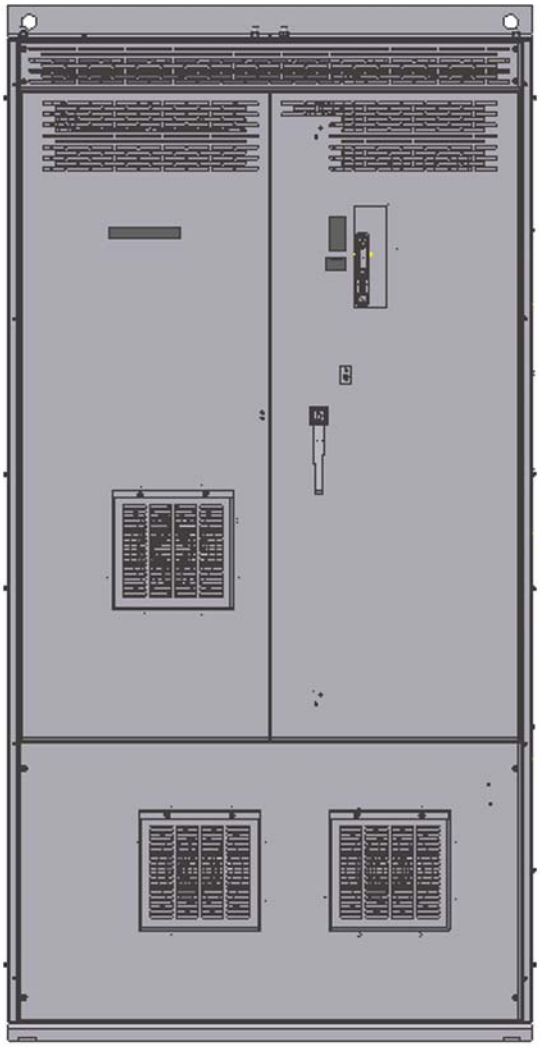
Altivar® 61/71 PowerGard™

Class 8839 Type CPD 18-Pulse Adjustable Speed Drive Controllers 40–450 hp CT & 50–500 hp VT, 460 Vac

Instruction Bulletin

Retain for future use.



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SQUARE D

HAZARD CATEGORIES AND SPECIAL SYMBOLS

Read these instructions carefully and look at the equipment to become familiar with the device before trying to install, operate, service or maintain it. The following special messages may appear throughout this bulletin or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.

The addition of either symbol to a “Danger” or “Warning” safety label indicates that an electrical hazard exists which will result in personal injury if the instructions are not followed.

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

⚠ DANGER

DANGER indicates an imminently hazardous situation which, if not avoided, **will result in** death or serious injury.

⚠ WARNING

WARNING indicates a potentially hazardous situation which, if not avoided, **can result in** death or serious injury.

⚠ CAUTION

CAUTION indicates a potentially hazardous situation which, if not avoided, **can result in** minor or moderate injury.

CAUTION

CAUTION, used without the safety alert symbol, indicates a potentially hazardous situation which, if not avoided, **can result in** property damage.

PLEASE NOTE

Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E – Standard for Electrical Safety Requirements for Employee Workplaces and OSHA Standards – 29 CFR Part 1910 Subpart S Electrical.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors, and covers before turning on power to this equipment.

Failure to follow these instructions will result in death or serious injury.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK

- Read and understand this bulletin in its entirety before installing or operating Altivar® 61/71 PowerGard drive controllers. Installation, adjustment, repair, and maintenance of the drive controllers must be performed by qualified personnel.
- User is responsible for conforming to all applicable code requirements with respect to grounding all equipment.
- Many parts in this drive controller, including printed wiring boards, operate at line voltage. DO NOT TOUCH. Use only electrically insulated tools.
- DO NOT short across DC bus capacitors or touch unshielded components or terminal strip screw connections with voltage present.
- Before servicing the drive controller:
  - Disconnect all power including external control power that may be present before servicing the drive controller.
  - Place a “DO NOT TURN ON” label on the drive controller disconnect.
  - Lock the disconnect in open position.
  - WAIT 15 MINUTES for the DC bus capacitors to discharge. Then follow the DC bus voltage measurement procedure on page 38 to verify that the DC voltage is less than 45 V. The drive controller LEDs are not accurate indicators of the absence of DC bus voltage.
- Install and close all covers before applying power or starting and stopping the drive controller.

Electric shock will result in death or serious injury.

TABLE OF CONTENTS

SECTION 1— INTRODUCTION AND TECHNICAL CHARACTERISTICS

INTRODUCTION

The Altivar® 61/71 PowerGard™ Class 8839 Type CPD family of drive controllers is an integrated 18-pulse AC drive solution designed for the construction and industrial markets. These drive controllers are offered in 40 to 450 hp, 460 V, constant torque (CT) ratings, and 50 to 500 hp, 460 V, variable torque (VT) ratings. They provide an effective means for harmonic mitigation. They may be configured with or without isolation and bypass power circuit configurations, and with or without options and user-specified control strategies.

See Table 1 for available enclosures and short-circuit current ratings. All standard drive controllers are UL 508C Listed, with selectable control and power configurations. All order engineered (OE) drive controllers are UL 508A or UL 508 Listed.

This instruction bulletin covers receiving, installation, start-up, configuration, and troubleshooting of the AC drive controllers listed in Table 1.

Table 1: AC Drive Controller Enclosures and Short-Circuit Current Ratings

Controllers		Enclosure[1] Type(s)	Short-Circuit[2] Current Rating
Constant torque (CT)	40–450 hp, 460 V	1, 1B	100 kA
Variable torque (VT)	50–500 hp, 460 V	1, 1B	100 kA

[1] 1B = Type 1 enclosure with fan filters

[2] See factory for short-circuit ratings on engineered power options.

RELATED DOCUMENTATION

For further information, refer to the latest revision of the instruction bulletins listed in Tables 2 and 3. These bulletins ship with the drive controller when the corresponding option is selected. They are also available from the Technical Library at www.us.SquareD.com.

Table 2: Instruction Bulletins

Bulletin No.	Title
1755843 (CT) or 1760643 (VT)	*Installation Manual*, 0–100 hp, 460 V
1755849 (CT) or 1760649 (VT)	*Installation Manual*, 125–700 hp, 460 V
1755855 (CT) or 1760655 (VT)	*Programming Manual*
1755861	*Communication Parameters*
W817574030111 (CD)	*Altivar 61*
W817555430114 (CD)	*Altivar 71*
30072-200-50	*Handling, Installation, Operation, and Maintenance of Electrical Control Equipment*

Table 3: Option Card Bulletins

Bulletin No.	Title	Option
1755869 30072-451-27 30072-451-43	*Modbus® Plus Card, VW3A3302* *Supplementary Instructions for ATV71 Option Cards* *Addendum to ATV71 Modbus® Plus Card VW3A3302*	A09
1755867 30072-451-27	*Modbus®/Uni-Telway™ Card, VW3A3303* *Supplementary Instructions for ATV71 Option Cards*	B09
1754480	*Option Card* (Metasys® N2 Card, VW3A3313)	C09
1755879	*Ethernet Modbus® TCP/IP Card, VW3A3310*	D09
1754480	*Option Card* (LonWorks® Card, VW3A3312)	E09
1755877 30072-451-27 30072-451-44	*DeviceNet™ Card, VW3A3309* *Supplementary Instructions for ATV71 Option Cards* *Addendum to ATV71 DeviceNet™ Card*	F09
1755873 30072-451-27 30072-451-45	*Profibus DP Card, VW3A3307* *Supplementary Instructions for ATV71 Option Cards* *Addendum to ATV71 Profibus DP VW3A3307*	G09
—	I/O Extension Card, VW3A3202: Refer to the Installation Manual. See Table 2 on page 8.	H09
1754480	*Option Card* (Apogee® P1 Card, VW3A3314)	J09
1754480	*Option Card* (BACnet® Card, VW3A3315)	K09
1755871 30072-451-27	*Interbus S Card, VW3A3304* *Supplementary Instructions for ATV71 Option Cards*	L09
1755883 30072-451-27	*Standard FIPIO® Card, VW3A3311* *Supplementary Instructions for ATV71 Option Cards*	M09
1629225	*Bluetooth® USB, VW3A8115*	O09 or Q09
30072-451-39	*Modbus® Bluetooth®, VW3A8114*	P09 or Q09

All controllers include factory-supplied user drawings and are identified by a factory order number. The factory order number for the controller appears on the nameplate (see Figure 1 on page 11). This same number appears as part of the number sequence in the title block of the factory-supplied user drawings. The drawing set includes:

- an enclosure outline drawing
- a power elementary drawing
- a control elementary drawing
- an interconnection drawing
- a component layout drawing (provided with standard drive controllers)

TERMINOLOGY

The following terminology is used throughout this instruction bulletin in reference to the Class 8839 Type CPD drive controllers. These terminology distinctions are made to minimize confusion when discussing installation and adjustment practices.

- When used as a component of the Class 8839 Type CPD drive controllers, the ATV61HD30N4 through ATV61HC31N4D VT controllers and ATV71HD30N4 through ATV71HC28N4D CT controllers are referred to as *power converters*.
- The combination of the reactor, transformer, rectifier, power converter, enclosure, power circuits, and control circuits that constitute the Class 8839 Type CPD product is referred to as the *drive controller*, the *controller*, or the *adjustable speed controller*.
- *18-pulse* refers to the design combination of reactor, transformer, and power converter for mitigating harmonic distortion in the Class 8839 Type CPD drive controllers.
- The combination of the controller and motor is referred to as the *drive*.
- *Power Circuit W* (power converter and disconnect means only) refers to the power circuit configuration designed for running the motor directly from the power converter.
- The bullet symbol "•" in a catalog number indicates the part of the number that can vary with the product configuration or rating.

PRECAUTIONS

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Turn off all power supplying this equipment before working on it.

Failure to follow this instruction will result in death or serious injury.

Follow these precautions when installing Altivar® 61/71 PowerGard™ drive controllers:

- The Type 1 and 1B controllers are suitable for installation in a Pollution Degree 2 environment as defined in NEMA ICS1 and IEC 60664-1. The expected environment must be compatible with this rating.
- When attaching floor-mounted controllers to their mounting surfaces, use fasteners rated for the weight of the apparatus, the expected shock and vibration of the installation, and the expected environment.
- Provide sufficient cooling to maintain a maximum 104 °F (40 °C) ambient temperature in accordance with the total dissipated watts loss specified in Table 15 on page 24.
- For seismic qualified products (Mod H10), follow the mounting precautions stated on the safety labels attached to the device.

CONTROLLER NAMEPLATE IDENTIFICATION

The nameplate for the drive controller is located on the inside of the door. This nameplate, shown in Figure 1 on page 11, identifies the controller Class, Type, and Modification (options) listing. When identifying or describing Altivar 61/71 PowerGard Class 8839 Type CPD drive controllers, use the data from this nameplate.

Figure 1: Drive Controller Nameplate

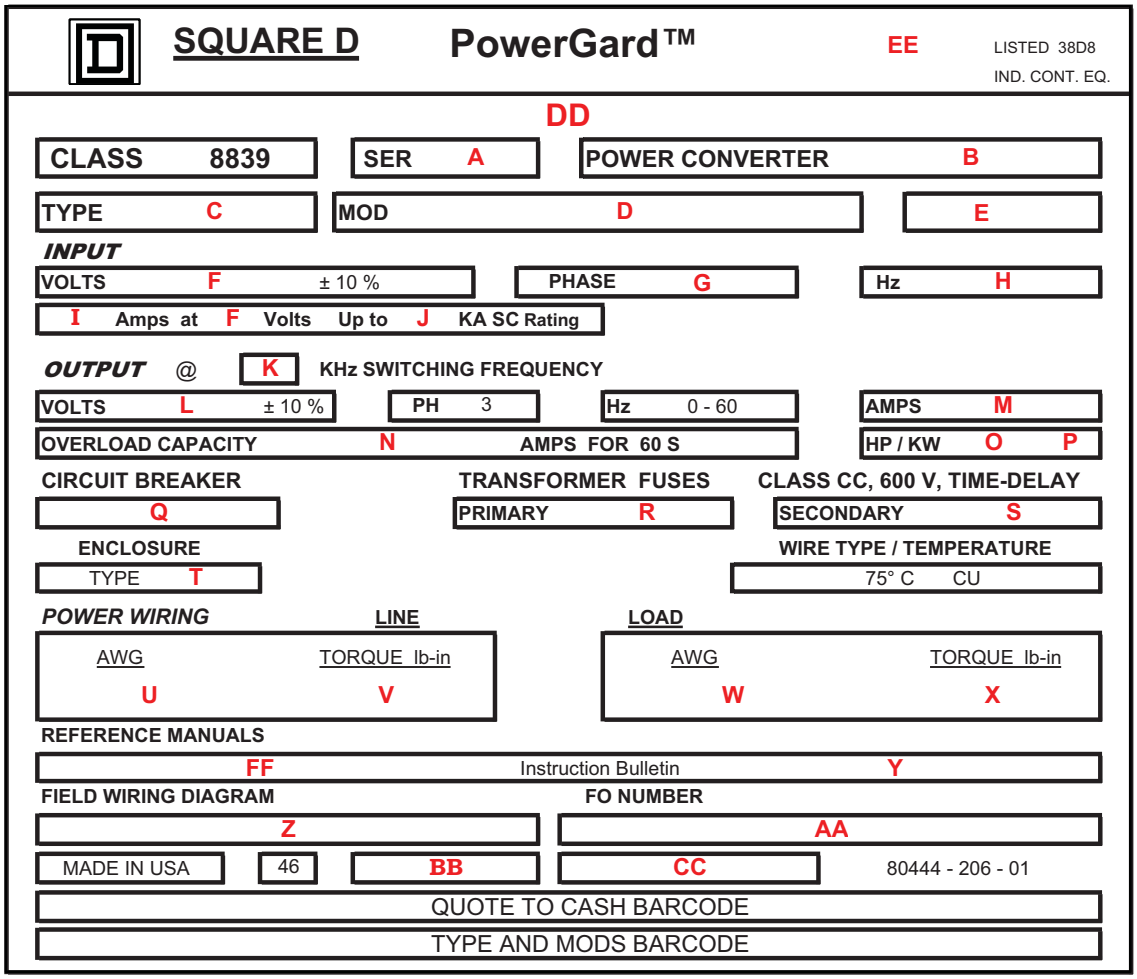


Table 4: Nameplate Legend

Designation	Value	Designation	Value
A	Product Series	Q	Circuit Breaker Catalog Number
B	Power Converter Part Number	R	Control Power Primary Fuse
C	Controller Type	S	Control Power Secondary Fuse
D	Controller Options	T	Enclosure Type Rating
E	UL 508 Designation	U	Input Power Wiring Size
F	Input Voltage	V	Torque Requirement for Input Wiring
G	Input Phase	W	Output Power Wiring Size
H	Input Frequency	X	Torque Requirement for Output Wiring
I	Maximum Input Current	Y	Card Option
J	Short Circuit Current Rating	Z	Field Wiring Diagram
K	Output Waveform Switching Frequency	AA	Factory Order Number
L	Output Voltage	BB	Date Code
M	Continuous Output Current	CC	Blank Field
N	Transient Output Current	DD	Enclosed Adjustable Frequency Drive Controller
O	Rated Horsepower	EE	UL Classification
P	Rated Kilowatts	FF	Instruction Bulletin Numbers and Titles

CONTROLLER CATALOG NUMBERS

The controller catalog number, located on the nameplate on the inside of the door, is coded to describe the configuration and options present. Use the grid on this page and on page 13 to translate the catalog number into a description of the drive controller.

NOTE: Gray-shaded options require order engineering.

Class	Type						Modifications				Series
							Control	Light	Card	Misc.	
8839	CPD	•	•	•	•	•	•	•	•	•	C
		①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩

① Product

Code	Drive Type
CPD	Altivar® 61/71 PowerGard™ Controller

② Horsepower Code

Code	Rating, hp	Code	Rating, hp
N	40 (CT only)	W	200
P	50	X	250
Q	60	Y	300
R	75	Z	350
S	100	4	400
T	125	5	450
U	150	6	500 (VT only)

③ Enclosure Type

Code	Environment Rating
G	Type 1
B	Type 1B

④ Voltage Rating

Code	Voltage
4	460 V

⑤ Application Type

Code	Applied Rating
V	Variable Torque
C	Constant Torque

⑥ Device Type

Code	Power Circuit
R	Barriered Bypass—RVAT
S	Barriered Bypass—SSRVS
T	Isolation and Transfer
W [1]	Drive Only
Y [2]	Integrated Bypass
Z [2]	Barriered Bypass—Full Voltage

Refer to “Power Circuits—General” beginning on page 56 for definitions.

Notes:

- The listings define the available factory modifications. All modifications follow specific interoperability rules for selection and configuration. Modification selection can be validated at the time of quotation or order entry by the Q2C/Product Selector process. Contact your local field sales representative for details.
- When modifications with a “3” and/or “SPL” prefix appear in field D of the nameplate (see Figure 1 on page 11), manufactured-to-specification options are provided.

[1] Barriered bypass is not compatible with this option.

[2] Includes AFC/Off/Bypass switch and Test/Normal switch.

[3] All controls are mutually exclusive. Select only one.

[4] The Hand-Off-Auto switch can be set to the Off position for AFC fault reset.

[5] Supplied as the default.

[6] Control option C07 is not compatible with bypass or any light cluster except C08.

[7] Only available without bypass.

[8] Only available with a communication card. This option is the default control option supplied when a communication option is selected.

[9] Light clusters are mutually exclusive. Select only one.

[10] Not available with option C07 or D07.

[11] Only available with bypass.

[12] Light cluster B08 is not compatible without bypass.

[13] Only available with option D07 and non-bypass.

[14] Only available with option A07, B07, or E07.

[15] Only available with option F07.

[16] Select only one option card.

[17] Must use option F07 for control.

[18] C10 is not compatible with C07, D07, or J10.

[19] User must buy separate device to program the controller.

[20] Smoke purge relay E10 permits the motor to run at full speed.

[21] J10 is not compatible with C07, D07, or C10.

[22] Only available with option C07 and non-bypass.

[23] Available only when pilot lights are selected.

[24] Not available on Power On light.

[25] Not available with option B07, C07, or D07.

[26] With options U10 and V10 you must select option F10.

[27] Supplied with illuminated reset push button.

⑦ Control Option [3]

Code	AFC Controls	Code	AFC Controls
A07 [4], [5]	Hand/Off/Auto, Speed Potentiometer	D07 [7]	Stop/Start, Forward/Reverse, Speed Potentiometer
B07 [4]	Hand/Off/Auto, Start/Stop, Speed Potentiometer	E07 [4]	Hand/Off/Auto, Local/Remote, Speed Potentiometer
C07 [6], [7]	Start/Stop, Speed Potentiometer	F07 [8]	Communication/Auto/Off/Hand, Speed Potentiometer
		N07	Wired for Remote Operation

⑧ Light Option [9]

Code	Light Cluster	Code	Light Cluster	Code	Light Cluster
A08 [10]	Red Power On	C08 [7]	Red Power On	E08 [14]	Red Power On
	Green AFC Run		Green AFC Run		Green AFC Run
	Yellow AFC Fault				Yellow AFC Fault
	Yellow Auto		Yellow AFC Fault		Blue Hand
					Yellow Auto
B08 [10], [11], [12]	Red Power On	D08 [7], [13]	Red Power On	F08 [15]	Red Power On
	Green AFC Run		Yellow AFC Fault		Green AFC Run
	Yellow AFC Fault		Green Run Forward		Yellow AFC Fault
	Yellow Bypass		Green Run Reverse		Yellow Communication

⑨ Option Cards [16]

Code	Feature	Code	Feature
A09 [17]	Modbus Plus™	J09 [17]	Apogee® P1
B09 [17]	Modbus® / Uni-Telway™	K09 [17]	BACnet®
C09 [17]	Metasys® N2	L09 [17]	Interbus S
D09 [17]	Ethernet	M09 [17]	FIPIO®
E09 [17]	LonWorks®	O09	Bluetooth® USB
F09 [17]	DeviceNet™	P09	Bluetooth Modbus
G09 [17]	Profibus	Q09	Bluetooth USB and Modbus
H09	I/O extension card: adds 2 analog output, 4 logic inputs, 2 logic output, and 1 differential analog input		

⑩ Miscellaneous Options

Code	Feature	Code	Feature
C10 [18]	3–15 PSIG Input	P10 [22]	AFC Fault Reset
D10 [19]	Omit Graphic Display Terminal	Q10 [23], [24]	Push-to-Test Pilot Lights
E10 [20]	Smoke Purge Relay	R10 [11], [25]	Auto Transfer to Bypass
F10	Additional 200 VA Control Power Transformer	S10	Motor Elapsed-Time Meter
G10	cUL Listing	T10 [10]	Emergency Stop
H10	Seismic Qualified	U10 [26]	Motor Space Heater Sequencing
I10	Permanent Wire Marker Sleeves	V10 [26]	Seal Water Solenoid
J10 [21]	Input Program for 0–10 Vdc AI2 input	W10 [27]	Check Valve Sequencing
K10	Additional N.O. Auxiliary Drive Run Contact	Y10	54-in. Wide Enclosure
L10	Additional N.C. Auxiliary Drive Fault Contact	Z10	24 Vdc Power Supply
M10 [11]	1 N.O. Auxiliary Bypass Run Contact	310	Order Engineered (internal use only)
O10 [10], [14]	1 N.O. Auxiliary Auto Mode Contact	610	I.D. Engraved Nameplate

TECHNICAL CHARACTERISTICS

ALTIVAR 61/71® POWERGARD™ DRIVE CONTROLLER RATINGS

NOTE: The drive reduces the switching frequency automatically in the event of excessive heat sink temperature.

Table 5: Constant Torque (Switching Frequency: 40–450 hp @ 2 kHz)

Drive Controller Catalog Number [1]	Motor Power [2] 460 V, 60 Hz (hp)	Max. Continuous Output Current (A) [3]	Max. Transient Output Current, 60 s (A)	Power Converter Catalog Number [4]
CPDN▼4C_	40	52	78	ATV71HD30N4
CPDP▼4C_	50	65	97.5	ATV71HD37N4
CPDQ▼4C_	60	77	115.5	ATV71HD45N4
CPDR▼4C_	75	96	144	ATV71HD55N4
CPDS▼4C_	100	124	186	ATV71HD75N4
CPDT▼4C_	125	156	234	ATV71HD90N4
CPDU▼4C_	150	180	270	ATV71HC11N4D
CPDW▼4C_	200	240	360	ATV71HC13N4D
CPDX▼4C_	250	302	453	ATV71HC16N4D
CPDY▼4C_	300	361	541.5	ATV71HC20N4D
CPDZ▼4C_	350	414	621	ATV71HC25N4D
CPD4▼4C_	400	477	715.5	ATV71HC25N4D
CPD5▼4C_	450	515	772.5	ATV71HC28N4D

Notes to Tables 5 and 6:

1. "▼" can be "G" or "B". "G" denotes a Type 1 enclosure; "B" denotes a Type 1B enclosure with fan filters.
   "_" indicates that the catalog number continues. See pages 12 and 13 for a detailed description of catalog numbers.
2. Power shown is for the carrier switching frequency shown. For a switching frequency above factory settings, select the next largest size drive controller. If the duty cycle does not exceed 60% (36 s maximum for a 60 s cycle) this is not necessary.
3. Continuous output current is based on NEC2005 table 430.250. The controller nameplate rating conforms to the NEC table, **not** the current value listed in the ATV61 or ATV71 instruction manual.
4. The first three characters of the power converter catalog number may be ATV, signifying an IP20 rating, or HTV, signifying an IP00 rating.

Table 6: Variable Torque (Switching Frequency: 50–500 hp @ 2 kHz)

Drive Controller Catalog Number [1]	Motor Power [2] 460 V, 60 Hz (hp)	Max. Continuous Output Current (A) [3]	Max. Transient Output Current, 60 s (A)	Power Converter Catalog Number [4]
CPDP▼4V_	50	65	71.5	ATV61HD30N4
CPDQ▼4V_	60	77	84.7	ATV61HD37N4
CPDR▼4V_	75	96	105.6	ATV61HD45N4
CPDS▼4V_	100	124	136.4	ATV61HD55N4
CPDT▼4V_	125	156	172	ATV61HD75N4
CPDU▼4V_	150	180	198	ATV61HC11N4D
CPDW▼4V_	200	240	264	ATV61HC13N4D
CPDX▼4V_	250	302	332	ATV61HC16N4D
CPDY▼4V_	300	361	397	ATV61HC22N4D
CPDZ▼4V_	350	414	455	ATV61HC22N4D
CPD4▼4V_	400	477	525	ATV61HC25N4D
CPD5▼4V_	450	515	567	ATV61HC31N4D
CPD6▼4V_	500	590	649	ATV61HC31N4D

NOTE: When the enclosed controller has an ATV61_ power converter catalog number, the hp rating on the power converter nameplate will be one size smaller than that shown on the controller nameplate. This is due to factory configuration of the power converter in an IP00 configuration.

When the controller has an HTV61_ power converter catalog number, the hp rating on the power converter nameplate will match that on the controller nameplate.

INPUT CURRENT RATINGS

All branch circuit components and equipment such as feeder cables, disconnect devices, and protective devices must be rated for the input current of the drive controller. An order engineered bypass must be rated for the motor full load current (MFLC). The input current and MFLC are printed on the nameplate (see Figure 1 on page 11). The branch circuit feeder protection must be sized according to the National Electrical Code® (NEC®).

The power distribution system must exceed the Minimum UL (kA) ratings shown in Table 7. Otherwise, the performance of the drive controller could be inhibited, which could reduce the motor's ability to produce sufficient starting torque.

Table 7: Short-Circuit Current Ratings

Range (hp)	Minimum UL (kA)	High Fault UL (kA)
40–50	5	100
51–200	10	100
201–400	18	100
450–500	30	100

Table 8: Input Line Currents for Selection of Branch Circuit Feeders, 40–450 hp, CT [1]

Drive Controller Catalog Number [2], [3]	Motor Power 460 V 60 Hz (hp)	Rated Output Current	100,000 A Short-Circuit Current Rating
CPDNG4C_	40	52	45.4
CPDPG4C_	50	65	55.9
CPDQG4C_	60	77	67.6
CPDRG4C_	75	96	82.3
CPDS▼4C_	100	124	111.9
CPDT▼4C_	125	156	132.0
CPDU▼4C_	150	180	161.4
CPDW▼4C_	200	240	192.8
CPDX▼4C_	250	302	232.8
CPDY▼4C_	300	361	289.1
CPDZ▼4C_	350	414	317.2
CPD4▼4C_	400	477	360.6
CPD5▼4C_	450	515	403.1

1. Input line currents are based on the source impedance capable of providing the listed amperage levels.
2. "▼" can be "G" or "B". "G" denotes a Type 1 enclosure; "B" denotes a Type 1B enclosure with fan filters.
3. "_" indicates that the catalog number continues. See pages 12 and 13 for a detailed description of catalog numbers.

Table 9: Input Line Currents for Selection of Branch Circuit Feeders, 50–500 hp, VT [1]

Drive Controller Catalog Number [2], [3]	Motor Power 460 V 60 Hz (hp)	Rated Output Current	100,000 A Short-Circuit Current Rating
CPDPG4V_	50	65	55.7
CPDQG4V_	60	77	67.4
CPDRG4V_	75	96	82.6
CPDSG4V_	100	124	111.3
CPDT▼4V_	125	156	134.2
CPDU▼4V_	150	180	160.3
CPDW▼4V_	200	240	192.1
CPDX▼4V_	250	302	231.7
CPDY▼4V_	300	361	309.0
CPDZ▼4V_	350	414	317.1
CPD4▼4V_	400	477	358.6
CPD5▼4V_	450	515	401.6
CPD6▼4V_	500	590	450.5

1. Input line currents are based on the source impedance capable of providing the listed amperage levels.
2. "▼" can be "G" or "B". "G" denotes a Type 1 enclosure; "B" denotes a Type 1B enclosure with fan filters.
3. "_" indicates that the catalog number continues. See pages 12 and 13 for a detailed description of catalog numbers.

SPECIFICATIONS

Table 10: Specifications for Drive Controllers

Input voltage	460 V ±10%
Displacement power factor	98% through speed range
Input frequency	50/60 Hz ± 5%
Output voltage	Three-phase output Maximum voltage equal to input voltage
Galvanic isolation	Galvanic isolation between power and control (inputs, outputs, and power supplies)
Frequency range of power converter	0.1 to 500 Hz (factory setting of 60 Hz)
Torque/overtorque	**VT:** 110% of nominal motor torque for 60 s **CT:** 150% of nominal motor torque for 60 s
Current (transient)	**VT:** 110% of controller rated current for 60 s **CT:** 150% of controller rated current for 60 s
Switching frequency	Selectable from 0.5 to 16 kHz. [1] Factory setting: **CT:** 2 kHz for 40–450 hp @460 V **VT:** 2 kHz for 50–500 hp @460 V The drive reduces the switching frequency automatically in the event of excessive heat sink temperature.
Speed reference	**AI1:** 0 to +10 V, Impedance = 30 kΩ. Can be used for speed potentiometer, 1–10 kΩ. **AI2:** Factory setting: 4 to 20 mA. Impedance = 242 Ω (reassignable, X–Y range with graphic display terminal). Factory modification J10 allows 0–10 Vdc reference signal to AI2, Z= 30 kΩ.
Frequency resolution in analog reference	0.1 for 100 Hz (11 bits)
Speed regulation	V/f control: equal to the motor's rated slip. SFVC: 10% of the motor's rate slip from 20% to 100% of nominal motor torque.
Efficiency	95% at full load typical
Reference sample time	2 ms ±0.5 ms
Acceleration and deceleration ramps	0.1 to 999.9 s (definition in 0.1 s increments)
Drive controller protection	• Thermal protection of power converter • Phase loss of AC mains • Circuit breaker protected
Motor protection	• Class 10 electronic overload protection (power converter) • Class 20 bypass overload protection (order engineered with bypass)
Graphic display terminal	Self diagnostics with fault messages in three languages; also refer to the *Programming Manual* supplied on CD with the power converter. [2]
Temperature	**Storage** for all enclosures: -13 to +149 °F (-25 to +65 °C). **Operation**: +14 to +104 °F (-10 to 40 °C). For **40–75 hp, CT and 50–100 hp, VT** drives operating between 104 and 122 °F (40 and 50 °C), derate the current 2% per °C above 40 °C. For **100–450 hp, CT and 125–500 hp, VT** drives operating between 104 and 122 °F (40 and 50 °C), derate the current 3.3% per °C above 40 °C.
Humidity	95% with no condensation or dripping water, conforming to IEC 60068-2-3.
Altitude	3,300 ft (1000 m) maximum without derating; derating of the current by 1% for each additional 330 ft (100 m)
Enclosure	Type 1
Pollution degree	Type 1, 1B: Pollution degree 2 per NEMA ICS-1 Annex A and IEC 60664-1
Operational test vibration	Conforming to IEC 60721-3-3-3M3 amplitude 1.5 mm peak to peak from 3 to 13 Hz 1 g from 13 to 200 Hz
Transit test to shock	Conforming to National Safe Transit Association and International Safe Transit Association test for packages.
Operational shock	15 g, 11 ms
Seismic qualification	2003 IBC, NFPA 5000, and ASCE 7 ICC ES AC156 acceptance criteria test protocol with an importance factor of 1.0.
Codes and standards	UL Listed per UL 508C under category NMMS. Conforms to applicable NEMA ICS, NFPA, and IEC standards. Manufactured under ISO 9001 standards. Factory modification G10 provides Canadian cUL certification.

1. On 40–75 hp CT and 50–100 hp VT controllers, above 4 kHz CT/8 kHz VT, select the next largest size drive controller. If the duty cycle does not exceed 60% (36 s maximum for a 60 s cycle), this is not necessary.
2. Refer to Table 2 on page 8 for the instruction bulletin number.

STANDARD FEATURES

DRIVE ONLY

Controllers without bypass are available up to 450 hp CT / 500 hp VT @460 V.

The following are standard for controllers without bypass when no options are ordered:

- Circuit breaker disconnect
- UL Listed per UL 508C
- 100,000 A short-circuit current rating
- Heavy duty industrial disconnect handle with lockout/tag-out provisions
- Hand-Off-Auto (H-O-A) selector switch and manual speed potentiometer
- Door-mounted graphic display terminal
- Auto-start relay (115 V control)
- One Form C AFC run mode contact
- One Form C AFC fault contact
- Remote fault-condition reset in Auto mode with transition of auto start contact [1]
- Manual fault-condition reset in Off position of H-O-A selector switch
- Safety interlock (*e.g.,* run permissive) wired to user terminal block TB1
- Permanent wire markers
- White component-mounting plate
- Removable conduit-entry plates on floor mounted enclosures
- ANSI 49 dark gray enclosure
- Class 10 electronic overload protection

FACTORY MODIFICATIONS

Refer to Tables 11–14 for the list of parts included with each factory modification.

NOTE: Legend plate part numbers beginning with 65170 are not available separately as an ordered part. Contact your local field sales office.

[1] Selection of additional control options may affect the availability of these features.

CONTROL OPTIONS

Table 11: Control Options

Control Option	Description	Parts List
A07	Hand-Off-Auto Selector Switch	ZB5AD3 Three-position selector switch ZB5AZ009 Mounting collar (2) ZBE205 Contact blocks (1 N.C. and 1 N.O.) 65170-166-17 Hand-Off-Auto legend plate ZBZ32 Legend plate holder
	Speed Potentiometer	ATVPOT25K Speed potentiometer assembly
B07	Hand-Off-Auto Selector Switch	ZB5AD3 Three-position selector switch ZB5AZ009 Mounting collar (2) ZBE205 Contact blocks (1 N.C. and 1 N.O.) 65170-166-17 Hand-Off-Auto legend plate ZBZ32 Legend plate holder
	Stop/Start Push Buttons	ZB5AA2 Black push button ZB5AA4 Red push button ZB5AZ101 Mounting collar with contact block (1 N.O.) ZB5AZ102 Mounting collar with contact block (1 N.C.) 65170-166-31 Start legend plate 65170-166-09 Stop legend plate (2) ZBZ32 Legend plate holders
	Speed Potentiometer	ATVPOT25K Speed potentiometer assembly
C07	Stop/Start Push Buttons	ZB5AA2 Black push button ZB5AA4 Red push button ZB5AZ101 Mounting collar with contact block (1 N.O.) ZB5AZ102 Mounting collar with contact block (1 N.C.) 65170-166-31 Start legend plate 65170-166-09 Stop legend plate (2) ZBZ32 Legend plate holders
	Speed Potentiometer	ATVPOT25K Speed potentiometer assembly
D07	Stop/Start Push Buttons	ZB5AA2 Black push button ZB5AA4 Red push button ZB5AZ101 Mounting collar with contact block (1 N.O.) ZB5AZ102 Mounting collar with contact block (1 N.C.) 65170-166-31 Start legend plate 65170-166-09 Stop legend plate (2) ZBZ32 Legend plate holders
	Forward/Reverse Selector Switch	ZB5AD2 Two-position selector switch ZBE203 Contact block (2 N.O.) ZBE204 Contact block (2 N.C.) ZB5AZ009 Mounting collar 65170-166-45 Forward/Reverse legend plate ZBZ32 Legend plate holder
	Speed Potentiometer	ATVPOT25K Speed potentiometer assembly
E07	Hand-Off-Auto Selector Switch	ZB5AD3 Three-position selector switch ZB5AZ009 Mounting collar (2) ZBE205 Contact blocks (1 N.C. and 1 N.O.) 65170-166-17 Hand-Off-Auto legend plate ZBZ32 Legend plate holder
	Local/Remote Selector Switch	ZB5AD2 Two-position selector switch ZB5AZ101 Mounting collar with contact block (1 N.O.) 65170-166-80 Local/Remote legend plate ZBZ32 Legend plate holder
	Speed Potentiometer	ATVPOT25K Speed potentiometer assembly
F07	Communication-Auto-Off-Hand (C-A-O-H) Selector Switch	KAXZ1M12 Operator handle 9003K2H0285USX Contact block assembly 65170-170-41 A-O-H legend plate 31164-098-01 Comms label ZA2BZ32 Legend plate holder
	Speed Potentiometer	ATVPOT25K Speed potentiometer assembly

LIGHT OPTIONS

Notes for Table 12:

1. If option Q10 (push-to-test pilot lights) is selected, the following pilot light operators are used:
   ZB5AW35 replaces ZB5AV05
   ZB5AW33 replaces ZB5AV03
   ZB5AW36 replaces ZB5AV06
2. If option Q10 (push-to-test pilot lights) is selected, ZB5AW065 (mounting collar with light module and 1 N.O. and 1 N.C. contact) replaces ZB5AV6 (mounting collar with light module).

Table 12: Light Options

Light Option	Description	Parts List
A08 Pilot Light Cluster Option #1	Red Power On	ZB5AV04 Red pilot light head ZB5AV6 Mounting collar with light module 25501-00003 LED 65170-166-24 Power On legend plate ZBZ32 Legend plate holder
	Green AFC Run	ZB5AV03 Green pilot light head [1] ZB5AV6 Mounting collar with light module [2] 25501-00005 LED 65170-166-42 AFC Run legend plate ZBZ32 Legend plate holder
	Yellow Fault	ZB5AV05 Amber pilot light head [1] ZB5AV6 Mounting collar with light module [2] 25501-00004 LED 65170-166-39 Fault legend plate ZBZ32 Legend plate holder
	Yellow Auto	ZB5AV05 Amber pilot light head [1] ZB5AV6 Mounting collar with light module [2] 25501-00004 LED 65170-166-08 Auto legend plate ZBZ32 Legend plate holder
B08 Pilot Light Cluster Option #2	Red Power On	ZB5AV04 Red pilot light head ZB5AV6 Mounting collar with light module 25501-00003 LED 65170-166-24 Power On legend plate ZBZ32 Legend plate holder
	Green AFC Run	ZB5AV03 Green pilot light head [1] ZB5AV6 Mounting collar with light module [2] 25501-00005 LED 65170-166-42 AFC Run legend plate ZBZ32 Legend plate holder
	Yellow Fault	ZB5AV05 Amber pilot light head [1] ZB5AV6 Mounting collar with light module [2] 25501-00004 LED 65170-166-39 Fault legend plate ZBZ32 Legend plate holder
	Yellow Bypass	ZB5AV05 Amber pilot light head [1] ZB5AV6 Mounting collar with light module [2] 25501-00004 LED 65170-166-37 Bypass legend plate ZBZ32 Legend plate holder
C08 Pilot Light Cluster Option # 3	Red Power On	ZB5AV04 Red pilot light head ZB5AV6 Mounting collar with light module 25501-00003 LED 65170-166-24 Power On legend plate ZBZ32 Legend plate holder
	Green AFC Run	ZB5AV03 Green pilot light head [1] ZB5AV6 Mounting collar with light module [2] 25501-00005 LED 65170-166-42 AFC Run legend plate ZBZ32 Legend plate holder
	Yellow Fault	ZB5AV05 Amber pilot light head [1] ZB5AV6 Mounting collar with light module [2] 25501-00004 LED 65170-166-39 Fault legend plate ZBZ32 Legend plate holder

Table 12: Light Options *(continued)*

Light Option	Description	Parts List
D08 Pilot Light Cluster Option #4	Red Power On	ZB5AV04 Red pilot light head ZB5AV6 Mounting collar with light module 25501-00003 LED 65170-166-24 Power On legend plate ZBZ32 Legend plate holder
	Yellow Fault	ZB5AV05 Amber pilot light head [1] ZB5AV6 Mounting collar with light module [2] 25501-00004 LED 65170-166-39 Fault legend plate ZBZ32 Legend plate holder
	Green AFC Forward	ZB5AV03 Green pilot light head [1] ZB5AV6 Mounting collar with light module [2] 25501-00005 LED 65170-166-15 Forward legend plate ZBZ32 Legend plate holder
	Green AFC Reverse	ZB5AV03 Green pilot light head [1] ZB5AV6 Mounting collar with light module [2] 25501-00005 LED 65170-166-27 Reverse legend plate ZBZ32 Legend plate holder
E08 Pilot Light Cluster Option #5	Red Power On	ZB5AV04 Red pilot light head ZB5AV6 Mounting collar with light module 25501-00003 LED 65170-166-24 Power On legend plate ZBZ32 Legend plate holder
	Green AFC Run	ZB5AV03 Green pilot light head [1] ZB5AV6 Mounting collar with light module [2] 25501-00005 LED 65170-166-42 AFC legend plate ZBZ32 Legend plate holder
	Yellow Fault	ZB5AV05 Amber pilot light head [1] ZB5AV6 Mounting collar with light module [2] 25501-00004 LED 65170-166-39 Fault legend plate ZBZ32 Legend plate holder
	Blue Hand	ZB5AV06 blue pilot light head [1] ZB5AV6 Mounting collar with light module [2] 25501-00006 LED 65170-166-16 Hand legend plate ZBZ32 Legend plate holder
	Yellow Auto	ZB5AV05 Amber pilot light head [1] ZB5AV6 Mounting collar with light module [2] 25501-00004 LED 65170-166-08 Auto legend plate ZBZ32 Legend plate holder
F08 Pilot Light Cluster Option #6	Red Power On	ZB5AV04 Red pilot light head ZB5AV6 Mounting collar with light module 25501-00003 LED 65170-166-24 Power On legend plate ZBZ32 Legend plate holder
	Green AFC Run	ZB5AV03 Green pilot light head [1] ZB5AV6 Mounting collar with light module [2] 25501-00005 LED 65170-166-42 AFC Run legend plate ZBZ32 Legend plate holder
	Yellow Fault	ZB5AV05 Amber pilot light head ZB5AV6 Mounting collar with light module 25501-00004 LED 65170-166-39 Fault legend plate ZBZ32 Legend plate holder
	Yellow Communication	ZB5AV05 Amber pilot light head ZB5AV6 Mounting collar with light module 25501-00004 LED 65170-170-39 Communication legend plate ZBZ32 Legend plate holder

Notes for Table 12:

1. If option Q10 (push-to-test pilot lights) is selected, the following pilot light operators are used:
   ZB5AW35 replaces ZB5AV05
   ZB5AW33 replaces ZB5AV03
   ZB5AW36 replaces ZB5AV06
2. If option Q10 (push-to-test pilot lights) is selected, ZB5AW065 (mounting collar with light module and 1 N.O. and 1 N.C. contact) replaces ZB5AV6 (mounting collar with light module).

OPTION CARDS

NOTE: Refer to the notes on pages 12 and 13 for rules governing component selection.

Notes for Table 13:

1. PowerSuite software is required for configuring the power converter. Options pending availability.

These cards must be programmed by the customer.

Table 13: Option Cards (Optional Selection)

Card Option	Name	Description	Connector
A09	Modbus Plus™	Factory-installed plug-in Modbus Plus card VW3A3302.	Equipped with one 9-pin female SUB-D connector
B09	Modbus®/Uni-Telway™ Serial Communication	Factory-installed plug-in Modbus card VW3A3303.	Equipped with one 9-pin female SUB-D connector
C09	Metasys® N2 Serial Communication	Factory-installed plug-in Metasys N2 card VW3A3313.	Equipped with one 9-pin female SUB-D connector
D09	Ethernet	Factory-installed plug-in Ethernet card VW3A3310 with RJ45 connector port.	Equipped with one RJ45 connector
E09	LonWorks® Serial Communication	Factory-installed LonWorks card VW3A3312.	Equipped with one removable 3-way screw connector
F09	DeviceNet™	Factory-installed plug-in DeviceNet card VW3A3309 and user terminal block TB5.	Equipped with one removable screw connector
G09	Profibus	Factory-installed Profibus card VW3A3307.	Equipped with one 9-pin female SUB-D connector
H09	I/O Extension Card	Factory-installed I/O extension card VW3A3202. Adds 2 analog output, 4 logic inputs, 2 logic output, and 1 differential analog input.	—
J09	Apogee® P1	Factory-installed P1 card VW3A3314.	Equipped with one 9-pin female SUB-D connector
K09	BACnet®	Factory-installed BACnet card VW3A3315.	Equipped with one 9-pin female SUB-D connector
L09	Interbus S	Factory-installed Interbus S card VW3A3304.	Equipped with one 9-pin male SUB-D connector and one 9-pin female SUB-D connector
M09	FIPIO®	Factory-installed FIPIO card VW3A3311.	Equipped with one 9-pin male SUB-D connector
O09 [1]	Bluetooth® USB	Factory-supplied Bluetooth® USB device VW3A8115.	—
P09 [1]	Bluetooth Modbus	Factory-supplied Bluetooth Modbus adapter VW3A8114.	—
Q09 [1]	Bluetooth USB and Modbus	Factory-supplied Bluetooth USB device VW3A8115 and Modbus adapter VW3A8114.	—

MISCELLANEOUS OPTIONS

NOTE: Refer to the notes on pages 12 and 13 for rules governing component selection.

Notes for Table 14:

1. Gray-shaded options require order engineering.
2. One N.O. and one N.C. Form C Drive Run contact is provided as standard on the user terminal block.
3. One N.O. and one N.C. Form C Drive Fault contact is provided as standard on the user terminal block.
4. If the motor space heater (U10) and seal water solenoid (V10) are both required, additional control power VA (F10) is also supplied.
5. See page 42 to locate customer interface terminal blocks.

Table 14: Miscellaneous Options (Optional Selection)

Misc. Option	Name	Description
C10	3–15 PSI transducer	Allows the controller to follow a user-supplied 3–15 PSIG input.
D10	Omit Door-Mounted Graphic Display Terminal	The graphic display terminal is not supplied. To alter the programming of the power converter, the user must order either a separate graphic display terminal or PowerSuite® software.
E10	Smoke Purge Relay	Provides a smoke purge operating mode controlled by a user-supplied 120 Vac signal wired to terminals 48 and 49 of terminal block TB1 [5].
F10 [4]	Additional 200 VA Control Power Transformer	Provides a 50 VA larger control transformer for use with 120 Vac connected to terminals 1 to 50 of terminal block TB1 [5].
G10	cUL Listing	Provides Canadian cUL certification when required by local code requirements.
H10	Seismic Qualified	Provides a certification label and hardware qualified to seismic rating ICC ES AC156 acceptance criteria test protocol with an importance factor of 1.0.
I10	Permanent Wire Marker Sleeves	Provides permanent wire-sleeve markers.
J10	0–10 Vdc Auto Speed Reference	Programmed for a 0–10 Vdc user-supplied auto-speed reference signal to the AI2 input.
K10	Additional N.O. Aux. Drive Run Contact [2]	Adds 1 N.O. controller run contact on terminals 57 and 58 of terminal block TB1 [5].
L10	Additional N.C. Aux. Drive Fault Contact [3]	Adds 1 N.C. controller fault contact on terminals 59 and 60 of terminal block TB1 [5].
M10	1 N.O. Aux. Bypass Run Contact	Provides 1 N.O. bypass run contact on terminals 61 and 62 of terminal block TB1 [5].
O10	1 N.O. Aux. Auto Mode Contact	Provides 1 N.O. auto mode contact on terminals 63 and 64 of terminal block TB1 [5].
P10	AFC Fault Reset	Factory-installed, door-mounted push button to reset the controller fault when Hand-Off-Auto is not used.
Q10	Push-to-Test Pilot Lights	Provides push-to-test function on all pilot lights except Power On.
R10	Auto Transfer to Bypass	Provides an automatic transfer to bypass operation when the drive controller faults. A selector switch enables or disables this function.
S10	Motor Elapsed-Time Meter	Provides an elapsed-time meter to record the motor running time. Runs whenever the motor is running.
T10	Emergency Stop	Provides a door-mounted, maintained-off, emergency-stop red mushroom push button with turn-to-reset feature.
U10 [4]	Motor Space Heater Sequencing	Provides 50 VA/120 V to terminals 45 to 50 of terminal block TB1 [5] for motor space heater whenever the motor is not running.
V10 [4]	Seal Water Solenoid	Provides 50 VA/120 V to terminals 43 to 50 of terminal block TB1 [5] whenever the motor is running.
W10	Check Valve Sequencing	Provides an automatic shutdown of the drive controller when the user-supplied N.C. contact from the check valve limit switch does not open within 5 s after the motor starts. The user-supplied limit switch contact connects to terminals 46 and 47 of terminal block TB1 [5].
Y10	54-in. Wide Enclosure	Provides an enclosure 54 in. (1372 mm) wide.
Z10	24 Vdc Power Supply	Provides 24 Vdc, 300 mA power supply at terminals 0 (+) to N (–) of terminal block TB1 [5].
310	Order Engineered (OE)	For internal use only.
610	I.D. Engraved Nameplates	Provides an engraved lamacoid nameplate attached to the front door of the enclosure (engraved per user request at time of order).

TOTAL DISSIPATED WATTS LOSS

The total dissipated watts loss in Table 15 is provided for sizing the environment HVAC cooling requirements based on worst-case operating conditions for Type 1 and Type 1B enclosures.

Table 15: Maximum Total Dissipated Watts Loss

Drive Controller Catalog No. [1]	Constant Torque		Variable Torque	
	hp	Total Dissipated Watts Loss	hp	Total Dissipated Watts Loss
CPDN▼4◊_	40	2478	—	—
CPDP▼4◊_	50	2674	50	2674
CPDQ▼4◊_	60	2838	60	2838
CPDR▼4◊_	75	3027	75	3027
CPDS▼4◊_	100	4776	100	3756
CPDT▼4◊_	125	6333	125	4843
CPDU▼4◊_	150	6637	150	6637
CPDW▼4◊_	200	7074	200	7074
CPDX▼4◊_	250	9582	250	9582
CPDY▼4◊_	300	11216	300	11216
CPDZ▼4◊_	350	11684	350	11684
CPD4▼4◊_	400	12894	400	12894
CPD5▼4◊_	450	13793	450	13793
CPD6▼4V_	—	—	500	14691

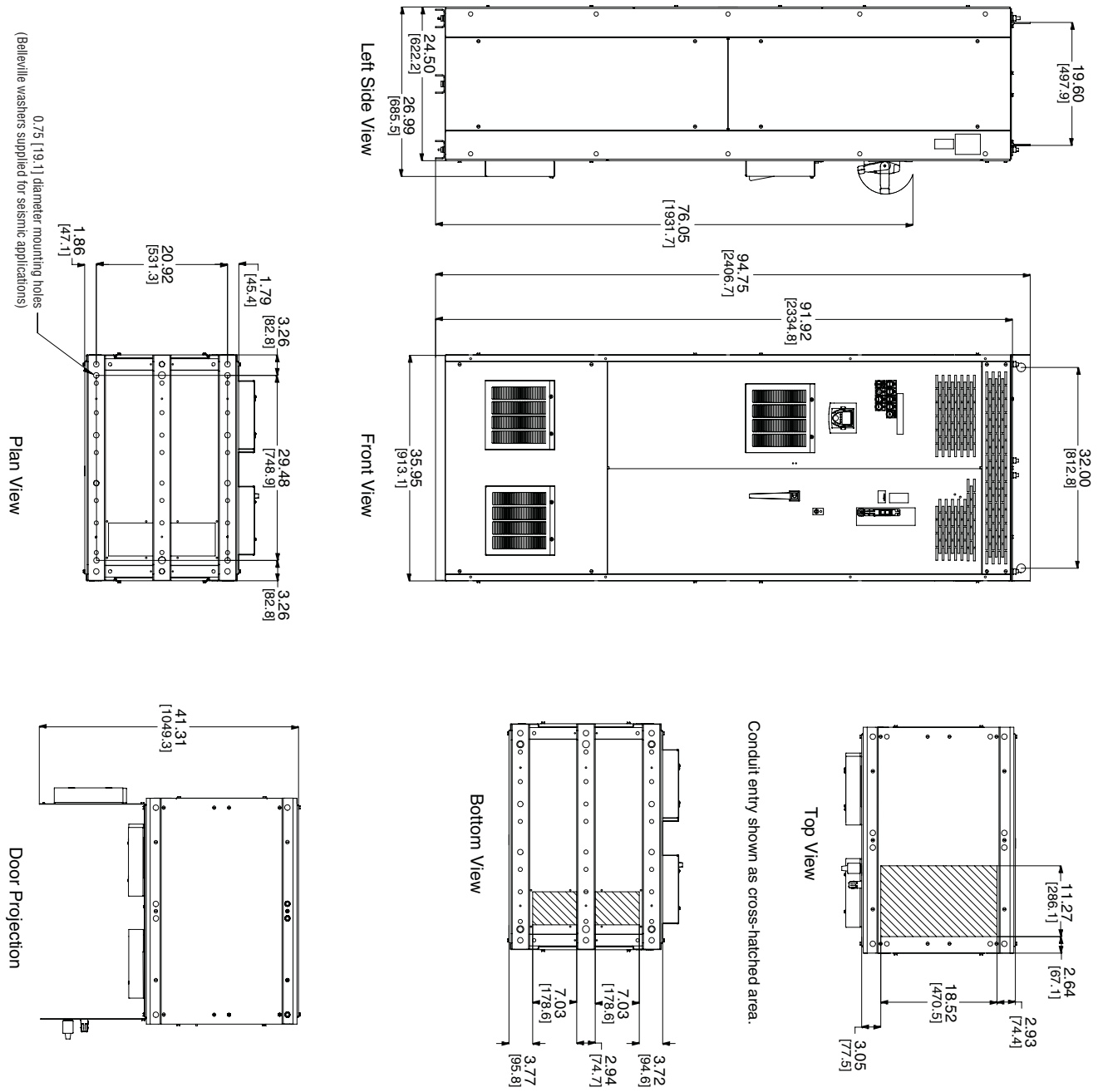
Note for Table 15:

1. "▼" can be "G" or "B". "G" denotes a Type 1 enclosure; "B" denotes a Type 1B enclosure with fan filters.
"◊" can be "C" or "V". "C" denotes a constant torque controller; "V" denotes a variable torque controller. "_" indicates that the catalog number continues. See pages 12 and 13 for a detailed description of catalog numbers.

MOUNTING DIMENSIONS

The dimensions shown are for devices without a bypass. For devices with the bypass option, please contact the factory for dimension drawings.

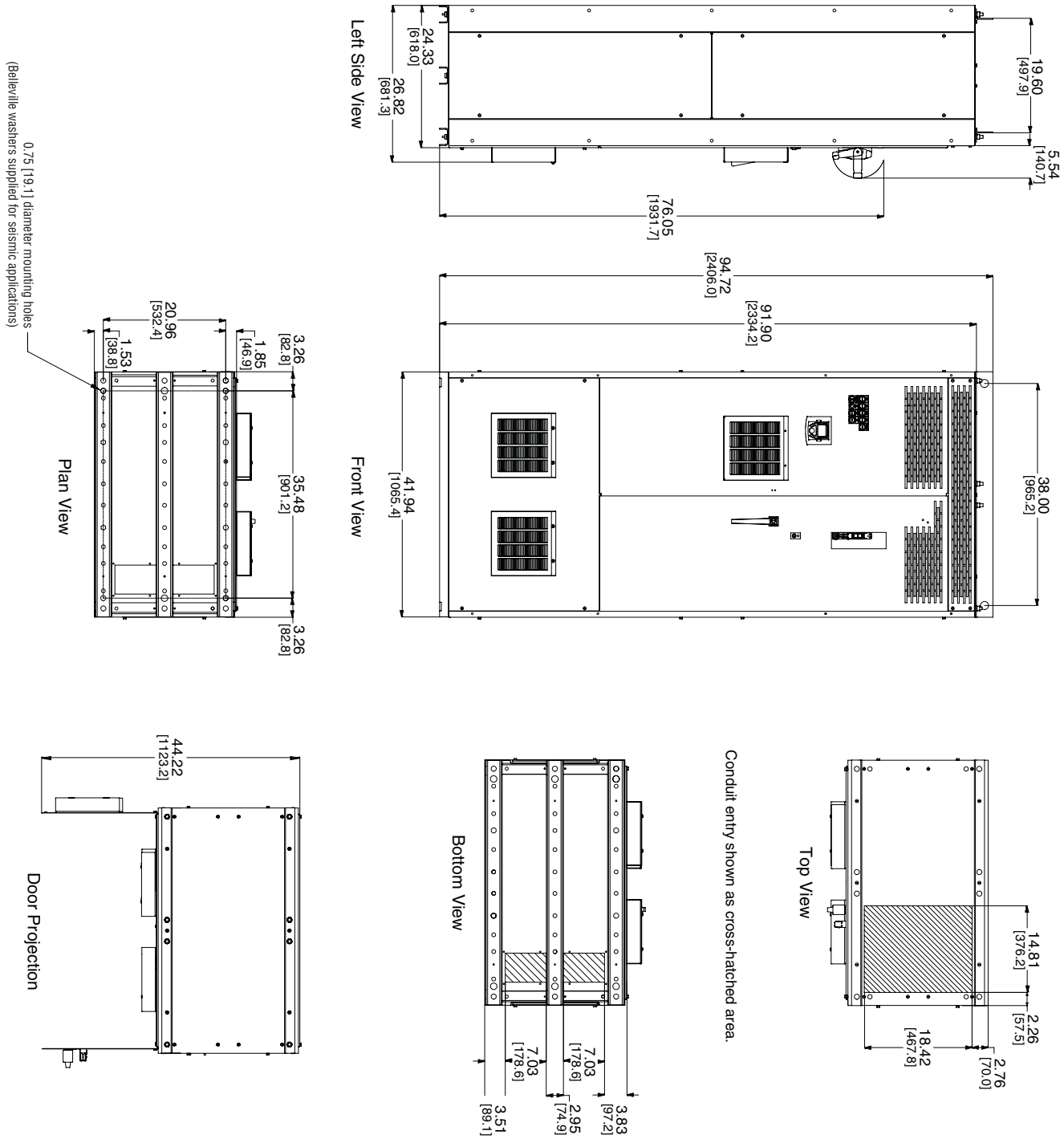
Figure 2: Mounting Information for 40–100 hp CT or 50–125 hp VT Controllers



NOTE: A minimum of 12 in. [305 mm] of free space is required above the enclosure for proper cooling. Sidewall clearance is not required. During operation, maintain the temperature of the air surrounding the enclosure within the range of 32–104 °F (0–40 °C).

Dimensions: Inches [mm]

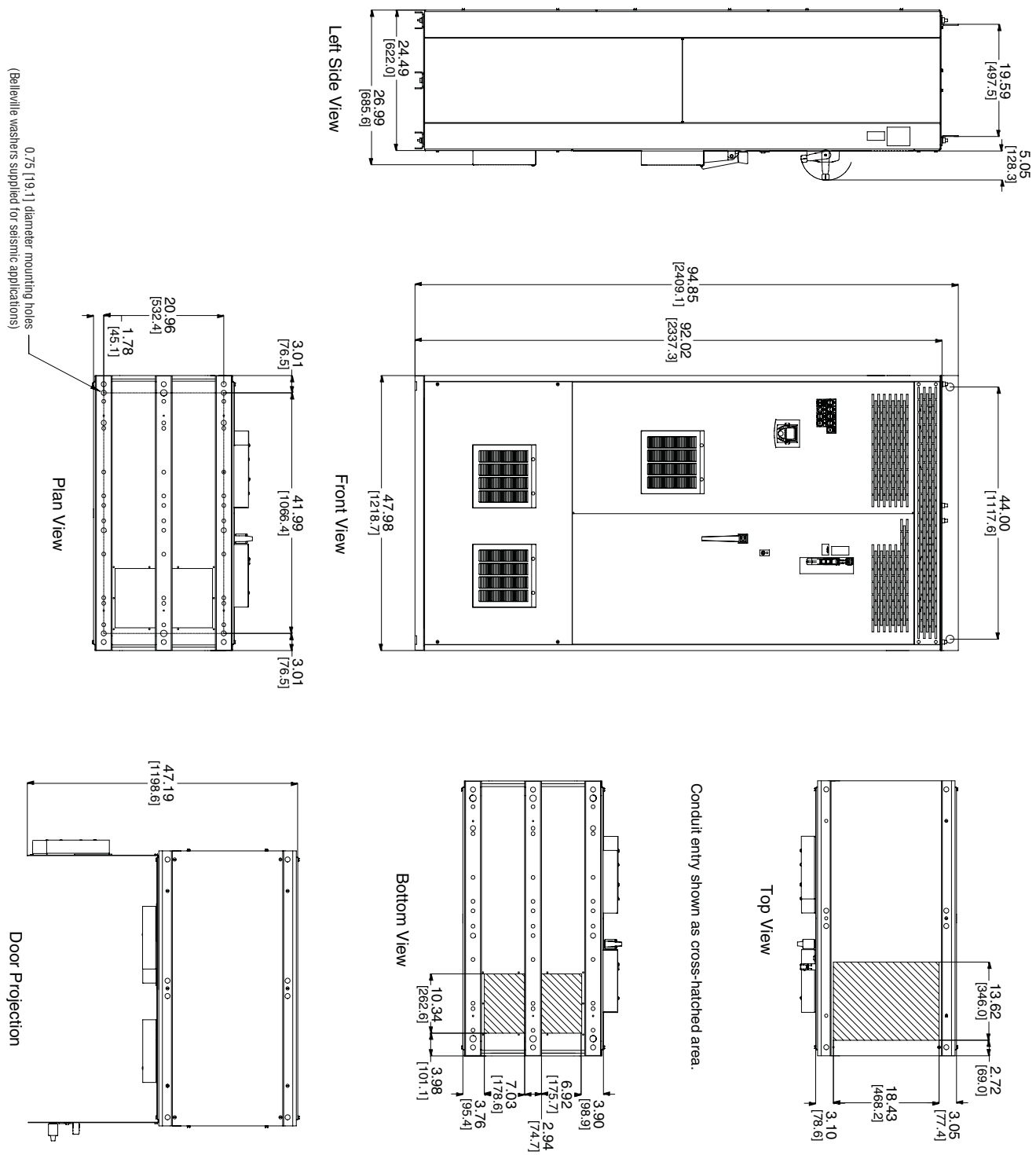
Figure 3: Mounting Information for 125–200 hp CT or 150–250 hp VT Controllers



NOTE: A minimum of 12 in. [305 mm] of free space is required above the enclosure for proper cooling. Sidewall clearance is not required. During operation, maintain the temperature of the air surrounding the enclosure within the range of 32–104 °F (0–40 °C).

Dimensions: Inches [mm]

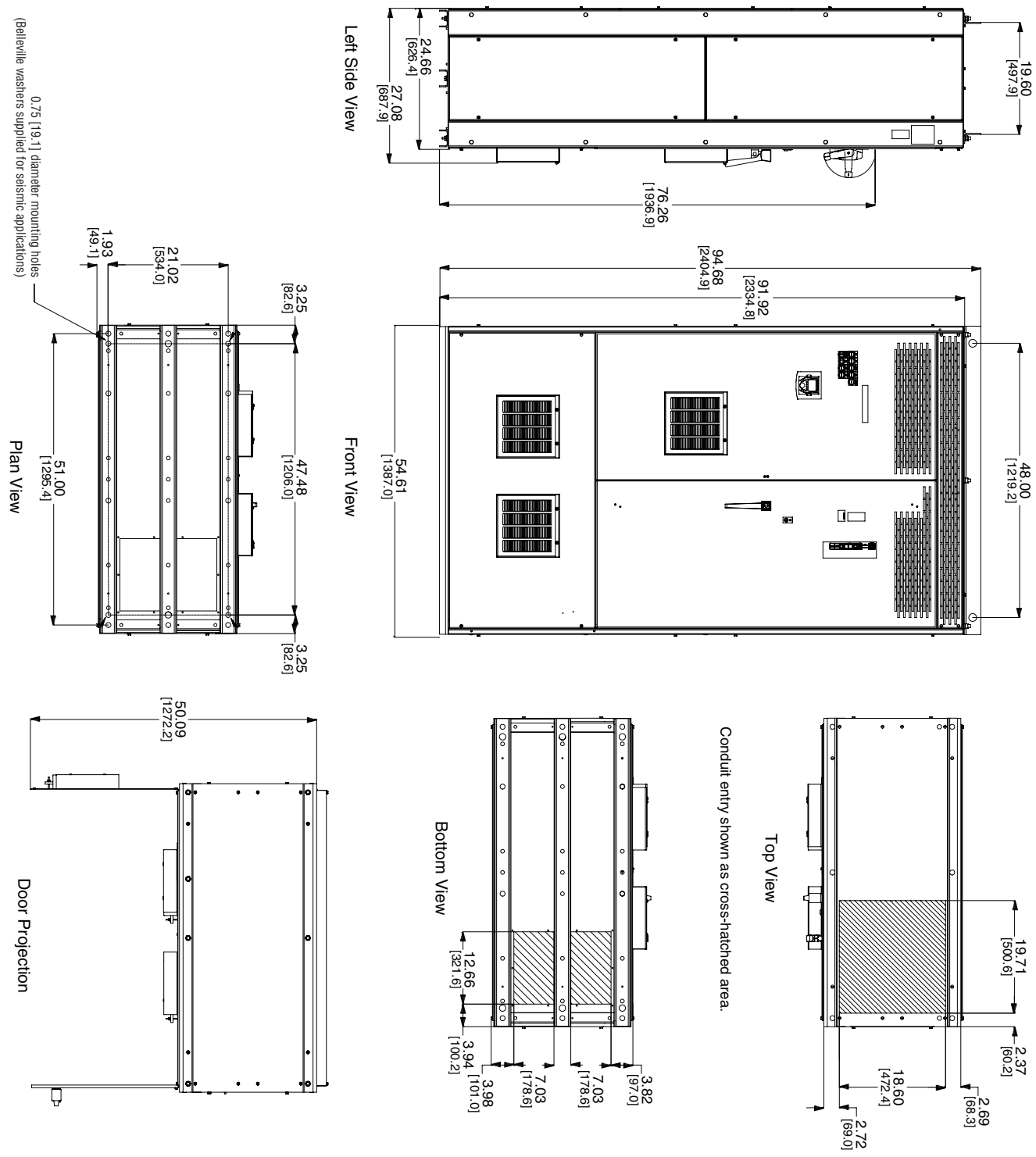
Figure 4: Mounting Information for 250–450 hp CT or 300–500 hp VT Controllers [48 in. (1219 mm) Wide]



NOTE: A minimum of 12 in. [305 mm] of free space is required above the enclosure for proper cooling. Sidewall clearance is not required. During operation, maintain the temperature of the air surrounding the enclosure within the range of 32–104 °F (0–40 °C).

Dimensions: Inches [mm]

Figure 5: Mounting Information for Y10 Option, 400–450 hp CT or 450–500 hp VT Controllers [54 in. (1372 mm) Wide]



NOTE: A minimum of 12 in. [305 mm] of free space is required above the enclosure for proper cooling. Sidewall clearance is not required. During operation, maintain the temperature of the air surrounding the enclosure within the range of 32–104 °F (0–40 °C).

Dimensions: Inches [mm]

SECTION 2— RECEIVING, INSTALLATION, AND START-UP

PRELIMINARY INSPECTION

⚠ CAUTION

DAMAGED EQUIPMENT

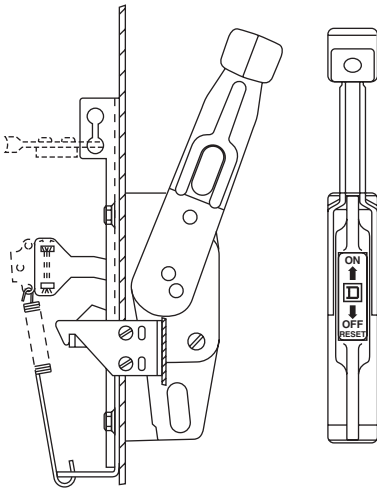
Do not operate any drive controller that appears damaged.

Failure to follow this instruction can result in injury or equipment damage.

The drive controller must be thoroughly inspected before it is stored or installed. Upon receipt:

A. Remove the drive controller from its packaging and visually inspect the exterior for shipping damage.
B. Ensure that the Class, Type, and Modification (options) specified on the drive controller nameplate (see Figure 1 on page 11) agree with the packaging slip and corresponding purchase order.
C. If you find any shipping damage, notify the carrier and your sales representative.
D. If you plan to store the drive controller after receipt, replace it in its original packaging material and follow the storage temperature and humidity specifications listed in Table 10 on page 17.

Figure 6: Circuit Breaker Handle Assembly



Before installation:

1. Open the drive controller door by moving the circuit breaker handle assembly to the Off position; refer to Figure 6.
2. Visually verify that all internal mounting and terminal connection hardware is properly seated, securely fastened, and undamaged.
3. Visually verify that the control board and any communication boards on the power converter are properly seated, securely fastened, and undamaged. Verify that the internal plugs and wiring connections are tight. Inspect all connections for damage.
4. Verify that all relays and fuses are installed and fully seated.
5. Close and secure the drive controller door.

HANDLING THE DRIVE CONTROLLER

⚠ WARNING

HANDLING AND LIFTING HAZARDS

Keep the area below any equipment being lifted clear of all personnel and property. Use the lifting method shown in Figure 7.

Failure to follow this instruction can result in death, serious injury, or equipment damage.

Drive controllers are shipped on a pallet. Store the drive controller in its shrink-wrapped packaging until it is at the final installation site. The packaging protects the drive controller and prevents damage to its exterior.

Handle the drive controller carefully.

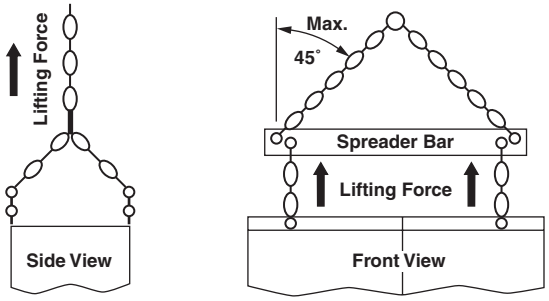
- Avoid damage to the internal components, frame, and exterior.
- Prevent the drive controller from tipping.

All Class 8839 Type CPD drive controllers require mechanical lifting with a crane or forklift. The lifting means must include appropriate structural strength and cross-bracing to allow full handling of the weight of the unit. The preferred lifting method is with a hoist, as follows:

- Attach a spreader bar to the lifting bracket mounted on top of the drive controller (see Figure 7).
- Do not allow the device to swing more than 10° from vertical while lifting.
- Mount the drive controller on a solid, flat surface.
- Secure the drive controller with hardware of a sufficient size and type.

For alternate lifting methods, refer to instruction bulletin 30072-200-50, *Handling Electrical Control Equipment*.

Figure 7: Hoisting Class 8839 Type CPD Controllers



INSTALLATION

MECHANICAL INSTALLATION

Refer to Table 10 beginning on page 17 for specifications.

- Secure all four appropriate corners of the controller with hardware of a sufficient size and type for the controller weight. These corners are on the base support of the enclosure. For locations, see pages 25–28.
- Mount the drive controller on a flat, solid surface capable of supporting the controller weight.
- Mount the drive controller in a location that provides air access into the lower front of the controller.
- For seismic qualified products (Mod H10), follow the mounting precautions stated on the safety labels attached to the device.
- If drilling for conduit entry, exercise care to prevent metal chips from falling on parts and electronic printed wiring boards.
- See Figures 2–5 on pages 25–28 for mounting dimensions and clearances, and location of conduit entry areas.
- Do not mount the drive controller on hot surfaces.
- Do not mount the drive controller in direct sunlight.

Seismic Qualification Mounting Criteria

Seismic qualification (MOD H10) harmonizes the following standards in compliance with ICC ES AC156 acceptance criteria test protocol with an importance factor of 1.0.

- 2003 IBC (International Building Code)
- NFPA 5000 (Building Code—National Fire Protection Agency)
- 2001 CBC (Canadian Building Code)
- 1997 UBC (Uniform Building Code)
- 1999 NBC (BOCA National Building Code)
- 1999 SBC (Standard Building Code)
- ASCE 7 (American Society of Civil Engineers)

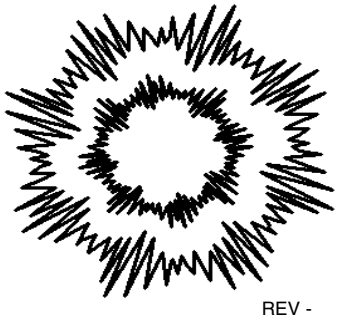
For seismic rating installation compliance, follow the specific labels attached to the drive controller and refer to Figures 8–10 on pages 32–33 for anchorage, lateral bracing, and mounting guidelines, using SAE Grade 5 hardware bolts and washers. These guidelines apply for all Type 1 construction.

Figure 8: Seismic Qualification Labels

Certification Label

SEISMIC QUALIFIED

2003 IBC
NFPA 5000
2001 CBC
1997 UBC
1999 NBC
1999 SBC
ASCE-7 02



80438-880-04 REV -

Danger Label

DANGER

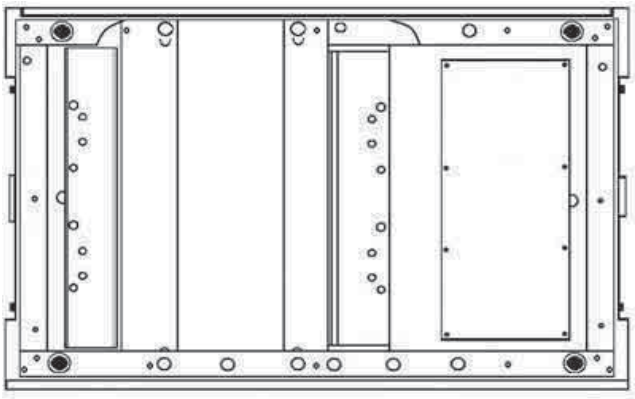
HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

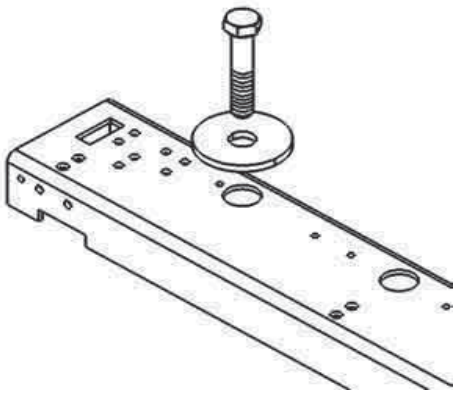
- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- This equipment must be installed and serviced only by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors, and covers before turning on power to this equipment.

Failure to follow these instructions will result in death or serious injury.

29513-22650

Figure 9: Seismic Qualification Label: Base Mounting for Floor-Mounted Units, 40–450 hp CT, 50–500 hp VT





◉ Seismic Anchorage Location

Seismic Anchorage Requirements

To maintain seismic qualification, each individual section must be anchored at the floor as shown above.

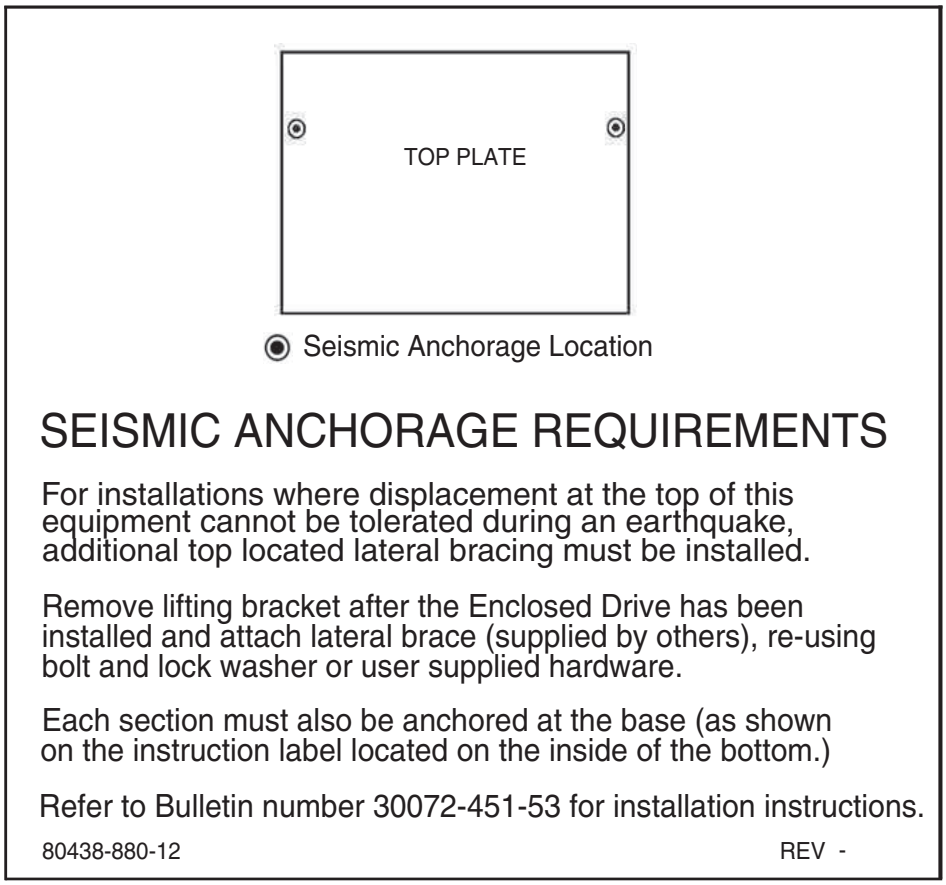
For installations where displacement at the top of this equipment cannot be tolerated during an earthquake, additional top located lateral bracing must be installed.

Use 3/4 " grade 5 bolts (supplied by others) and the appropriate Belleville spring washers (supplied with equipment). In order to develop full strength of the anchor, torque bolts to the value specified by the anchor manufacturer.

Refer to Bulletin number 30072-451-53 for installation instructions.

80438-880-13 REV -

Figure 10: Seismic Qualification Label: Lateral Bracing for Floor-Mounted Units, 40–450 hp CT, 50–500 hp VT



ELECTRICAL INSTALLATION

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- Turn off all power (main and remote) before installing the equipment.
- Read the hazard statements on page 3 of this manual.

Failure to follow these instructions will result in death or serious injury.

General Wiring Practices

Before wiring, perform the bus voltage measurement procedure on page 38. Good wiring practice requires the separation of control circuit wiring from all power wiring. Power wiring to the motor must have the maximum possible separation from all other power wiring, whether from the same drive controller or other drive controllers. **Do not run power and control wiring, or multiple power wiring, in the same conduit**. This separation reduces the possibility of coupling electrical transients from power circuits into control circuits or from motor power wiring into other power circuits.

⚠ CAUTION

IMPROPER WIRING

Follow the wiring practices described in this document in addition to those already required by the National Electrical Code and local codes.

Failure to follow this instruction can result in injury or equipment damage.

Follow the practices below when wiring the drive controller:

- Use metallic conduit for all drive controller wiring. Do not run control and power wiring in the same conduit.
- Separate metallic conduits carrying power wiring or low-level control wiring by at least 3 inches (76 mm).
- Separate existing, non-metallic conduits or cable trays used to carry power wiring from metallic conduit carrying low-level control wiring by at least 12 inches (305 mm).
- Whenever power and control wiring cross, the metallic conduits and non-metallic conduits or trays must cross at right angles.
- Equip all inductive circuits near the controller (relays, contactors, solenoid valves) with noise suppressors, or connect them to a separate circuit.

INPUT POWER

The drive controller operates from a three-phase, 460 Vac ±10% supply connected to the input of the controller.

BRANCH CIRCUIT CONNECTIONS

All branch circuit components and equipment such as feeder cables, disconnect devices, and protective devices must be rated for either the maximum input current of the drive controller, or the MFLC, whichever is greater. The input current and MFLC are printed on the nameplate (see Figure 1 on page 8). Refer to Tables 8–9 (pages 15–16) for drive controller input currents. Refer to Tables 20–24 (pages 43–45) for lug data and wire range of drive controller input terminals L1, L2, and L3.

- For devices with two disconnects, connect input power leads L1, L2, and L3 to the labeled circuit breaker in the bypass compartment.
- For all other products, connect input power leads L1, L2, and L3 to the input of the circuit breaker.

⚠ WARNING

IMPROPER OVERCURRENT COORDINATION

- Properly coordinate all protective devices.
- Do not connect the drive controller to a power feeder whose short circuit capacity exceeds the short-circuit current rating listed on the drive controller nameplate.

Failure to follow these instructions can result in death or serious injury.

CAUTION

IMPROPER WIRING

The drive controller will be damaged and the warranty voided if input line voltage is applied to the output terminals (T1, T2, T3). Check the power connections before energizing the drive controller.

Failure to follow this instruction can result in equipment damage.

GROUNDING

Ground the drive controller according to the National Electrical Code and all local codes. To ground the drive controller:

- Connect a copper wire from the ground bar terminal to the power system ground.
- Verify that the resistance to ground is 1 Ω or less. Improper grounding causes intermittent and unreliable operation.
- Do not remove any internal ground wires or connections.

⚠ DANGER

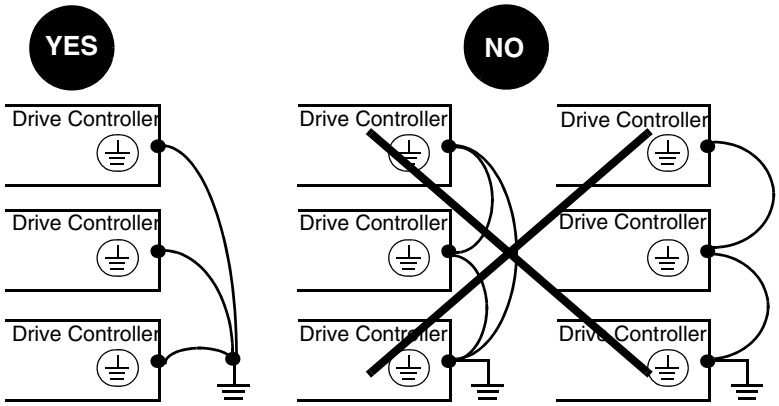
HAZARD OF ELECTRIC SHOCK

- Ground equipment using the provided ground connection point as shown in Figure 13 on page 42. Properly ground the drive controller panel before applying power.
- Do not use metallic conduit as a ground conductor.

Failure to follow these instructions will result in death or serious injury.

Ground multiple drive controllers as shown in Figure 11. Use one grounding conductor per device. Do not loop ground conductors or install them in series.

Figure 11: Grounding Multiple Drive Controllers



OUTPUT WIRING

Size the ampacity of motor power conductors according to the motor full load current, National Electrical Code, and applicable local codes.

Connect motor conductors to the lugs provided, and connect the motor ground to the ground bar provided.

If the controller is supplied with a bypass circuit, connect the motor conductors to T1, T2, and T3 on the overload relay. If the controller is supplied without a bypass circuit, connect the motor conductors to terminals T1, T2, and T3 on the power converter. See Figure 13 on page 42 for location. Refer to Tables 20–24 (pages 43–45) for lug data and wire range. Refer to the nameplate for torque requirements.

The drive controller is sensitive to the amount of capacitance (either phase-to-phase or phase-to-ground) present on the output power conductors. If excessive capacitance is present, the drive controller may trip on overcurrent.

Output Cable

Follow the guidelines below when selecting output cable:

- Cable type: the cable selected must have a low capacitance phase-to-phase and phase-to-ground. Do not use mineral-impregnated cable because it has a very high capacitance. Immersion of cables in water increases capacitance.
- Cable length: the longer the cable, the greater the capacitance. Cable lengths greater than 150 ft (50 m) may cause ground faults. For installation where cable capacitances may be a problem, a reactor or motor protection filter can be installed between the drive controller and the motor.

  Refer to the guidelines in Table 16 on page 37 for the maximum cable length for typical drive/motor applications. These limits are based on the maximum recommended peak voltage that can be allowed at the motor terminals, due to the reflected wave phenomenon.

  The recommended peak voltage is primarily determined by:

  — the degree of impedance mismatch between the power conductor and the motor

  — the dV/dt of the specific semiconductors used in the inverter section

  These factors vary by horsepower.

Many variables affect the performance of the drive, motor, and cables in long-lead applications. Motor protection filters can provide substantial benefits for:

— AC drives rated 460 V or higher

— Existing general-purpose motors subject to retrofit with an AC drive

— Shielded cables

Motors compliant with NEMA MG-1 Part 31 are recommended but not required. Consult the motor manufacturer or vendor literature to address any specific limitations governing the application.

- Proximity to other output cables: because of high frequency switching and increased capacitance, the drive controller may fault under some conditions.
- **Do not use lightning arrestors or power factor correction capacitors on the output of the drive controller.**

> **⚠ CAUTION**
>
> **INSUFFICIENT OUTPUT INDUCTANCE**
>
> For proper drive controller short circuit protection, certain values of inductance may be required in the output power wiring. If necessary, increase inductance using the power wiring or auxiliary inductors.
>
> **Failure to follow this instruction can result in injury or equipment damage.**

A minimum inductance is needed to protect the drive controller output from short circuits. Provide at least 20 in. (508 mm) of cable at the drive controller output (T1, T2, and T3).

Table 16: Maximum Cable Length for Standard Duty Motors

Drive Controller Rating hp @ 480 V	Type of Cable	Approximate length of motor cables, ft (m)							
		20 in. to 164 ft (0.5 to 50 m)	164–328 (50–100)	328–492 (100–150)	492–656 (150–200)	656–984 (200–300)	984–1,312 (300–400)	1,312–1,968 (400–600)	1,968–3,280 (600–1000)
40–100 CT 50–125 VT	Shielded	—		3% Load Reactor	Motor Protection Filter				
	Unshielded	—			3% Load Reactor		Motor Protection Filter		Consult Factory
125–450 CT 150–500 VT	Shielded	—		3% Load Reactor		Motor Protection Filter			
	Unshielded	—		3% Load Reactor			Motor Protection Filter		

DC BUS VOLTAGE MEASUREMENT PROCEDURE

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- Read and understand the bus voltage measurement procedure before performing the procedure. Measurement of bus capacitor voltage must be performed by qualified personnel.
- Many parts in this drive controller, including printed wiring boards, operate at line voltage. DO NOT TOUCH. Use only electrically insulated tools.
- DO NOT short across DC bus capacitors or touch unshielded components or terminal strip screw connections with voltage present.

Failure to follow these instructions will result in death or serious injury.

Refer to the inside front cover for additional safety information.

To measure the DC bus capacitor voltage:

1. Observe the lockout/tagout procedures as identified in OSHA Standard 29 CFR, Subpart J covering:
   - — 1910.147: The control of hazardous energy (lockout/tagout).
   - — 1910.147: App A, Typical minimal lockout procedures.
2. Open the disconnect between the input line and the drive controller. Lock the disconnect in the open position and install a “Do Not Turn On” sign. Open the circuit breaker disconnect located on the front of the drive controller. Also, be sure to remove all external control power that may be present such as on the control board and the option board terminals.
3. Wait 15 minutes for the DC bus capacitors to discharge.
4. Open the door of the drive controller.
5. Set a properly rated voltmeter to the 1000 Vdc scale. Measure the voltage between the PA/+ and PC/– terminals. The physical location of these terminals varies by the power converter model number, which is listed on the power converter nameplate.
6. Verify that the DC bus voltage has discharged below 45 V before servicing the drive controller. If the DC bus capacitors will not discharge below 45 V, contact your local Schneider Electric representative. **Do not operate the drive controller.**
7. After servicing the drive controller, close and secure the door.

WIRE ROUTING AND INTERCONNECTION

Wire Class

The Wire Class describes the compatibility of the field wiring terminal with the conductor material and insulation system. When used in conjunction with the required conductor current rating and controller ambient temperature rating, the Wire Class forms the basis for selecting a conductor size that limits the temperature on the conductor insulation at the field wiring terminal to acceptable limits. Although it is permissible to use conductors with operating temperatures exceeding those given by the Wire Class, conductor **size** must fall within the Wire Class limits.

Noise Class

The Noise Class categorizes the electromagnetic properties of the voltages and currents present. The Noise Class comprises the six categories shown in Table 17.

Table 17: Noise Class Categories

Noise Class	Definition
Quiet Wiring 1 (QW1)	High susceptibility to analog and digital control signals. Signals falling under this classification include digital communication/network circuits, controller analog I/O, and analog process signals.
Quiet Wiring 2 (QW2)	Medium susceptibility to analog and digital control signals. Signals falling under this classification include 24 Vdc and Vac control circuits.
Standard Wiring 1 (SW1)	Low susceptibility to control or power circuits rated less than 600 Vac (250 Vdc) and less than 15 A (voltage and current spectra are generally contained within 0.05–9 kHz). Signals falling under this classification include 120 Vac control circuits.
Standard Wiring 2 (SW2)	Power circuits rated greater than 15 A (voltage and current spectra are generally contained within 0.05–9 kHz). Signals falling under this classification include line power to controllers.
Standard Wiring 3 (SW3)	Reserved.
Pulse Wiring 1 (PW1)	Control or power circuits whose voltage or current spectra significantly exceed 9 kHz. Signals falling under this classification include motor and dynamic braking circuits fed from pulse width modulation (PWM) power converters.

Voltage Class

The Voltage Class categorizes the voltages present into recognized conductor insulation categories (30, 150, 300, and 600 V) for selection of the conductor voltage rating and physical segregation purposes.

Wiring Methods

Based on the Noise Class and Voltage Class of the conductors, apply the wiring methods in Table 18 to the drive controller system.

Table 18: Wire Routing and Interconnection

Wiring Methods and Considerations	Noise Class of Conductors				
	QW1	QW2	SW1	SW2	PW1
Conductor Grouping in Wireways/Conduits					
1. All conductors of 1 or 3 phase AC power circuits must be bundled to minimize stray magnetic fields.			X	X	X
2. All conductors of a DC power circuit must be bundled to minimize stray magnetic fields.			X	X	X
3. When paralleled conductors must be run in separate wireways or conduit, bundle conductors into groups that minimize stray magnetic fields.				X	X
4. Maintain conductor runs as short and direct as practical.	X	X	X	X	X
Separation of Circuits					
1. DO NOT run different Noise Class conductors in the same conduit.	X	X	X	X	X
2. DO NOT run different Voltage Class conductors in the same conduit unless all conductors are insulated for the maximum Voltage Class present.	X	X	X	X	X
3. All PW conductor groups must be individually segregated using metallic conduit.					X
4. Segregate all conductors by Noise Class. Use the following circuit separation when conductors can run parallel for more than 12 in. (305 mm)					
• Metallic conduit: 3 in. (76 mm) between QW and SW/PW	X	X	X	X	X
• Metallic tray: 3 in. (76 mm) between SW and PW			X	X	X
• Metallic tray: 6 in. (152 mm) between QW and SW/PW	X	X	X	X	X
• Against continuous metal surface: 3 in. (76 mm) between SW and PW			X	X	X
• Against continuous metal surface: 6 in. (152 mm) between QW and SW/PW	X	X	X	X	X
• Metallic conduit housing QW: 12 in. (305 mm) to non-metallic conduit SW/PW	X	X	X	X	X
• Non-metallic conduit: 3 in. (76 mm) between SW and PW			X	X	X
• Non-metallic conduit: 24 in. (610 mm) between QW and SW/PW	X	X	X	X	X
5. If QW and SW1 wiring must cross SW2 or PW1 wiring, the bundles must cross at right angles.	X	X	X	X	X
Common Mode Noise Issues					
1. Provide adjacent signal returns using twisted pair cable.	X	X			
2. Galvanically isolate signal and associated signal return path when possible.	X	X			
Shielding					
1. Use metallic conduit for all power and control circuits external to the controller enclosure.	X	X	X	X	X
2. Shields should be continuous and equipped with a drain wire.	X	X	X		
3. DO NOT group different Noise Class conductors within the same shield.	X	X	X	X	X
4. Minimize non-shielded portion of conductor at the ends of shielded cable.	X	X	X	X	X
5. When shielding AC or DC power conductors, group conductors to minimize magnetic field in shield.			X	X	X
Grounding					
1. Ground shields only at the controller end.	X	X	X	X	X
2. Use separate ground wire for each shield ground.	X	X	X	X	X
3. Provide a ground wire with all conductor groups whether in tray or conduit.			X	X	X
4. When multiple grounds must be made to a shielded power cable, the shield must have the same short-circuit current rating as the ground conductor in the power cable.			X	X	X
5. Terminate all power grounds and power shield grounds to the controller grounding point or bar.			X	X	X
6. Terminate all signal shield grounds to the terminals provided.	X	X			
7. Always supply a separate equipment-grounding conductor with the controller power feed. DO NOT depend on metallic conduit for ground connection.			X	X	X

COMPONENT LOCATIONS

Figure 12 illustrates the external components of the Class 8839 Type CPD controllers. See Figure 13 on page 42 for the location of the internal components.

Figure 12: External Component Locations

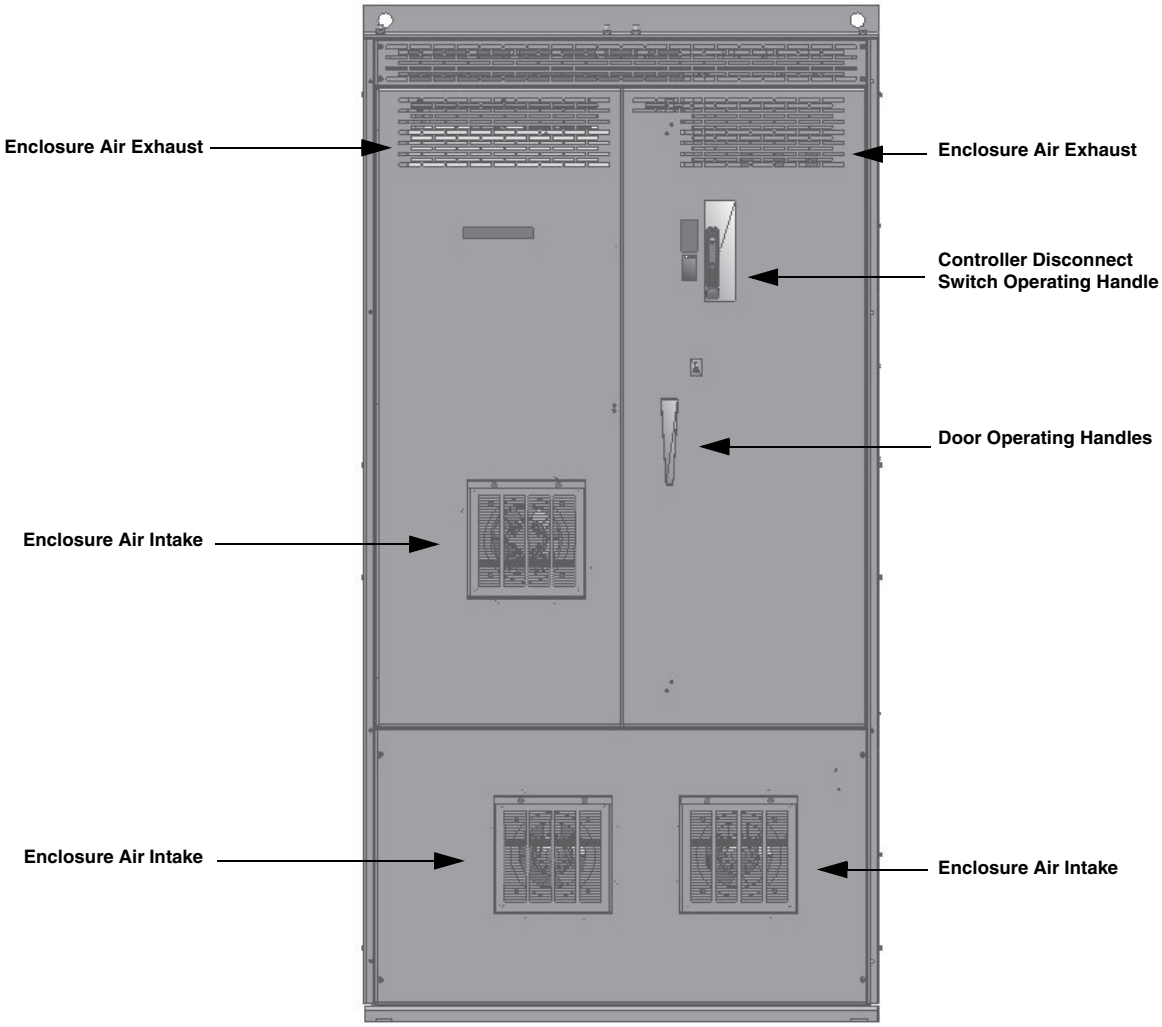
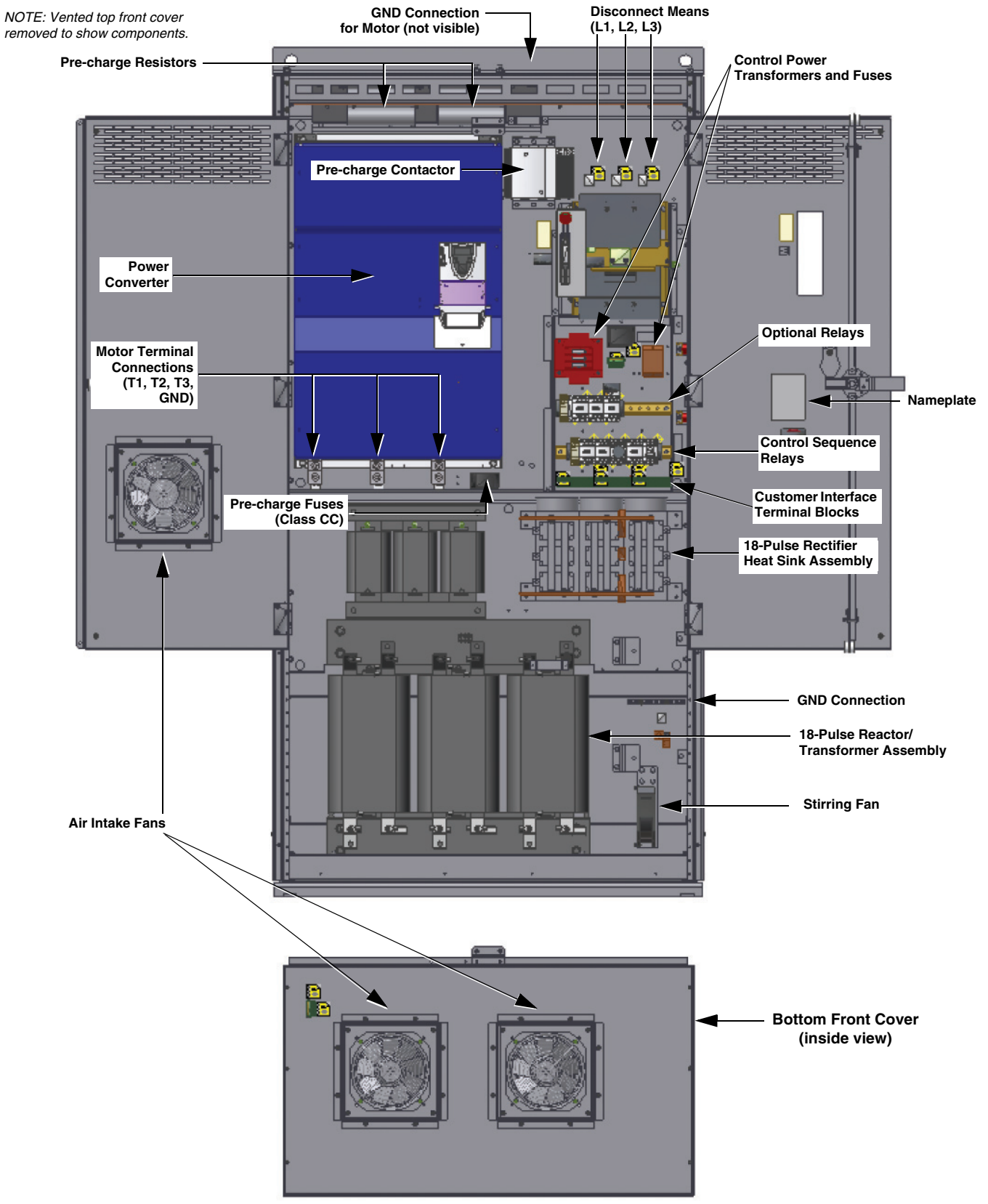


Figure 13: Typical Internal Component Locations



POWER WIRING

Table 19: Power Terminal Functions [1]

Terminal		Function
GND		Ground bar and ground lugs
L1, L2, L3	without integrated bypass	3-phase input power (at top of circuit breaker)
T1, T2, T3	with bypass	Output connections to motor (at bottom of overload relay)
	without bypass	Output connections to motor (converter terminals), 40–450 hp CT, 50–500 hp VT

1. For terminal locations, refer to Figure 13 on page 42.

Wire Range and Power Terminal Torque Requirements

- **Drive controller:** For the wire range and power terminal torque requirements of the drive controller, refer to Tables 20–24 (pages 43–45).
- **Power converter:** For the power terminal torque requirements of the power converter, refer to Table 38 on page 69.

Table 20: Drive Converter Terminal Wire Size and Torque—Constant Torque and Variable Torque Controllers

Constant Torque Converter	hp	Max. Wire Size		Terminal Torque	
		AWG	mm²	lb-in	N•m
ATV71HD30N4	40	1/0	50	106.2	12
ATV71HD37N4	50	1/0	50	106.2	12
ATV71HD45N4	60	300	150	360	41
ATV71HD55N4	75	300	150	360	41
ATV71HD75N4	100	300	150	360	41
ATV71HD90N4D	125	2–250	2–100	212	24
ATV71HC11N4D	150	2–250	2–100	212	24
ATV71HC13N4D	200	2–250	2–120	212	24
ATV71HC16N4D	250	2–350	2–150	360	41
ATV71HC20N4D	300	3–350	4–185	360	41
ATV71HC25N4D	350	3–350	4–185	360	41
ATV71HC25N4D	400	3–350	4–185	360	41
ATV71HC28N4D	450	3–350	4–185	360	41

Variable Torque Converter	hp	Max. Wire Size		Terminal Torque	
		AWG	mm²	lb-in	N•m
ATV61HD30N4	50	1/0	50	106.2	12
ATV61HD37N4	60	1/0	50	106.2	12
ATV61HD45N4	75	300	150	360	41
ATV61HD55N4	100	300	150	360	41
ATV61HD75N4	125	300	150	360	41
ATV61HD90N4D	125	2–250	2–100	212	24
ATV61HC11N4D	150	2–250	2–100	212	24
ATV61HC13N4D	200	2–250	2–100	212	24
ATV61HC16N4D	250	2–250	2–120	212	24
ATV61HC22N4D	300–350	2–350	2–150	360	41
ATV61HC25N4D	400	3–350	4–185	360	41
ATV61HC31N4D	450–500	3–350	4–185	360	41

Table 21: Circuit Breaker Terminal Wire Size and Torque—Constant Torque Controller

hp	Circuit Breaker	Wire Range, AWG (mm²)	Terminal Torque, lb-in (N.m)
40	KIL36150	[1] #4-350 (21–177)	225 (25)
50	KIL36150	[1] #4-350 (21–177)	225 (25)
60	KIL36150	[1] #4-350 (21–177)	225 (25)
75	KIL36175	[1] #4-350 (21–177)	225 (25)
100	KIL36200	[1] #4-350 (21–177)	300 (34)
125	KIL36200	[1] #4-350 (21–177)	300 (34)
150	KIL36225	[1] #4-350 (21–177)	300 (34)
200	LIL36300	[2] 4/0–500 (107–253)	300 (34)
250	LIL36450	[2] 4/0–500 (107–253)	300 (34)
300	LIL36500	[2] 4/0–500 (107–253)	300 (34)
350	MHL36600	[3] 3/0–500 (85–253)	300 (34)
400	MHL36600	[3] 3/0–500 (85–253)	300 (34)
450	MHL36800	[3] 3/0–500 (85–253)	300 (34)

Table 22: Circuit Breaker Terminal Wire Size and Torque—Variable Torque Controller

hp	Circuit Breaker	Wire Range, AWG (mm²)	Terminal Torque, lb-in (N.m)
50	KIL36150	[1] #4-350 (21–177)	225 (25)
60	KIL36150	[1] #4-350 (21–177)	225 (25)
75	KIL36175	[1] #4-350 (21–177)	225 (25)
100	KIL36200	[1] #4-350 (21–177)	300 (34)
125	KIL36200	[1] #4-350 (21–177)	300 (34)
150	KIL36225	[1] #4-350 (21–177)	300 (34)
200	LIL36300	[2] 4/0–500 (107–253)	300 (34)
250	LIL36450	[2] 4/0–500 (107–253)	300 (34)
300	LIL36500	[2] 4/0–500 (107–253)	300 (34)
350	MHL36600	[3] 3/0–500 (85–253)	300 (34)
400	MHL36600	[3] 3/0–500 (85–253)	300 (34)
450	MHL36800	[3] 3/0–500 (85–253)	300 (34)
500	MHL36800	[3] 3/0–500 (85–253)	300 (34)

Table 23: Power Converter Power Terminal Strip Characteristics

Terminals	Location	Function	Characteristics
GND, L1, L2, L3	J2 [1]	Three-phase power supply	460 Vac ±10% 60 Hz ±2%
PA (+), PC (–)	J2 [1]	Filtered DC voltage (18-pulse input)	550 to 850 Vdc
U/T1, V/T2, W/T3	J2 [1]	Output connections to motor for controller without bypass (Power Circuit B)	0 to 460 Vac

1. The 250–400 hp units do not have a J2 terminal block. See Figure 13 on page 42 for terminal locations.

Table 24: Power Terminal Wire Range, Power Circuit W (Without Bypass)

hp		**Power Converter** (T1, T2, T3)		**Ground Bar**		**Ground Lug**	
CT	VT	Maximum Wire Size AWG (mm^2)	Terminal Torque lb-in (N•m)	Maximum Wire Size AWG (mm^2)	Terminal Torque lb-in (N•m)	Maximum Wire Size AWG (mm^2)	Terminal Torque lb-in (N•m)
40	—	1/0 (50)	106.2 (12)	1/0 (53.5)	45 (5.1)	4/0 (107)	110 (12.43)
50	50	1/0 (50)	106.2 (12)	1/0 (53.5)	45 (5.1)	4/0 (107)	110 (12.43)
60	60	300 (150)	360 (41)	1/0 (53.5)	45 (5.1)	350 (177)	250 (28.3)
75	75	300 (150)	360 (41)	1/0 (53.5)	45 (5.1)	350 (177)	250 (28.3)
100	100	300 (150)	360 (41)	1/0 (53.5)	45 (5.1)	300 (152)	250 (28.3)
125	125	2-250 (2-100)	212 (24)	250 (127)	200 (22.6)	300 (152)	275 (31.1)
150	150	2-250 (2-100)	212 (24)	250 (127)	200 (22.6)	300 (152)	275 (31.1)
200	200	2-250 (2-100)	212 (24)	250 (127)	200 (22.6)	300 (152)	275 (31.1)
250	250	2-350 (2-150)	360 (41)	250 (127)	200 (22.6)	300 (152)	275 (31.1)
300	300	3-350 (4-185)	360 (41)	250 (127)	200 (22.6)	300 (152)	275 (31.1)
350	350	3-350 (4-185)	360 (41)	250 (127)	200 (22.6)	300 (152)	275 (31.1)
400	400	3-350 (4-185)	360 (41)	250 (127)	200 (22.6)	300 (152)	275 (31.1)
450	450	3-350 (4-185)	360 (41)	250 (127)	200 (22.6)	300 (152)	275 (31.1)
—	500	3-350 (4-185)	360 (41)	250 (127)	200 (22.6)	300 (152)	275 (31.1)

INITIAL STARTUP PROCEDURE

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Before working on this equipment, turn off all power supplying it and perform the bus voltage measurement procedure on page 38.

Failure to follow this instruction will result in death or serious injury.

⚠ DANGER

UNQUALIFIED PERSONNEL

- This equipment must be installed and serviced only by qualified personnel.
- Qualified personnel performing diagnostics or troubleshooting that requires electrical conductors to be energized must comply with NFPA 70 E – Standard for Electrical Safety Requirements for Employee Workplaces and OSHA Standards – 29 CFR Part 1910 Subpart S Electrical.

Failure to follow this instruction will result in death or serious injury.

The Altivar® 61/71 PowerGard™ drive controller has been configured for the installed options and tested at the factory. Minor adjustments to complete the field installation may be required, based on the application requirements. This initial start-up procedure should be followed step by step. In case of difficulty, refer to “Maintenance and Support”, beginning on page 65.

Use the door-mounted or remote-mounted graphic display terminal, or the optional PowerSuite™ software to perform the initial start-up procedure.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK

- Properly ground the controller panel before applying power.
- Close and secure the enclosure door before applying power.
- Certain adjustments and test procedures require that power be applied to this controller. Exercise extreme caution, as hazardous voltages exist. Close and secure the enclosure door while turning on power or while starting and stopping this controller.

Failure to follow these instructions will result in death or serious injury.

⚠ WARNING

UNINTENDED CONFIGURATION CHANGES

- Changing the macro configurations or installing a new option card reconfigures the drive controller to factory settings.
- The controller configuration must be reinstalled.

Failure to follow these instructions can result in death or serious injury.

After replacing the power converter or installing any plug-in option card, you must set the programming parameters as listed in the elementary diagram that corresponds to the options ordered. See the diagrams provided with the controller.

In addition, after you install any plug-in option card for the first time, the previously saved parameters downloaded from the keypad or PC software will not be correct because they do not include the additional parameters available with the card. You must set the extended I/O card parameters as listed in the elementary diagram that corresponds to the options ordered. See the diagrams provided with the controller.

START-UP PROCEDURE

With all incoming power removed, make the following equipment checks:

- ❑ Step 1: Check the enclosure components and connections (see procedure below).
- ❑ Step 2: Adjust motor overload protection for the full load current of the motor (see procedure below).
- ❑ Step 3: Test motor rotation (see procedure on page 48).
- ❑ Step 4: If your controller has a bypass, test the motor rotation in bypass mode (see procedure on page 49).
- ❑ Step 5: Check the graphic display terminal high speed, low speed, acceleration, and deceleration settings (see procedure on page 49).

STEP 1: CHECKING THE ENCLOSURE COMPONENTS AND CONNECTIONS

A. Verify that all equipment disconnects are open.

B. Set the Hand-Off-Auto selector switch (controller mounted or remote mounted) to Off and the AFC-Off-Bypass switch (if used) to Off.

C. Set the speed potentiometer (controller mounted or remote mounted) to its minimum setting (full counterclockwise position).

D. Move the circuit breaker and handle assembly to the Off position as shown in Figure 6 on page 29. Open the enclosure doors.

E. Check the wiring of the input power ground, motor ground, speed potentiometer (if remote mounted), and Hand-Off-Auto circuit connections (if remote mounted). See the control circuit elementary diagrams provided separately, and the power circuit descriptions starting on page 56, for wiring diagrams of the remote control operators.

F. When using the bypass circuit, check that the motor conductors are wired to the T1, T2, and T3 terminals of the bypass unit. When using the power circuit *without* bypass, ensure that the motor conductors are wired to terminals T1, T2, and T3 of the power converter.

G. Follow the “Circuit Breaker Trip Adjustment Procedure” on page 50.

H. Using a voltmeter set at the 1000 Vac scale, verify that the incoming line voltage at the line side of the disconnecting means is within ±10% of the input voltage rating on the controller nameplate.

STEP 2: ADJUSTING MOTOR OVERLOAD PROTECTION

⚠ CAUTION

OVERHEATED MOTOR

- This drive controller does not provide direct thermal protection for the motor.
- Use of a thermal sensor in the motor may be required for protection at all speeds or load conditions.
- Consult the motor manufacturer for the thermal capability of the motor when it is operated above the desired speed range.

Failure to follow these instructions can result in injury or equipment damage.

To adjust motor overload protection, refer to the *Programming Manual* supplied on CD with the power converter.

STEP 3: TESTING MOTOR ROTATION

⚠ WARNING

HAZARDOUS MOVING PARTS

Before starting the drive controller, ensure that personnel are clear of the motor and its connected load and that the motor and load are ready to run.

Failure to follow this instruction can result in death or serious injury.

NOTE: The settings listed in this procedure are suitable for most applications. If your application requires different operating characteristics, refer to the Programming Manual *supplied on CD with the power converter for more information.*

A. Set the AFC-Off-Bypass selector switch (if used) to AFC, the Normal-Test selector switch (if used) to Normal, and Hand-Off-Auto selector switch to Hand (push Start if the Start/Stop push buttons are used).
B. Slowly turn the speed potentiometer clockwise to accelerate the motor. Check the direction of motor rotation.
   — If correct, proceed to "Step 4: Testing Motor Rotation in Bypass Mode" on page 49.
   — If incorrect, stop the drive controller. **Remove all power!** Correct the motor rotation.

Correcting Motor Rotation

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- Turn off all power supplying this equipment and perform the bus voltage measurement procedure on page 38 before proceeding.

Failure to follow this instruction will result in death or serious injury.

To correct the direction of motor rotation:

A. Reverse any two motor leads located on the device terminals marked T1, T2, or T3.
B. Reset the speed potentiometer to minimum speed (fully counterclockwise). Close and secure the enclosure door, then reapply power and restart the controller.
C. Slowly turn the speed potentiometer clockwise to accelerate the motor. Check the direction of motor rotation.
   — If correct, this completes the controller mode motor rotation check.
   — If incorrect, repeat Steps A–C until correct.

STEP 4: TESTING MOTOR ROTATION IN BYPASS MODE

A. Set the AFC-Off-Bypass selector switch (if used) to Off, leaving the Hand-Off-Auto selector switch in the Hand position.

B. Momentarily set the AFC-Off-Bypass selector switch to Bypass to check the direction of motor rotation, then return it immediately to the Off position.

   — If the direction of motor rotation is correct, proceed to step "Step 5: Checking the Graphic Display Settings" on page 49.

   — If incorrect, stop the drive controller. **Remove all power!** Correct the motor rotation.

NOTE: If the controller circuit breaker trips during this test, a higher trip setting may be required. Refer to "Circuit Breaker Trip Adjustment Procedure" on page 50.

Correcting Motor Rotation in Bypass Mode

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- Turn off all power supplying this equipment and perform the bus voltage measurement procedure on page 38 before proceeding.

Failure to follow this instruction will result in death or serious injury.

To correct the direction of motor rotation:

C. Reverse any two incoming leads to the controller input marked L1, L2, or L3.

D. Momentarily set the AFC-Off-Bypass selector switch to Bypass to check the direction of motor rotation, then return it immediately to the Off position.

   — If correct, this completes the motor rotation check in bypass mode.

   — If incorrect, repeat Steps C and D until correct.

STEP 5: CHECKING THE GRAPHIC DISPLAY SETTINGS

A. Check the **High Speed (HSP)** setting (maximum motor speed setting).

   a. Press ESC on the graphic display terminal until Main Menu is displayed and Drive Menu is highlighted. Press the keypad knob (ENT) twice. The Simply Start menu is displayed.

   b. Rotate the keypad knob clockwise until High Speed is highlighted. Press ENT.

   c. Rotate the keypad knob until the display indicates the maximum output frequency required for the application (factory default is 60 Hz). Press ENT.

      The controller HSP setting is now complete.

      Refer to the *Programming Manual* supplied on CD with the power converter.

B. Check the **Low Speed (LSP)** setting (minimum motor speed setting).

   a. Continuing from Step A above, rotate the keypad knob counter-clockwise until Low Speed is highlighted. Press ENT.

   b. Rotate the keypad knob until the display indicates the minimum output frequency required for the application (preset value is 3 Hz; factory default is 0 Hz). Press ENT.

The controller LSP setting is now complete. To return to the monitor screen, press ESC three times.

Refer to the *Programming Manual* supplied on CD with the power converter.

C. The application may require changing the setting of **Acceleration (ACC)** and **Deceleration (dEC)** times. Preset value is 10 s. If the power converter has been replaced or reset to factory defaults, the value will be 3 s. To change the setting:

   a. Press ESC on the graphic display terminal until Main Menu is displayed and Drive Menu is highlighted. Press the keypad knob (ENT) twice. The Simply Start menu is displayed.

   b. Rotate the keypad knob clockwise until Acceleration is highlighted. Press ENT.

   c. Rotate the keypad knob until the display indicates the acceleration time required for the application. Press ENT.

   d. Rotate the keypad knob clockwise until Deceleration is highlighted. Press ENT.

   e. Rotate the keypad knob until the display indicates the deceleration time required for the application. Press ENT.

   The controller acceleration and deceleration time settings are now complete. To return to the monitor screen, press ESC three times.

CIRCUIT BREAKER TRIP ADJUSTMENT PROCEDURE

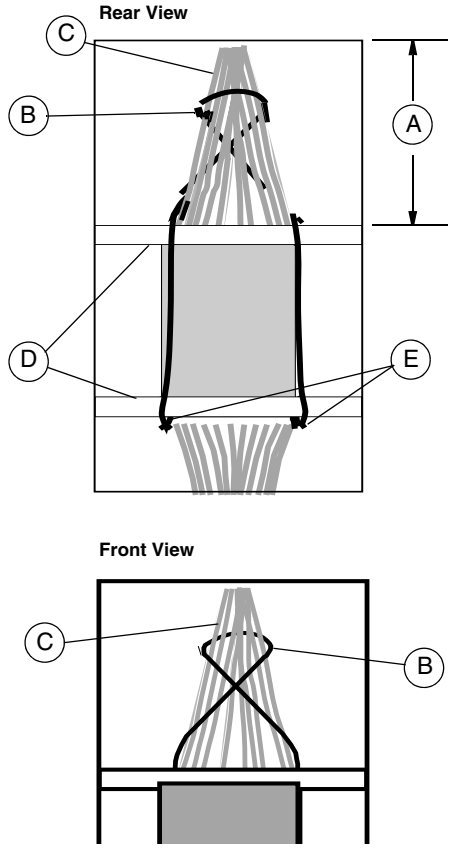
NOTE: Do not set the circuit breaker dial settings beyond NEC® recommendations.

Table 25: Circuit Breaker Ratings

CT	NEC 460 Motor Currents (A)	Catalog Number	Circuit Breaker		Line Input Current (A)	VT	NEC 460 Motor Currents (A)	Catalog Number	Circuit Breaker		Line Input Current (A)
hp			Rating (A)	Factory Setting (A)		hp			Rating (A)	Factory Setting (A)	
40	52	KIL36150	150	1500	45.4	50	65	KIL36150	150	1500	55.7
50	65	KIL36150	150	1500	55.9	60	77	KIL36150	150	1500	67.4
60	77	KIL36150	150	1500	67.6	75	96	KIL36175	175	1750	82.6
75	96	KIL36175	175	1750	82.3	100	124	KIL36200	200	2000	111.3
100	124	KIL36200	200	2000	111.9	125	156	KIL36200	200	2000	134.2
125	156	KIL36200	200	2000	132.0	150	180	KIL36225	225	2250	160.3
150	180	KIL36225	225	2250	161.4	200	240	LIL36300	300	3000	192.1
200	240	LIL36300	300	3000	192.8	250	302	LIL36450	450	4500	231.7
250	302	LIL36450	450	4500	232.8	300	361	LIL36500	500	5000	309.0
300	361	LIL36500	500	5000	289.1	350	414	MHL36600	600	6000	317.1
350	414	MHL36600	600	6000	317.2	400	477	MHL36600	600	6000	358.6
400	477	MHL36600	600	6000	360.6	450	515	MHL36800	800	8000	401.6
450	515	MHL36800	800	8000	403.1	500	590	MHL36800	800	8000	450.5

480 Vac MH Circuit Breaker Installation

Figure 14: Restraining Conductor Movement



CAUTION

HAZARD OF PHYSICAL DAMAGE TO CIRCUIT BREAKER IF CONDUCTOR RESTRAINT IS NOT USED

Restrain the circuit breaker conductors in installations where the available fault current exceeds 50 kA and the distance from the top of the circuit breaker to the top of the enclosure (dimension A) exceeds 12 in. (305 mm).

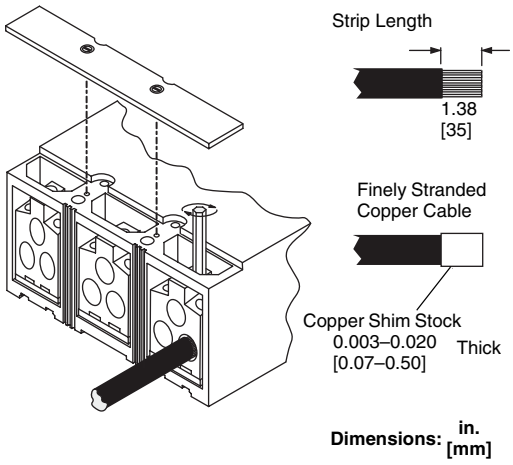
Failure to follow this instruction can result in equipment damage.

On circuit breakers in 480 Vac installations where the available fault current exceeds 50 kA and the distance from the top of the circuit breaker to the top of the enclosure (A) exceeds 12 in. (305 mm), restrain the conductor movement by using 7 ft. (2 m) of 1/2 in. (12 mm) sisal rope, or equivalent.

1. Wrap the rope (B) around the upper conductors (C). Cross the rope ends.
2. Pull the rope back behind the circuit breaker between the mounting pan brackets (D).
3. Tie the rope to the mounting pan brackets at the opposite end (E). The rope must be taut and secure with the conductors (C) pulled into as small a grouping as possible.
4. Wrap the lower conductors in the same way and tie off at the opposite end of the mounting pan brackets.
5. Recheck the wire binding screw torque after securing the rope.
6. Remove or tape any frayed rope ends.

Wire Installation—All Circuit Breakers

Figure 15: Wire Installation



CAUTION

FALSE TORQUE INDICATION

- Do not allow the conductor strands to interfere with the threads of the wire binding screw.
- Wrap the stripped portion of finely stranded wire with a sleeve made from copper shim stock.

Failure to follow these instructions can result in equipment damage.

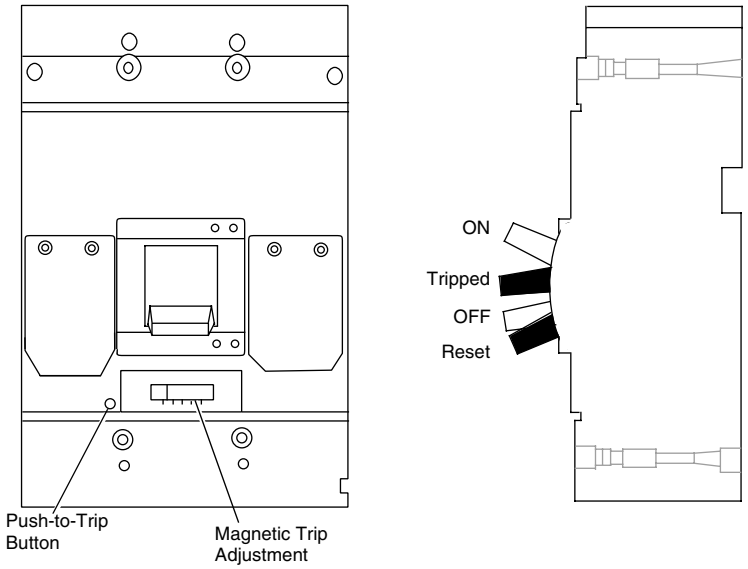
1. See the circuit breaker faceplate label or the optional lug instructions for the wire size and torque.
2. Replace the lug cover.

Circuit Breaker Operation

NOTE: The push-to-trip button will not function when the circuit breaker handle is in the Off (O) position.

Press the push-to-trip button once a year to exercise the circuit breaker.

Figure 16: Circuit Breaker Operation



Circuit Breaker Removal

If installing a new circuit breaker:

1. Turn off all power supplying this equipment before working on or inside the equipment.
2. Remove the circuit breaker in the reverse order of the installation procedure described in the instruction bulletin accompanying the new circuit breaker.

START-UP CHECKLIST

This is an initial start-up checklist for customer use. Schneider Electric recommends that you store this information with the drive controller.

Table 26: Drive Controller Start-Up Checklist

	Yes	No	N/A
Equipment Location			
1. Are the drives mounted in their permanent locations?			
2. Is the work area around the drives accessible?			
3. Does the work facility have safety provisions such as first aid, fire extinguishers, etc.?			
Power Connections (Line Side)			
1. Are the properly sized incoming power connections installed, completely terminated, and properly tightened?			
2. Are the incoming power leads in the standard (A-B-C) rotation pattern?			
3. Have proper grounding practices been followed, in accordance with NEC codes?			
Motor Connections (Load Side)			
1. Are the suitable motors installed for each drive controller?			
2. Are the motor leads completely terminated and properly tightened to the output of each drive controller?			
3. If a bypass application is part of the installation, are the contactors mounted, wired, and properly tightened?			
4. Is each AFC output power cable in an independent conduit with respect to other AFC output cables?			
5. Can the motor be run at **full** speed in Bypass mode?			
Motor Load Device			
1. Is the proper load device installed and ready?			
2. Is the desired motor rotation known?			
3. Is the load properly coupled to the motor shaft?			
4. At time of start-up, can the application provide maximum motor loading?			
Control Circuit Wiring			
1. Is all local and remote control wiring properly identified, securely terminated, and properly tightened?			
2. Are the low-level analog signals separated from control and power wiring?			
3. Is shielded cable used for all analog signals, and is the shield wire grounded at the AFC end **only**?			
4. Is control wiring separated from the power wiring?			
Other User Interfaces			
1. Are all required remote commissioning terminals and interconnect cables operational and available?			
2. Are serial communication links ready for AFC?			
3. Are accurate control and power wiring diagrams available at the start-up location?			
4. Are specific drive settings known for each drive controller (*e.g.,* Min/Max speed, Acc/Dec Time, etc.)?			
Availability Of Equipment			
1. Will the equipment be available to be energized and de-energized on the date of start-up?			
2. Will the **process/load** be available to be exercised?			
Authorized Personnel			
1. Will the person(s) responsible for the entire process be available to verify final operation?			
2. Will all necessary **union** trade personnel be ready and available if they need to be present when Schneider Electric personnel are working on the equipment?			
Special Requirements: Please list any **specific** concerns/comments			
For enclosed drive controllers with bypass, are the bypass fuses installed?			
For bypass drive controllers with NEMA contactors, are the overload elements installed and properly selected according to the motor nameplate information?			

CUSTOMER READINESS ACKNOWLEDGMENT

I/We have verified that all checklist questions have been answered. All questions with a **Yes** response indicate a ready state for the start-up to be efficient and successful. An explanation for any question with a **No** response is listed in the Special Requirements section above.

CUSTOMER NAME: _____

COMPANY NAME: _____

PHONE: (_____) _____ FAX: (_____) _____

SIGNATURE:_____ DATE: _____

SECTION 3— CIRCUIT DESCRIPTIONS AND OPTIONS

INTRODUCTION

This section describes basic sequences of operation for the power circuit configurations.

TERMINAL COMMAND VERSUS KEYPAD COMMAND OPERATION

For factory and/or user-supplied pilot devices and controls to be recognized, the Altivar® 61/71 PowerGard™ drive controller is factory-configured to operate from the terminal strip. Changing settings in Menu 1.6 COMMAND disables certain power converter logic inputs. Factory and user-provided control devices are ignored. For this reason, do not operate the drive controller with Menu 1.6 settings different from those shown in the ATV61 or ATV71 Factory Configuration tables.

Before re-programming inputs, outputs, torque types, or control types:

- Consult the factory configuration listing on the applicable control circuit diagram in the diagrams provided separately.
- Refer to the *Programming Manual* supplied with the power converter.
- Refer to the instruction bulletin corresponding to the selected option, as specified in Table 33.

Table 33: Option Card Bulletins

Bulletin No.	Title	Option
1755869 30072-451-27 30072-451-43	*Modbus Plus™ Card, VW3A3302* *Supplementary Instructions for ATV71 Option Cards* *Addendum to ATV71 Modbus Plus™ Card VW3A3302*	A09
1755867 30072-451-27	*Modbus® / Uni-Telway™ Card, VW3A3303* *Supplementary Instructions for ATV71 Option Cards*	B09
1754480	*Option Card* (Metasys® N2 Card, VW3A3313)	C09
1755879	*Ethernet Modbus® TCP/IP Card, VW3A3310*	D09
1754480	*Option Card* (LonWorks® Card, VW3A3312)	E09
1755877 30072-451-27 30072-451-44	*DeviceNet™ Card, VW3A3309* *Supplementary Instructions for ATV71 Option Cards* *Addendum to ATV71 DeviceNet™ Card*	F09
1755873 30072-451-27 30072-451-45	*Profibus DP Card, VW3A3307* *Supplementary Instructions for ATV71 Option Cards* *Addendum to ATV71 Profibus DP VW3A3307*	G09
—	I/O Extension Card, VW3A3202: Refer to the Installation Manual. See Table 2 on page 8.	H09
1754480	*Option Card* (Apogee® P1 Card, VW3A3314)	J09
1754480	*Option Card* (BACnet® Card, VW3A3315)	K09
1755871 30072-451-27	*Interbus S Card, VW3A3304* *Supplementary Instructions for ATV71 Option Cards*	L09
1755883 30072-451-27	*Standard FIPIO® Card, VW3A3311* *Supplementary Instructions for ATV71 Option Cards*	M09
1629225	*Bluetooth® USB Adapter, VW3A8115*	O09 or Q09
30072-451-39	*Modbus® Bluetooth® Adapter, VW3A8114*	P09 or Q09

NOTE: Changing certain factory settings will affect the performance of the drive controller.

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

- The controller has been factory-programmed. Alteration of factory programming may create incompatibilities with the supplied controller configuration.
- Read and understand the *Programming Manual* supplied on CD with the power converter, as well as the programming information found in the applicable control circuit elementary diagrams provided with each controller.
- If the power converter unit or the main control board of the power converter is replaced, or if any option cards are field installed, the power converter must be re-programmed according to the programming instructions found in the applicable control circuit elementary diagrams provided with each controller.

Failure to follow this instruction can result in death or serious injury.

NOTE: The factory program can be saved in the graphic display terminal. Refer to the Programming Manual *for information on saving and retrieving factory settings.*[1]

GRAPHIC DISPLAY TERMINAL OPERATION

The graphic display terminal is for programming and display. The FWD/REV, Run, and Stop/Reset buttons are not for controller primary operation. Use the operators located on the front of the controller door to command the AFC and Bypass modes of operation.

FAULT RESET

When a communication option is selected, the drive controller fault reset feature is removed. If Start/Stop commands are not sent over the communication system network, you may choose to activate the fault reset function by assigning fault reset to LI4.

CONTROL CIRCUIT SEQUENCING AND OPERATION

The following descriptions **do not** represent all possible combinations of standard control options. Order engineered (OE) options are available for other possible combinations. OE options are denoted by gray shaded text.

RUN COMMAND RELAY (RCR)

The RCR closes if all safety interlocks are closed and the controller has been commanded to run. A run command initiates when:

- The Hand-Off-Auto (H-O-A) selector switch is in the Hand position.
- The H-O-A selector switch is in the Hand position and the Start push button has been pressed.
- The H-O-A selector switch is in the Auto position and a user-supplied start contact is closed.
- The Communication-Auto-Off-Hand (C-A-O-H) selector switch is in the Communication position, allowing the communication relay to close, and a start command has been transmitted over a digital communication link.
- The Start push button has been pushed.

[1] User documentation for Altivar® 61 and Altivar 71 drive controllers is available electronically from the Technical Library at www.us.SquareD.com.

AUXILIARY DRIVE FAULT RELAY (ADFR)

The ADFR provides fault contacts for initiating drive controller shutdown. If the drive controller detects a fault condition, it illuminates the drive fault pilot light. This relay is controlled by a programmable relay (R1), internal to the drive controller. ADFR provides one N.O. and one N.C. fault contact as standard for customer use.

CHANNEL MODE RELAY (CMR)

The CMR is provided when control option F07 is supplied. The CMR provides contacts to control the RCR circuit. CMR contacts are also used to remove forced local from LI4. Forced local is a logic input assignment used to force start/stop and speed control command away from communication systems using local control operators such as H-O-A.

FAULT RESET

The drive controllers have remote fault reset capability when H-O-A or H-O-A with Local/Remote control is used. In Auto mode, faults can be remotely reset by cycling the user's auto start contact. If automatic fault reset is not desired, the user's auto start contacts must remain in the closed state. To manually reset fault conditions, select the Off position of the H-O-A selector switch. To disable automatic fault reset, remove the wire connected between terminals TB1-C and RCR-22.

When a fault reset occurs, the display fault is cleared and stored in the drive controller. The last eight faults are stored in the drive controller and can be viewed using the graphic display terminal.

When Start-Stop control option C07 or D07 is provided, a separate fault reset push button (option P10) must be used. When the fault reset push button is pressed, the drive fault is reset.

When C-A-O-H control option F07 is provided, a fault reset can be performed over the communication link or by cycling power using the disconnect handle at the drive controller.

POWER CIRCUITS—GENERAL

CONTROLLER OPERATION

To operate the controller, the circuit breaker disconnect located on the front of the drive controller must be in the closed position. There are several modes of operation depending upon the control method used.

- Two-wire control functionality: H-O-A selector switch.
  - — In **Hand** mode, the controller automatically restarts when power is restored after a power loss or upon resetting a fault condition
  - — In **Auto** mode, restart depends on the auto-start contact position.
- Three-wire control functionality: Start/Stop push buttons. The controller will not restart when power is restored after a power loss or upon resetting an AFC fault. In Hand mode, the Start push button must be pressed to restart the controller. In Auto mode, restart is dependent on the auto start contact position.

INTERLOCKS

The interlock terminals on terminal block TB1, noted below, are dedicated for accepting a user-supplied N.C. interlock. The power converter will stop operation if the connection between the two terminals is opened. Remove the factory jumper wire located on these terminals before installing the interlock.

- The fire/freezestat interlock connects to terminals TB1-1 to TB1-2.
- Additional user interlocks connect at terminals TB1-2 to TB1-3.

POWER CIRCUIT W (DRIVE ONLY)

This power circuit operates the motor from the power converter only (without bypass). It consists of:

- 18-pulse transformer/reactor assembly
- 18-pulse bridge rectifier assembly
- a fused control transformer
- circuit breaker disconnect with means for locking in the open position
- power converter
- optional equipment as specified

OPERATOR CONTROLS—GENERAL ARRANGEMENT AND OPERATION (DRIVE ONLY)

The operator controls are located on the front door of the drive controller unless no control options are specified. The power converter is factory configured to operate in terminal mode.

Option D10 omits the graphic display terminal. If D10 is selected, to alter the programming of the power converter, you must order either a separate graphic display terminal or PowerSuite software.

ENGINEERED POWER CIRCUITS

Other engineered power-circuit modifications are available to provide backup and redundant control if the power converter becomes inoperable. Refer to the factory-supplied documentation for information on applying these configurations to address your specific requirements.

For units supplied with full-voltage starters, full-speed operation is provided at the end of the acceleration ramp.

TEST-NORMAL OPERATION

The Test-Normal switch can be used to test the power converter while operating the motor in bypass. To use this function and maintain motor operation, place the following switches in these positions:

- AFC-Off-Bypass: Set the switch to Bypass to run the motor at full speed across the line.
- Test-Normal: Set the switch to Test.
- Hand-Off-Auto: Set the switch to Hand. Use the manual speed potentiometer to change the speed reference and observe power converter operation. Refer to the *Programming Manual* supplied on CD with the power converter, for fault definitions.

POWER CIRCUIT R (ISOLATION AND TRANSFER—RVAT)

This power circuit consists of isolation and transfer contactors integrated with a reduced-voltage autotransformer starter (RVAT) as the bypass.

POWER CIRCUIT S (BARRIERED BYPASS—SSRVS)

This power circuit consists of a barriered, compartmentalized enclosure design integrating a solid-state reduced-voltage starter (electronic soft start) as the bypass.

POWER CIRCUIT T (ISOLATION AND TRANSFER)

This power circuit consists of isolation and transfer contactors to coordinate and connect an external electromechanical combination starter, reduced-voltage starter, or solid-state reduced-voltage starter as the bypass.

POWER CIRCUIT Y (INTEGRATED BYPASS)

This power circuit operates the motor either from the power converter or from full voltage line power (bypass mode) integrated in a common enclosure. The motor can be run in the bypass mode in the unlikely event that the power converter becomes inoperative. The bypass package consists of:

- Isolation and bypass contactors with Class 20 overloads
- Fused control transformer
- Circuit breaker disconnect with means for locking in the open position
- AFC-Off-Bypass switch
- Test-Normal switch
- Overload relay reset push button
- 18-pulse power converter
- Optional equipment as specified

POWER CIRCUIT Z (BARRIERED BYPASS—FULL VOLTAGE)

This power circuit consists of two separate enclosure compartments, one for the drive controller and one for the bypass. This provides maximum maintenance flexibility if emergency full speed operation is required while servicing or repairing the drive controller. The bypass circuit consists of an across-the-line, full-voltage starter, consisting of a contactor (NEMA or IEC) and an overload relay. Each section is supplied by its own circuit breaker disconnect.

MODIFICATIONS

CONTROL FUNCTION DESCRIPTIONS (A07–F07)

Table 34 shows the door-mounted power converter control functions supplied with the available control options. Selector switches are provided for Hand-Off-Auto, Communication-Auto-Off-Hand, Forward/Reverse, and Local/Remote control. Push buttons are provided for Start and Stop functions and reset functions.

Table 34: Modification Control Circuits

Control Option (Modifications)	Hand	Off	Auto	Speed Potentiometer	Start/ Stop	Forward/ Reverse	Local/ Remote	Communication
A07	X	X	X	X				
B07	X	X	X	X	X			
C07 [1]				X	X			
D07 [1]				X	X	X		
E07	X	X	X	X			X	
F07	X	X	X	X				X

1. This option is only available for power circuit W (drive only).

Hand Mode (2-Wire Control—Without Start/Stop)

Hand mode is for local control. In Bypass operation, as soon as Hand mode is selected, a full-voltage across-the-line start occurs. In AFC operation, as soon as Hand mode is selected, the power converter starts the motor.

Hand Mode (3-Wire Control—With Start/Stop)

Hand mode is for local control. When used with Start/Stop buttons, the power converter does not start the motor until the Start button is pressed. In Bypass operation, a full-voltage across-the-line start occurs. In AFC operation, the power converter starts the motor.

Off Mode

Off mode commands the power converter to stop the motor by either following the programmed deceleration ramp (factory setting) or by a freewheel stop. Set the H-O-A switch to Off for fault reset.

Auto Mode

Auto mode is for remote control. In Bypass operation, a full-voltage or reduced-voltage start occurs when the user-supplied run contact is closed between controller terminals 8 and 9 on terminal block TB1. In Auto mode and AFC operation, the power converter starts the motor when the user-supplied run contact is closed between controller terminals 8 and 9 on terminal block TB1. Motor speed is varied by adjusting the user-supplied auto speed reference signal (4–20 mA) supplied to terminals G1 (S2+) and J (S3) on terminal block TB1 in the drive controller. Refer to the *Programming Manual* supplied on CD with the power converter, for scaling of this signal.

When using a communication card in Auto mode, forced local is inactive; therefore, the communications network can change the programming of the power converter.

When option J10 is selected, the motor speed is varied by adjusting the user-supplied auto speed reference signal (0–10 Vdc) supplied to terminals G1 (S2+) and J (S3) on terminal block TB1.

Start Push Button

The Start push button commands the drive controller to start the motor (in Hand mode) for local control.

Stop Push Button

⚠ WARNING

INABILITY TO INITIATE A STOP

The Stop push button is only active in the Hand mode.

- To stop the drive controller, open the disconnect switch or set the Hand-Off-Auto switch to Off.
- Use appropriate guarding or interlocking.

Failure to follow this instruction can result in death or serious injury.

The Stop push button commands the drive controller to stop the motor for local control by either following the programmed deceleration ramp (factory setting) or by freewheel stopping. If the H-O-A switch is in the Auto mode, the switch must be set to Off to stop the power converter. The Stop push button is only active for local control (Hand), not for remote control (Auto).

Manual Speed Potentiometer

The manual speed potentiometer is used to control the speed of the controller in Hand mode.

Forward/Reverse

The Forward/Reverse switch selects the input to the power converter, which is programmed for LI1= forward and LI2= reverse.

Local/Remote

The Local/Remote switch selects whether speed control is sent by signal into terminal AI1 (local) or AI2 (remote) on terminal block TB1, when the H-O-A switch is in Auto mode.

Communication Mode

Communication mode is for communication option card control of the drive controller. When Communication mode is selected the RCR is picked up, input to LI1 opens, and forced local releases. In Communication mode, the drive controller receives start, stop, and speed commands from a serial communication protocol.

PILOT LIGHT OPTION CLUSTERS (A08–F08)

The pilot light options listed in Table 35 provide visual indication of protective functions and circuit status. All pilot light bulbs are LEDs, which can be removed from the front with the enclosure door closed. All pilot lights are rated for 120 Vac.

Table 35: Pilot Light Cluster Identification

Cluster/Option	Power On	AFC Run	Auto	Fault	Bypass	Forward	Reverse	Hand	Comm
A08, #1 Cluster	X	X	X	X					
B08, #2 Cluster [1]	X	X		X	X				
C08, #3 Cluster [2]	X	X		X					
D08, #4 Cluster [2]	X			X		X	X		
E08, #5 Cluster	X	X	X	X				X	
F08, #6 Cluster	X	X		X					X

1. This option is only available for bypass circuits.
2. This option is only available for power circuit W (drive only).

Power On (red)

This pilot light illuminates when mains power is applied to the controller.

AFC Run (green)

This pilot light illuminates when an AFC run condition is active.

Auto (yellow)

This pilot light illuminates when speed control is via the remote contact closure, with input of the 4–20 mA (or 0–10 Vdc) signal into AI2 with the H-O-A switch set to Auto.

Fault (yellow)

- For power circuit W (drive only): the pilot light illuminates when an AFC fault (trip) condition is active.
- For power circuit Y (bypass) or power circuit Z (barriered bypass): the pilot light illuminates when an AFC fault (trip) condition is active.

Bypass (yellow)

This pilot light illuminates when the bypass is initiated, indicating that the motor is running from line voltage.

Forward (green)

This pilot light illuminates when the power converter is set to run in the forward direction with input to LI1.

Reverse (green)

This pilot light illuminates when the power converter is set to run in the reverse direction with input to LI2.

Hand (blue)

This pilot light illuminates when speed control is by the speed potentiometer on AI1 and the H-O-A switch is set to Hand.

Comm (yellow)

This pilot light illuminates when the C-A-O-H switch is set to Comm.

COMMUNICATION OPTIONS

All communication cards are provided without factory programming. Refer to the communication card manual for a description of forced local operation.

Option A09
Modbus Plus™

This option card provides a factory-installed, plug-in Modbus Plus card, VW3A3302. This interface device connects to a Modbus Plus tap.

Option B09
Modbus®/ Uni-Telway™

This option card provides a factory-installed, plug-in Modbus card, VW3A3303.

Option C09
Metasys® N2

This option provides a factory-installed, plug-in Metasys N2 card, VW3A3313.

Option D09
Ethernet

This option provides a factory-installed, plug-in Ethernet card, VW3A3310, with user termination to RJ45 plug-in interface connector.

Option E09
LonWorks®

This option provides a factory-installed LonWorks card, VW3A3312.

Option F09
DeviceNet™

This option provides a factory-installed, plug-in DeviceNet card, VW3A3309, with user termination to a terminal block.

Option G09
Profibus

This option provides a factory-installed Profibus card, VW3A3307.

Option H09
I/O Extension Card

This option provides a 0–20 mA analog output for customer use. It includes a plug-in, I/O extension card, VW3A3202. The output is factory-programmed for motor frequency. Refer to the *Programming Manual* supplied on CD with the power converter for other programming choices. This option includes a selectable x–y range with graphic display terminal.

Option J09
Apogee® P1

This option provides a factory-installed P1 card, VW3A3314.

Option K09
BACnet®

This option provides a factory-installed BACnet card, VW3A3315.

Option L09
Interbus S

This option provides a factory-installed Interbus S card, VW3A3304.

Option M09
FIPIO®

This option provides a factory-installed FIPIO card, VW3A3311.

Option O09
Bluetooth® USB

This option provides a Bluetooth USB device, VW3A8115, pending availability.

Option P09
Bluetooth Modbus

This option provides a Bluetooth Modbus adapter, VW3A8114, pending availability.

Option Q09
Bluetooth USB and Modbus

This option provides both a Bluetooth USB device, VW3A8115, and a Bluetooth Modbus adapter, VW3A8114, pending availability.

MISCELLANEOUS OPTIONS	*NOTE: Gray-shaded options require order engineering.*
Option C10 **3–15 PSI Transducer**	This option allows the controller to follow a user-supplied 3–15 PSIG input.
Option D10 **Omit Graphic Display Terminal**	This option omits the graphic display terminal. If option D10 is selected, to alter the programming of the power converter, you must order either a separate graphic display terminal or PowerSuite™ software.
Option E10 **Smoke Purge Relay**	This option provides a smoke purge operating mode controlled by a user-supplied 120 Vac signal. • For power circuit W (drive only): When 120 Vac power is supplied, the drive controller runs the motor at 60 Hz. • For power circuit Y (integrated bypass) or power circuit Z (barriered bypass): When 120 Vac power is supplied to 48 and 49, motor operation is transferred to bypass (if not operating in this mode already), and runs at full speed.
Option F10 **200 VA CPT**	This option provides an additional 200 VA control power transformer.
Option G10 **cUL Listing**	This option provides Canadian cUL certification when required by local code requirements.
Option H10 **Seismic Qualified**	This option supplies a certification label and hardware qualified to seismic rating AC156 acceptance criteria test protocol with an importance factor of 1.0. Refer to “Seismic Qualification Mounting Criteria” on page 31.
Option I10 **Permanent Wire Marker Sleeves**	This option provides permanent wire marking on the control wires with marker sleeves.
Option J10 **0–10 V Auto Speed Reference** **(TB1-G1/S2+ to J-S3)**	This option provides for a 0–10 V user-supplied auto speed reference signal into the AI2 input, terminals G1 (S2+) and J (S3) on terminal block TB1. The 0–10 V analog input is not optically isolated, but it does contain noise suppression circuitry and a programmable electronic filter. Not available with C07 or D07 controls, or with 3–15 psi transducer, C10.
Option K10 **Additional N.O. Auxiliary Drive Run**	This option provides one N.O. drive run contact at terminals 57 and 58 on terminal block TB1 in addition to the Form C drive run contacts provided as standard. This contact indicates when the power converter is running.
Option L10 **Additional N.C. Auxiliary Drive Fault**	This option supplies one N.C. drive fault contact at terminals 59 and 60 on terminal block TB1 in addition to the standard Form C drive fault contacts. This contact indicates a power converter fault.
Option M10 **N.O. Auxiliary Bypass Run Contact**	This option is only available for power circuit Y (bypass). It supplies one N.O. bypass run contact at terminals 61 and 62 on terminal block TB1 to indicate that the controller is running in bypass mode.
Option O10 **N.O. Auxiliary Auto Mode Contact**	This option supplies one N.O. auto mode contact at terminals 63 and 64 on terminal block TB1 to indicate that the controller is set to run in Auto mode with a signal into AI2 and operation by remote operating contact. Not available with C07 or D07 controls.

Option P10
AFC Fault Reset

This option is only available with control options C07 and D07 and for power circuit W (drive only). It provides fault reset to LI4 on the power converter at terminals A and C on terminal block TB1 when an H-O-A switch is not supplied.

Option Q10
Push-to-Test Pilot Lights

This option provides a push-to-test feature on all pilot lights except Power On. Not available on a fault light unless P10 is selected.

Option R10
Auto Transfer to Bypass

This option is only available for power circuit Y (integrated bypass) or power circuit Z (barriered bypass). It is not available with control options B07, C07, or D07. This option provides an automatic transfer to bypass at terminals 23 to 27 and 22 to 23 on terminal block TB1. Whenever the power converter faults, this function transfers to bypass within 5 seconds of the fault. An enable/disable (off) switch is provided internally.

Option S10
Motor Elapsed-Time Meter

This option provides an elapsed-time meter, connected at terminals 44 and 50 on terminal block TB1, which operates whenever the motor runs. The motor elapsed-time meter is non-resettable

⚠ WARNING

POWER IS MAINTAINED ON MOTOR AND CONTROLLER

- Emergency Stop, option T10, does not remove all power from the motor or the drive controller.
- Automatic restart may occur when the mushroom head operator is rotated to reclose the contact.
- Emergency Stop is a normal ramp-to-stop function using power from the drive controller, and it will force a controlled ramp-to-stop in all control modes, including Communication mode.
- Always open the controller disconnect or remove power to the controller after an emergency stop is initiated.

Failure to follow this instruction can result in death or serious injury.

Option T10
Emergency Stop

This option provides an emergency stop mushroom-operator push button mounted on the enclosure door. The push button is maintained in the open position until the mushroom-operator is rotated to reclose the contact. This option is not available with control options C07 or D07.

Option U10
Motor Space Heater Sequencing

This option provides contact closure and terminals on terminal block TB1 with 120 V/50 VA available. This voltage will be available at terminals 45 and 50 whenever the motor is not running.

Option V10
Seal Water Solenoid

This option provides contact closure and terminals on terminal block TB1 with 120 V/50 VA available. This voltage will be available at terminals 43 and 50 whenever the motor is energized.

Option W10
Check Valve Sequencing

This option provides a timed safety contact at terminals 46 and 47 on terminal block TB1, available for an N.C. limit switch contact that shuts down the drive controller whenever the user-supplied limit switch contact does not open within a specified time. This option also supplies an illuminated blue reset push button on the enclosure door.

Option Y10
54-in. Wide Enclosure

This option provides a 54-in. (1372 mm) wide enclosure.

Option Z10 **24 Vdc Power Supply** **[TB1-O (+) to TB1-N (COM)]**	This option provides a 24 Vdc/300 mA power supply to terminals O (+) and N (COM) on terminal block TB1.
Option 310 **Order Engineered (OE)**	This option is for internal use only.
Option 610 **I.D. Engraved Nameplates**	This option provides a lamacoid nameplate, engraved according to user request, attached to the front door of the enclosure.

SECTION 4— MAINTENANCE AND SUPPORT

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors, and covers before turning on power to this equipment.

Failure to follow these instructions will result in death or serious injury.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK

- Read and understand this bulletin in its entirety before installing or operating Altivar® 61/71 PowerGard™ drive controllers. Installation, adjustment, repair, and maintenance of the drive controllers must be performed by qualified personnel.
- User is responsible for conforming to all applicable code requirements with respect to grounding all equipment.
- Many parts in this drive controller, including printed wiring boards, operate at line voltage. DO NOT TOUCH. Use only electrically insulated tools.
- DO NOT short across DC bus capacitors or touch unshielded components or terminal strip screw connections with voltage present.
- Before servicing the drive controller:
  - Disconnect all power including external control power that may be present before servicing the drive controller.
  - Place a “DO NOT TURN ON” label on the drive controller disconnect.
  - Lock the disconnect in open position.
  - WAIT 15 MINUTES for the DC bus capacitors to discharge. Then follow the “DC Bus Voltage Measurement Procedure” on page 38 to verify that the DC voltage is less than 45 V. The drive controller LEDs are not accurate indicators of the absence of DC bus voltage.
- Install and close all covers before applying power or starting and stopping the drive controller.

Electric shock will result in death or serious injury.

INTRODUCTION

A number of diagnostic and status codes are included on the power converter. The graphic display terminal provides visual indication of controller operation and protective circuit functions and indicator lights to assist in maintenance and troubleshooting. If the controller trips while operating, the codes must be viewed before power is removed because removing power resets the fault code.

EXTERNAL SIGNS OF DAMAGE

The following are examples of external signs of damage:

- Cracked, charred, or damaged covers or enclosure parts
- Damage to the graphic display terminal, such as scratches, punctures, burn marks, chemical burns, or moisture in the screen
- Oil or electrolyte on the bottom of the drive controller which might have leaked from the capacitors inside
- Excessive surface temperatures of enclosures and conduits
- Damage to power or control conductors
- Unusual noise or odors from any of the equipment
- Abnormal temperature, humidity, or vibration

If any of the above signs are found while the equipment is powered up, immediately inform operating personnel and assess the risk of leaving the drive system powered up. Before removing power from the equipment, always consult with the operating personnel responsible for the machinery and process.

If troubleshooting indicates that component replacement is necessary, refer to “Field Replacement of Power Converters” on page 67.

PREVENTIVE MAINTENANCE

Inspect the interior fans and exterior fans of the controller for blockage and impeded rotation. To prevent overheating and to allow proper air flow, maintain the clearances shown on the enclosure outline drawings on pages 25–28.

The graphic display terminal is an integral part of the enclosure and must be installed on the door to maintain the environmental integrity. It can be omitted when option D10 is selected; in that case a closing plate must be installed to maintain the environmental rating.

On controllers with 1B enclosures, clean the fan filters at least once every six months.

FIELD REPLACEMENT OF POWER CONVERTERS

40–75 hp CT and 50–100 hp VT (not applicable on 100–450 hp CT or 125–500 hp VT)

If the power converter becomes inoperable in an Altivar® 61/71 PowerGard™ drive controller, it must be replaced. Refer to Table 36 for power converter weights before handling this component.

For replacement of any 100–450 hp CT or 125–500 hp VT power converters, contact:

Square D AC Drives Technical Support Group
P.O. Box 27446
Raleigh, NC 27611-7446

Telephone: 888-778-2733 (888-SquareD)
Fax: 919-217-6508

E-mail: drive.products.support@us.schneider-electric.com

Table 36: Power Converter Weights

Horsepower [1]		Maximum Weight	
Constant Torque (CT)	Variable Torque (VT)	lb	kg
40–50	50–60	57.3	26.0
60–100	75–100	97.0	44.0
125	125	132.3	60.0
150	150	163.1	74.0
200	200	176.4	80.0
250	250	242.5	110.0
300–450	300–350	308.7	140.0
—	400–500	474.0	215.0

1. For replacement of any 100–450 hp CT or 125–500 hp VT power converters, contact Square D AC Drives Technical Support.

Observe the lockout/tagout procedures as identified in OSHA Standard 29 CFR, Subpart J covering:

- 1910.147: The control of hazardous energy (lockout/tagout).
- 1910.147: App A, Typical minimal lockout procedures.

REMOVING THE POWER CONVERTER ASSEMBLY

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- Disconnect all power.
- Place a “Do Not Turn On” label on the drive controller disconnect.
- Lock the disconnect in the open position.
- Read and understand the “DC Bus Voltage Measurement Procedure” on page 38 before performing the procedure. Measurement of bus capacitor voltage must be performed by qualified personnel.
- Many parts in the drive controller, including printed wiring boards, operate at line voltage. DO NOT TOUCH. Use only electrically insulated tools.
- DO NOT short across DC bus capacitors or touch unshielded components or terminal strip screw connectors with voltage present.

Failure to follow these instructions will result in death or serious injury.

⚠ CAUTION

ELECTROSTATIC DISCHARGE

Do not subject this device to electrostatic discharge. This controller contains electronic components that are very susceptible to damage from electrostatic discharge.

Failure to follow this instruction can result in injury or equipment damage.

To replace the power converter:

1. Open the door of the drive controller. Refer to step 1 on page 29.
2. Measure the DC bus voltage as described on page 38 of this instruction bulletin.
3. Disconnect all power and control wiring from the power converter assembly. Identify each wire for ease of re-assembling the new power converter.
4. Remove the screws that secure the power converter to the enclosure back pan. Refer to Figure 13 on page 42 for screw locations.
5. Remove the power converter assembly from the enclosure.

INSTALLING THE POWER CONVERTER ASSEMBLY

To install the new power converter:

1. Install the new power converter assembly in the enclosure.
2. Secure the power converter to the enclosure back pan using the screws from the removed power converter. Torque the screws to the proper value, as shown in Table 37.

Table 37: Torque Values for Power Converter Screws

Drive Controller Size	Screw Size	Torque Value
40–100 hp CT; 50–125 hp VT	5/16-18 (M8 x 1.25)	125–155 lb-in. (14.1–17.5 N•m)
125–450 CT; 150–500 VT	3/8-16 (M10 x 1.5)	225–270 in-lb. (25.4–30.5 N•m)

3. Install all power and control wiring to the power converter assembly terminal blocks. Install all other removed equipment. Tighten the hardware to the torque values given in Table 38 on page 69. Check all wiring connections for correct terminations and check the power wiring for grounds with an ohmmeter.
4. Shut the enclosure door, secure the door, and close the circuit breaker disconnect.

⚠ DANGER

UNQUALIFIED PERSONNEL

- This equipment must be installed and serviced only by qualified personnel.
- Qualified personnel performing diagnostics or troubleshooting requiring electrical conductors to be energized, must comply with NFPA 70 E – Standard for Electrical Safety Requirements for Employee Workplaces and OSHA Standards – 29 CFR Part 1910 Subpart S Electrical.

Failure to follow these instructions will result in death or serious injury.

5. Program the drive controller according to the control circuit elementary diagrams provided with each controller. Follow the initial start-up procedure on page 46.

The drive controller is now ready to operate.

Table 38: Converter Power Terminal Torque

CT		VT		Torque	
Catalog Number	**hp**	**Catalog Number**	**hp**	**lb-in**	**N•m**
CPDM•4C_ to CPDP•4C_	40–50	CPDN•4V_ to CPDQ•4V_	50–60	106.2	12
CPDQ•4C_ to CPDS•4C_	60–100	CPDR•4V_ to CPDT•4V_	75–125	360	41
CPDT•4C	125	CPDU•4V_	150	212	24
CPDU•4C	150	CPDW•4V_	200	212	24
CPDW•4C	200	CPDX•4V_	250	212	24
CPDX•4C	250	CPDY•4V_	300	360	41
CPDY•4C	300	CPDZ•4V_	350	360	41
CPDZ•4C	350	CPD4•4V_	400	360	41
CPD4•4C	400	CPD5•4V_	450	360	41
CPD5•4C	450	CPD6•4V_	500	360	41

TECHNICAL SUPPORT

When troubleshooting the Altivar® 61/71 PowerGard™ drive controller, discuss the symptoms of the reported problems with operating personnel. Ask them to describe the problem, when they first observed the problem, and where the problem was seen. Observe directly the drive system and process.

For more information, call, fax, or write:

Square D AC Drives Technical Support Group
P.O. Box 27446
Raleigh, NC 27611-7446

The Technical Support Group is staffed from 8:00 a.m. to 6:00 p.m., Eastern time, for product selection, start-up assistance, or diagnosis of product problems and advice for the correct course of action. **Emergency phone support** is available 24 hours a day, 365 days a year.

Toll free: 1-888-778-2733 (1-888-SquareD)
E-mail: drive.products.support@us.schneider-electric.com
Fax Line: 919-217-6508

Square D Services (On-Site)

The Square D Services division is committed to providing quality, on-site service that consistently meets customer expectations. Services responds to your requests, seven days a week, 24 hours a day.

Toll free: 1-888-778-2733 (1-888-SquareD)

Customer Training

Schneider Electric offers a variety of instructor-led, skill enhancing and technical product training programs for customers. For a complete list of drives/soft start training with dates, locations, and pricing, please call:

Phone: 978-975-9306
Fax Line: 978-975-2821

Product Literature

To view or download product literature, visit the Technical Library on the Square D web site:

www.us.SquareD.com

APPENDIX A—RENEWABLE PARTS

Table 39: Renewable Parts, 40–75 hp CT / 50–100 hp VT

Description	Qty	40–50 hp	Qty	60–100 hp
Power Converter: Constant Torque (CT) [1]	1	ATV71HD30N4 (40 hp) ATV71HD37N4 (50 hp)	1	ATV71HD45N4 (60 hp) ATV71HD55N4 (75 hp)
Power Converter: Variable Torque (VT) [1]	1	ATV61HD30N4 (50 hp)	1	ATV61HD37N4 (60 hp) ATV61HD45N4 (75 hp) ATV61HD55N4 (100 hp)
Graphic Display Terminal	1	VW3A1101	1	VW3A1101
Primary Control Fuses				
CPT	2	25430-20250 (500 VA)	2	25430-20250 (500 VA)
Secondary Control Fuses				
CPT	1	25430-20500 (500 VA)	1	25430-20500 (500 VA)
Pilot Light, Red	1	LED 25501-00003 Head ZB5AV04	1	LED 25501-00003 Head ZB5AV04
Pilot Light, Yellow	2	LED 25501-00004 Head ZB5AV05 w/o p-t-t [2] Head ZB5AW35 w/ p-t-t [2]	2	LED 25501-00004 Head ZB5AV05 w/o p-t-t [2] Head ZB5AW35 w/ p-t-t [2]
Pilot Light, Green	1	LED 25501-00005 Head ZB5AV03 w/o p-t-t [2] Head ZB5AW33 w/ p-t-t [2]	1	LED 25501-00005 Head ZB5AV03 w/o p-t-t [2] Head ZB5AW33 w/ p-t-t [2]
Pilot Light, Blue	1	LED 25501-00006 Head ZB5AV06 w/o p-t-t [2] Head ZB5AW36 w/ p-t-t [2]	1	LED 25501-00006 Head ZB5AV06 w/o p-t-t [2] Head ZB5AW36 w/ p-t-t [2]
Pilot Light Mounting Collar w/ Light Module	1	ZB5AV6	1	ZB5AV6
Pilot Light Mounting Collar w/ Light Module, and 1 N.O. and 1 N.C. Contact for p-t-t [2]	1	ZB5AW065	1	ZB5AW065
I/O Extension [3]	1	VW3A3202	1	VW3A3202
24 Vdc Supply	1	ABL7CEM24003	1	ABL7CEM24003
Enclosure Door Fans	3	26016-31534	3	26016-31534
Heatsink Fans	1	VZ3V1211 (40 hp) VZ3V1206 (50 hp)	1	VZ3V1206 (60 hp) VZ3V1208 (75–100 hp)
Pre-charge Resistor Assembly				
CT	1	2WR500-N0B2 (40 hp)	1	2WR500-N0B2
VT	1	2WR500-N0B2 (50 hp)	1	2WR500-N0B2
Pre-charge Fuses				
CT	2	25430-21500 (40 hp)	2	25430-21500
VT	2	25430-21500 (50 hp)	2	25430-21500
Pre-charge Fuseblock	1	9080FB2611CC	1	9080FB2611CC

1. The first three characters of the power converter catalog number may be ATV, signifying an IP20 rating, or HTV, signifying an IP00 rating.
2. p-t-t: Push-to-test operator.
3. Field replacement of the option board resets the power converter to the factory defaults. The user must configure the controller according to the elementary diagram provided.

Table 40: Renewable Parts 100–450 hp CT / 125–500 hp VT

Description	Qty	125–200 hp	Qty	250 hp	Qty	300–500 hp
Power Converter: Constant Torque (CT) [1]	1	ATV71HD75N4 (100 hp) ATV71HD90N4 (125 hp) ATV71HC11N4D (150 hp) ATV71HC13N4D (200 hp)	1	ATV71HC16N4D (250 hp)	1	ATV71HC20N4D (300 hp) ATV71HC25N4D (350 hp) ATV71HC25N4D (400 hp) ATV71HC28N4D (450 hp)
Power Converter: Variable Torque (VT) [1]	1	ATV61HD75N4 (125 hp) ATV61HC11N4D (150 hp) ATV61HC13N4D (200 hp)	1	ATV61HC16N4D (250 hp)	1	ATV61HC22N4D (300 hp) ATV61HC22N4D (350 hp) ATV61HC25N4D (400 hp) ATV61HC31N4D (450 hp) ATV61HC31N4D (500 hp)
Graphic Display Terminal	1	VW3A1101	1	VW3A1101	1	VW3A1101
Primary Control Fuses CPT	2	25430-20250 (500 VA)	2	25430-20250 (500 VA)	2	25430-20250 (500 VA)
Secondary Control Fuses CPT	1	25430-20500 (500 VA)	1	25430-20500 (500 VA)	1	25430-20500 (500 VA)
Pilot Light Red	1	LED 25501-00003 Head ZB5AV04	1	LED 25501-00003 Head ZB5AV04	1	LED 25501-00003 Head ZB5AV04
Pilot Light Yellow	2	LED 25501-00004 Head ZB5AV05 w/o p-t-t [2] Head ZB5AW35 w/ p-t-t [2]	2	LED 25501-00004 Head ZB5AV05 w/o p-t-t [2] Head ZB5AW35 w/ p-t-t [2]	2	LED 25501-00004 Head ZB5AV05 w/o p-t-t [2] Head ZB5AW35 w/ p-t-t [2]
Pilot Light Green	1	LED 25501-00005 Head ZB5AV03 w/o p-t-t [2] Head ZB5AW33 w/ p-t-t [2]	1	LED 25501-00005 Head ZB5AV03 w/o p-t-t [2] Head ZB5AW33 w/ p-t-t [2]	1	LED 25501-00005 Head ZB5AV03 w/o p-t-t [2] Head ZB5AW33 w/ p-t-t [2]
Pilot Light Blue	1	LED 25501-00006 Head ZB5AV06 w/o p-t-t [2] Head ZB5AW36 w/ p-t-t [2]	1	LED 25501-00006 Head ZB5AV06 w/o p-t-t [2] Head ZB5AW36 w/ p-t-t [2]	1	LED 25501-00006 Head ZB5AV06 w/o p-t-t [2] Head ZB5AW36 w/ p-t-t [2]
Pilot Light Mounting Collar w/ Light Module	1	ZB5AV6	1	ZB5AV6	1	ZB5AV6
Pilot Light Mounting Collar w/ Light Module and 1 N.O. and 1 N.C. Contact for p-t-t [2]	1	ZB5AW065	1	ZB5AW065	1	ZB5AW065
I/O Extension [3]	1	VW3A3202	1	VW3A3202	1	VW3A3202
24 Vdc Supply	1	ABL7CEM24003	1	ABL7CEM24003	1	ABL7CEM24003
Stirring Fan Assembly	—	—	—	—	1	80444-712-50
Enclosure Door Fans	3	26016-31534	3	26016-31534	3	26016-31534
Heatsink Fan Assembly	1	VZ3V3808 (125 hp) VZ3V3809 (150–200 hp)	1	VZ3V3809	1	VZ3V3810
Foam Filter Element for 1B Enclosures	1	80444-134-01	1	80444-134-01	1	80444-134-02
Circuit Breaker Operating Mechanism	1	80418-841-50 (125 hp, no bypass) 80439-801-51 (150–200 hp, no bypass)	1	80439-801-51 (no bypass)	1	80439-805-51 (no bypass)
Pre-charge Resistor Assembly						
CT	1	2WR200-N0B2	1	2WR200-N0B2	1	2WR100-N0B2 (300–450 hp)
VT	1	2WR200-N0B2	1	2WR200-N0B2	1	2WR100-N0B2
Pre-charge Fuses						
CT	2	25430-22000	2	25430-22000	2	25430-23000(300–450 hp)
VT	2	25430-22000	2	25430-22000	2	25430-23000
Pre-charge Fuseblock	1	9080FB2611CC	1	9080FB2611CC	1	9080FB2611CC

1. The first three characters of the power converter catalog number may be ATV, signifying an IP20 rating, or HTV, signifying an IP00 rating.
2. p-t-t: Push-to-test operator.
3. Field replacement of the option board resets the power converter to the factory defaults. The user must configure the controller per the elementary diagram provided.

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