SIEMENS

SED2 VFD Electronic Bypass Options

Operating Instructions

SED2
Easy Drive

SIEMENS

SED2 VFD Electronic Bypass Option Operating Instructions

Table of Contents

How to Use this Manual

Manual Organization

This manual contains the following sections:

- *How to Use this Manual*, describes the organization of this manual and the symbols used throughout this manual.

- *Safety Instructions*, provides general guidelines for your safety and to prevent equipment damage.

- *Electronic Bypass Option Overview*, describes the Electronic Bypass Option Controller board, inputs, outputs, contactors, and keypad.

- *Installation Instructions*, provides mounting information and details on electrical connections.

- *Startup Procedures*, provides step-by-step procedures to start up the Electronic Bypass Option.

- *Required SED2 Parameter Settings*, lists SED2 parameter settings necessary for operation of the Electronic Bypass Option.

- *Application Feature Setup*, describes application features and provides the necessary parameter settings.

- *Technical Specifications*, lists Electronic Bypass Option and SED2 VFD specifications.

- *Troubleshooting*, provides guidelines for troubleshooting the Electronic Bypass Option.

Manual Notations

Notation	Symbol	Meaning
WARNING:	⚠	Indicates that personal injury/loss of life may occur if you do not perform a procedure as specified.
CAUTION:	⚠	Indicates that equipment damage, or loss of data may occur if you do not perform a procedure as specified.
NOTES:	(no symbol)	Provides other important information or helpful hints.

Where To Send Comments

Your feedback is important to us. If you have comments about this manual, please submit them to technical.editor@sbt.siemens.com.

Reference Documents

The following SED2 documentation is available from your local Siemens Building Technologies, Inc. representative:

- *SED2 VFD Startup Operation, and Maintenance Manual* (125-3201), provides operating instructions and procedures for the SED2.

- *SED2 VFD Parameter Reference Guide* (125-3214), provides descriptions of SED2 parameters.

- *SED2 VFD Submittal Sheet* (154-042), provides a synopsis of the SED2 product line, accessories, and technical data.

- *SED2 VFD Electronic Bypass Options Submittal Sheet* (154-051), provides a comprehensive overview of the SED2 Electronic Bypass option.

Safety Instructions

The following guidelines are provided for your safety, to prevent damage, and to extend the service life of the SED2 product and any connected equipment. *Read this information carefully*. Specific Warnings, Cautions, and Notes are provided in the relevant sections of this manual.

WARNING:

- The SED2 uses hazardous voltages and controls potentially dangerous rotating mechanical parts. Non-compliance with warnings or failure to follow the instructions contained in this manual can result in loss of life, severe personal injury, or serious damage to property/equipment.

- Only authorized personnel should work on this equipment, and only after becoming familiar with all local regulations and ordinances; safety notices; and installation, operation, and maintenance procedures in this manual. Successful and safe operation of this equipment depends upon its proper handling, installation, operation, and maintenance.

- Before carrying out any installation and commissioning procedures, you must read all safety instructions and warnings, including all warning labels attached to the equipment. Make sure that the warning labels are kept in a legible condition and ensure missing or damaged labels are replaced.

- Observe the regulations of Safety Code VBG 4.0 (in particular, "Permissible Deviations when Working with Live Parts") whenever measuring or testing is performed on live equipment. Also, use suitable electronic tools.

- Only use this equipment for the purpose specified by the manufacturer. Unauthorized modifications and the use of spare parts and accessories that are not sold or recommended by the manufacturer of the equipment can cause fires, electric shocks, and injuries.

- Prevent the general public from accessing or approaching this equipment.

NOTE: Keep these Operating Instructions near the equipment and available to all users.

Electronic Bypass Option Overview

General Description

During normal operation in a typical application, the input and output contactors close and the SED2 operates the motor (Figure 1). The bypass contactor provides the ability to operate the motor on utility power and eliminate the SED2 from the motor control circuit. The SED2 Electronic Bypass Option also allows you to select features that enhance the control of the contactors and the outputs that report operation.

The SED2 Electronic Bypass (E-Bypass) Option consists of a SED2 VFD, and a bypass enclosure with electronic controls (Figure 2). The electronic controls include:

- Controller board

- Keypad

- Step-down power transformer

- Contactors:

  - Bypass

  - Output

  - Input (optional)

- Overload (current) relay

- Reactor (optional)

- Disconnect switch (or optional circuit breaker)

- Fuses (optional)

- Cable harnesses

Figure 1. Functional Block Diagram of Typical Electronic Bypass Option.
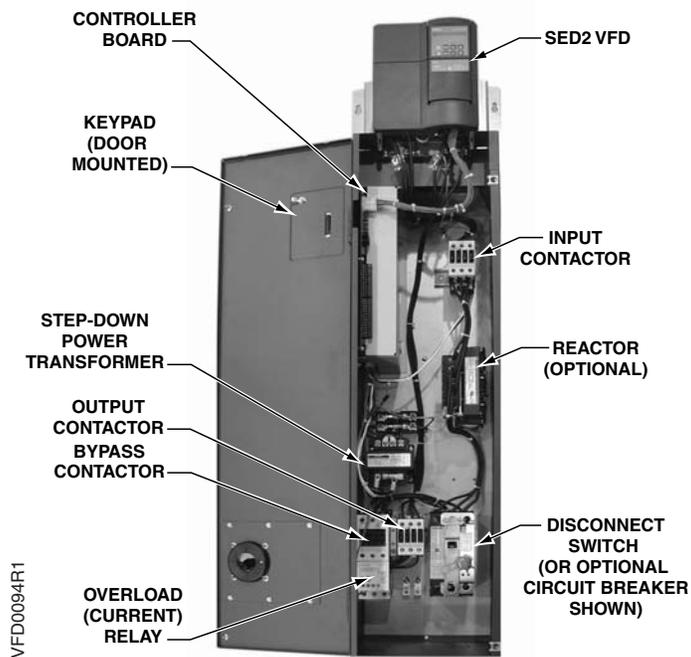
Figure 2. Typical SED2 E-Bypass Components.

Controller Board

The Controller board is the foundation of the SED2 Electronic Bypass Option. It controls communications to and from the SED2, keypad, isolated digital inputs, relay/digital outputs, and contactors (Figure 3).

SED2 INTERFACE
Supports two SED2 non-isolated, digital relay outputs and three SED2 digital inputs. The maximum current draw for a relay output is 2 mA and the voltage between the digital output source and return lines is 24V. The Controller board provides unregulated, non-isolated 24V to power the SED2 digital inputs.

BASIC SANITY TEST INDICATOR
Provides indication of initialization and normal operation.

KEYPAD INTERFACE
Supports inputs and outputs from the Electronic Bypass Option keypad. The keypad provides user interface indicators and push buttons.

FACTORY USE ONLY
Connector J8 is for factory use only.

DIGITAL INPUTS
Supports six isolated digital inputs for customer use. The inputs require a contact closure capable of providing a low impedance path at currents less than 20 mA.

DIGITAL RELAY OUTPUTS
Supports six digital relay outputs for customer use. Each relay has a maximum rating of 2A at 120 Vac.

OVERRIDE JUMPER

CONTROLLER BOARD

MCU

TRANSFORMER

F1

J4 J3 J8 SW1 J2 J1 J6 J7 J5

CONTACTOR CONTROLS   POWER

DIP SWITCHES
The Controller board DIP switches enable/disable the Electronic Bypass Option features.

OPTIONS ON OFF

5 — Not used, factory test selector switch #2; leave this switch OFF.
4 — Not used, factory test selector switch #1; leave this switch OFF.
3 — Interlock selector switch; requires SED2 programming.
2 — Automatic Bypass selector switch; requires SED2 programming.
1 — Essential Services selector switch.

SW1

When the switch is ON the option is enabled; when the switch is OFF the option is disabled.

VFD0095R1

Figure 3. Controller Board Inputs and Outputs.

Contactors

The Controller board provides two or three relay contact circuits controlled by the Electronic Bypass Option: bypass, input, and output contactors. Each circuit includes a NO relay. Controller board connector J7 enables circuit connections. The relay circuits route power to the SED2 and the motor via the contactors. Controlling the contactors through the relay circuits is the main function of the Controller board.

Bypass Contactor – The bypass relay on the Controller board controls the bypass contactor. The output and bypass relays are interconnected to 120 Vac Hot. This enables a safety circuit that prevents the bypass and output contactors from simultaneously being energized.

Output Contactor – The output relay on the Controller board controls the output contactor.

Input Contactor – The input relay on the Controller board controls the optional input contactor.

Keypad Functions

2-CONTACTOR KEYPAD   3-CONTACTOR KEYPAD

Figure 4. E-Bypass Keypad Indicators and Pushbuttons.

The keypad provides user interface indicators and pushbuttons. The following table describes specific pushbutton and indicator functions:

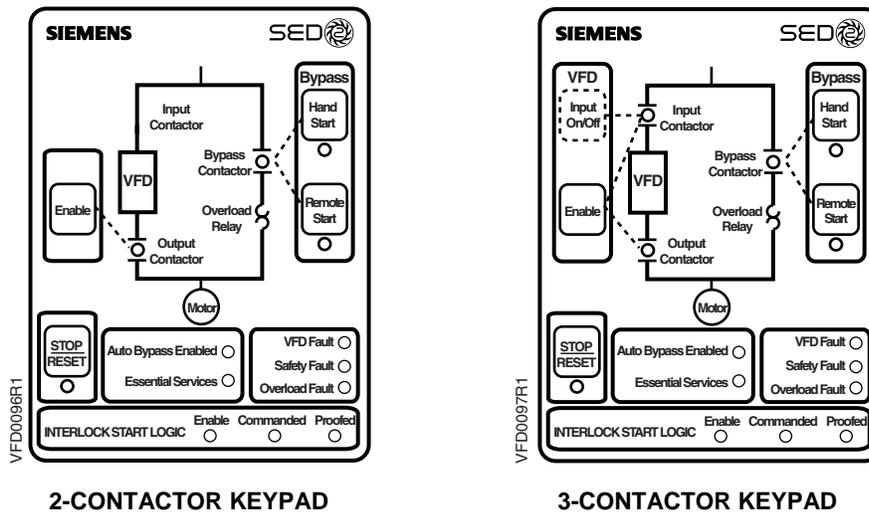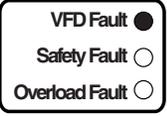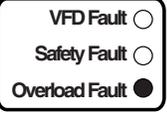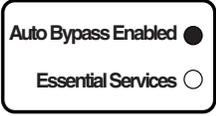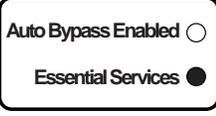| Pushbutton/Indicator	Description
Input On/Off	The Input On/Off pushbutton is supplied with the optional drive input contactor. In VFD mode, this switch does nothing. In bypass mode, this switch closes/opens the input contactor, switching the SED2 power on/off.
Enable	Enables SED2 operation by closing the input and output contactors.
Hand Start	Manually enables bypass mode operation by ensuring that the output contactor is open and then closing the bypass contactor.
Remote Start	Activates the bypass mode and operates the bypass contactor according to the status of the Remote Start input on the Controller board.
STOP RESET	Opens the output and bypass contactors, disconnecting the motor.
VFD Fault ● Safety Fault ○ Overload Fault ○	When a VFD Fault is indicated, the VFD Fault indicator lights and the VFD Fault Relay output on the Controller Board is triggered.
VFD Fault ○ Safety Fault ● Overload Fault ○	The Safety Fault indicator lights when either of the Remote Safety inputs on the Controller board opens. The motor is prohibited from operating in either the VFD or bypass modes while either of these contacts is open. **EXCEPTION:** Essential Services ignores a Safety Fault. **NOTE:** If not using the Remote Safety feature, hard wire the two Remote Safety inputs.
VFD Fault ○ Safety Fault ○ Overload Fault ●	If the Electronic Bypass Option current overload relay trips, the Overload Fault indicator lights and the motor will not run in bypass mode.
Auto Bypass Enabled ● Essential Services ○	When the Auto Bypass DIP switch is enabled, the Auto Bypass Enabled indicator is on steady. Bypass operation is automatically initiated by the SED2. When Auto Bypass is active, the Auto Bypass Enabled indicator flashes.
Auto Bypass Enabled ○ Essential Services ●	When the Essential Services DIP switch is enabled, the Essential Services indicator is on steady. When the Essential Services input is open, normal operation is indicated as the output contactor remains closed to keep the motor running and the Essential Services indicator is on steady. When the Essential Services input is closed, the bypass contactor closes and the Essential Services indicator flashes. Nothing can interrupt the Essential Services mode except for the Essential Services input opening.

Pushbutton/Indicator	Description
VFD0108R1 INTERLOCK START LOGIC Enable Commanded Proofed ○ ○ ○	When the Interlock DIP switch is enabled, the Interlock Start Logic Enable indicator is on steady. Any call to start the motor in either VFD or bypass modes will not start the motor; instead it will close the Programmable Output relay on the Controller board. The Programmable Output can be used to actuate another device. When this occurs, the Interlock Start Logic Commanded indicator also lights, and the Interlock Start Logic Proofed indicator flashes. A contact closure from this other device is wired to the Interlock Start on the Controller board which then starts the motor and turns the Interlock Start Logic Proofed indicator on steady. This feature is also called damper end switch relay logic.

Installation Instructions

Environmental Conditions

Install the Electronic Bypass Option in a heated, indoor controlled environment that is free of moisture and conductive contaminants such as condensation and dust. The air entering the unit for ventilation/cooling must be clean and free from corrosive gases.

The ambient temperature must be between 14°F and 104°F (-10°C to 40°C) and the relative humidity must be 0% to 95% noncondensing. Do not mount unit in direct sunlight.

Mechanical Installation

Inspection

1. As you unpack the Electronic Bypass Option, check for shipping damage. In the event of damage, contact the transport company.

2. Locate the Electronic Bypass Option nameplate and confirm that the unit is configured to the installation requirements.

3. Verify the delivery is complete. If not, contact the supplier.

Dimensions and Weights

Figure 5 shows overall and mounting dimensions for the Electronic Bypass Option. Figures 6 through 8 show conduit locations.

Approximate weights are as follows.

Bypass Frame Size	Weight lb (kg)
A	45 (20)
B	55 (25)
C	75 (34)
D	150 (68)
E	180 (82)
F	470 (213)

NOTE: Exact weight will be affected by actual horsepower/voltage and selected power options.

Mounting

1. To ensure safe installation, verify that the surface of the mounting location is level.

2. Mount the Electronic Bypass Option vertically with the SED2 operator panel, Electronic Bypass Option keypad, and disconnect accessible.
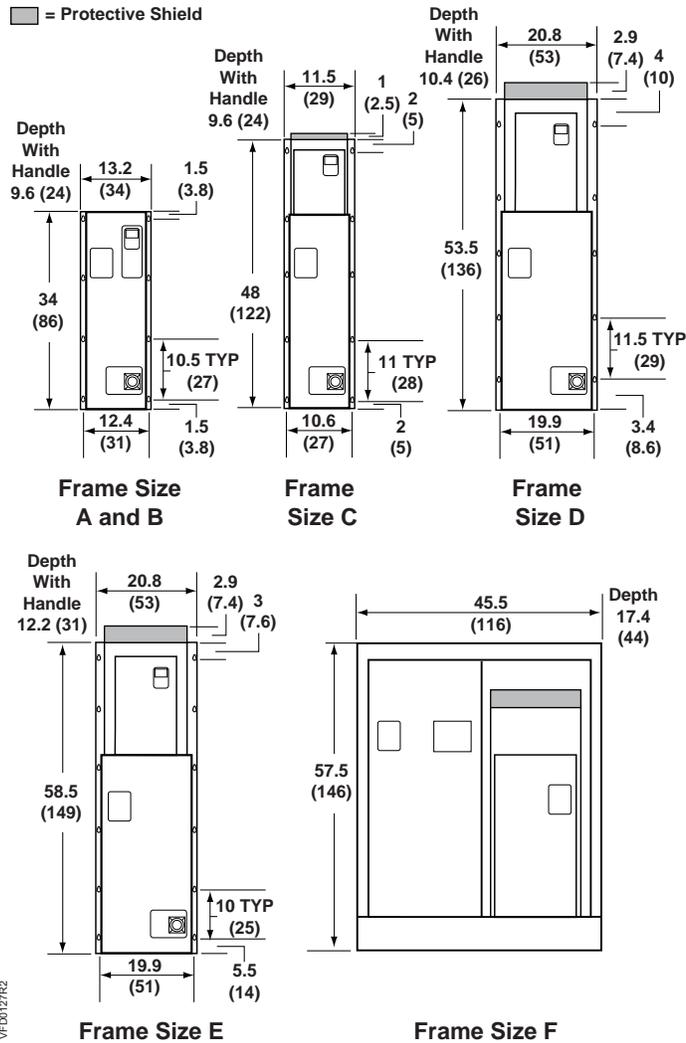
NOTE: It is recommended to leave 6 inches (15 cm) around the top and sides of the unit.

Figure 5. E-Bypass Dimensions in Inches (Centimeters).
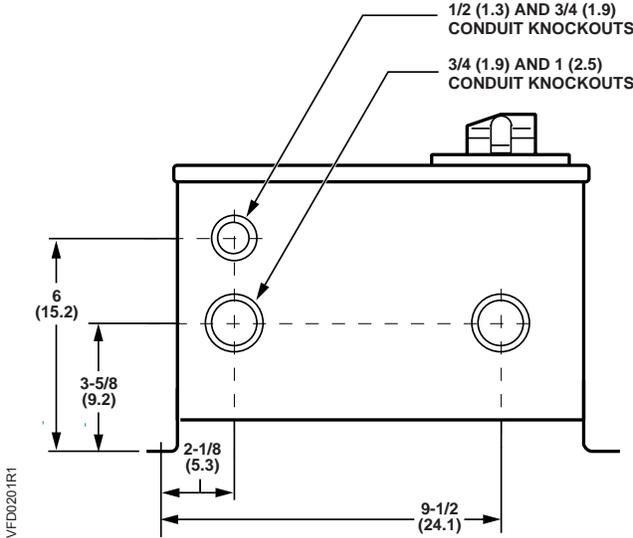
Figure 6. Frame Sizes A through C Conduit Locations. Viewed from Bottom; Dimensions in Inches (Centimeters).
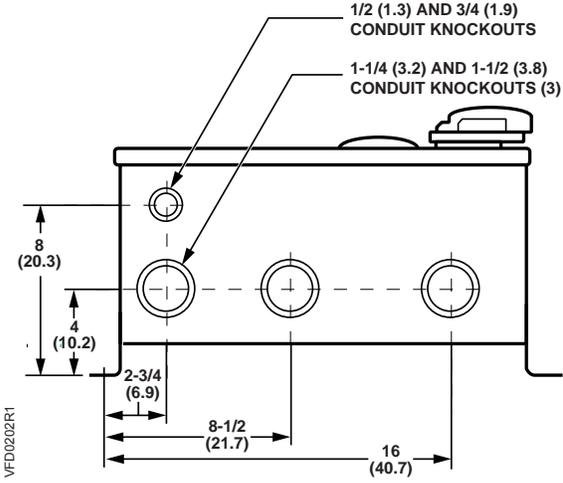
Figure 7. Frame Sizes D and E Conduit Locations. Viewed from Bottom; Dimensions in Inches (Centimeters).
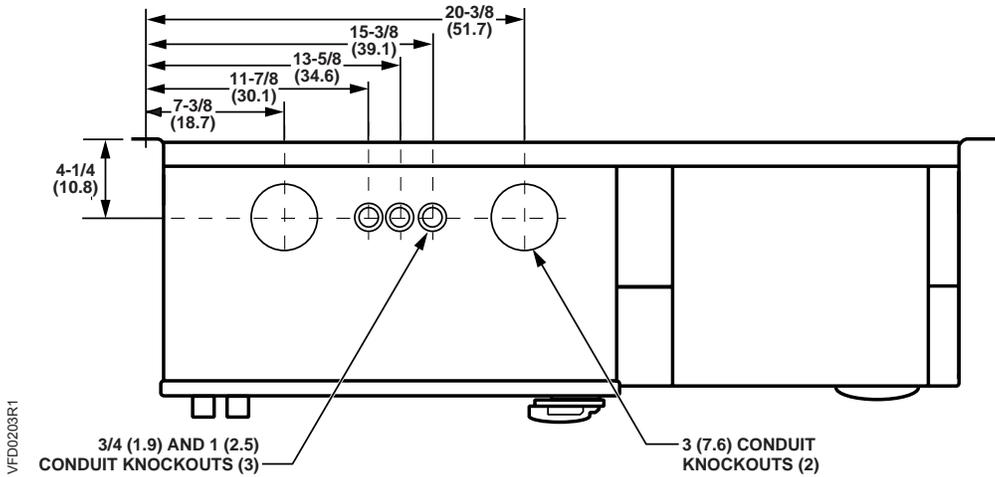
Figure 8. Frame Size F Conduit Locations. Viewed from Top; Dimensions in Inches (Centimeters).

Electrical Installation

See Figure 9 for all Electronic Bypass Option wiring.

1. Route shielded twisted pair (recommended wire type) cable, 24 gauge minimum *control wiring* in conduit through knockout and into housing (Figures 10 through 12). Connect control wiring per job-specific drawings.

    NOTES:

    - Terminate shield at control device.

    - Control wiring is 12 to 26 AWG and tightening torque is 5 lb-in.

2. If applicable, route *communications wiring (P1)* in conduit through knockout and into housing (Figures 10 through 12). Continue to route communications wiring to SED2 and terminate per *SED2 VFD Startup, Operation, and Maintenance Manual* (125-3201).

3. Route motor wiring in conduit through knockout and into housing (Figures 10 through 12). Connect motor wiring to motor overload and ground lug. See Tables 1 through 4 for wire sizes and tightening torques.

4. Route input power wiring in conduit through knockout and into housing (Figures 10 through 12). Connect input power wiring to disconnect switch and ground lug or to circuit breaker and ground lug. See Tables 1 through 4 for wire sizes and tightening torques.
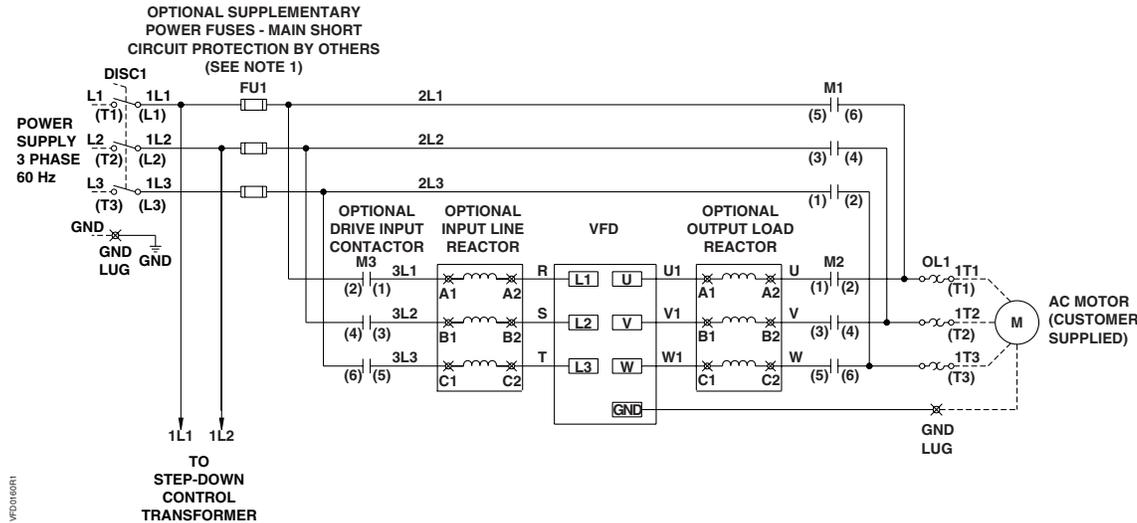
NOTES:

1. Branch circuit protection to be provided by installer, per UL508A, if not provided with drive.

2. For bypass operation, modify these drive parameters: P0702[0] and P0702[1] = 3,
    P0748 = Digital Out 1 Reverse ($----\neg$).

3. Control and communication wiring should be 300V UL minimum.

4. Communication wiring should be run with maximum separation possible from all other wiring.

5. Essential service mode operates the motor full speed (bypass) with no protection for the motor or system.

6. Ensure that automatic bypass will not damage the system before activating.

7. See Table 8 for proper fuse and wire sizes.

8. See Siemens Publication No. *125-3201* for SED2 input/output control signal wiring details.

Figure 9. E-Bypass Power Circuit.

SED2 VFD

CONTROLLER BOARD

COMMUNICATIONS WIRING (P1) VIA 1 KNOCKOUT

INPUT CONTACTOR (OPTIONAL)

J2

J1

CONTROL WIRING (DIGITAL INPUTS/ OUTPUTS) VIA 2 KNOCKOUTS

REACTOR (OPTIONAL)

TRANSFORMER

OUTPUT CONTACTOR

POWER FUSES (OPTIONAL)

GROUND LUGS

BYPASS CONTACTOR

DISCONNECT SWITCH (OR OPTIONAL CIRCUIT BREAKER)

T1 T2 T3   L1 L2 L3

MOTOR OVERLOAD

MOTOR WIRING VIA KNOCKOUT

INPUT POWER WIRING VIA KNOCKOUT
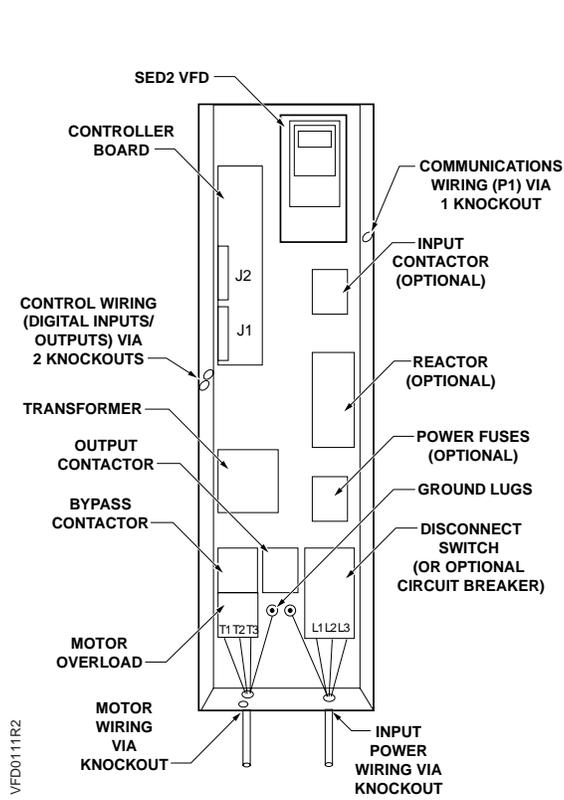
VFD0111R2
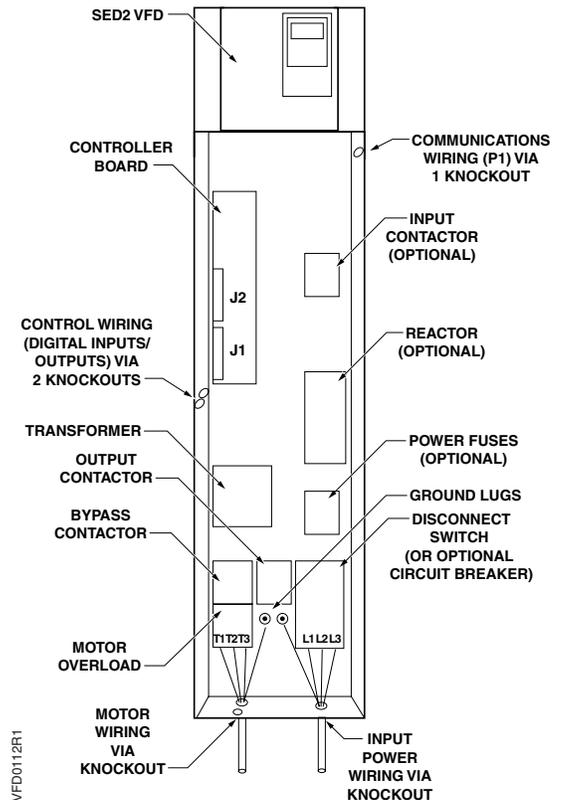
Figure 10. Routing of Power and Control Wiring for Frame Sizes A and B.

SED2 VFD

CONTROLLER BOARD

COMMUNICATIONS WIRING (P1) VIA 1 KNOCKOUT

INPUT CONTACTOR (OPTIONAL)

J2

J1

CONTROL WIRING (DIGITAL INPUTS/ OUTPUTS) VIA 2 KNOCKOUTS

REACTOR (OPTIONAL)

TRANSFORMER

OUTPUT CONTACTOR

POWER FUSES (OPTIONAL)

BYPASS CONTACTOR

GROUND LUGS

DISCONNECT SWITCH (OR OPTIONAL CIRCUIT BREAKER)

T1 T2 T3   L1 L2 L3

MOTOR OVERLOAD

MOTOR WIRING VIA KNOCKOUT

INPUT POWER WIRING VIA KNOCKOUT

VFD0112R1

Figure 11. Routing of Power and Control Wiring for Frame Sizes C, D, and E.

MOTOR WIRING VIA KNOCKOUT

GROUND LUGS (2)

INPUT POWER WIRING VIA KNOCKOUT

SED2 VFD

DISCONNECT SWITCH (OR OPTIONAL CIRCUIT BREAKER)

T3 T2 T1   L3 L2 L1

MOTOR OVERLOAD

BYPASS CONTACTOR

OUTPUT CONTACTOR

J2

J1

CONTROLLER BOARD

TRANSFORMER

INPUT CONTACTOR (OPTIONAL)

POWER FUSES (OPTIONAL)

COMMUNICATIONS WIRING (P1) VIA 1 KNOCKOUT

REACTOR (OPTIONAL)
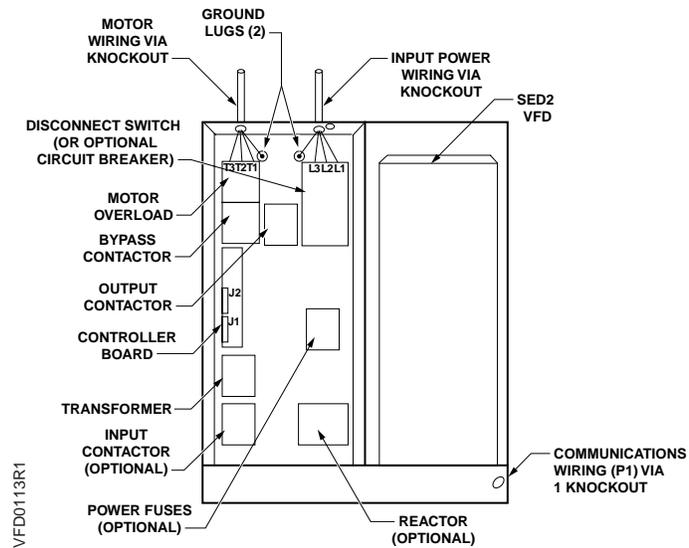
VFD0113R1

Figure 12. Routing of Power and Control Wiring for Frame Size F.

Table 1. Wire Sizes and Tightening Torques for E-Bypass with 208V Drive.

Part Number	Bypass Frame Size	HP	kW	Amps	Circuit Breaker		Disconnect Switch		Overload				Ground Lug	
					Wire Size *	Torque, lb-in (Nm)	Wire Size *	Torque, lb-in (Nm)	Wire Size *	Torque, lb-in (Nm)	Range, Amps	Max Backup Fuse, Amps	Wire Size *	Torque, lb-in (Nm)
VBE10.5----	A	0.5	0.37	2.3	14-10 Cu	32 (3.6)	18-10	13 - (1.5 - 1.7)	18-14	7 - 10.3 (8 - 1.2)	1.8 - 2.5	10	14-2	35 (4)
VBE10.7----	A	0.7	0.55	3.0	14-10 Cu	32 (3.6)	18-10	13 - (1.5 - 1.7)	18-14	7 - 10.3 (8 - 1.2)	2.2 - 3.2	12	14-2	35 (4)
VBE11.0----	A	1.0	0.75	3.9	14-10 Cu	32 (3.6)	18-10	13 - 17 (1.5 - 1.7)	18-14	7 - 10.3 (8 - 1.2)	2.8 - 4	16	14-2	35 (4)
VBE11.5----	B	1.5	1.1	5.5	14-10 Cu	32 (3.6)	18-10	13 - (1.5 - 1.7)	18-14	7 - 10.3 (8 - 1.2)	4.5 - 6.3	25	14-2	35 (4)
VBE12.0----	B	2.0	1.5	7.4	14-10 Cu	32 (3.6)	18-10	13 - (1.5 - 1.7)	18-14	7 - 10.3 (8 - 1.2)	5.5 - 8.0	30	14-2	35 (4)
VBE13.0----	B	3.0	2.2	10.4	14-10 Cu	32 (3.6)	18-10	13 - 17 (1.5 - 1.7)	18-14	7 - 10.3 (8 - 1.2)	7 - 10	40	14-2	35 (4)
VBE15.0----	C	5.0	4.0	16.7	14-10 Cu	32 (3.6)	14-8	17 - 22 (1.9 - 2.5)	14-10	18 - 22 (2 - 25)	14 - 20	80	14-2	35 (4)
VBE17.5----	C	7.5	5.5	22.0	14-10 Cu	20 - 60 (2.2 - 6.8)	14-8	17 - 22 (1.9 - 2.5)	14-10	18 - 22 (2 - 25)	20 - 25	100	14-2	35 (4)
VBE110.----	C	10	7.5	28	10-1/0 Cu	20 - 60 (2.2 - 6.8)	14-8	17 - 22 (1.9 - 2.5)	18-3	27 - 40 (3.1 - 4.5)	22 - 32	125	14-2	35 (4)
VBE115.----	D	15	11.0	42	10-1/0 Cu	20 - 60 (2.2 - 6.8)	14-6	22 - 27 (2.5 - 3.1)	18-3	27 - 40 (3.1 - 4.5)	40 - 50	200	14-2	35 (4)
VBE120.----	D	20	15.0	54	10-1/0 Cu	20 - 60 (2.2 - 6.8)	12-1	22 - 27 (2.5 - 3.1)	10-1/0	36 - 53 (4.1 - 6)	45 - 63	250	14-2	35 (4)
VBE125.----	D	25	18.5	68	3-3/0-3 Cu	80 (9)	12-1	22 - 27 (2.5 - 3.1)	10-1/0	36 - 53 (4.1 - 6)	57 - 75	300	14-2	35 (4)
VBE130.----	E	30	22.0	80	3-3/0-3 Cu	80 (9)	12-1	22 - 27 (2.5 - 3.1)	10-1/0	36 - 53 (4.1 - 6)	70 - 90	350	14-2	35 (4)
VBE140.----	F	40	30.0	104	6 - 350 kcmil Cu	120 - 275 (14 - 31.1)	12-1	22 - 27 (2.5 - 3.1)	6-3/0	124 - 210 (14 - 23.7)	50 - 200	800	14-2/0	50 (5.6)
VBE150.----	F	50	37.0	130	6 - 350 kcmil Cu	120 - 275 (14 - 31.1)	6 - 350 kcmil	120 - 275 (13.5 - 31.1)	6-3/0	124 - 210 (14 - 23.7)	50 - 200	800	14-2/0	50 (5.6)
VBE160.----	F	60	45.0	154	6 - 350 kcmil Cu	120 - 275 (14 - 31.1)	6 - 350 kcmil	120 - 275 (13.5 - 31.1)	6-3/0	124 - 210 (14 - 23.7)	50 - 200	800	14-2/0	50 (5.6)

* Wire size is AWG unless noted otherwise. Use Copper (Cu) wire that is rated 167°F (75°C) minimum 600 Vac.

Table 2. Wire Sizes and Tightening Torques for E-Bypass with 230V to 240V Drive.

Part Number	Bypass Frame Size	HP	kW	Amps	Circuit Breaker		Disconnect Switch		Overload				Ground Lug	
					Wire Size *	Torque, lb-in (Nm)	Wire Size *	Torque, lb-in (Nm)	Wire Size *	Torque, lb-in (Nm)	Range, Amps	Max Backup Fuse, Amps	Wire Size *	Torque, lb-in (Nm)
VBE20.5----	A	0.5	0.37	2.2	14-10 Cu	32 (3.6)	18-10	13 - (1.5 - 1.7)	18-14	7 - 10.3 (8 - 1.2)	1.8 - 2.5	10	14-2	35 (4)
VBE20.7----	A	0.7	0.55	3.0	14-10 Cu	32 (3.6)	18-10	13 - (1.5 - 1.7)	18-14	7 - 10.3 (8 - 1.2)	2.2 - 3.2	12	14-2	35 (4)
VBE21.0----	A	1.0	0.75	3.9	14-10 Cu	32 (3.6)	18-10	13 - (1.5 - 1.7)	18-14	7 - 10.3 (8 - 1.2)	2.8 - 4	16	14-2	35 (4)
VBE21.5----	B	1.5	1.1	5.5	14-10 Cu	32 (3.6)	18-10	13 - (1.5 - 1.7)	18-14	7 - 10.3 (8 - 1.2)	4.5 - 6.3	25	14-2	35 (4)
VBE22.0----	B	2.0	1.5	6.8	14-10 Cu	32 (3.6)	18-10	13 - (1.5 - 1.7)	18-14	7 - 10.3 (8 - 1.2)	5.5 - 8.0	30	14-2	35 (4)
VBE23.0----	B	3.0	2.2	9.6	14-10 Cu	32 (3.6)	18-10	13 - (1.5 - 1.7)	18-14	7 - 10.3 (8 - 1.2)	7 - 10	40	14-2	35 (4)
VBE25.0----	C	5.0	4.0	15.2	14-10 Cu	32 (3.6)	14-8	17 - 22 (1.9 - 2.5)	14-10	18 - 22 (2 - 25)	14 - 20	80	14-2	35 (4)
VBE27.5----	C	7.5	5.5	22	14-10 Cu	20 - 60 (2.2 - 6.8)	14-8	17 - 22 (1.9 - 2.5)	14-10	18 - 22 (2 - 25)	20 - 25	100	14-2	35 (4)
VBE210----	C	10	7.5	28	10-1/0 Cu	20 - 60 (2.2 - 6.8)	14-8	17 - 22 (1.9 - 2.5)	18-3	27 - 40 (3.1 - 4.5)	22 - 32	125	14-2	35 (4)
VBE215----	D	15	11.0	42	10-1/0 Cu	20 - 60 (2.2 - 6.8)	14-6	22 - 27 (2.5 - 3.1)	18-3	27 - 40 (3.1 - 4.5)	40 - 50	200	14-2	35 (4)
VBE220----	D	20	15.0	54	10-1/0 Cu	20 - 60 (2.2 - 6.8)	12-1	22 - 27 (2.5 - 3.1)	10-1/0	36 - 53 (4.1 - 6)	45 - 63	250	14-2	35 (4)
VBE225----	D	25	18.5	68	3-3/0-3 Cu	80 (9)	12-1	22 - 27 (2.5 - 3.1)	10-1/0	36 - 53 (4.1 - 6)	57 - 75	300	14-2	35 (4)
VBE230----	E	30	22.0	80	3-3/0-3 Cu	80 (9)	12-1	22 - 27 (2.5 - 3.1)	10-1/0	36 - 53 (4.1 - 6)	70 - 90	350	14-2	35 (4)
VBE240----	F	40	30.0	104	6 - 350 kcmil Cu	120 - 275 (14 - 31.1)	12-1	22 - 27 (2.5 - 3.1)	6-3/0	124 - 210 (14 - 23.7)	50 - 200	800	14-2/0	50 (5.6)
VBE250----	F	50	37.0	130	6 - 350 kcmil Cu	120 - 275 (14 - 31.1)	6 - 350 kcmil	120 - 275 (13.5 - 31.1)	6-3/0	124 - 210 (14 - 23.7)	50 - 200	800	14-2/0	50 (5.6)
VBE260----	F	60	45.0	154	6 - 350 kcmil Cu	120 - 275 (14 - 31.1)	6 - 350 kcmil	120 - 275 (13.5 - 31.1)	6-3/0	124 - 210 (14 - 23.7)	50 - 200	800	14-2/0	50 (5.6)

* Wire size is AWG unless noted otherwise. Use Copper (Cu) wire that is rated 167°F (75°C) minimum 600 Vac.

Table 3. Wire Sizes and Tightening Torques for E-Bypass with 380V to 480V Drive.

Part Number	Bypass Frame Size	HP	kW	Amps	Circuit Breaker		Disconnect Switch		Overload				Ground Lug	
					Wire Size *	Torque, lb-in (Nm)	Wire Size *	Torque, lb-in (Nm)	Wire Size *	Torque, lb-in (Nm)	Range, Amps	Max Backup Fuse, Amps	Wire Size*	Torque, lb-in (Nm)
VBE30.5----	A	0.5	0.37	1.1	14-10 Cu	32 (3.6)	18-10	13 - 17 (1.5 - 1.7)	18-14	7 - 10.3 (8 - 1.2)	.7 - 1.0	4	14-2	35 (4)
VBE30.7----	A	0.7	0.55	1.6	14-10 Cu	32 (3.6)	18-10	13 - 17 (1.5 - 1.7)	18-14	7 - 10.3 (8 - 1.2)	1.1 - 1.6	6	14-2	35 (4)
VBE31.0----	A	1.0	0.75	2.1	14-10 Cu	32 (3.6)	18-10	13 - 17 (1.5 - 1.7)	18-14	7 - 10.3 (8 - 1.2)	1.4 - 2.0	8	14-2	35 (4)
VBE31.5----	A	1.5	1.1	3.0	14-10 Cu	32 (3.6)	18-10	13 - 17 (1.5 - 1.7)	18-14	7 - 10.3 (8 - 1.2)	2.2 - 3.2	12	14-2	35 (4)
VBE32.0----	A	2.0	1.5	3.4	14-10 Cu	32 (3.6)	18-10	13 - 17 (1.5 - 1.7)	18-14	7 - 10.3 (8 - 1.2)	2.8 - 4	16	14-2	35 (4)
VBE33.0----	B	3.0	2.2	4.8	14-10 Cu	32 (3.6)	18-10	13 - 17 (1.5 - 1.7)	18-14	7 - 10.3 (8 - 1.2)	3.5 - 5	20	14-2	35 (4)
VBE35.0----	B	5.0	4.0	7.6	14-10 Cu	32 (3.6)	18-10	13 - 17 (1.5 - 1.7)	18-14	7 - 10.3 (.8 - 1.2)	7 - 10	40	14-2	35 (4)
VBE37.5----	C	7.5	5.5	11	14-10 Cu	32 (3.6)	18-10	13 - 17 (1.5 - 1.7)	18-14	7 - 10.3 (8 - 1.2)	9 - 12	45	14-2	35 (4)
VBE310----	C	10	7.5	14	14-10 Cu	32 (3.6)	18-10	13 to17 (1.5 - 1.7)	14-10	18 - 22 (2 - 2.5)	11 - 16	60	14-2	35 (4)
VBE315----	C	15	11.0	21	14-10 Cu	20 - 60 (2.2 - 6.8)	14-8	17 - 22 (1.9 - 2.5)	14-10	18 - 22 (2 - 2.5)	17 - 22	80	14-2	35 (4)
VBE320----	C	20	15.0	27	10-1/0 Cu	20 - 60 (2.2 - 6.8)	14-8	17 - 22 (1.9 - 2.5)	18-3	27 - 40 (3.1 - 4.5)	22 - 32	125	14-2	35 (4)
VBE325----	D	25	18.5	34	10-1/0 Cu	20 - 60 (2.2 - 6.8)	14-6	22 - 27 (2.5 - 3.1)	18-3	27 - 40 (3.1 - 4.5)	28 - 40	150	14-2	35 (4)
VBE330----	D	30	22.0	40	10-1/0 Cu	20 - 60 (2.2 - 6.8)	14-6	22 - 27 (2.5 - 3.1)	18-3	27 - 40 (3.1 - 4.5)	28 - 40	150	14-2	35 (4)
VBE340----	D	40	30.0	52	10-1/0 Cu	20 - 60 (2.2 - 6.8)	14-6	22 - 27 (2.5 - 3.1)	18-3	27 - 40 (3.1 - 4.5)	40 - 50	200	14-2	35 (4)
VBE350----	E	50	37.0	65	10-1/0 Cu	20 - 60 (2.2 - 6.8)	12-1	22 - 27 (2.5 - 3.1)	10-1/0	36 - 53 (4.1 - 6)	57 - 75	300	14-2	35 (4)
VBE360----	E	60	45.0	77	3-3/0 Cu	80 (9)	12-1	22 - 27 (2.5 - 3.1)	10-1/0	36 - 53 (4.1 - 6)	70 - 90	350	14-2	35 (4)
VBE375----	F	75	55.0	96	3-3/0 Cu	80 (9)	12-1	22 - 27 (2.5 - 3.1)	10-1/0	36 - 53 (4.1 - 6)	80 - 100	400	14-2/0	50 (5.6)
VBE3100----	F	100	75.0	124	6 - 350 kcmil Cu	120 - 275 (14 - 31.1)	6 - 350 kcmil	120 - 275 (13.5 - 31.1)	6-3/0	124 - 210 (14 - 23.7)	50 - 200	800	14-2/0	50 (5.6)
VBE3125----	F	125	90.0	156	6 - 350 kcmil Cu	120 - 275 (14 - 31.1)	6 - 350 kcmil	120 - 275 (13.5 - 31.1)	6-3/0	124 - 210 (14 - 23.7)	50 - 200	800	14-2/0	50 (5.6)
VBE3125--HA	F	—	90.0	178	6 - 350 kcmil Cu	120 - 275 (14 - 31.1)	6 - 350 kcmil	120 - 275 (13.5 - 31.1)	6-3/0	124 - 210 (14 - 23.7)	50 - 200	800	14-2/0	50 (5.6)

* Wire size is AWG unless noted otherwise. Use Copper (Cu) wire that is rated 167°F (75°C) minimum 600 Vac.

Table 4. Wire Sizes and Tightening Torques for E-Bypass with 500V to 600V Drive.

Part Number	Bypass Frame Size	HP	kW	Amps	Circuit Breaker		Disconnect Switch		Overload				Ground Lug	
					Wire Size *	Torque, lb-in (Nm)	Wire Size *	Torque, lb-in (Nm)	Wire Size *	Torque, lb-in (Nm)	Range, Amps	Max Backup Fuse, Amps	Wire Size*	Torque, lb-in (Nm)
VBE40.5----	C	0.5	0.37	.9	14-10 Cu	32 (3.6)	18-10	13 - 17 (1.5 - 1.7)	18-14	7 - 10.3 (8 - 1.2)	.7 - 1.0	4	14-2	35 (4)
VBE40.7----	C	0.7	0.55	1.3	14-10 Cu	32 (3.6)	18-10	13 - 17 (1.5 - 1.7)	18-14	7 - 10.3 (8 - 1.2)	.9 - 1.25	5	14-2	35 (4)
VBE41.0----	C	1.0	0.75	1.4	14-10 Cu	32 (3.6)	18-10	13 - 17 (1.5 - 1.7)	18-14	7 - 10.3 (8 - 1.2)	1.1 - 1.6	6	14-2	35 (4)
VBE41.5----	C	1.5	1.1	2.1	14-10 Cu	32 (3.6)	18-10	13 - 17 (1.5 - 1.7)	18-14	7 - 10.3 (8 - 1.2)	1.8 - 2.5	10	14-2	35 (4)
VBE42.0----	C	2.0	1.5	2.7	14-10 Cu	32 (3.6)	18-10	13 - 17 (1.5 - 1.7)	18-14	7 - 10.3 (8 - 1.2)	2.2 - 3.2	12	14-2	35 (4)
VBE43.0----	C	3.0	2.2	3.9	14-10 Cu	32 (3.6)	18-10	13 - 17 (1.5 - 1.7)	18-14	7 - 10.3 (8 - 1.2)	2.8 - 4	16	14-2	35 (4)
VBE45.0----	C	5.0	4.0	6.1	14-10 Cu	32 (3.6)	18-10	13 - 17 (1.5 - 1.7)	18-14	7 - 10.3 (8 - 1.2)	4.5 - 6.3	25	14-2	35 (4)
VBE47.5----	C	7.5	5.5	9	14-10 Cu	32 (3.6)	18-10	13 - 17 (1.5 - 1.7)	18-14	7 - 10.3 (8 - 1.2)	7 - 10	40	14-2	35 (4)
VBE410.----	C	10	7.5	11	14-10 Cu	32 (3.6)	18-10	13 - 17 (1.5 - 1.7)	18-14	7 - 10.3 (8 - 1.2)	9 - 2	45	14-2	35 (4)
VBE415.----	C	15	11.0	17	14-10 Cu	32 (3.6)	14-8	17 - 22 (1.9 - 2.5)	14-10	18 - 22 (2 - 2.5)	14 - 20	80	14-2	35 (4)
VBE420.----	C	20	15.0	22	10-1/0 Cu	20 - 60 (2.2 - 6.8)	14-8	17 - 22 (1.9 - 2.5)	14-10	18 - 22 (2 - 2.5)	17 - 22	80	14-2	35 (4)
VBE425.----	C	25	18.5	27	10-1/0 Cu	20 - 60 (2.2 - 6.8)	14-6	22 - 27 (2.5 - 3.1)	18-3	27 - 40 (3.1 - 4.5)	22 - 32	125	14-2	35 (4)
VBE430.----	D	30	22.0	32	10-1/0 Cu	20 - 60 (2.2 - 6.8)	14-6	22 - 27 (2.5 - 3.1)	18-3	27 - 40 (3.1 - 4.5)	28 - 40	150	14-2	35 (4)
VBE440.----	D	40	30.0	41	10-1/0 Cu	20 - 60 (2.2 - 6.8)	14-6	22 - 27 (2.5 - 3.1)	18-3	27 - 40 (3.1 - 4.5)	36 - 45	175	14-2	35 (4)
VBE450.----	E	50	37.0	52	10-1/0 Cu	20 - 60 (2.2 - 6.8)	14-6	22 - 27 (2.5 - 3.1)	18-3	27 - 40 (3.1 - 4.5)	40 - 50	200	14-2	35 (4)
VBE460.----	E	60	45.0	62	10-1/0 Cu	20 - 60 (2.2 - 6.8)	12-1	22 - 27 (2.5 - 3.1)	10-1/0	36 - 53 (4.1 - 6)	45 - 63	250	14-2	35 (4)
VBE475.----	F	75	55.0	77	3-3/0 Cu	80 (9)	12-1	22 - 27 (2.5 - 3.1)	10-1/0	36 - 53 (4.1 - 6)	70 - 90	350	14-2/0	50 (5.6)
VBE4100----	F	100	75.0	99	3-3/0 Cu	80 (9)	12-1	22 - 27 (2.5 - 3.1)	10-1/0	36 - 53 (4.1 - 6)	80 - 100	400	14-2/0	50 (5.6)
VBE4125----	F	125	90.0	125	6 - 350 kcmil Cu	120 - 275 (14 - 31.1)	6 - 350 kcmil	120 - 275 (14 - 31.1)	10-1/0	124 - 210 (14 - 23.7)	50 - 200	800	14-2/0	50 (5.6)

* Wire size is AWG unless noted otherwise. Use Copper (Cu) wire that is rated 167°F (75°C) minimum 600 Vac.

Startup Procedures

Safety Precautions

WARNING:

When you connect input power to the Electronic Bypass Option, the motor terminals are energized even if the motor is not running. Do not make any connections with input power connected to the Electronic Bypass Option. Disconnect and lock out power to the drive before servicing it. Failure to disconnect input power may cause serious injury or death.

CAUTION:

After you disconnect input power, the DC bus capacitors must be allowed to discharge to a safe voltage. This will take about 5 minutes.

Installation Inspection

Inspect the mechanical and electrical installation for compliance with local electrical codes and regulations. After installation, verify that:

- Electronic Bypass Option and motor are properly grounded.

- Input power and motor wire sizes are correct and connections are secure.

- Control wiring is correct, connections are secure, and wire shield is properly grounded.

- Control wiring is not routed with power wiring.

- Electronic Bypass Option has proper ventilation.

- Internal Bypass connections are secure.

Power-On

1. Turn on Electronic Bypass Option power.

   Power-on initialization performs a basic sanity test (approximately 7 seconds) to initialize the Controller board. Also, the Stop/Reset indicator will flash.

   A unit fault condition occurs if the Electronic Bypass Option did not pass the basic sanity test. See the *Troubleshooting* section in this manual for more details.

After the basic sanity test, if the DIP switches have not changed and there is no operator intervention, the most recent bypass function is restored. If the DIP switches have changed, the Electronic Bypass Option activates the Stop/Reset function.

2. Press the **Enable** key on the Electronic Bypass Option keypad to place the unit in VFD mode.

3. Perform SED2 commissioning per the *SED2 VFD Startup, Operation, and Maintenance Manual* (125-3201). If using the Quick Commissioning mode, end this mode with P3900 = 3 to run a motor calculation without resetting the SED2 to factory defaults.

4. After basic SED2 operation is established and verified, turn SED2 power off via the Electronic Bypass Option input power device and verify that no dangerous voltages are present in the enclosure.

5. Select Electronic Bypass Option application features using the DIP switches.

DIP Switch Settings for E-Bypass Features.

Switch Position	Description
1	Essential Services selector switch.
2	Automatic Bypass selector switch; requires SED2 programming.
3	Interlock selector switch; requires SED2 programming.
4	Factory test #1 selector switch. Not used; leave this switch OFF.
5	Factory test #2 selector switch. Not used; leave this switch OFF.

NOTE: When the switch is ON, the feature is enabled; when the switch is OFF, the feature is disabled. For details on the Electronic Bypass Option features, see the *Application Feature Setup* section in this manual.

6. Re-apply power to the Electronic Bypass Option. On units with three contactors, energize the SED2 by pressing the **Input** pushbutton on the Electronic Bypass Option keypad.

7. Program the SED2 per the *Application Feature Setup* section in this manual.

8. Test all SED2 and bypass features.

9. If motor rotation is incorrect in either VFD, bypass, or both modes, have the appropriate site personnel take corrective action as follows:

    –   **Wrong Rotation in Bypass, Right in VFD Mode** – Swap two input leads on the main input device of the Electronic Bypass Option.

    –   **Wrong Rotation in VFD, Right in Bypass Mode** – Swap two input leads on the main input device of the Electronic Bypass Option and swap two motor leads at the motor overload in the Electronic Bypass Option.

    –   **Wrong Rotation in both VFD and Bypass Modes** – Swap two motor leads at the motor overload in the Electronic Bypass Option.

Quick Commissioning

Parameter P0010 is the Commissioning Parameter Filter. It allows you to select a group of parameters that can be used for quick commissioning, including motor data, and motor ramp-up and ramp-down settings.

It is important to use parameter P0010 to commission the SED2, parameter P0003 to select the access level for using parameters, and parameter P0004 to filter the parameters according to their functionality. When Commissioning Parameter Filter P0010 = 1, it initiates the quick commissioning procedure.

It is recommended that you use the quick commissioning procedure. However, experienced users may commission the equipment without the P0004 filter functions.

At the end of the quick commissioning procedure, set parameter P3900 = 3. This setting performs the necessary motor calculations and sets all remaining parameters (those not included in P0010 = 1) to the factory default values. If 3900 is set to a value greater than 0, P0010 is automatically reset to 0. (If P0010 = 1, the SED2 cannot start.) The process of performing motor calculations and setting all parameters to factory default values is only possible via quick commissioning.

Parameter	Description	Action	Setting/Default
P0003	**User Access Level** Allows you to access more parameters. 1 = Standard 2 = Extended 3 = Expert	1. Press [P] to access parameter r0000 and to enter the SED2 parameter mode. 2. Press [▲] to advance to parameter **P0003**. 3. Press [P] to access the parameter values level. 4. Press [▲] to advance to **3** (expert level). 5. Press [P] to confirm and save the P0003 = 3 setting.	Setting = 3 Default = 1
NOTE: Before starting quick commissioning, set P0003 = 3 to ensure all necessary parameters are available during quick commissioning.			
P0010	**Quick Commissioning** 0 = Ready to Run 1 = Quick Commissioning 30 = Factory Setting	1. Press [P] to access parameter r0000 and to enter the SED2 parameter mode. 2. Repeatedly press [▲] to advance to parameter **P0010**. 3. Press [P] to access the parameter values level. 4. Press [▲] to advance to **1**. 5. Press [P] to confirm and save the P0010 = 1 setting.	Setting = 1 Default = 0
NOTES: 1. P0010 must always be set back to 0 before operating the motor. 2. If P3900 is greater than 0 on completion of commissioning, P0010 is automatically set back to 0.			

Parameter	Description	Action	Setting/ Default
P0100	**Operation for Europe/N. America** 0 = 50 Hz, kW (Europe) factory default 1 = 60 Hz, hp (North America) 2 = 60 Hz, kW (North America) The setting of Motor Frequency and Unit of Measurement DIP switch 2 overrides P0100 settings 0 and 1.	1. Press ▲ to advance to parameter **P0100**. 2 Press P to access the parameter values level. 3. Press ▲ to advance to **1**. 4. Press P to confirm and save the P0100 = 1 setting.	Setting = 1 Default = 0 or 1 (Default is determined by the setting of the motor frequency and unit of measurement DIP switches.)
NOTES: 1. Stop the SED2 (that is, disable all pulses) before changing this parameter. 2. Changing P0100 resets all rated motor parameters as well as other parameters that depend on the rated motor parameters (such as P0340, Calculation of motor Parameters).			
P0304*	**Rated Motor Voltage** 10V to 2000V. Rated motor voltage (V) from motor nameplate.	1. Press ▲ to advance to parameter **P0304**. 2. Press P to access the parameter values level. 3. Press ▲ to advance to nominal voltage. 4. Press P to confirm and save the setting.	Setting = Motor nameplate Default = Varies by model

* Motor related parameters.

Parameter	Description	Action	Setting/ Default
P0305*	**Rated Motor Current** 0A to 10,000A. Rated motor current (A) from motor nameplate.	1. Press ▲ to advance to parameter **P0305**. 2. Press P to access the parameter values level. 3. Press ▲ to advance to nominal current. 4. Press P to confirm and save the setting.	Setting = Motor nameplate Default = Varies by model
P0307*	**Rated Motor Power** 0 kW or hp to 200 kW or hp. Rated motor power (kW or hp) from motor nameplate. If P0100 =1 (60 Hz, hp, North America), then motor power is in hp.	1. Press ▲ to advance to parameter **P0307**. 2. Press P to access the parameter values level. 3. Press ▲ to advance to nominal power. 4. Press P to confirm and save the setting.	Setting = Motor nameplate Default = Varies by model (hp/voltage dependent)
P0308*, or P0309	**Rated Motor cosPhi (P308), or Rated Motor Efficiency (P0309)** 0.000 to 1.00 (P0308) or 0.0 to 99.9 (P0309) Rated motor cosPhi or motor efficiency from motor nameplate. If P0100 = 2 and P0307 = kW, P0308 displays. If P0100 = 1 and P0307 = hp, P0309 displays. P0309 = 100% corresponds to super conducting. **NOTE:** This parameter is available when P0003 = 3 and P0010 = 1.	1. Press ▲ to advance to parameter **P0308** or **P0309**. 2 Press P to access the parameter values level. 3. Press ▲ to advance to nominal cosPhi or motor efficiency. 4. Press P to confirm and save the setting.	Setting = Motor nameplate P0308 Default = 0.00 P0309 Default = Varies by model (hp/voltage dependent)

* Motor related parameters.

Parameter	Description	Action	Setting/ Default
P0310*	**Rated Motor Frequency** 12 Hz to 650 Hz Rated motor frequency (Hz) from motor nameplate. Pole pair number is recalculated automatically if the parameter is changed.	1. Press ⬆ to advance to parameter **P0310**. 2. Press [P] to access the parameter values level. 3. Press ⬆ to advance to nominal frequency (**60 Hz**). 4. Press [P] to confirm and save the setting.	Setting = Motor nameplate 60 Hz Default = 50 Hz/60 Hz Default is dependent on the setting of the motor frequency and unit of measurement DIP switches.
P0311*	**Rated Motor Speed** 0 to 40,000 1/min Rated motor speed (rpm) from motor nameplate. A setting of 0 causes an internal calculation of this value. Vector control and V/f control with speed controller require this value. Slip compensation in V/f control requires this value for correct operation. Pole pair number is recalculated automatically if the parameter is changed.	1. Press ⬆ to advance to parameter **P0311**. 2. Press [P] to access the parameter values level. 3 Press ⬆ to advance to nominal motor speed. 4. Press [P] to confirm and save the setting.	Setting = Motor nameplate Default = Varies by model

* Motor related parameters.

Parameter	Description	Action	Setting/ Default
P0640	**Motor Overload Factor** 10% to 400% Limited to the maximum SED2 output current rating, or to 400% of the rated current (P0305), whichever is lower. **NOTE:** This parameter is available when P0003 = 3 and P0010 = 1.	1. Press ▲ to advance to parameter **P0640**. 2. Press **P** to access the parameter values level. 3. Press ▲ to advance to desired value. 4. Press **P** to confirm and save the setting.	Setting = As applicable Default = 110
P0700(0)**	**Selection of Command Source (Start Command)** Selects the command source as follows: 0 = Factory default setting 1 = BOP (keypad) 2 = Terminal digital input 4 = USS on BOP link (AOP) 5 = USS on COM link 6 = CB (Communications board or module) on COM link (P1/N2)	1. Press ▲ to advance to parameter **P0700**. 2. Press **P** to access the parameter indexes. 3. Press ▲ to advance to index [**0**], IN000, AUTO. 4. Press **P** to confirm index selection. 5. Press ▲ to advance to **2**. 6. Press **P** to confirm and save the setting.	Setting = 2 Default = 2
NOTE: Changing this parameter resets (to default) all settings on the selected item. For example, changing from 1 to 2 resets all digital inputs to default settings.			

** Parameters have two index settings: IN000 = Auto and IN001 = Hand.

Parameter	Description	Action	Setting/ Default
P0700[1]**	**Selection of Command Source (Start Command)** Selects the command source as follows: 0 = Factory default setting 1 = BOP (keypad) 2 = Terminal digital input 4 = USS on BOP link (AOP) 5 = USS on COM link 6 = CB (Communications board or module) on COM link (P1/N2)	1. Press ▲ to advance to index [**1**], IN001, HAND. 2. Press P to confirm index selection. 3. Press ▲ to advance to **1**. 4. Press P to confirm and save the setting. 5. Press P again to return to the parameter selection level.	Setting = 1 Default = 1
NOTE: Changing this parameter resets (to default) all settings on the selected item. For example, changing from 1 to 2 resets all digital inputs to default settings.			
P1000[0]**	**Selection of Frequency Setpoint** **(Speed Command Source)** Selects the frequency setpoint source as follows: 1 = Motor potentiometer setpoint/BOP (keypad) 2 = Analog input 3 = Fixed frequency setpoint 4 = USS on BOP Link/AOP 5 = USS on COM link 6 = CB (Communications board or module) on COM link (P1/N2)	1. Press ▲ to advance to parameter **P1000**. 2. Press P to access the parameter indexes. 3. Press ▲ to advance to index [**0**], IN000, AUTO. 4 Press P to confirm index selection. 5. Press ▲ to advance to **2**. 6. Press P to confirm and save the setting.	Setting = 2 Default = 2

** Parameters have two index settings: IN000 = Auto and IN001 = Hand.

Parameter	Description	Action	Setting/Default
P1000[1]**	**Selection of Frequency Setpoint** **(Speed Command Source)** Selects the frequency setpoint source as follows: 1 = Motor potentiometer setpoint/AOP 2 = Analog input 3 = Fixed frequency 4 = USS on BOP Link/AOP 5 = USS on COM link 6 = CB (Communications board or module) on COM link (P1/N2)	1. Press ▲ to advance to index [**1**], IN001, HAND. 2. Press P to confirm index selection. 3. Press ▲ to advance to **1**. 4. Press P to confirm and save the setting. 5. Press P again to return to the parameter selection level.	Setting = 1 Default = 1
P1080	**Minimum Motor Frequency** 0 Hz to 650 Hz Minimum motor frequency at which the motor will run irrespective of the frequency setpoint. This value applies to both clockwise and counterclockwise rotation.	1. Press ▲ to advance to parameter **P1080**. 2. Press P to access the parameter values level. 3. Press ▲ to advance to desired value. 4. Press P to confirm and save the setting.	Site Setting (20% to 30% Max) Default = 10

** Parameters have two index settings: IN000 = Auto and IN001 = Hand.

Parameter	Description	Action	Setting/ Default
P1082	**Maximum Motor Frequency** 0 Hz to 650 Hz Maximum motor frequency at which the motor will run regardless of the frequency setpoint. This value applies to both clockwise and counterclockwise rotation.	1. Press ▲ to advance to parameter **P1082**. 2. Press P to access the parameter values level. 3. Press ▲ to advance it desired value. 4. Press P to confirm and save the setting.	Site Setting Default = 50 or 60 (Default is determined by the setting of the motor frequency and unit of measurement DIP switches.)
NOTE: This value is limited internally to 200 Hz or five times the rated motor frequency (P0305). When P1300 is greater than or equal to 20 (control mode = vector control), the value displays via r0209 (maximum frequency).			
P1120	**Ramp-up Time** 0s to 650s	1. Press ▲ to advance to parameter **P1120**. 2. Press P to access the parameter values level. 3. Press ▲ to advance it desired value. 4. Press P to confirm and save the setting.	Site Setting Default = 10 Typical fan = 120s Typical pump = 30s
NOTES: 1. Setting the ramp-up time too short can cause the SED2 to trip (F0001 over current, F0002 over voltage, or F0003 under voltage). 2. If using an external frequency setpoint with set ramp rates (such as from a PLC), achieve optimum SED2 performance by setting ramp time (P1120 and P1121) slightly shorter than those of the PLC.			

Parameter	Description	Action	Setting/Default
P1121	**Ramp-down time** 0s to 650s	1. Press ▲ to advance to parameter **P1121**. 2. Press P to access the parameter values level. 3. Press ▲ to advance it desired value. 4. Press P to confirm and save the setting.	Site Setting Default = 30 Typical fan = 120s Typical pump = 30s

NOTES:

1. Setting the ramp-up time too short can cause the SED2 to trip (F0001 over current, F0002 over voltage, or F0003 under voltage.

2. If using an external frequency setpoint with set ramp rates (such as from a PLC), achieve optimum SED2 performance by setting ramp times (P1120 and P1121) slightly shorter than those of the PLC.

Parameter	Description	Action	Setting/Default
P3900	**End Quick Commissioning** 0 = End without motor calculation or factory reset. 1 = End with motor calculation and factory reset (recommended on SED2 without bypass option). 2 = End with motor calculation and with I/O reset. 3 = End with motor calculation but without I/O reset (recommended with SED2 with bypass option).	1. Press ▲ to advance to parameter **P3900**. 2. Press P to access the parameter values level. 3. Press ▲ to advance to 1. 4. Press P to confirm the setting.	Setting = 1 Default = 0

NOTES:

1. P0010 must always be set back to 0 before operating the motor.

2. If P3900 is greater than 0 on completion of commissioning, P0010 is automatically set back to 0.

3. If P0700 either indeed was changed during this process, programming of P0704 = 3 is required.

Additional Parameter Settings

NOTE: If Display Selection for r0000, parameter P0005 = 21 (actual frequency), then the BOP display alternately shows setpoint values and the actual value (0 Hz).

Flying Start

Parameter	Description	Action	Setting/ Default
P1200	**Flying Start** Starts SED2 into a spinning motor by rapidly changing the output frequency of the SED2 until the actual motor speed is found. Then, the motor runs up to setpoint using the normal ramp time. 0 = Flying start disabled. 1 = Flying start is always active, start in direction of setpoint. 2 = Flying start is active, if power on, fault, OFF2, start in direction of setpoint. 3 = Flying start is active if fault, OFF2, start in direction of setpoint. 4 = Flying start is always active, only in direction of setpoint. 5 = Flying start is active if power on, fault, OFF2, only in direction of setpoint. 6 = Flying start is active if fault, OFF2, only in direction of setpoint.	1. Press ▲ to enter the SED2 parameter mode and to display **r0000**. 2. Press ▲ to advance to parameter **P1200**. 3. Press P to access the parameter values level. 4. Press ▲ to advance to desired setting. 5. Press P to confirm and save the setting.	Minimum = 0 Default = 0 Maximum = 6 Suggested = 2

NOTES:

1. Flying start is useful for motors with high inertia loads.

2. Settings 1 through 3 search in both directions. Settings 4 through 6 search only in the direction of the setpoint.

3. Flying start must be used in cases where the motor may still be turning (such as after a brief input power break) or can be driven by the load. Otherwise, overcurrent trips occur.

4. If the SED2 faults on F0002 (overvoltage) on a start command, flying start may have to be optimized by reducing the values in P1203 and P1202.

Parameter	Description	Action	Setting/ Default
P1202	**Motor Current: Flying Start** Defines search current used for flying start. Value is in % based on the rated motor current (P0305).	1. Press ▲ to enter the SED2 parameter mode and to display **r0000**. 2. Press ▲ to advance to parameter **P1202**. 3. Press P to access the parameter values level. 4. Press ▲ to advance to desired value. 5. Press P to confirm and save the setting.	Minimum = 10 Default = 100 Maximum = 200

NOTE:

Reducing the search current may improve performance for flying start if the inertia of the system is not very high.

Parameter	Description	Action	Setting/ Default
P1203	**Search Rate: Flying Start** Sets factor by which the output frequency changes during flying start to synchronize with the turning motor. This value, entered in % relative to the default time factor, defines the initial gradient and influences the time taken to search for the motor frequency. The search time is the time taken to search through all frequencies between f_max + 2 × f_slip to 0 Hz.	1. Press ▲ to enter the SED2 parameter mode and to display **r0000**. 2. Press ▲ to advance to parameter **P1203**. 3. Press P to access the parameter values level. 4. Press ▲ to advance to desired value. 5. Press P to confirm and save the setting.	Minimum = 10 Default = 100 Maximum = 200

NOTES:

1. P1203 = 100% is defined as giving a rate of 2% of f_slip, nom/ms.

2. P1203 = 200% would result in a rate of frequency change of 1% of f_slip, nom/ms.

3. A higher value produces a flatter gradient, and thus a longer search time. A lower value has the opposite effect.

Automatic Restart

CAUTION:

Settings 2 through 7 can cause the motor to restart unexpectedly.

Parameter	Description	Action	Setting/ Default

P1210	**Automatic Restart**
	
	Enables SED2 restart after a supply power break or after a fault.
	
	P1210 = 0, Disabled: Automatic restart is disabled.
	
	P1210 = 1, Trip reset after power on (P1211 disabled: The inverter will acknowledge (reset) faults; that is, it will reset a fault when it is re-applied. This means the inverter must be fully powered down, a brownout is not sufficient. The inverter will not run until the ON command has been toggled.
	
	P1210 = 2, Restart after supply power blackout (P1211 disabled): The inverter will acknowledge the fault F0003 at power on after blackout and will restart the drive. It is necessary that the ON command is wired via digital input (DIN).
	
	P1210 = 3, Restart after brownout or fault (P1211 enabled): For these settings it is fundamental that the drive only restarts if it has been in a RUN state at the time of the faults (F0003, etc.). The inverter will acknowledge the fault and will restart the drive after a blackout or brownwout. It is necessary that the ON command is wired via digital input (DIN).
		1. Press ▲ to enter the SED2 parameter mode and to display **r0000**.
		
		2. Press ▲ to advance to parameter **P1210**.
		
		3. Press P to access the parameter values level.
		
		4. Press ▲ to advance to desired setting.
		
		5. Press P to confirm and save the setting.
			Minimum = 0
			Default = 1
			Maximum:
			  5=Control Board Version 1.20 or earlier
			  6=Control Board Version 1.30
			  7=Control Board Version 1.40
			Suggested:
			  3=Control Board Version 1.20 or earlier
			  6=Control Board Version 1.30
			  7=Control Board Version 1.40

Automatic Restart Continued

Parameter	Description	Action	Setting/ Default
P1210 (Continued)	P1210 = 4, Restart after supply power brownout (P1211 disabled): For these settings it is fundamental that the drive only restarts if it has been in a RUN state at the time of the fault (F0003). The inverter will acknowledge the fault and will restart the drive after a blackout or brownwout. It is necessary that the ON command is wired via digital input (DIN). P1210 = 5, Restart after blackout or fault (P1211 disabled): The inverter will acknowledge the faults (F0003 etc.) at power on after blackout and will restart the drive. It is necessary that the ON command is wired via digital input (DIN). P1210 = 6, Restart after supply power brown/blackout or fault (P1211 disabled): The inverter will acknowledge the faults (F0003 etc.) at power on after blackout or brownout and will restart the drive. It is necessary that the ON command is wired via digital input (DIN). Setting 6 causes the motor to restart immediately. P1210 = 7, Restart after supply power brown/blackout or fault (P1211 enabled): This setting is for use where an external bypass system or process is interlocked with a relay that is set to P0731/P0732=52.3 (fault). The inverter functions the same as P1210=6 (trip on brownout, blackout or fault) but uses P1211 and only sets the fault bit P0731/P0732=52.3 when the specified number of restarts defined in P1211 has expired. If no trip occurs after 2 hours, the fault counter is reset.		

NOTES:

1. Auto restart requires a constant ON command (such as via a digital input).

2. P1200 flying start must be used in cases where the motor may still be turning, such as after a brief input power break, or can be driven by the load.

3. A **supply power brownout** is when the power is interrupted and reapplied before the operator panel display has gone dark. It is a very short supply power break where the DC link has not fully collapsed.

4.   A **supply power blackout** is when the operator panel display has gone dark before the power is reapplied. It is a long supply power break where the DC link has fully collapsed.

Parameter	Description	Action	Setting/ Default
P1211	**Number of Restart Attempts** Specifies the number of times SED2 will attempt to restart after supply power brownout or fault, if P1210 automatic restart is activated.	1. Press ▲ to enter the SED2 parameter mode and to display **r0000**. 2. Press ▲ to advance to parameter **P1211**. 3. Press P to access the parameter values level. 4. Press ▲ to advance to desired value. 5. Press P to confirm and save the setting.	Minimum = 0 Default = 3 Maximum = 10 Suggested = 10
P1212	**Time to First Restart** Selects the time (seconds) before the SED2 is restarted for the first time if P1210 automatic restart is activated.	1. Press ▲ to enter the SED2 parameter mode and to display **r0000**. 2. Press ▲ to advance to parameter **P1212**. 3. Press P to access the parameter values level. 4. Press ▲ to advance to desired value. 5. Press P to confirm and save the setting.	Minimum = 0 Default = 3 Maximum = 10 Suggested = 10

Parameter	Description	Action	Setting/Default
P1213	**Restart Time Increment** Selects the amount (seconds) that the restart time is incremented for each restart of the SED2 if P1210 automatic restart is activated.	1. Press ▲ to enter the SED2 parameter mode and to display **r0000**. 2. Press ▲ to advance to parameter **P1213**. 3. Press P to access the parameter values level. 4. Press ▲ to advance to desired value. 5. Press P to confirm and save the setting.	Minimum = 0 Default = 30 Maximum = 1000 Suggested = 10

Vdc Controller

Parameter	Description	Action	Setting/Default
P1240	Configuration of Vdc Controller Enables/disabled Vdc controller. The Vdc controller dynamically controls the DC link voltage to prevent overvoltage trips on high inertia systems. Vdc-max automatically increases ramp-down times to keep the DC link voltage (r0026) within limits. 0 = Vdc controller disabled 1 = Vdc-max controller enabled 2 = Reserved 3 = Reserved	1. Press ▲ to enter the SED2 parameter mode and to display **r0000**. 2. Press ▲ to advance to parameter **P1240**. 3. Press P to access the parameter values level. 4. Press ▲ to advance to desired value. 5. Press P to confirm and save the setting.	Minimum = 0 Default = 1 Maximum = 3

Pulse Frequency

Parameter	Description	Action	Setting/Default
P1800	Pulse Frequency Sets pulse frequency (kHz) of power switches in SED2. The frequency can be changed in increments of 2 kHz. Pulse frequencies > 4 kHz selected on 380V to 480V units reduce the maximum continuous motor current.	1. Press ▲ to enter the SED2 parameter mode and to display **r0000**. 2. Press ▲ to advance to parameter **P1800**. 3. Press P to access the parameter values level. 4. Press ▲ to advance to desired value. 5. Press P to confirm and save the setting.	Minimum = 4 Default = Varies by model (hp/voltage dependent) Maximum = 16

NOTES:

1. Minimum pulse frequency depends on P1082 (maximum frequency) and P0310 (rated motor frequency).

2. At 4 kHz, full output current is obtained up to 50 degrees C (CT mode); over 50 degrees C, full output may be obtained at 8 kHz.

3. If silent operation is not absolutely necessary, lower pulse frequencies may be selected to reduce SED2 losses and radio-frequency emissions.

4. Under certain circumstances, the SED2 may reduce the switching frequency to provide protection against over-temperature.

Motor Data Identification

Parameter	Description	Action	Setting/ Default
P1910	**Motor Data Identification** Performs stator resistance measuring. 0 = Disabled. 1 = Identification of Rs with parameter change. 2 = Identification of Rs without parameter change. 3 = Identification of the saturation characteristic with parameter change. 20 = Set voltage vector.	1. Press ▲ to enter the SED2 parameter mode and to display **r0000**. 2. Press ▲ to advance to parameter **P1910**. 3. Press P to access the parameter values level. 4. Press ▲ to advance to setting P1910=1. Press P to confirm and save the setting. When P1910=1, Alarm A0541 (motor data identification active) is output and internally P0340 is set to 3. Initiate the measuring operation with a continuous (steady-state) ON command. The motor aligns itself and current flows through it. Diagnostics are possible using r0069 (CO: phase current). On completion of the motor data identification routine, P1910 resets (P1910=0, motor data identification routine inhibited) and Alarm A0541 is cleared (deleted). 5. To set the SED2 into a defined state, issue an OFF1 command.	Minimum = 0 Maximum = 20

Motor Data Identification Continued

	6. Press ▲ to advance to setting P1910=3. Press P to confirm and save the setting. When P1910=3, Alarm 0541 (motor data identification active) is output and internally P0340 is set to 2. Initiate the measuring operation with a continuous (steady-state) ON command. On completion of the motor data identification routine, P1910 resets (P1910=0, motor data identification routine inhibited) and Alarm A0541 is cleared (deleted). 7. To set the SED2 into a defined state, issue an OFF1 command.	

NOTES:

1. Motor must be cool to perform motor data identification.

2. Before selecting motor data identification, perform quick commissioning.

3. This measurement may take several minutes depending on motor size.

4. When P1910=1, the calculated value for stator resistance (P0350) is overwritten.

5. When P1910=2, the values already calculated (P0350) are not overwritten.

6. When choosing the setting for measurement, observe the following:

   – P1910=1 means that the value is actually adopted as P0350 parameter setting and applied to the control as well as being shown in the read-only parameters.

   – P1910=2 means that the value is only displayed. That is, it is shown for checking purposes in the read-only parameter r1912 (identified stator resistance). The value is not applied to the control.

Reset to Factory Defaults

Parameter	Description	Action	Setting/ Default
P0010 P0970	Reset to Factory Default Resets SED2 parameters to the factory defaults.	1. Press ⬆ to enter the SED2 parameter mode and to display **r0000**. 2. Press ⬆ to advance to parameter **P0010**. 3. Press P to access the parameter values level. 4. Press ⬆ to advance to **30**. 5. Press P to confirm and save the setting. 6. Press ⬆ to go to parameter **P0970**. 7. Press P to access the parameter values level. 8. Press ⬆ to advance to **1**. 9. Press P to confirm and save the setting.	P0010: Setting = 30 Default = 0 P0970: Setting = 1 Default = 0

NOTES:

1. First set P0010 = 30.

2. Stop SED2 (that is, disable all pulses) before you reset parameters to factory default values.

3. The following parameters retain their values after a factory reset:

   - P0918 (address of CB, communications board or module)

   - P2010 (USS baud rate)

   - P2011 (USS address)

4. The reset process takes about 10 seconds.

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Required SED2 Parameter Settings

The following SED2 parameters are programmed by the factory before shipping. If these parameters are changed or if the SED2 is ever reset to factory default, you must reset these parameters as follows:

Parameter	Setting
P0748	⌐
P0702 in000	3
P0702 in001	3
P0731	52.3

NOTES:

1. The Interlock Start on the Controller board is simply a follower that can be used to tell the drive to do anything by closing the SED2 Interlock Start and programming P0704.

2. The Programmable Output on the Controller board is simply a follower of the SED2 Relay.

3. The SED2 Fault must always be programmed as a fault. Do not change the SED2 relay fault for other uses via P0731.

4. Changing P0700 resets all digital inputs and P0702 will require programming.

Application Feature Setup

Overview

The Controller board supports six isolated digital inputs and six digital relay outputs for customer use (Figure 13). The digital inputs include: Remote Start Input, Remote Safety #1 and #2, Interlock Start, Essential Services, and Overload Trigger. The digital outputs include:

- VFD Fault

- Programmable Output

- Drive Select

- Bypass Select

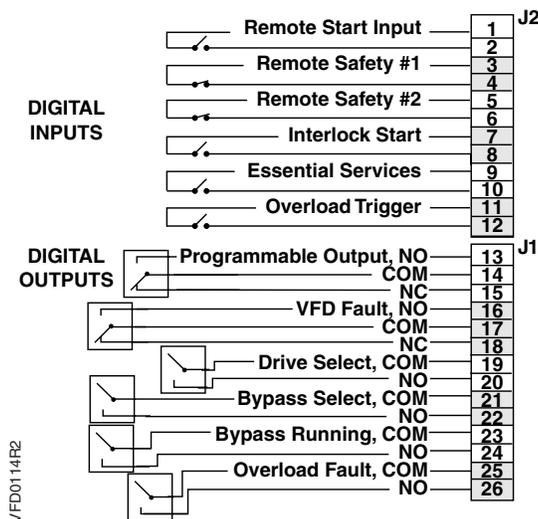- Bypass Running

- Overload Fault

Figure 13. Controller Board Digital Inputs and Outputs.

Auto Bypass without Interlock

Description

The Auto Bypass feature enables the SED2 to initiate automatic bypass mode operation. Closing of the SED2 Relay sends the motor to hand bypass mode. See the *SED2 VFD Startup, Operation, and Maintenance Manual* (125-3201) for programming of this relay and for its desired action.

When the SED2 initiates bypass mode operation, the following occurs:

- The SED2 stops delivering power

- The output contactor opens.

- The bypass contactor closes and the Programmable Output on the Controller board closes.

NOTES:

1. All safety conditions must be met for bypass mode operation.

2. The input contactor remains energized.

    The Electronic Bypass Option will return to VFD mode operation as soon as the SED2 Relay in control opens. When the Electronic Bypass Option returns to VFD mode operation, the following occurs:
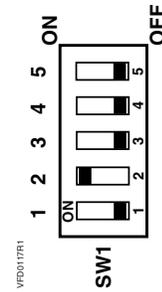
    - The SED2 Relay opens, the Programmable Output on the Controller board opens, and the bypass contactor opens.

    - The output contactor closes.

    NOTE: All safety conditions must be met for VFD mode operation.

Settings

The Auto Bypass feature requires that Controller board DIP Switch 2 is set ON.

NOTE: During operation, the Auto Bypass Enabled indicator is on steady.

Example SED2 Settings

Set parameters P0732 and P0748 for Auto Bypass on Drive Fault. Programming of the SED2 Relay is required for proper Auto Bypass activation. Set P0732 and P0748 as follows:

Parameter	Setting
P0732 in000	52.3
P0732 in001	52.3
P0748	− − − ┌┐

Interlock

Description

The Interlock feature (also called damper end switch logic) enables the SED2 outputs to inhibit motor start until a safety condition (proofing sequence) is confirmed. Any call to start the motor from the SED2 or bypass does not directly start the motor, but instead initiates the following Interlock procedure:

- The Interlock Start Logic Enable indicator is ON. Proofing is required to start in VFD or bypass mode.

- The Interlock Start Logic Command indicator turns ON and the Proofing indicator flashes.

- When in VFD mode, the SED2 Relay closes and the Controller board Programmable Output closes to initiate the proofing sequence. The Programmable Output relay is used to supply power to an external device such as a damper actuator.

- When not in VFD mode, the Controller board ignores the SED2 Relay.

- When in bypass mode, any call to start the motor in bypass (in either hand bypass or auto bypass) initiates the proofing sequence. The Programmable Output closes and is used to supply power to an external device such as a damper actuator.

- When control of the external device (such as a damper actuator) is satisfied, it must supply a contact closure to the Controller board Interlock Start. The Interlock Start Logic Command indicator turns OFF and the Proofing indicator turns ON. The motor then starts in the selected mode.

- Any call for the motor not to be running requires a new proofing sequence to be initiated.
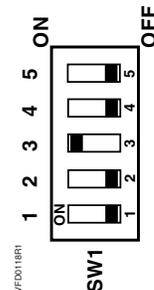
NOTE: This feature can only be used with a hardwired start/stop command.

Settings

The Interlock feature requires that Controller board DIP Switch 3 is set ON.

NOTES:

1. The Interlock Start Logic Enabled indicator is on steady.

2. Example assumes hardwired start is in auto. If other, modify P0732 as appropriate.

   For proper Interlock operation, set the following SED2 parameters:

   - P0700 in000 = 2
     Digital input that is the start command in the auto mode (from the damper end switch)

   - P0700 in001 = 2
     Digital input that is the start command in the hand mode (from the damper end switch)

   - P0701 in000 = 99 and P0701 in001 = 99
     Initiate BiCo

   - P0702 in000 = 3 and P0702 in001 = 3

   - P0732 in000 = 722.0
     Tells the drive through BiCo that instead of starting the drive in auto mode when the Remote Start input closes, it should close the SED2 Relay.
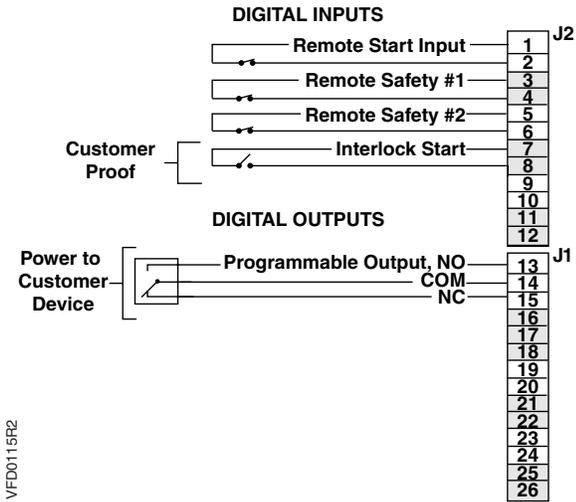
     NOTE: If P1 is the start command in auto, change the following parameters:

     P0003 = 4 (before changing this setting, note the current setting)
     P3950 = 46
     P0732 in000 = 2090.0
     P0003 = Change back to previous setting (1, 2, or 3)

   - P0732 in001 = 19.0
     Tells the drive through BiCo that instead of starting the drive in hand mode when the green Start button is selected, it should close the SED2 Relay.

   - P0704 in000 = 1 and P0704 in001 = 1

   NOTE: For a complete description of BiCo, see the *SED2 VFD Startup, Operation, and Maintenance Manual (*125-3201).

Wiring Example for Interlock

DIGITAL INPUTS

	J2
Remote Start Input	1
	2
Remote Safety #1	3
	4
Remote Safety #2	5
	6
Interlock Start	7
	8
	9
	10
	11
	12

Customer Proof

DIGITAL OUTPUTS

Power to Customer Device

	J1
Programmable Output, NO	13
COM	14
NC	15
	16
	17
	18
	19
	20
	21
	22
	23
	24
	25
	26

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Essential Services

Description

The Essential Services feature allows full-power bypass mode control of the motor during an emergency scenario. Activation of Essential Services overrides any other selected operation. Essential Services ensures that the bypass contactor will not open when a safety input or overload opens. Power goes directly to the motor.

NOTES:

1. If using both the Interlock and Essential Services features, Essential Services waits 10 seconds for the Interlock to confirm the safety condition (such as opening a damper). After the 10-second delay, Essential Services controls the motor regardless of the Interlock safety condition status.

2. Use extreme care when using the Essential Services mode. All safety circuits are no longer active (including motor overload and safety inputs to the Controller board).

Settings

The Essential Services feature requires that Controller board DIP Switch 1 is set ON.

> **NOTE:** The Essential Services indicator is on steady.
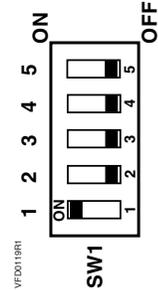
Essential Services does not require SED2 parameter settings. The Essential Services feature simply puts the Electronic Bypass Option into override bypass mode no matter what operation is selected.

Wiring Example for Essential Services
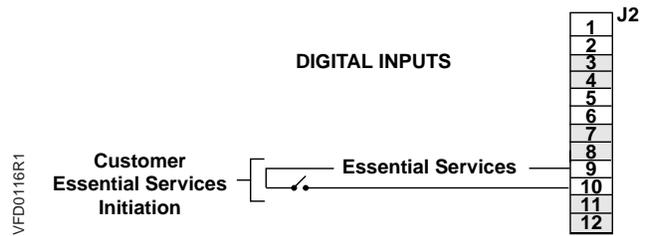
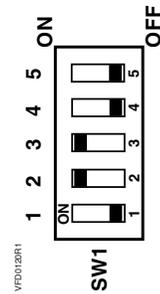# Interlock and Auto Bypass on VFD Fault

Description

Interlock and Auto Bypass features are both active. Auto bypass now becomes auto bypass on a VFD fault only (bypass is initiated by the SED2 Fault and this digital output must always be programmed to VFD fault).

- All set-up is the same as with Interlock (see the Interlock section in Application Feature Setup).

- Hand bypass is now initiated by SED2 Fault.

- The Programmable Output is still used to initiate the proofing sequence.

Settings

Interlock and Auto Bypass requires that Controller board DIP Switches 2 and 3 are set ON.

NOTE: During operation, the Auto Bypass Enabled indicator is on steady. Also, the Interlock Start Logic Enabled indicator is on steady.

See the *Auto Bypass without Interlock on VFD Relay Output* and *Interlock* sections for parameter settings.

Wiring Example for Interlock and Auto Bypass on VFD Fault
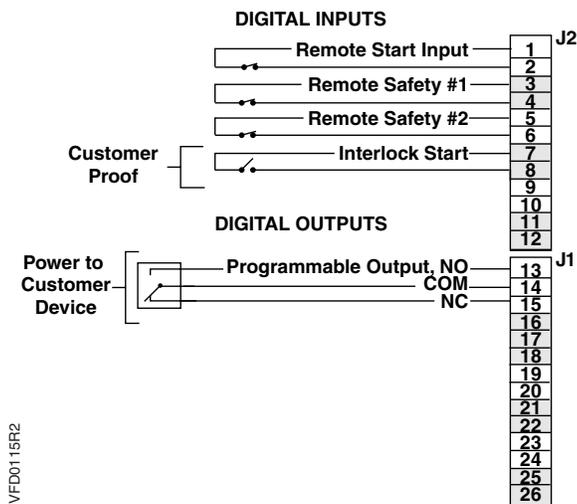
Technical Specifications

Table 5. Electronic Bypass Specifications.

Specifications	Description
Input Voltage (3 phase)	208V, 3 ac±10%
	240V, 3 ac ±10%
	480V, 3 ac ±10%
	575V, 3 ac ±10%
Digital Inputs	Six Digital Inputs as follows: • Remote start input • Remote safety 1 • Remote safety 2 • Interlock start • Essential services • Overload trigger Inputs require a contact closure capable of providing a low impedance path at currents less than 20 mA.
Relay/Digital Outputs	Six Relay/Digital Outputs as follows: • VFD fault • Programmable output • Drive select • Bypass select • Running on bypass • Overload fault Each relay has a maximum rating of 2A at 120V ac.
Temperature	Operating: 14°F to 104°F (-10°C to 40°C)
	Storage: –40°F to 158°F (–40°C to 70°C)
Humidity	0 to 95% rh, noncondensing

Table 6. SED2 Specifications.

Drive Specifications	Description
Input voltage, 3 phase power, and amps	200V to 240V, 3 ac ± 10%. 1/2 hp to 60 hp, (2.3 Amps to 154 Amps)
	380V to 480V, 3 ac ± 10% 1/2 hp to 125 hp, (1.2 Amps to 178 Amps)
	500V to 600V, 3 ac ± 10% 1 hp to 125 hp, (2.3 Amps to 125 Amps)
Input frequency	47 Hz to 63 Hz
Output frequency	0 Hz to 150 Hz
Power factor	≥0.9
VFD degree of efficiency	96% to 97%
Switch-on current	Less than nominal input current

Table 6. SED2 Specifications (Continued).

Drive Specifications	Description
Auxiliary supply 24V	Glavanically separated, unregulated auxiliary supply (18V to 32V) 100 mA
Overload capacity	110% for 60 seconds
Control method	Linear, parabolic and programmable V/f; and flux current control low-power mode
PWM frequency	4k Hz to 16k Hz (adjustable in 2k Hz increments)
Fixed frequencies	15 programmable
Skip frequency bands	4 programmable
Setpoint resolution	0.01 Hz digital, 0.01 Hz serial, 10 bit analog
Digital inputs (sink/source)	6: fully programmable and scalable isolated digital inputs, switchable
Analog inputs	2: 0 to 10 Vdc, 0/4 to 20 mA, can also be configured as digital inputs or Ni 1000 input
Relay outputs	2: configurable 30 Vdc/5A (resistive), 250 Vac 2A (inductive)
Analog outputs	2: programmable (0/4 to 20 mA)
Serial interface	RS-485 Transmission rate: Up to 38.4k Baud Protocols: Siemens, P1 and Johnson, N2;
Protection level	IP20: NEMA Type 1 with protective shield and gland plate installed
	IP54: NEMA Type 12 (400V and 500V series only)
Temperature ranges	Operating: 14°F to 104°F (–10°C to 40°C) Storage: –40°F to 158°F (–40°C to 70°C)
Humidity	95% rh, non-condensing
Operational altitudes	Up to 3280 ft (1000m) above sea level without de-rating
Protection features	Under-voltage, Over-voltage, Overload, Ground fault, Short circuit, Stall prevention, Locked motor, Motor overtemperature I^2t PTC, Over-temperature, Parameter PIN protection
Standards	UL, cUL

NOTE: SED2 Compliance with EN61000-3-12:
From September 1st, 2005 all electrical apparatus covered by the EMC directive will have to comply with EN61000-3-12 "Limits for harmonic currents produced by equipment connected to public low voltage systems with input currents > 16A and =< 75 A per phase".

Siemens variable speed drives of the product range SED2 (Micromaster 436) fulfil the requirements of the EN 61000-3-12 (without the need for external line reactors) regarding the THD values of Table 3 under the pre condition of Rsce > 190. The required PWHD values will not be achieved. Due to this fact it is recommended to apply for connection approval at the local electricity board.

The local electricity board will evaluate among many other data the content of the 5th harmonic current and the Line Power Factor "Lambda", which is the ratio of active power and apparent power.

Siemens frequency inverters are optimized in design and operation characteristics regarding energy efficiency and less interference with line supplies.

Troubleshooting

WARNING:

Always disconnect all power sources before opening the SED2 Electronic Bypass Option.

Power-on Initialization Failure (Unit Fault Condition)

During power-on initialization, a unit fault condition occurs if the Electronic Bypass Option did not pass the basic sanity test. Rather than flash normally, the basic sanity test indicator pauses, flashes a fault code, and then repeats.

Table 7 shows the fault codes. For example, if the basic sanity test indicator flashes three times rapidly, pauses, and then repeats, this means that there is a keypad failure.

Table 7. Basic Sanity Test Fault Codes.

Basic Sanity Test Fault Code/Flashes	Description
1	Non-Volatile Memory Failure
2	Flash Memory Failure (CRC, cyclic redundancy check)
3	Keypad Failure
4	RAM Memory Failure (not used)
5	EEPROM Read error
6	EEPROM Write Failure
7	Runtime Flash Failure (CRC, cyclic redundancy check)
8	Main Program Failed (or hangs)

It may be possible to recover from the unit fault condition by simply attempting a power down/up of the Electronic Bypass Option. If the unit fault condition still exists, replace the Controller board.

CAUTION:

When powering down/up the Electronic Bypass Option, power down the unit, wait 5 minutes, and then power up the unit.

Override Jumper

An Override Jumper (J8) is supplied on the Controller board. Moving this jumper to the override position removes the Controller board and its keypad from the control and closes the drive output contactor (and the input contactor if supplied).
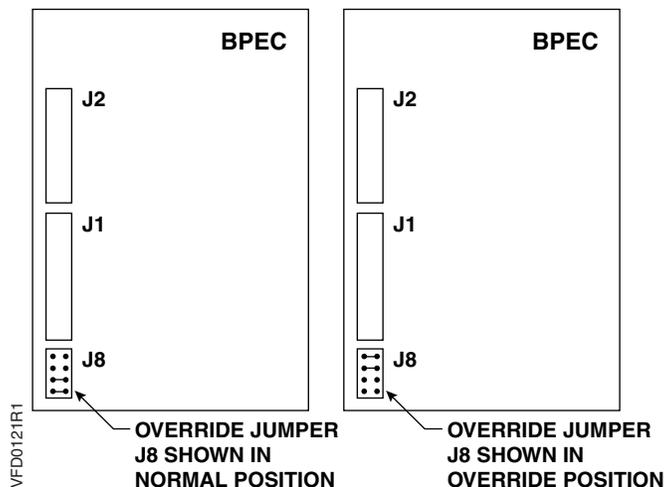

Figure 14. Override Jumper J8 Location and Positions.

Fuses

The Controller board contains a fuse (F1) under its cover (Figure 15). Determine if the fuse F1 needs replacement as follows:

1. If the basic sanity test indicator (Figure 15) is flashing, fuse F1 is OK and no action is required.

2. Verify that 120 Vac power is available on the secondary side of the Electronic Bypass Option power transformer (Figure 15). If power is not proper, check the Electronic Bypass Option components such as:

    *   Power transformer

    *   Power transformer fuses (F2, F3, and F4). Table 8 provides fuse replacement information.

3. If power is proper, check fuse F1 as follows:

    *   Power down the Electronic Bypass Option.

    *   Remove the Controller board cover.

    *   Remove fuse F1.

    *   Use an ohm meter to check the fuse.

    *   Replace fuse F1 if necessary.

    NOTE: Replace fuse F1 with an 8 AG, 1/2 amp, 250V, fast-acting instrument fuse such as a Bussmann AGX1/2 or Littlefuse 361.500.

Table 8. Fuse Replacement Information.

| Bypass Option Part Number	Primary Fuse (F3 and F4)	Secondary Fuse (F2)
VBE10.5… to VBE17.5…	Bussmann/Littlefuse LP-CC-1	Bussmann/Littlefuse LP-CC-6/10
VBE110… to VBE110…	Bussmann/Littlefuse LP-CC-2	Bussmann/Littlefuse LP-CC-1 1/4
VBE115… to VBE160…	Bussmann/Littlefuse LP-CC-3	Bussmann/Littlefuse LP-CC-2
VBE20.5… to VBE27.5…	Bussmann/Littlefuse LP-CC-1	Bussmann/Littlefuse LP-CC-6/10
VBE210… to VBE210…	Bussmann/Littlefuse LP-CC-2	Bussmann/Littlefuse LP-CC-1 1/4
VBE215… to VBE260…	Bussmann/Littlefuse LP-CC-3	Bussmann/Littlefuse LP-CC-2
VBE30… to VBE315…	Bussmann/Littlefuse LP-CC-1/2	Bussmann/Littlefuse LP-CC-6/10
VBE320… to VBE320…	Bussmann/Littlefuse LP-CC-1	Bussmann/Littlefuse LP-CC-1 1/4
VBE325… to VBE3125…	Bussmann/Littlefuse LP-CC-1 1/2	Bussmann/Littlefuse LP-CC-2
VBE40… to VBE420…	Bussmann/Littlefuse FNQ-R-4/10	Bussmann/Littlefuse LP-CC-6/10
VBE425… to VBE425…	Bussmann/Littlefuse LP-CC-8/10	Bussmann/Littlefuse LP-CC-1 1/4
VBE430… to VBE4125…	Bussmann/Littlefuse LP-CC-1 1/4	Bussmann/Littlefuse LP-CC-2
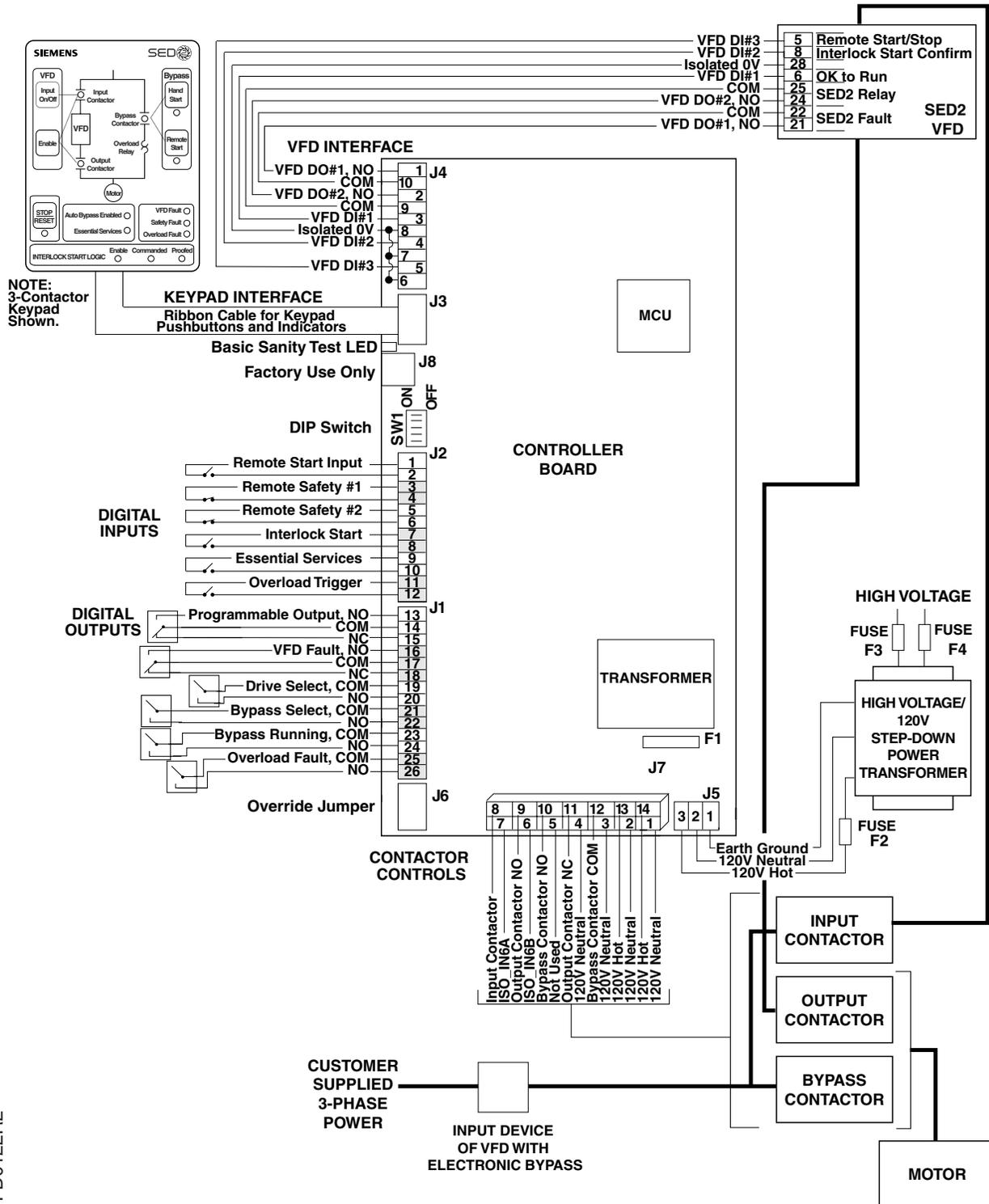
Figure 15. Controller Board Inputs and Outputs.

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