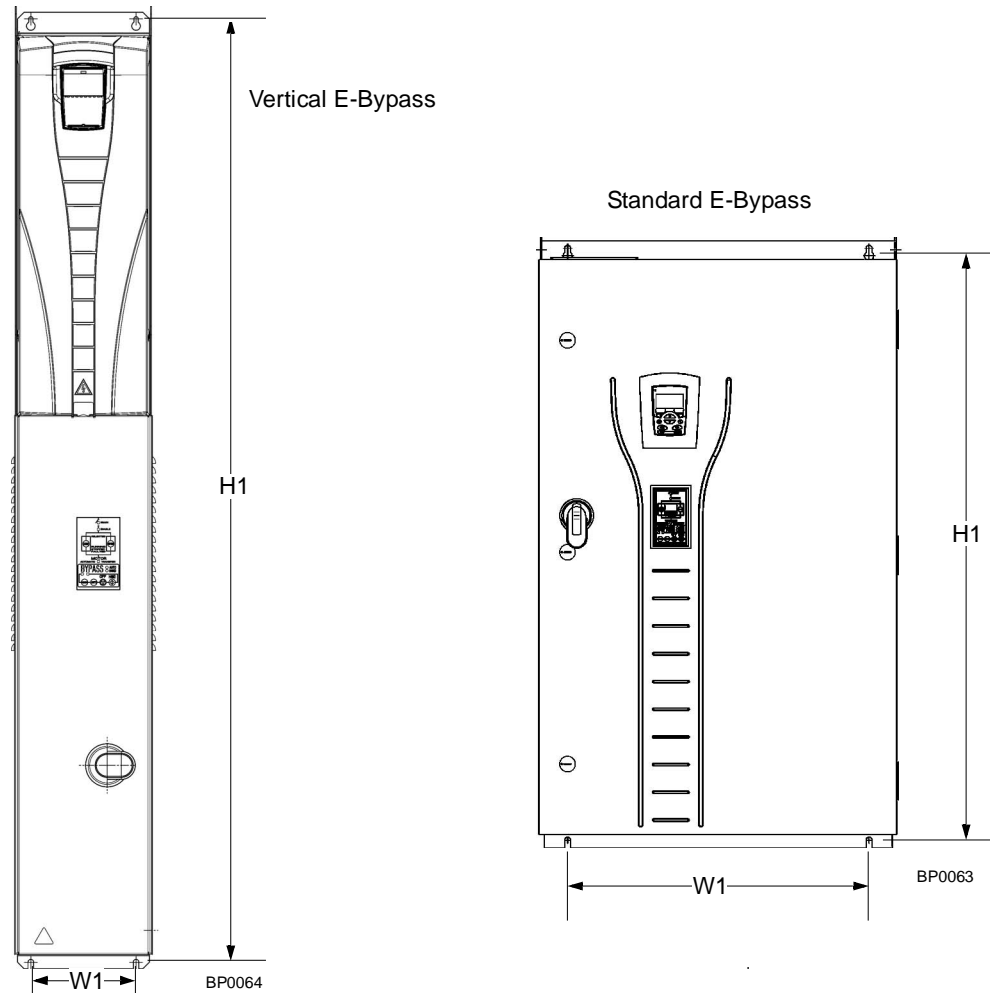
The following table provides specifications for the E-Bypass's control terminals

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 Enclosure, R1...R4

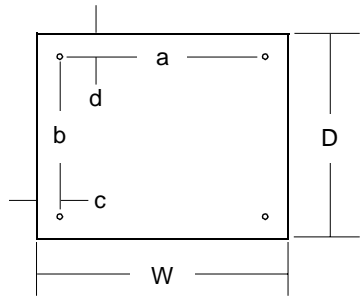
IP 21 / UL type 1 – Mounting Dimensions for each Frame Size								
Ref.	R1		R2		R3		R4	
	mm	in	mm	in	mm	in	mm	in
W1*	98	3.9	98	3.9	160	6.3	160	6.3
H1*	1078	42.4	1178	46.4	1332	52.4	1437	56.6
Mounting Hardware								
	M6	1/4	M6	1/4	M6	1/4	M6	1/4

Standard Enclosure, R1...R6

IP 21 / UL type 1 and IP 54 / UL type 12 – Mounting Dimensions for each Frame Size												
Ref.	R1		R2		R3		R4		R5		R6	
	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in
W1*	320	12.6	320	12.6	400	15.7	400	15.7	600	23.6	600	23.6
H1*	810	31.9	810	31.9	920	36.2	920	36.2	1175	46.3	1175	46.3
Mounting Hardware												
	M10	3/8	M10	3/8	M10	3/8	M10	3/8	M10	3/8	M10	3/8

* Measurements are center to center.

Standard Enclosure, R7...R8

IP 21 / UL type 1 and IP 54 / UL type 12 – Dimensions for each Frame Size			
Ref.	R7 & R8		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, R1...R4

Enclosure	Weight							
	R1		R2		R3		R4	
	kg	lb.	kg	lb.	kg	lb.	kg	lb.
IP 21 / UL type 1	18	40	23	50	51	112	59	131

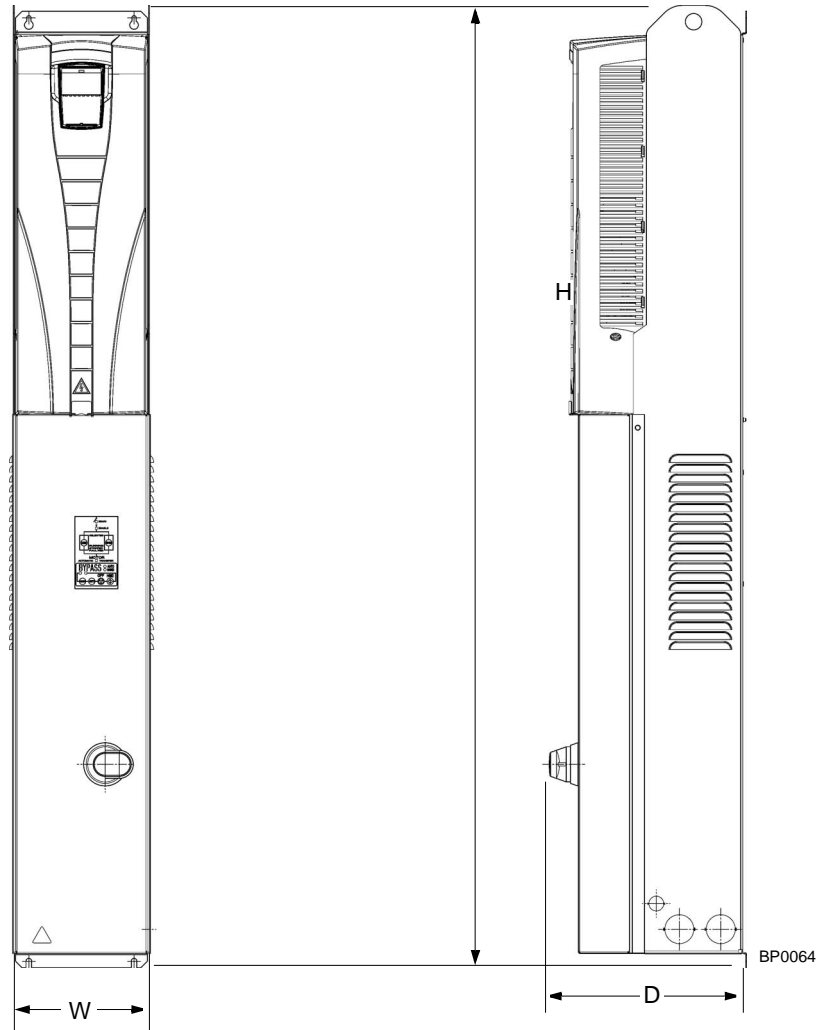
Standard Enclosure, R1...R6

Enclosure	Weight											
	R1		R2		R3		R4		R5		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

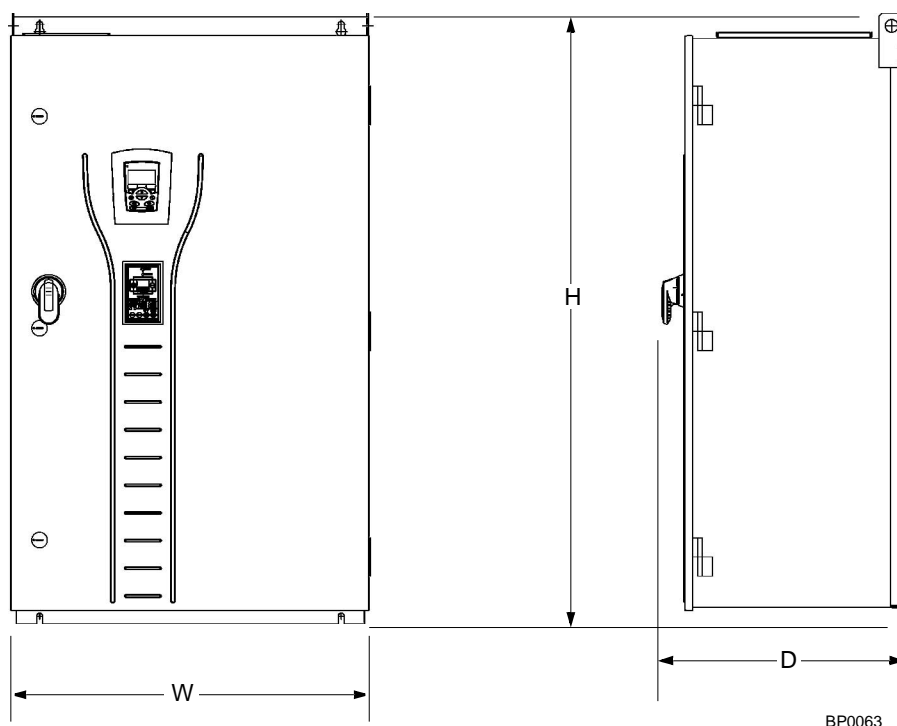
Standard Enclosure, R7...R8

Enclosure	Weight			
	R7		R8	
	kg	lb.	kg	lb.
IP 21 / UL type 1	303	668	454	1000
IP 54 / UL type 12	324	713	474	1045

Outside Dimensions (R1...R6, Wall Mounted Units)

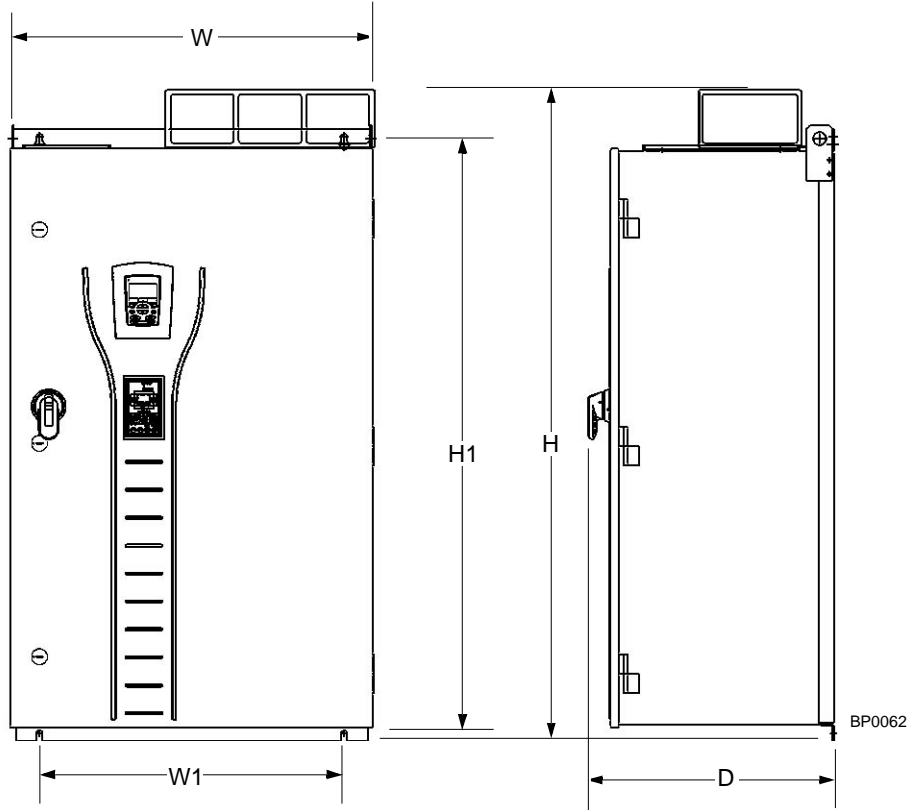
Vertical E-Bypass, **UL type 1**, R1...R4

Vertical E-Bypass, UL type 1								
Dimensions Ref.	R1		R2		R3		R4	
	mm	in.	mm	in.	mm	in.	mm	in.
W	136	5.4	136	5.4	220	8.7	220	8.7
H	1095	43.1	1195	47	1361	53.6	1466	57.7
D	225	10.0	269	10.6	300	11.8	300	11.8

Standard E-Bypass, **UL type 1**, R1...R6

Standard E-Bypass, UL type 1, R1...R6												
Dimensions Ref.	R1		R2		R3		R4		R5		R6	
	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.
W	443	17.4	443	17.4	521	20.5	521	20.5	713	28.1	713	28.1
H	849	33.4	849	33.4	957	37.7	957	37.7	1212	47.7	1212	47.7
D	319	12.6	319	12.6	365	14.4	365	14.4	485	19.1	485	19.1

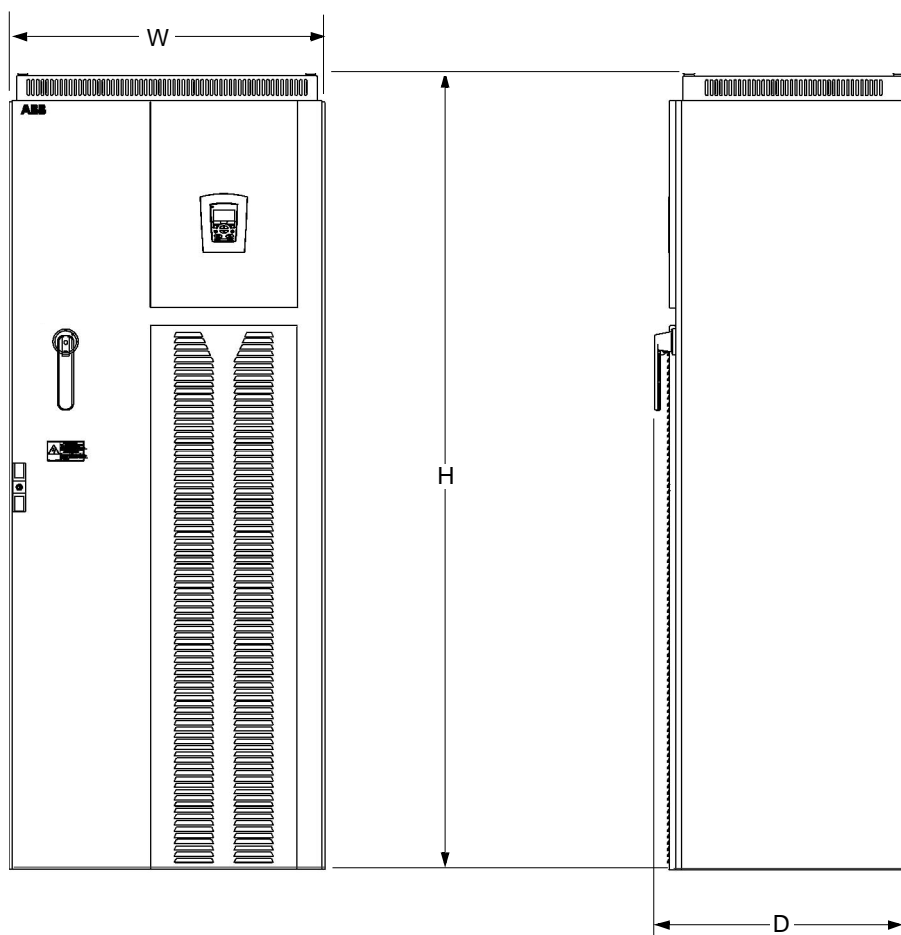
Standard E-Bypass, **UL type 12**, R1...R6



Standard E-Bypass, UL type 12, R1...R6												
Dimensions Ref.	R1		R2		R3		R4		R5		R6	
	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.
W	463	18.2	463	18.2	541	21.3	541	21.3	734	28.9	734	28.9
H	926	36.5	926	36.5	1116	43.8	1116	43.8	1371	54.0	1371	54.0
D	319	12.6	319	12.6	365	14.4	365	14.4	485	19.1	485	19.1

Outside Dimensions – R7...R8

Outside dimensions for the R7 and R8 cabinets are defined below.



BP0017

Outside Dimensions by Frame Size					
Enclosure	Ref.	R7		R8	
		mm	in	mm	in
IP 21 / UL type 1	W	806	31.7	806	31.7
	H	2065	81.3	2065	81.3
	D	659	25.9	659	25.9
IP 54 / UL type 12	W	806	31.7	806	31.7
	H	2377	93.6	2377	93.6
	D	659	25.9	659	25.9

Applicable Standards

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

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