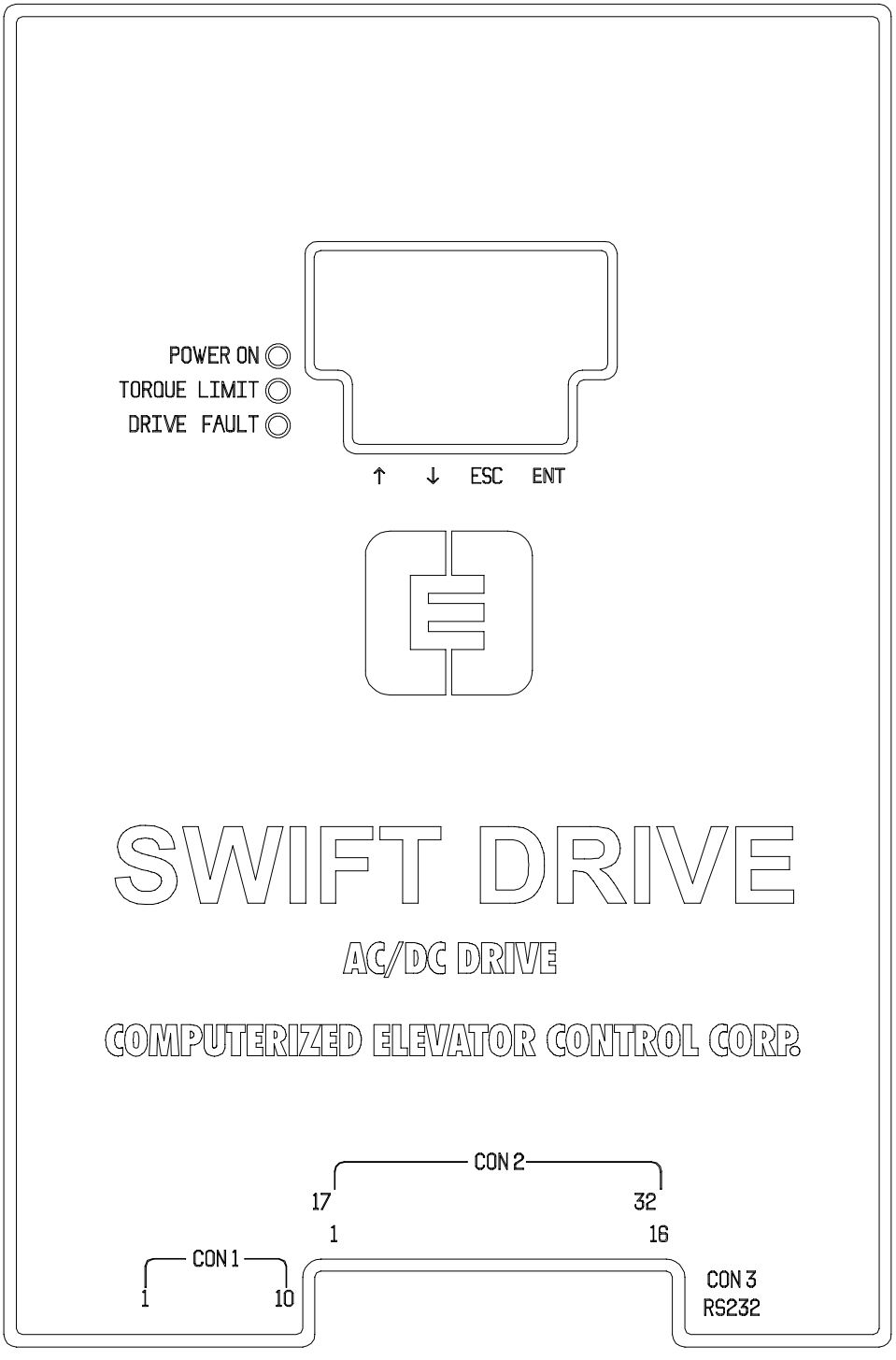
Computerized
Elevator
Control Corp.

Drive–Swift Stand Alone
Quantum® Quiet
AC/DC



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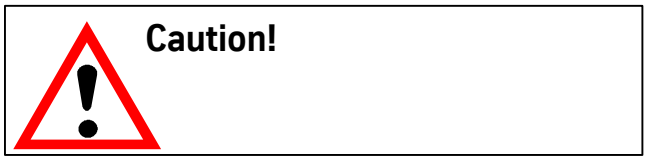
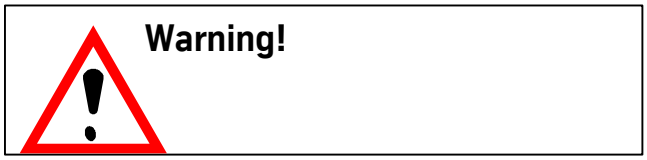
Safety Precautions
Important!

The procedures contained in this manual are intended for the use of qualified elevator personnel. In the interest of your personal safety and the safety of others, do NOT attempt ANY procedure that you are NOT qualified to perform.

All Procedures in this manual must be done in accordance with the applicable rules of the latest edition of the National Electrical Code, Article 620; the latest edition of ASME A17.1, Safety Code for Elevators and any governing local codes.



CAUTION statements identify conditions that could result in damage to the equipment or other property if improper procedures are followed.



WARNING statements identify conditions that could result in personal injury if improper procedures are followed.

Arrival of The Equipment

Receiving

Upon arrival of the equipment, inspect it for damage and promptly report all *visible* damage to the carrier. All shipping damage claims must be filed with the carrier.

Storing

During storage in a warehouse or on the elevator job site, precautions should be taken to protect the machine from dust, dirt, moisture, and temperature extremes.

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Product Overview

Quantum Quiet AC/DC drive systems from ThyssenKrupp Elevator offer a wide range of cost effective pulse width modulated (PWM) drive capability for elevator applications employing the latest state of the art in power electronics and controls technology with key features such as:

- Reliable operations using the latest intelligent power IGBT modules with internal gate drive and protection circuitry for inverter bridge, soft start and regenerative braking functions.
- Tune-free DSP digital closed loop speed/flux vector control with matched and proven ThyssenKrupp AC motors.
- Tune-free closed loop speed control with both closed armature and motor field current loops for quick and easy start-up of DC motor systems.
- Unmatched flexibility with drive ratings ranging from 10HP to 60HP in 230V line input and 10HP to 120HP in 460V line input, connecting directly to building supplies without costly transformers.
- Simple field configuration to control either AC or DC motors providing an excellent opportunity for modernization market where an existing DC motor can be re-used until the end of its life and then the system can be upgraded with an AC motor using the same drive.
- Supplied with a simple user interface tool (16 x 2 LCD and 4 push buttons) for all drive parameter adjustments and drive diagnostics.
- Programmable operation with either:
    - Internal time-based S-curve with adjustable accel/decel/jerk rates with multi-speed level operations via reliable opto-isolated inputs
    - Analog speed reference interface (-10V to +10V).
- Compact packaging.

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Specifications

Ratings

Power ratings at 230 Volt AC Input
- 7.5, 15, 20, 30, 40 and 60HP Non- Regenerative
- 30, 40 and 60HP Regenerative

Power ratings at 460 Volt AC Input
- 7.5, 15, 20, 30, 40 and 60HP Non-Regenerative
- 30, 40, 60, 80 and 120HP Regenerative

150% of continuous current rating (general purpose rating) for 60 seconds.

250% Of continuous current rating for 5 seconds

Input Power

Voltage
- 230 VAC, 3-phase, ± 10%
- 460 VAC, 3-phase, ± 10%

Frequency
- 48 - 63HZ

Line Impedance
- 3% without line reactor
- 1% with line reactor

Nominal Voltage Levels
- 230 & 460VAC, 3-phase, 60/50HZ

Output Power

Voltage
- 0 - Input Voltage

Frequency
- 0 - 60HZ

Carrier Frequency
- 10kHZ

Design Features

Internal "Soft - Start" IGBT

Internal Dynamic Brake IGBT

Connections for external Dynamic Brake Resistor

Field configuration for AC or DC Motor Control Operation

Serial Channel
- Optically Isolated RS232 / RS485 port

Performance Features

Control Methods
- Digital flux vector, Quantum Quiet AC
- Quantum Quiet DC

Speed Command Sources
- Analog Channel
- Internal S-Curve (time-based)

Speed Control
- Range: 0 to rated speed
- Accuracy: ± 0.02%

Speed Reference Resolution
- Internal S-Curve: 1ft./min.
- Analog reference: 0.05%

Speed Reference Signal
- –10V to +10V

Internal programmable S-curve
- Adjustable accel. / decel. rates
- Adjustable jerk rates (accel./decel. & leveling)

Torque Limit
- Setting range: 0 to max. current

Selectable Functions
- Multi-speed level operation (7 levels max.) with Internal S-Curve (time based)

Functions Available
- Configuration and tuning of the speed regulator
- Specifying the input line and motor parameters
- Monitoring various internal signals
- Fault annunciation and fault log viewing
- Programmable auto-restart on a resetable fault

Protective Features

Drive/Motor Overload fault

DC Bus Overvoltage and Undervoltage faults

Overspeed fault

Speed Tracking fault

Encoder Malfunction fault

Overcurrent fault

IGBT fault(s)

Field Loss fault (Quantum Quiet DC)

Motor Open-Circuit Fault

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Digital Opto-isolated logic Inputs

Voltage
- 24VDC pull-up

Sinking Current
- 10mA

Sample Frequency
- 128 HZ

Standard Signals
- DEN - Drive Enable
- RUND - Run Drive
- MA - Motor contactor Aux.
- FAULT RESET

Internal S-Curve Signals
- DIR - Run Direction
- SR0-2 - Speed Reference Selection (Binary Code)

Quantum Quiet DC Signals
- MFF - Motor Field Forcing
- MFW - Motor Field Weakening
- MFS - Motor Field Shutdown

Digital Outputs

Six Relays, Relay 1-6
- 5A at 30VDC / 250VAC
- 1,000,000 operations

Update Frequency
- 128 HZ

Standard Signals
- Motor Contactor
- Drive Fault
- Drive Running
- Motor Field Protection (MFP) Contactor
- Up Direction
- Down Direction

Analog Inputs

Two differential inputs

Software adjustment of gain for available voltage

Voltage
- ±10 Volts DC

Channel 1
- Speed Command

Channel 2
- Pre-Torque

Resolution
- 12 Bit

Sample Frequency
- 170 HZ

Analog Outputs

Two (2) programmable test point outputs
- Voltage - ±10 Volts DC
- Capacity - 10 mA
- Resolution - 12 Bit
- Update Frequency - 1024 HZ

Encoder Feedback

Supply Voltage
- Isolated 5VDC

Capacity
- 200 mA

Resolution
- 600 to 10,000 PPR

Maximum Frequency
- 300 kHZ

Input
- 2 channel quadrature - optically isolated
- 5 Volts DC differential (A, $\overline{A}$, B, $\overline{B}$)

Environmental

Operating Temperature Range
- –10° C to 50°C (14°F to 120°F)

Storage Temperature
- –15° C to 70°C (0°F to 158°F)

Altitude
- 3300 FT without derating

Relative Humidity
- 95% (non-condensing)

Regenerative Applications
- Geared or Gearless
- AC or DC Motor
- Modernization or New Sales

Regenerative Benefits
- Energy efficient line regenerative drive systems
- Meet IEEE 519-1992 in both voltage and current harmonics
- High power factor (close to unity)

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Electrical Specifications - Non-Regenerative Drives

230V AC Drives						
Drive HP	7.5/10HP	15HP	20HP	30HP	40HP	60HP
Input Voltage	230V ±10% 50/60HZ					
Output Voltage	0 to 230V					
Output Frequency	0 to 60HZ					
Rated Current (rms)	28A	40A	53A	80A	106A	160A
Maximum Current (rms)	66A	99A	129A	198A	258A	400A

230V DC Drives						
Drive HP	7.5/10HP	15HP	20HP	30HP	40HP	60HP
Input Voltage	230V ±10% 50/60HZ					
Output Voltage	0 to 325V					
Output Frequency	DC					
Rated Current (DC)	30A	45A	58A	91A	117A	184A
Maximum Current (DC)	95A	140A	182A	280A	364A	565A

460V AC Drives						
Drive HP	7.5/10HP	15HP	20HP	30HP	40HP	60HP
Input Voltage	460V ±10% 50/60HZ					
Output Voltage	0 to 460V					
Output Frequency	0 to 60HZ					
Rated Current (rms)	14A	20A	28A	40A	53A	80A
Maximum Current (rms)	33A	50A	67A	99A	129A	198A

460V DC Drives						
Drive HP	7.5/10HP	15HP	20HP	30HP	40HP	60HP
Input Voltage	460V ±10% 50/60HZ					
Output Voltage	0 to 650V					
Output Frequency	DC					
Rated Current (DC)	15A	22A	30A	45A	58A	91A
Maximum Current (DC)	46A	70A	95A	140A	182A	280A

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Electrical Specifications - Regenerative Drives

230V Regenerative AC Drives			
Drive HP	30HP	40HP	60HP
Input Voltage	230V ±10% 50/60HZ		
Output Voltage	0 to 230V		
Output Frequency	0 to 60HZ		
Rated Current (rms)	80A	106A	160A
Maximum Current (rms)	198A	258A	400A

230V Regenerative DC Drives			
Drive HP	30HP	40HP	60HP
Input Voltage	230V ±10% 50/60HZ		
Output Voltage	0 to 325V		
Output Frequency	DC		
Rated Current (DC)	91A	117A	184A
Maximum Current (DC)	280A	364A	565A

460V Regenerative AC Drives					
Drive HP	30HP	40HP	60HP	80HP	120HP
Input Voltage	460V ±10% 50/60HZ				
Output Voltage	0 to 460V				
Output Frequency	0 to 60HZ				
Rated Current (rms)	40A	53A	80A	106A	160A
Maximum Current (rms)	99A	129A	198A	258A	400A

460V Regenerative DC Drives					
Drive HP	30HP	40HP	60HP	80HP	120HP
Input Voltage	460V ±10% 50/60HZ				
Output Voltage	0 to 650V				
Output Frequency	DC				
Rated Current (DC)	45A	58A	91A	117A	184A
Maximum Current (DC)	140A	182A	280A	364A	565A

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Size Specifications, Non-Regenerative Drives

Drive Size	Length	Width	Depth
230V AC/DC Drives 30HP or smaller 6–pack IPM Module	19.00″ (482.6mm)	12.25″ (311.15mm)	12.312″ (312.7mm)
230V AC/DC Drives 40-60HP Dual IPM Modules	23.562″ (598.5mm)		13.437″ (341.3mm)
460V AC/DC Drives 30HP or smaller 6–pack IPM Module	19.00″ (482.6mm)	15.25″ (387.35mm)	12.00″ (304.8mm)
460V AC/DC Drives 40-60HP Dual IPM Modules	23.50″ (597mm)		13.125″ (333.4mm)

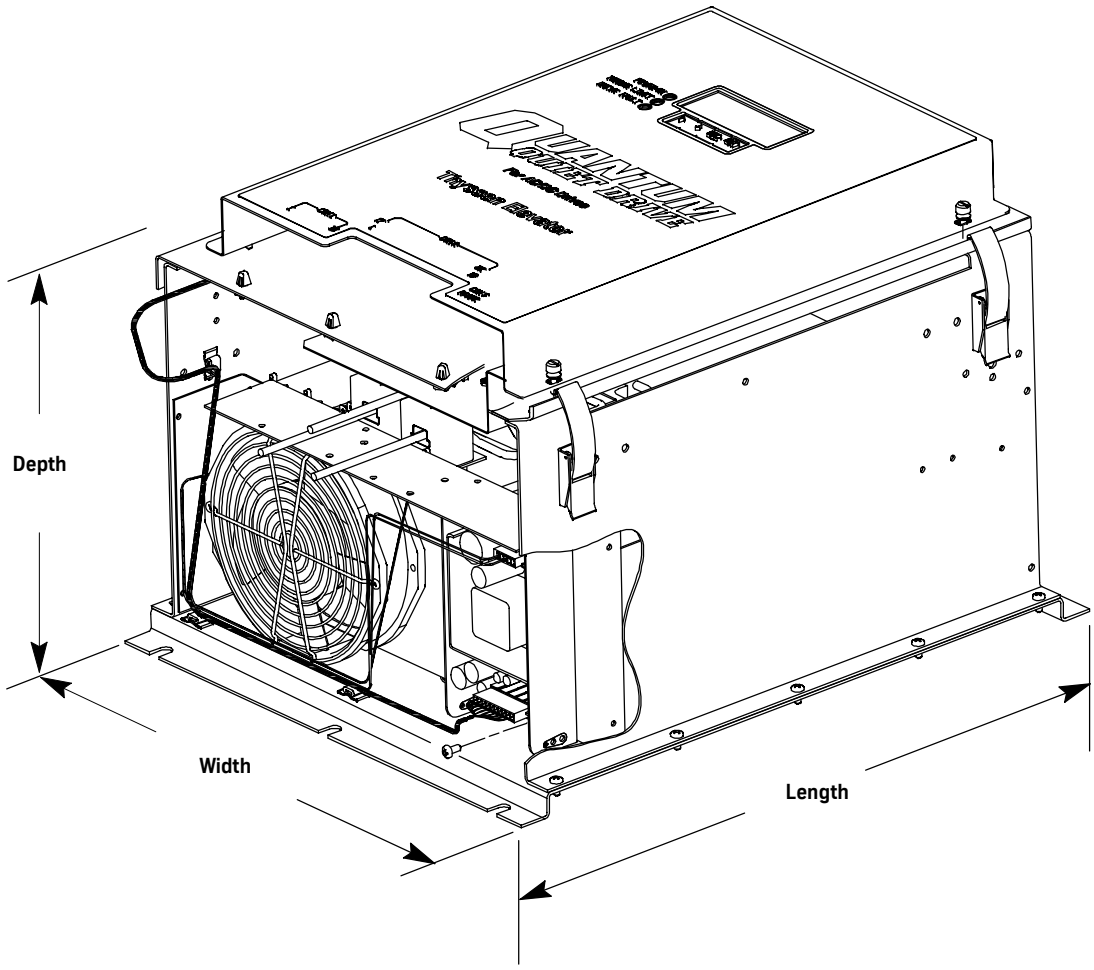

Figure 1

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Size Specifications - Regenerative Drives

Drive Size	Length	Width	Depth
Stand Alone Regen Drive 30-60 HP 230V/460V AC/DC Regenerative Drives	32.375”	21.750”	13.375” (339.7mm)

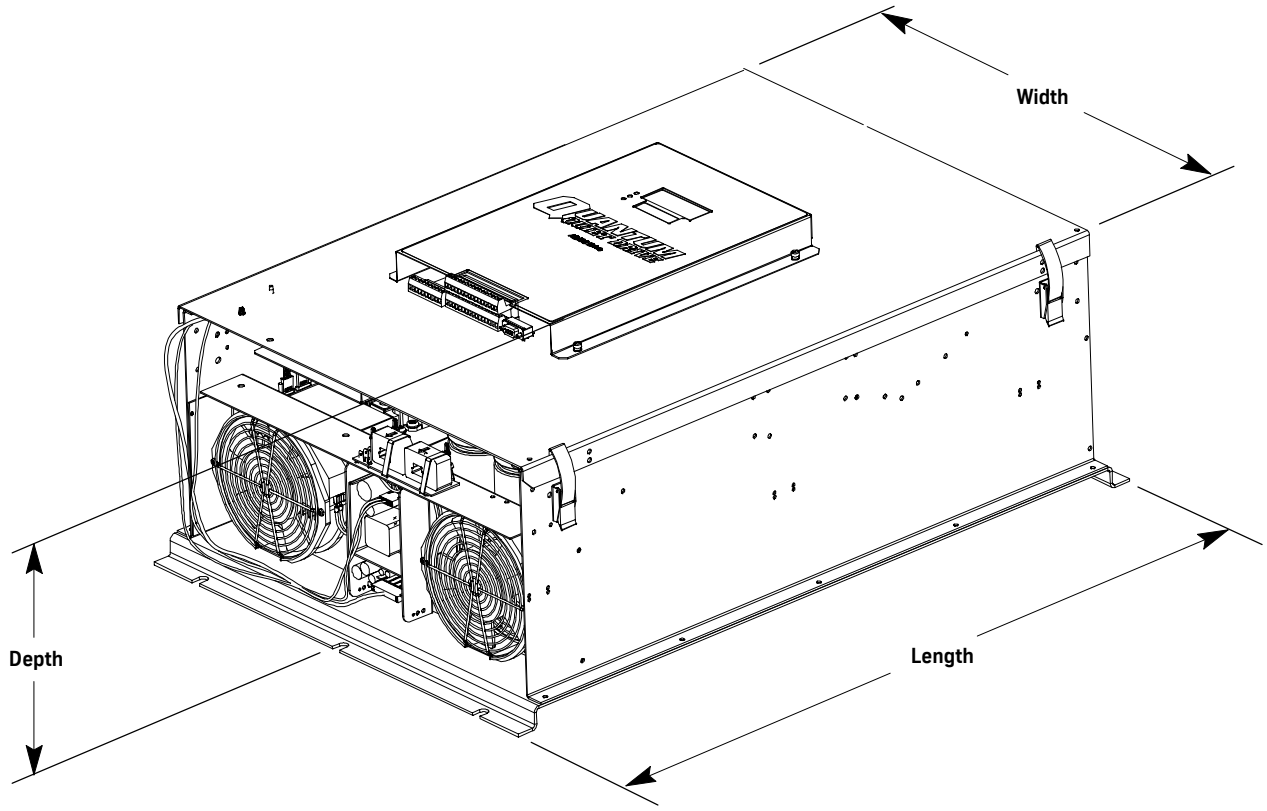

Figure 2

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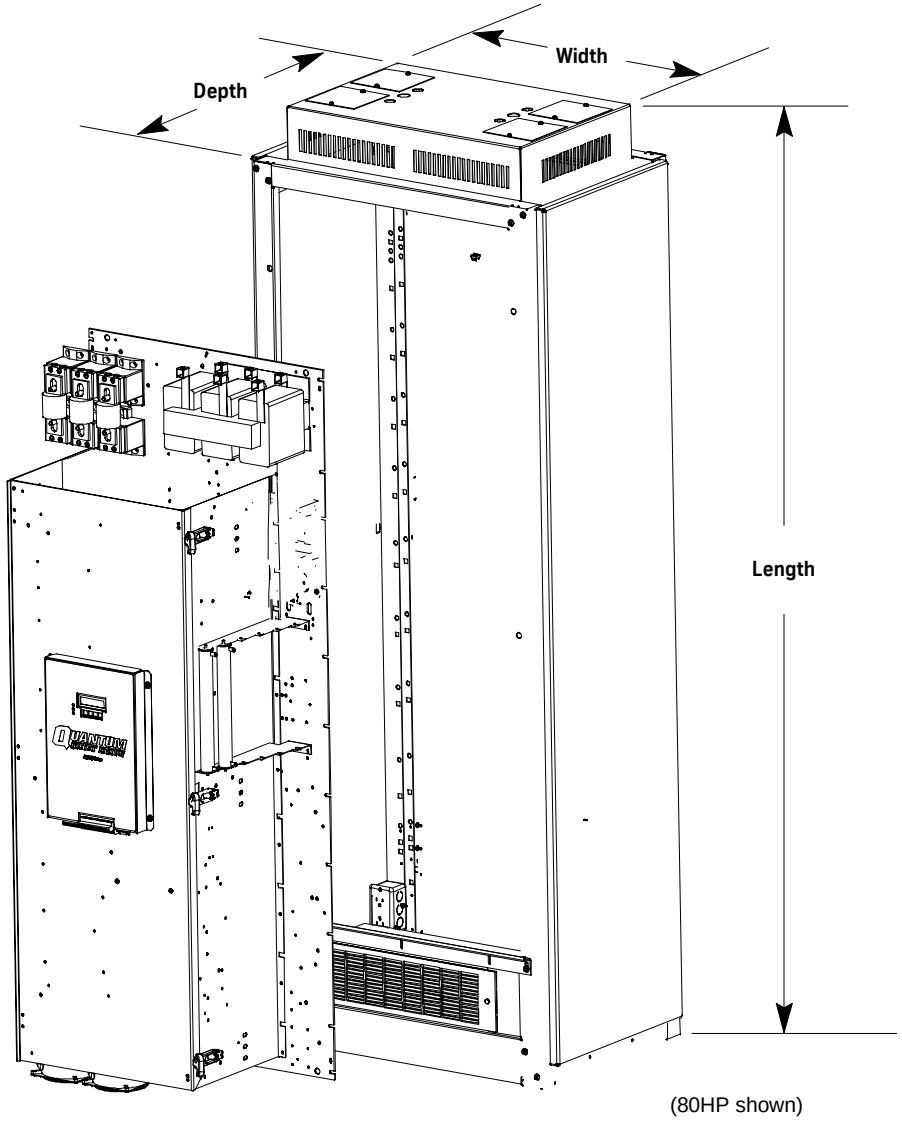
Size Specifications - Regenerative Drives

Drive Size	Length	Width	Depth
Stand Alone Regen Drive 80-120 HP 460V AC/DC Regenerative Drives	80.750”	29.875”	21.75”



(80HP shown)

Figure 3

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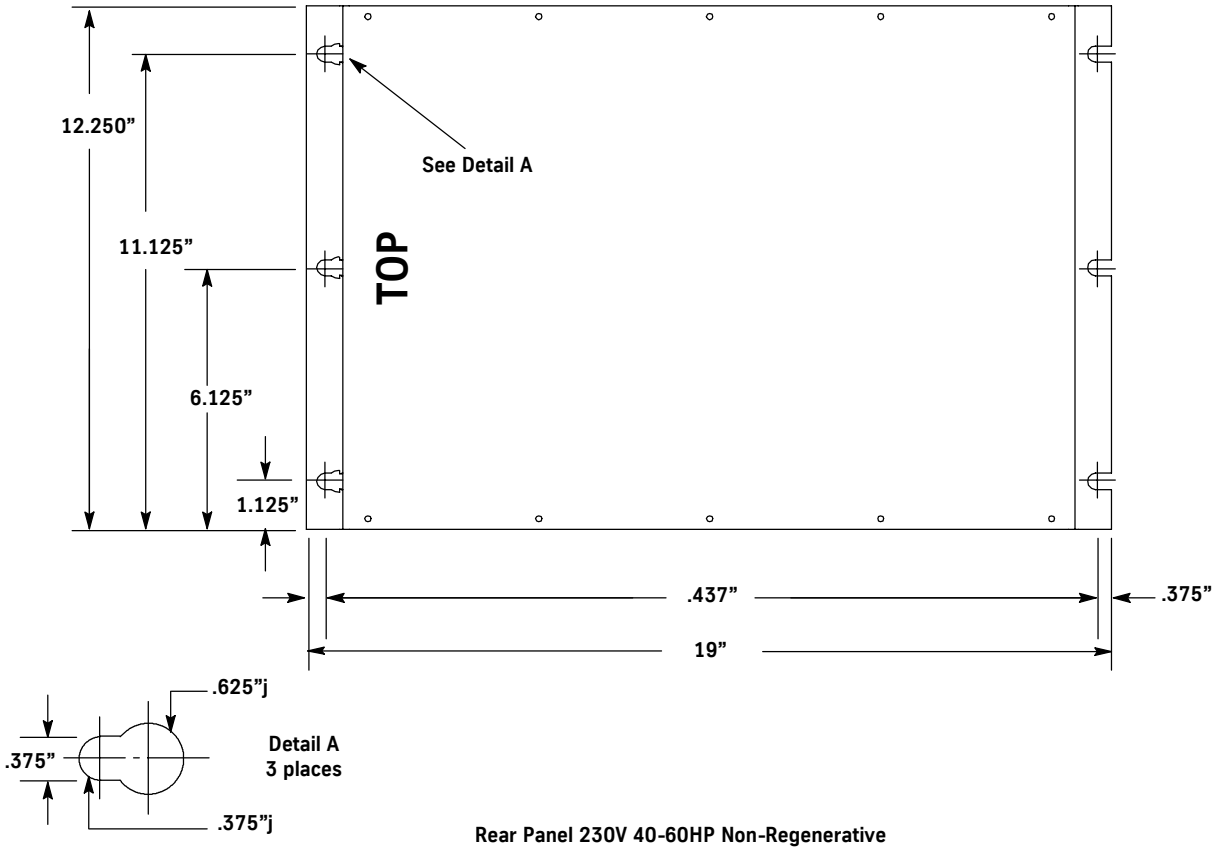
Mounting Specifications

Rear Panel 230V 10-30HP Non- Regenerative



Rear Panel 230V 40-60HP Non-Regenerative

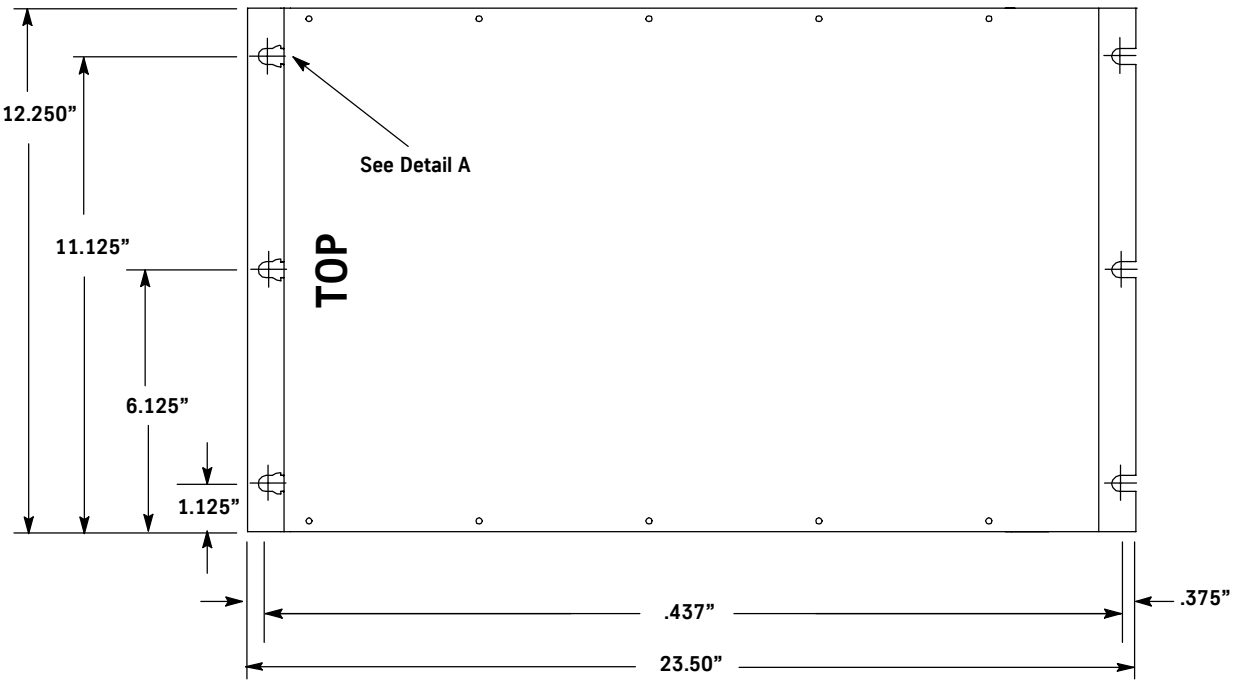


Figure 4 - Mounting Specifications

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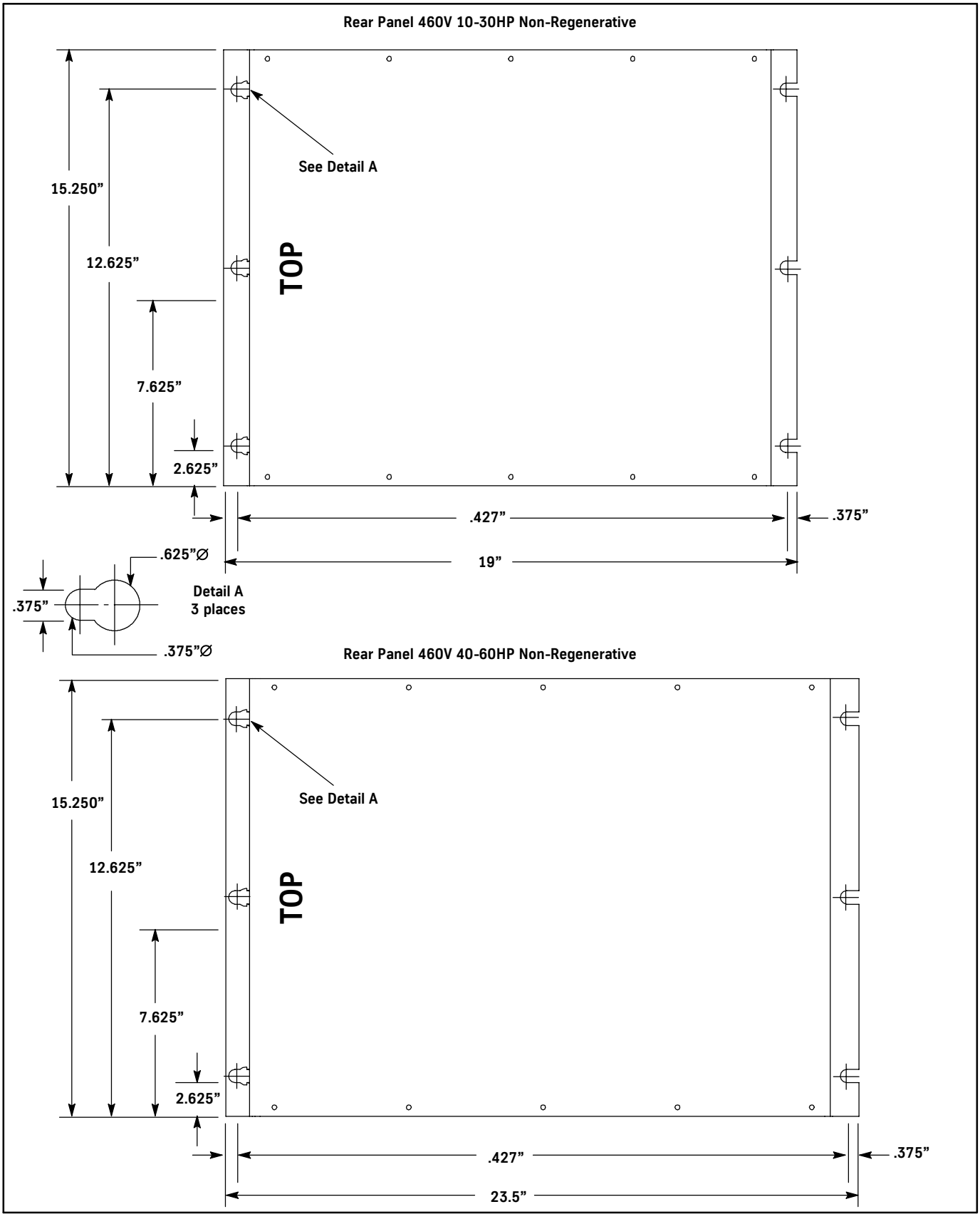

Figure 5 - Mounting Specifications

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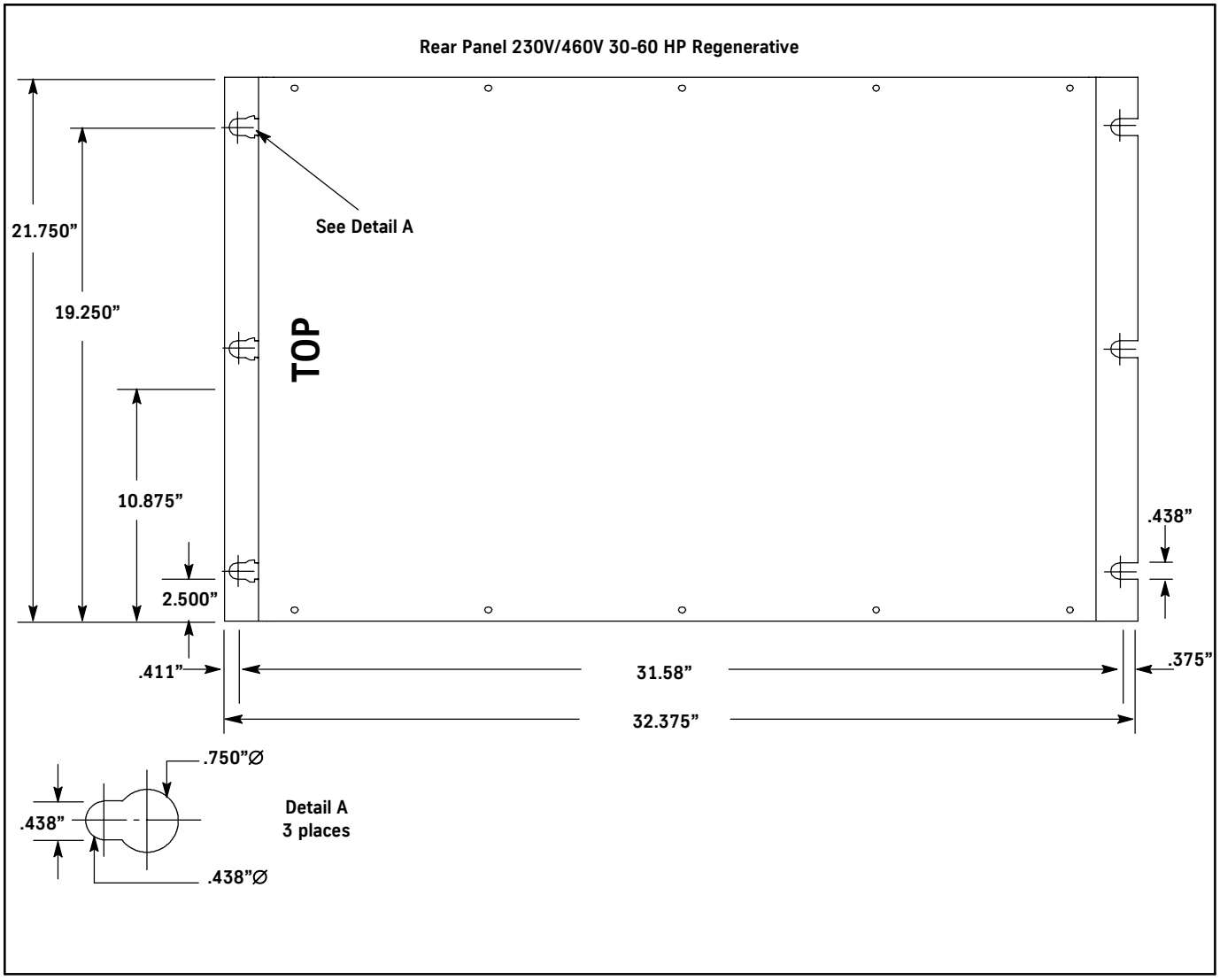

Figure 6 - Mounting Specifications

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Start Up

Pre-Power Check Out

1. Turn Off and Lockout the Mainline Disconnect. Be sure that there is no voltage present in the controller.

2. Place the controller on Inspection (Maintenance) and disable the automatic door opening circuitry.

3. Open the disconnect switch panel and measure the building supply voltage present at the feed side of the circuit breaker or fuses.

4. Verify that the Building Supply Voltage measures within 10% of the rated voltage indicated on the side panel of the Quantum Drive.

NOTE: If the building supply voltage is not within the specifications of the Quantum Drive, verify an Isolation Transformer is installed between the Main Line Disconnect Switch and the Solid State Fuses (Amp Traps), feeding the Quantum Drive. Make sure that the Primary is rated for the measured building supply voltage and the secondary rating is within 10% of the Quantum Drive input voltage. Verify that the KVA rating is correct for the motor horsepower.

Wiring

NOTE: Connect all wiring in the order given.

Incoming Power Wiring

1. Turn Off and Lockout the Mainline disconnect.

2. Connect the building 3 phase power from disconnect, isolation transformer or inductor to the Quantum Drive as follows:

   - **Installations WITHOUT AC Line Contactor: See Figure 7.**
     a. LA power lead to the Quantum Drive terminal R.
     b. LB power lead to the Quantum Drive terminal S.
     c. LC power lead to the Quantum Drive terminal T.
     d. Building distribution ground lead to Quantum Drive terminal G.

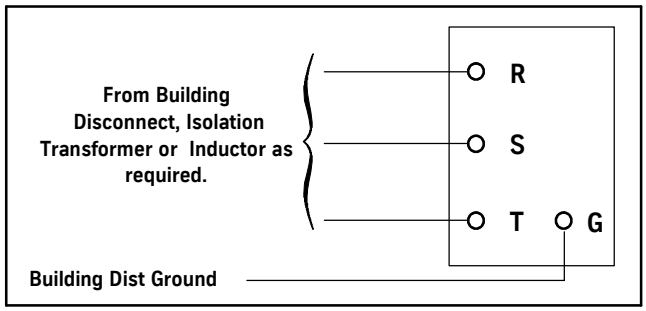

Figure 7

   - **Installations WITH AC Line Contactor: See Figure 8.**
     a. LA power lead to one side of the normally open contact on the first pole of a 3 phase power contactor. Contactor must be sized for conducting the phase currents of the AC Drive Motor.
     b. Power lead from the other side of the first pole normally open contact to the Quantum Drive terminal R.
     c. LB power lead to one side of a normally open contact on the second pole of the 3 phase line contactor.
     d. Power lead from the other side of the second pole normally open contact to the Quantum Drive terminal S.
     e. LC power lead to one side of the normally open contact on the third pole of the 3 phase line contactor.
     f. Power lead from the other side of the third pole normally open contact to the Quantum Drive terminal T.
     g. Building distribution ground lead to Quantum Drive terminal G.

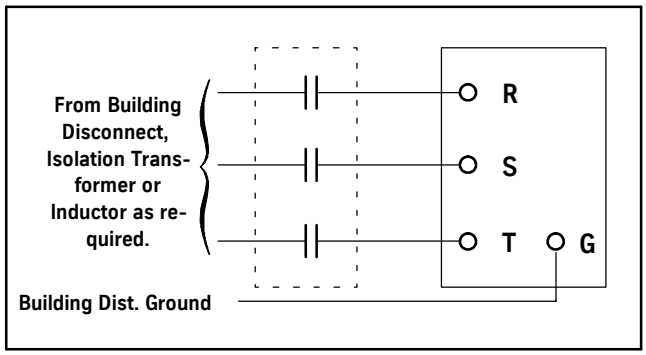

Figure 8

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3. Connect the following wiring from the user's controller: See Figure 9 and Figure 10.
   a. HOT side of the 1 amp/115VAC power source to Conn. 1, Pin 1 on the DSP Card.
   b. Neutral side of the 1 amp/115VAC power source to Conn. 1 Pin 2 on the DSP Card.
   c. Positive side of the 24VDC interface logic supply to Conn. 2, Pin 17 on the DSP Card.
   d. Negative side of the 24VDC interface logic supply to Conn. 2, Pin 18 on the DSP Card.
   e. Signal Interface Logic common to Conn 2, Pin 19 on the DSP card.

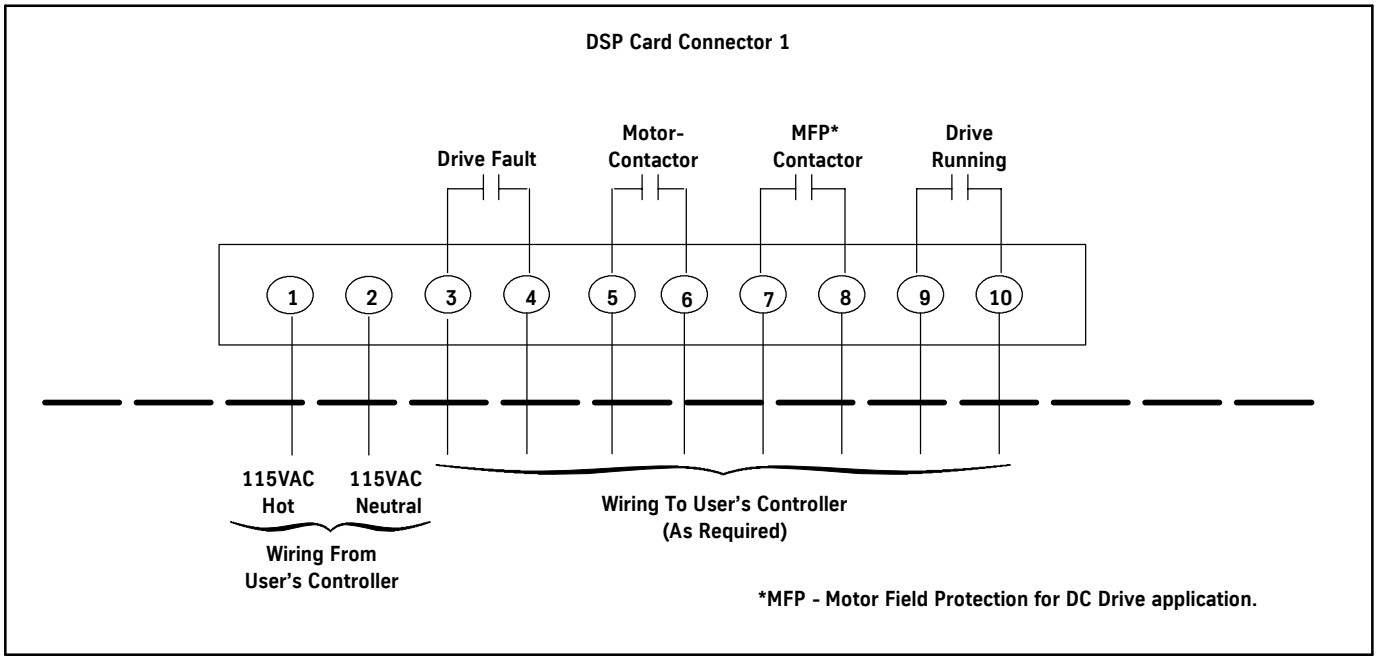

Figure 9 - DSP Connector 1 Wiring

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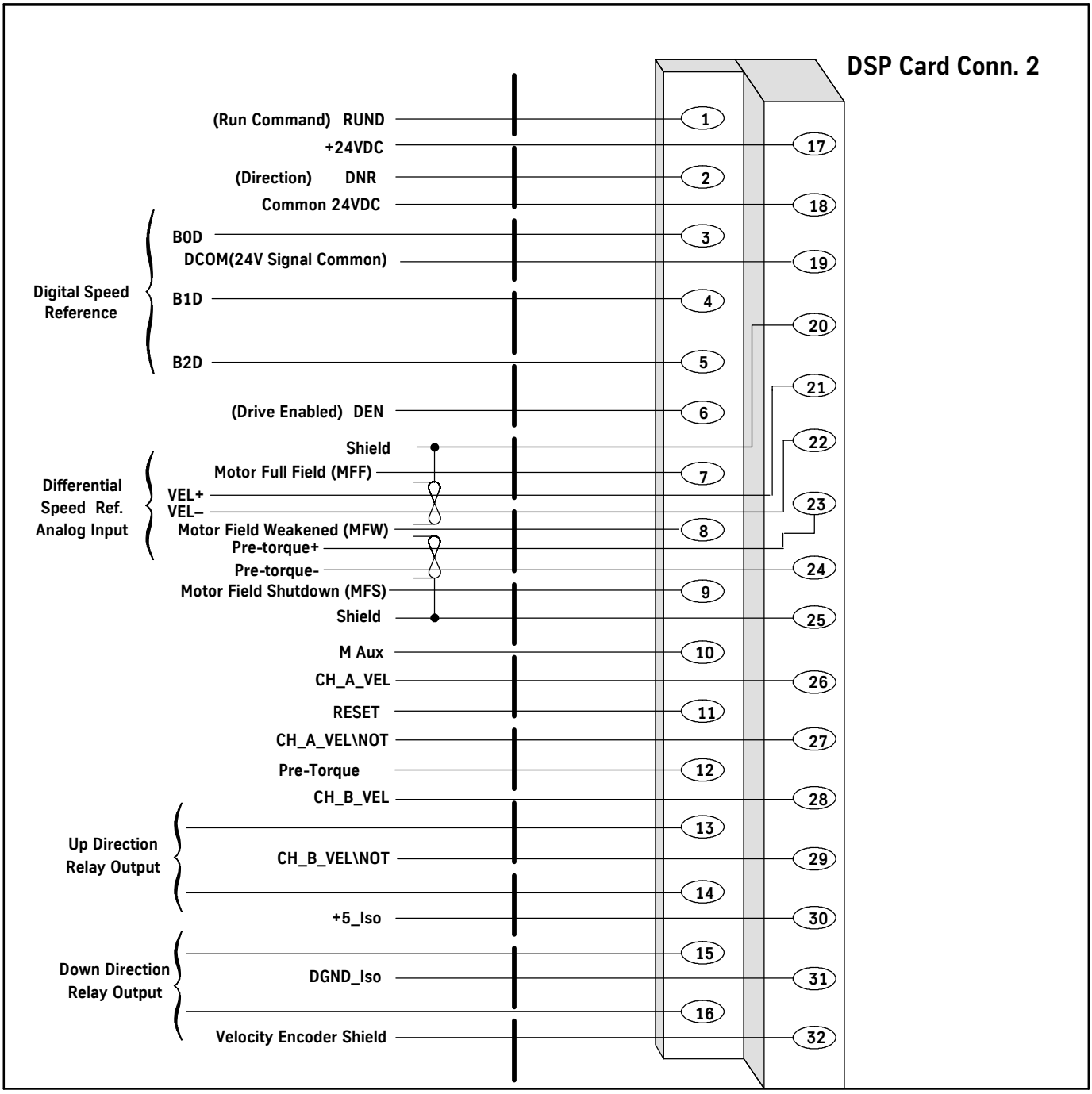

Figure 10 - DSP Connector 2 Wiring

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AC Motor Output Power Wiring

1. Connect the power output wiring between the Quantum Drive output and the 3 phase AC motor as follows:

   - **Installations WITHOUT Motor Contactor**: **See Figure 11.**

     a. Route the T1 motor lead through the U phase LEM module and connect to the U drive terminal.

     b. Connect the T2 lead to the W drive terminal.

     c. Route the T3 motor lead through the V Phase LEM module and connect to the V drive terminal.

   - **Installations WITH Motor Contactor**: **See Figure 12.**

     a. Connect the T1 motor lead to one side of a normally open contact on the first pole of a 3 phase power contactor. (Size contactor for motor HP.)

     b. Route a power lead from the other side of the first pole normally open contact through the U phase LEM module and connect to the U drive terminal.

     c. Connect the T2 motor lead to the second pole of the 3 phase motor contactor.

     d. Connect a power lead from the other side of the second pole normally open contact to W drive terminal.

     e. Connect the T3 motor lead to the third pole of the 3 phase motor contactor.

     f. Route a power lead from the other side of the third pole normally open contact through the V phase LEM module and connect to the V drive terminal.

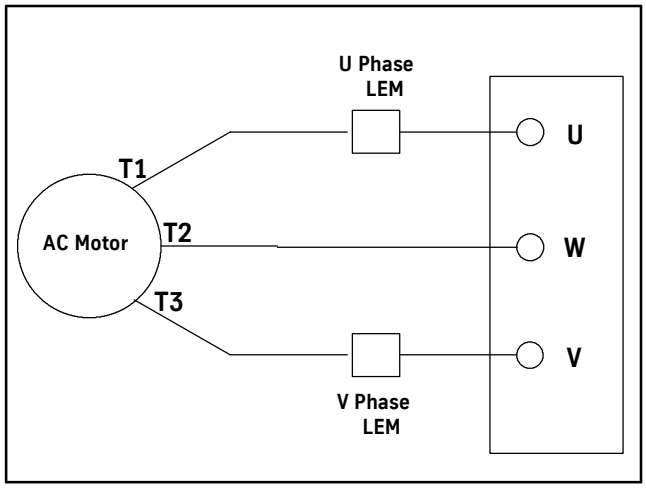

Figure 11 - AC Output Wiring without Motor Contactor

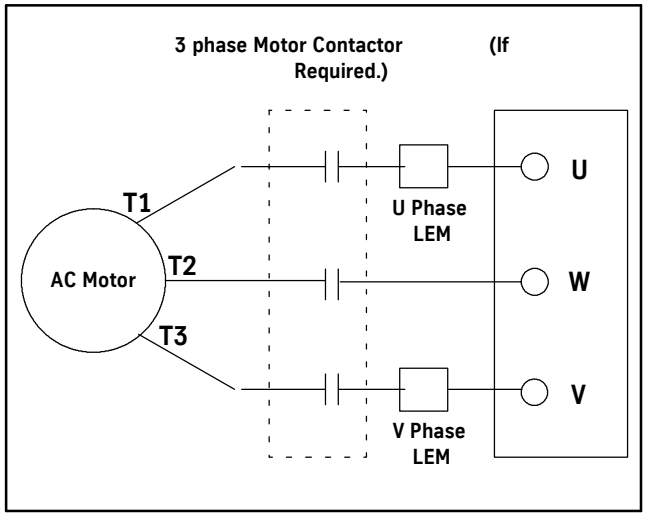

Figure 12 - AC Output Wiring with Motor Contactor

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DC Motor Output Power Wiring

1. Connect the power output wiring between the Quantum Drive output and DC motor as follows:
   - **Installations WITHOUT Motor Contactor**: **See Figure 13.**
     a. Route the A1 motor lead through the U phase LEM module and connect to the U drive terminal.
     b. Connect the A2 lead to the W drive terminal.
     c. Connect the F2 motor field lead through the V Phase LEM module and connect to the V drive terminal.
     d. Connect the F1 motor field lead to Bus–.
   - **Installations WITH Motor Contactor**: **See Figure 14.**
     a. Connect the A1 motor lead to one side of a normally open contact on the first pole of a DC power contactor. (Size contactor for motor HP.)
     b. Route a power lead from the other side of the first pole normally open contact through the U phase LEM module and connect to the U drive terminal.
     c. Connect the A2 motor lead to the second pole of the DC power contactor.
     d. Connect a power lead from the other side of the second pole normally open contact to W drive terminal.
     e. Connect the F2 motor field lead through the V phase LEM to the V Drive terminal.
     f. Connect F1 motor field lead to BUS–.

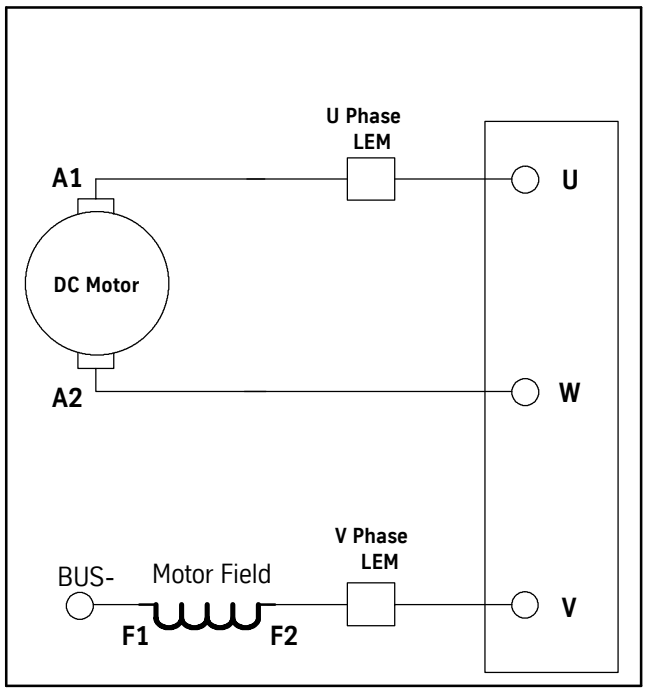

Figure 13 - DC Motor Output Wiring without Motor Contactor

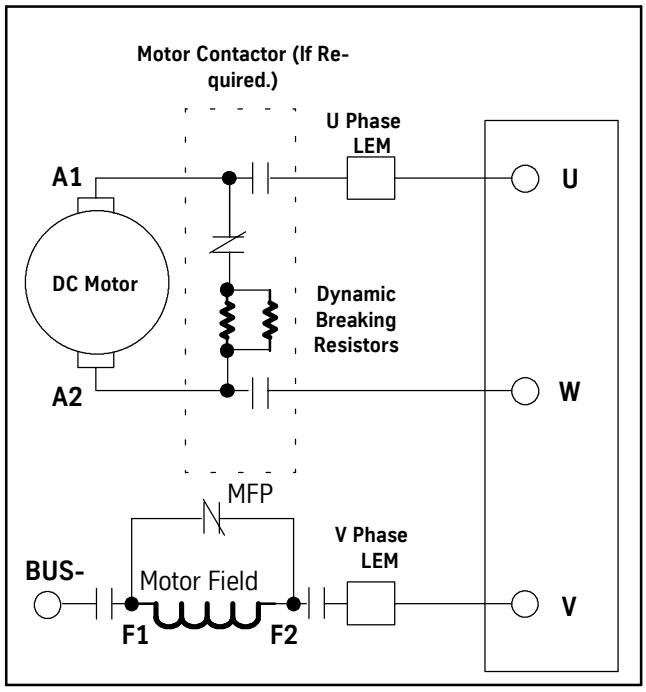

Figure 14 - DC Motor Output Wiring with Motor Contactor

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Signal Input Wiring

Connect the following 24VDC signal wires between the DSP Card and the user's controller. All signals are active low to, 24V signal common. See Figure 10.

Signal Name	DSP Connector	Description
RUND	Conn. 2, Pin1	Run Drive: Active Low, (to Signal Logic Common): Signal from elevator controller to indicate the controller has established a direction to run. This signal initiates the drive to energize the motor contactor.
DEN	Conn. 2, Pin 6	Drive Enable: Signal from user's controller to indicate the elevator is safe to move.
M Aux	Conn. 2, Pin 10	Motor Contactor Energized: Signal from an auxiliary contact of the motor contactor to indicate the motor contactor is energized.
RESET	Conn. 2, Pin 11	Drive Reset: Signal from user's controller to reset drive faults.

Optional Input Wiring

Signal Name	DSP Connector	Description
MFF	Conn. 2, Pin 7	Motor Full Field: Active Low, Signal from elevator controller to increase DC Motor Fulll Field
MFW	Conn. 2, Pin 8	Motor Field Weakened: Active Low, Signal from elevator controller to weaken DC Motor Field.
MFS	Conn. 2, Pin 9	Motor Field Shutdown: Active Low, Signal from elevator controller to shutdown DC Motor Field.
Pre-Torque	Conn. 2, Pin 12	Pre-Torque Command: Active Low, Signal from elevator controller to Pre-Torque the drive.

Table 1 - Signal and Optional Input Wiring

Signal Output Wiring

Connect the following contacts between the DSP Card terminals and the user's controller. See Figure 9.

Signal Name	DSP Connector	Description
Drive Fault	Conn. 1, Pin 3 Conn. 1, Pin 4	Contact opens to indicate a critical drive fault has occurred in the drive.
Motor Contactor	Conn. 1, Pin 5 Conn. 1, Pin 6	Dry contact closes to allow user's 3ph motor contactor to energize and apply the drive's 3ph output power to the machine motor.
Motor Field Protection Contactor	Conn. 1, Pin 7 Conn. 1, Pin 8	Dry contact closes to allow user's (MFP) contactor to energize and apply power to the Motor Field.
Drive Running	Conn. 1, Pin 9 Conn.1, Pin 10	Dry contact closes indicating to the controller that the drive is ready to run and the motor contactor is energized. The controller uses this signal as an indication that it is safe to energize the machine brake and apply the speed reference signal to the drive.

Table 2 - Signal Output Wiring

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Speed Dictation Wiring

Connect the following wires between the indicated DSP Card terminals and the user's controller. See Figure 10. For controllers configured with Digital Speed Reference signals, use Table 3. For controllers configured with an analog speed pattern, use Table 4.

Signal Name	DSP Connector	Description
DNR	Conn. 2, Pin 2	Direction Down Run: Signal from the controller issued in conjunction with the RUND signal to enable a down run.
B0D	Conn. 2, Pin 3	Binary Dictation Level 0: Signal from the controller. When active, it dictates the drive to run at the speed set by the SR1 parameter. (Leveling Speed)
B1D	Conn. 2, Pin 4	Binary Dictation Level 1: Signal from the controller. When active dictates the drive to run at the speed set by the SR2 parameter. (Inspection/Maintenance Speed)
B2D	Conn. 2, Pin 5	Binary Dictation Level 2: Signal from controller. When active, dictates the drive to run at the speed set by the SR4 parameter. (Contract Speed)

Table 3 - Digital Speed Pattern Signals

Signal Name*	DSP Connector*	Description
VEL +	Conn. 2 Pin 21	Velocity Command Positive: Signal input from user's S-curve. Ramps positive voltage with respect to VEL – for an up run. (Scaleable to 10VDC max. from drive parameter AFS.
VEL –	Conn. 2 Pin 22	Velocity Command Negative: Signal input from the user's S–curve. Ramps positive voltage with respect to VEL + for a down run. (Scaleable to 10VDC max. from drive parameter AFS.)
Shield	Conn. 2 Pin 20	Shield Reference: Connection point for the shield lead of the twisted shield cable. **NOTE**: Shield lead should be connected at the drive end only. Leave the shield lead disconnected at the controller end. Tape up shield lead in the controller to isolate from ground.
*** Connections must be made with 20 gauge min., twisted shielded pair only.**		

Table 4 - Analog Speed Pattern Signal

Digital Velocity Encoder Wiring

Connect the following wiring between the DSP Card terminal indicated and the motor encoder. This shielded cable must be routed in a separate conduit isolated from the machine brake and motor wiring. See Figure 10.

NOTE: Motor Velocity encoder must be mounted to the shaft of the motor. Friction drive cannot be used.

Signal Name*	DSP Connector*	Description
CH_A_VEL	Conn. 2, Pin 26	Channel A: Ch A signal. Connect to the CH A terminal on the motor encoder.
CH_A_VEL\NOT	Conn. 2, Pin 27	Channel A Negative: Ch A minus signal. Connect to the CH A\not terminal on the motor encoder.
CH_B_VEL	Conn. 2, Pin 28	Channel B: Ch B signal. Connect to the CH B terminal on the motor encoder.
CH_B_VEL\not	Conn. 2, Pin 29	Channel B Negative: Ch B Minus signal. Connect to the CH B\not terminal on the motor encoder.
+5V_Iso	Conn. 2, Pin 30	+5VDC Isolated Power: Positive 5V power source for the Velocity Encoder. Connects to the +5 or VIN terminal on the motor encoder.
DGND_Iso	Conn. 2, Pin 31	Digital Encoder Ground: 5V power common for the Velocity Encoder. Connects to the GND terminal on the motor encoder.
SHIELD	Conn. 2, Pin 32	Shield Reference: Connection common for the shield lead of the twisted shielded cable used for the rotor position and speed signal to the drive. **NOTE**: Shield lead should be connected at the drive end only. Leave the shield disconnected at the encoder end. Tape up shield lead in the encoder to isolate from ground.
*** Connections must be made with 20 gauge min., twisted shielded pair only.**		

Table 5 - Digital Velocity Encoder Wiring

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Current Regulator Card Header Jumper Configuration

Verify the header jumper settings on the Current Regulator Card are configured correctly for the applied line voltage and drive horsepower rating, as shown in the following table.

HP	230V		460V	
	AC	DC	AC	DC
7.5	NA	NA	J1 & J2 - On J13 - Off J15 - 1 & 2 J16 - 1 & 2	NA
10	J5 & J6 - On J13 - Off J15 - 1 & 2 J16 - 1 & 2	J5 & J2 - On J13 - On J15 - 1 & 2 J16 - 1 & 2	J1 & J2 - On J13 - Off J15 - 1 & 2 J16 - 1 & 2	J1 & J2 - On J13 - On J15 - 1 & 2 J16 - 1 & 2
15	J7 & J8 - On J13 - Off J15 - 1 & 2 J16 - 1 & 2	J7 & J2 - On J13 - On J15 - 1 & 2 J16 - 1 & 2	J3 & J4 - On J13 - Off J15 - 1 & 2 J16 - 1 & 2	J3 & J2 - On J13 - On J15 - 1 & 2 J16 - 1 & 2
20	J9 & J10 - On J13 - Off J15 - 1 & 2 J16 - 1 & 2	J9 & J2 - On J13 - On J15 - 1 & 2 J16 - 1 & 2	J5 & J6 - On J13 - Off J15 - 1 & 2 J16 - 1 & 2	J5 & J2 - On J13 - On J15 - 1 & 2 J16 - 1 & 2
30	J7 & J18 - On J13 - Off J15 - 1 & 2 J16 - 1 & 2	J7 & J2 - On J13 - On J15 - 1 & 2 J16 - 1 & 2	J7 & J8 - On J13 - Off J15 - 1 & 2 J16 - 1 & 2	J7 & J2 - On J13 - Off J15 - 1 & 2 J16 - 1 & 2
40	J9 & J10 - On J13 - Off J15 - 1 & 2 J16 - 1 & 2	J9 & J2 - On J13 - On J15 - 1 & 2 J16 - 1 & 2	J9 & J10 - On J13 - Off J15 - 1 & 2 J16 - 1 & 2	J9 & J2 - On J13 - On J15 - 1 & 2 J16 - 1 & 2
60	J11 & J12 - On J13 - Off J15 - 1 & 2 J16 - 1 & 2	J11 & J2 - On J13 - On J15 - 1 & 2 J16 - 1 & 2	J7 & J8 - On J13 - Off J15 - 1 & 2 J16 - 1 & 2	J7 & J2 - On J13 - On J15 - 1 & 2 J16 - 1 & 2
80	NA	NA	J9 & J10 - On J13 - Off J15 - 1 & 2 J16 - 1 & 2	NA
120	NA	NA	J11 & J12 - On J13 - Off J15 - 1 & 2 J16 - 1 & 2	NA

NOTES:

- When using the 6300LR3 Current Regulator Card with 460V Drives with AC Geared Motor connect J19 Pin 1 and 2, J20 Pin 1 and 2.
- When using the 6300LR3 Current Regulator Card with 460V Drives with AC Gearless Motor connect J19 Pin 2 and 3, J20 Pin 2 and 3. (Remember to add 32 to the DCN parameter for AC Gearless - See Table 6.)

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Initial Power Check Out

1. Place the controller on Inspection Operation and verify that the door opening circuitry is disabled.

2. Unlock and turn ON the Main Line Disconnect and verify the following:
   a. Voltage is present at drive terminals R, S, and T and is within 10% of the drive rating on the side label.
   b. 115VAC ± 10% is present on Pins 1 and 2 of Conn. 1 on the DSP Card.
   c. +24VDC ± 10% is present on Pin 17 with respect to Pin 18 of Conn. 2 on the DSP Card.
   d. +24VDC ± 10% is present on Pin 17 with respect to Pin 19 of Conn. 2 on the DSP Card.
   e. +15VDC ± 5% is present on Test Point +15V with respect to Test Point AGND on the DSP Card.
   f. –15VDC ± 5% is present on Test Point –15V with respect to Test Point AGND on the DSP Card.
   g. +5VDC +.25V–0.0V is present on Test Point +5V with respect to Test Point DGND on the DSP Card.
   h. Green Power On LED is flashing on the front panel of the drive. The following power-up message should also be displayed on the LCD front panel display:

   For AC Drive: CEC Swift
   Quantum AC Drive

   For DC Drive: CEC Swift
   Quantum DC Drive

   i. Heat sink fan, located at the bottom of the drive unit is on and blowing air up into the heat sink.

Preliminary Parameter Adjustment

The parameters for the drive are accessed and adjusted through the User Interface Card mounted on the front of the DSP Card at the front of the drive. All information to the drive is entered with the Up Arrow, Down Arrow, ESCape and ENTer keys. See Figure 15.

1. Press any key on the display to activate the Users Interface.

2. Use the Up or Down arrow key to scroll the display to the desired parameter category in the Main Menu.

3. Press the ENT key to enter the category displayed.

4. Use the Up or Down arrow keys to scroll between the Mon (Monitor), Cmd (Command) and Adj (Adjustment) modes.

5. When the adjustment mode is displayed, press the ENT key to access the parameter menu.

6. Use the Up and Down arrow keys to display the desired parameter name and it's present setting.

7. To change the parameter value, press the ENT key with the desired parameter displayed. This will highlight the parameter value with an asterick (*). Use the Up and Down arrow keys to raise or lower the displayed value to the new desired value.

8. Press the ENT key to save the new value.

9. Press the ESC key to return to the parameter menu in the selected category.

10. From the parameter menu, either use the Up and Down arrow keys to scroll to another parameter name or press the ESC key multiple times to back out of the selected parameter, mode or category and return to the Main Menu.

11. Repeat these steps for all parameter settings.

NOTE: Refer to the Users Interface Section of this manual for more information on the use of the interface module and a parameter map of all the drive settings.

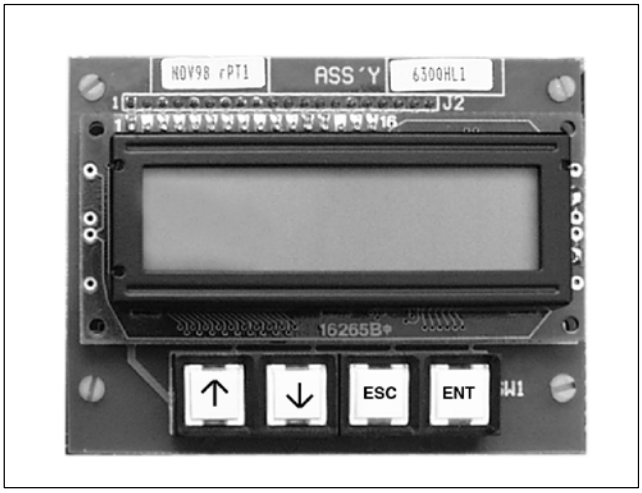

Figure 15 - User Interface Card

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Initial Drive Settings

Verify the following parameters are set to the values indicated to match job requirements. Re-adjust any parameter as necessary to match the following list or the actual known job conditions.

System Category Settings

Par.	Job Conditions		
DCN	**Note: Add only the numbers that match your actual known job conditions to determine the number (nn) for the DCN parameter.**		
	DC Drive	=	+ 1
	AC Drive	=	+ 0
	230V Drive	=	+ 2
	460V Drive	=	+ 0
	Analog Speed Reference	=	+ 4
	Digital Speed Pattern	=	+ 0
	Regenerative Drive	=	+ 8
	Non-Regenerative Drive	=	+ 0
	Motion Direction	=	+16
	No Motion Direction	=	+0
	Low Frequency (AC Gearless)	=	+32
	High Frequency (AC Geared)	=	+0
DCN	**Total**	=	nn (DCN setting)
	Example: 460V DC Drive with analog speed reference for a non-regenerative drive with motion direction **Add:** 1 + 0 + 4 + 0 + 16 = 21 DCN parameter setting **Example:** 230V AC Drive with digital speed reference for a regenerative drive with motion direction **Add:** 0 + 2 + 0 + 8 + 16 = 26 DCN parameter setting		
MAL	1		
FRS	0		

Table 6 - System Parameters

Speed Loop Category Settings

Par.	Recommended / Initial Setting		
	Geared	**Gearless 2:1**	**Gearless 1:1**
CTS	Set to Contract Speed. (fpm)		
RPM	Set to the motor RPM when running at contract speed.		
REV	0		
KFP	45.00	22.50	15.00
KVI	300.0	150.0	100.0
LPF	0	16	16
NCF	0	85	85

Table 7 - Speed Loop Parameters

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Control Category Settings

Par.	Recommended / Initial Setting
FLD	0
MOL	0
OLT	30
OSD	0
OSP	110

Table 8 - Control Parameters

Speed Reference Category Settings

•For systems using Digital Speed Pattern Signal Input

Par.	Recommended / Initial Setting
SR1	Set to the desired Leveling Speed in FPM. (8)
SR2	Set to the desired Inspection/Maintenance Speed of the elevator. (50)
SR3	Set to the desired One-Floor-Run Speed in FPM.
SR4	Set to the desired Contract Speed of the elevator in FPM.

Table 9 - Digital Speed Pattern Reference

•For systems using Analog Speed Pattern Signal Input

Par.	Recommended / Initial Setting
AFS	Sets the Contract Speed Dictation voltage level in the drive. (Value entered as customer's analog contract speed pattern volts x 10.)

Table 10 - Analog Speed Pattern Reference

AC Motor Drive Category Settings

Par.	HP	Recommended / Initial Setting	
		230 VAC Input	460VAC Input
KFF		Set per Table 12 or Table 13.	
MDC	10	66.0	33.0
	15	99.0	50.0
	20	129.0	67.0
	30	198.0	99.0
	40	258.0	129.0
	60	400.0	198.0
	80	-	258.0
	120	-	400.0
MFC		Set per Table 12 or Table 13.	
RSF		Set per Table 12 or Table 13.	
MTP		Set per Table 12 or Table 13.	
VEP		Set to Pulse per Revolution rating of the motor velocity encoder.	
VEI		0	

Table 11 - AC Drive Parameters

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AC Motor Parameter Set Up

MOTOR HP	MOTOR NAMEPLATE NUMBER	DRIVE HP	FRAME	DEFAULT ADJUSTMENTS					CONTRACT SPEED MOTOR RPM
				KFF	MFC		RSF	MTP	
					230V	460V			
7.5	590CA1	10	213TC	0	4.4	2.2	2.16	4	<1800
10	590CA2	10	215TC	0	5.4	2.7	1.36	4	<1800
15	590CA3	15	254TC	0	12.8	6.4	1.44	4	<1800
20	590CA4	20	256TC	0	15.2	7.6	1.44	4	<1800
30	590CC1	30	286TSC	0	24.0	12	1.52	4	1400–1799
30	590CC1	40	286TSC	0	24.0	12	2	4	1400–1799
40	590CC4	40	324TC	0	25.6	12.8	1.2	4	1400–1799
50	590CC5	60	326TC	0	27.2	13.6	1.36	4	1400–1799
40	590BJ11	30	326TS	0	27.2	13.6	1.2	6	775–1199
40	590BJ11	40	326TS	0	27.2	13.6	1.44	6	1200–1399
60	590BJ13	60	404TS	0	48.4	24.2	1.12	6	715–1200
65	590BW1	60R	447T	0	-	35	0.56	8	126–250
75	590BW2	80R	449T	0	-	45	0.46	8	100–250
75	590BW3	80R	449T	0	-	45	0.72	8	80–165
110	590BW5	80R	685T	0	-	45	0.312	8	114–210
110	590BW5	120R	685T	0	-	45	0.456	8	114–210
110	590BW6	80R	685T	0	-	40	0.400	8	50–160
110	590BW6	120R	685T	0	-	40	0.600	8	50–160
MOTORS FOR MODERNIZATION APPLICATIONS									
20	590BM1, 3 / 590BJ4, 5	20	286T	0	7.6		1.2	6	<1200RPM
20	590BM1, 3 / 590BJ4, 5	20	286T	0	7.6		1.6	6	>1200RPM
40	590BM2, 4 / 590BJ1, 6, 7	30	326TS	0	13.6		1.2	6	<1200RPM
40	590BM2, 4 / 590BJ1, 6, 7	40	326TS	0	13.6		1.6	6	>1200RPM

Table 12 - Foreign Motor Parameter Setup (See note below.)

Other AC Motor Parameter Setup

Parameter Name	Method Used to Determine Setting
KFF	0
MFC	Set for the No Load data, (Balanced Load), on the motor nameplate: or 35% of the Full Load Nameplate Rating. (Value entered in Amps)
MTP	Set to the number of stator poles per phase in the machine motor.
RSF	Set per Formula Below $\frac{\text{(Synchronous Motor RPM – Rated Load RPM)}}{\text{Rated Load RPM}} \times 60$

Table 13 - Foreign Motor Parameter Setup

NOTE: The quality of the insulation on foreign motors should be verified to ensure acceptable performance.

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DC Motor Drive Category Settings

Par.	Recommended / Initial Setting
CTR	Set per Table 15.
FFC	Set to full field requirements of the motor. Refer to the motor nameplate data or the job survey sheets for the field configuration and full field current requirements. (Amps)
FFR	100
SFC	20
UTL	70
VEI	0
VEP	Set to the Pulse Per Revolution rating of the shaft mounted velocity encoder.
WFC	60
WFR	50

Table 14 - DC Drive Parameters

DC Motor CTR Parameter Settings

Drive HP	230V	460V
10	500	200
15	500	200
20	500	200
30	1000	200
40	1000	200
60	1250	400
80	NA	400
120	NA	500

Table 15 - DC Drive Parameters

DC Motor Field Set-up

1. Turn OFF and lockout the mainline disconnect.

2. Measure the resistance of the disconnected motor field leads and verify the actual motor field resistance agrees with the value indicated on the survey data or wiring diagrams provided for the job.

NOTE: If survey information is not available, determine the rated field current data from the nameplate of the hoist motor (or use ohms law to calculate the current from the field resistance and voltage information) and verify the measured field resistance agrees with the nameplate data. Reconfigure field wiring as necessary.

3. Unlock and turn ON the mainline disconnect.

4. View the FFC (Forced Field Current) parameter setting using the Users Interface Card on the front of the drive.

NOTE: The FFC value displayed = field current (AMPS) x 100.

5. The FFC setting is the actual full field motor field current.

6. Adjust the FFC value in the drive to agree with either the motor nameplate or calculated field current.

7. View the SFC (Standby Motor Field Current) parameter and verify that it is set to 20.

NOTE: The displayed value is a percentage of the FFC setting that is used to provide the Standby Motor Field Current.

8. Turn OFF and lockout the mainline disconnect.

9. Connect the motor field leads to controller terminals V and Bus-.

10. Unlock and turn ON the mainline disconnect.

11. Monitor the motor field current, using the User Interface Card, to verify the correct motor field operation.

NOTE: The displayed current is equal to FFC x SFC setting.

NOTE: Raise or lower the SFC value as necessary to obtain the desired standing field current.

12. Verify that the Green Power_On LED is flashing on the front of the drive and that the Red Drive_Fault LED is off.

NOTE: If the Red Drive_Fault LED is lit or flashing, access the drive Diagnostic Category and enter the command function to display or clear drive faults as necessary. All fault conditions should be corrected before continuing.

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AC Motor Start-up and Direction Check

1. Verify that the controller is on Inspection/Maintenance Operation and that the Door Opening Circuitry is inactive or blocked.
2. Verify the Red LED on the front of the drive is not lit or flashing. Use the ENT, ESC and arrow buttons as necessary to access the DIAGNOSTIC category and view, correct, and reset any fault condition.
3. While observing the drive sheave — Momentarily initiate a down inspection run and then an up inspection run and check for one of the following conditions:
   a. **Car moves correctly in both directions.** Car moves in the down direction when a down inspection run is initiated and the car moves up when the up run is initiated. If direction is correct proceed to the *AC/DC Speed Regulator Calibration Test* section.
   b. **Car does not move.** Check the following items and then check the items according to the use of Digital or Analog Speed Reference signal. Troubleshoot and make any corrections necessary. Recheck operation beginning at Step 3 under *AC Motor Start-up and Direction Check*.
      1. Verify the Motor Contactor is energizing when the up and down runs are initiated.
      2. Verify Conn. 2, Pin 10, on the DSP Card goes low with respect to DCOM (Conn. 2, Pin 19) when the down run is initiated.
      3. Verify the the Red LED on the front of the drive is not lit or flashing. Use the ENT, ESC, and arrow buttons as necessary to access the DIAGNOSTIC category and view, correct, and reset any fault condition.
      4. If the Yellow LED lights on the front of the drive, as the down run is initiated; verify the machine brake is lifting free of the brake drum before the car moves.
      5. If the Yellow LED lights on the front of the drive, as the down run is initiated; Verify the counter weighting of the car is not excessive.
      6. Verify the Speed Reference Signals are activating properly.
         - **Controllers with Digital Speed Reference Signal:**
           a. Verify both input signals RUND (Conn.2, Pin 1) and DNR (Conn. 2, Pin 2), on the DSP Card are going low with respect to DCOM (Conn. 2, Pin 19), when the down inspection run is initiated.
           b. Verify the DNR input signal does not go low when the up run is initiated.
           c. Verify the RUND signal goes low.
           d. Verify that signal B1D (Conn. 2, Pin 4) on the DSP Card is going low with respect to DCOM (Conn. 2, Pin 19), when the up or down inspection runs are initiated.
           e. Verify SR2 parameter is set to 50.
         - **Controllers with Analog Speed Reference Signal:**
           a. Verify signal RUND, (Conn.2, Pin 1) on the DSP Card goes low with respect to DCOM (Conn. 2, Pin 19), when the up or down run is initiated.
           b. Verify the user's S-Curve signal voltage is present at Conn. 2, Pin 21 & 22, on the DSP Card when either an up or down runs is initiated.
   c. **The car moves very slow in the up or down direction then shuts down**. Check the items below and then recheck operation beginning at Step 3 under *AC Motor Start-up and Direction Check*.
      1. Verify the shaft mounted motor encoder wiring to the DSP Card.
      2. Verify the power at Conn. 2, Pin 30 (+5V), and Conn. 2, Pin 31 (DGND) on the DSP Card is connected properly to the Input Power Connections on the shaft mounted motor encoder.
      3. Verify the CH_A & CH_B Signals toggle between high and low states as the car is slowly drifted through the brake. Make sure that these signals are present at Conn. 2, Pins 26 to 27 and Conn. 2 Pins 28 to 29 on the DSP Card.
   d. **The car moves in the same direction when the up and down runs are initiated.** Check the following items, trouble shoot and make any corrections necessary. Recheck operation beginning at Step 3.
      1. Verify the input signal DNR (Conn. 2, Pin 2), on the DSP Card goes low with respect to DCOM when the down run is initiated.
      2. Verify the input signal DNR does not go low with respect to DCOM when the up run is initiated.
      3. Remove power from the controller. Swap the two motor encoder connections (CH_A & CH_A/NOT), at Conn. 2, Pins 26 & 27 on the DSP Card. Recheck operation beginning at Step 3 under *AC Motor Start-up and Direction Check*.

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e. **The car moves in the wrong direction:** Check the items below and then recheck operation beginning at Step 3 under *AC Motor Start-up and Direction Check*.

- **Controllers with Digital Speed Reference Signal:**

1. Verify the input signal DNR, (Conn 2, Pin 2 on the DSP Card) goes low to DCOM when the down run is initiated.
2. Verify the input signal DNR does not go low to DCOM when the up run is initiated.
3. If the car continues to move in the wrong direction:
   a. Turn OFF and Lock Out the mainline disconnect.
   b. Reverse the T1 and T2 motor connections at the motor contactor.
   c. Unlock and turn ON the mainline disconnect.
   d. Repeat step 3 under *AC Motor Start-up and Direction Check* to verify correct direction.

- **Controllers with Analog Speed Reference Signal:**

1. Verify the customer's Down S-Curve input signal voltage is negative at the Conn 2, Pin 21 with respect to Conn 2, Pin 22 on the DSP Card.
2. Verify the customer's Up S-Curve input signal voltage is positive at Conn 2, Pin 21 with respect to Conn 2 Pin 22 on the DSP Card.
3. If the car continues to move in the wrong direction:
   a. Turn OFF and Lock Out the mainline disconnect.
   b. Reverse the motor field wires, F1 and F2.
   c. Unlock and turn ON the mainline disconnect.
   d. Repeat step 3 under *AC Motor Start-up and Direction Check* to verify correct direction.

DC Motor Start-up and Direction Check

1. Using the User Interface Card, verify that the Drive Adjustment parameter UTL is set to 50.
2. Turn OFF and lockout the mainline disconnect.
3. Connnect the motor armature leads to the U and W output of the Drive.
4. Disable the velocity encoder by disconnecting the encoder lead connected to terminal 30 of conn 2 on the DSP Card.
5. Unlock and turn ON the mainline disconnect and place the car on Inspection Operation.
6. Observe the drive sheave while momentarily pressing the SAFE and DOWN buttons on the controller. Check for one of the following conditions:
   a. **The car moves in the down direction.** Operation is correct, proceed to Step 7.
   b. **The car does not move.** Check the following items, trouble shoot and make any corrections necessary. Recheck operation beginning at Step 6.
      1. Safety curcuit is closed.
      2. Red LED on the drive front panel is not lit or flashing. (If the red LED is on, access the Diagnostic Command function and clear drive faults as necessary.)
      3. Conn 2,Pins 1 and 2 on the DSP Card are low to PC while the DOWN and SAFE buttons are energized.
      4. Conn 2, Pin 4 on the DSP Card is low while the DOWN buttons are pressed.
      5. If the Yellow Drive LED lights as the buttons ar prressed to run down, verify the following:
         a. Machine brake is energizing free of the drum.
         b. Counter weighting of the car is not excessive.
      6. If the Yellow Drive LED lights as the buttons are pressed to run down, all above items are OK and the car still will not move, increase the UTL parameter setting to 60 or higher as necessary until the Yellow LED no longer lights.
   c. **The car moves in the up direction.** Verify that both down run signals at Conn 2, Pins 1 and 2 on the DSP Card are low to PC while the DOWN and SAFE buttons are energized.
      1. If signals are correct:
         a. Turn OFF and Lockout the mainline disconnect.
         b. Reverse the motor field connections at controller terminals V and Bus-.
         c. Unlock and turn ON the mainline disconnect.
         d. Repeat Step 6 above to verify correct direction.
7. Turn OFF and lockout mainline disconnect.
8. Reconnect the velocity encoder lead to Conn 2, Pin 30 on the DSP Card.

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9. Unlock and turn ON mainline disconnect.

10. Access and monitor the Speed Feedback Signal on the User Interface Card while momentarily pressing SAFE and DOWN buttons to run the car in the down direction. Check for one of the following conditions:
    a. **Speed Feedback Signal is negative as the car moves in the down direction.** Operation is correct, continue to Step 11.
    b. **Speed Feedback Signal does not change from 0 as the car moves in the down direction.** Check the following, trouble shoot and make any corrections necessary. Recheck operation beginning with Step 10.

        1. Velocity encoder wiring connecctions at the encoder and on Conn 2 on the DSP Card.
        2. +5VDC present at Conn 2, Pin 30 on DSP Card.
        3. Encoder coupling is properly tightened and the encoder shaft turns as the car moves.
        4. If all above items are OK, use oscilloscope or meter to verify good phase A and B signal output from the encoder as the encoder turns.

    c. **Speed Feedback Signal is positive as the car moves in the down direction.** Swap the two velocity encoder connections (Ch_A and Ch_A not) at Conn2, Pins 26 and 27 on the DSP Card. Recheck operation beginning with Step 10.

11. Increase the Drive Adjustmnet parameter UTL to 100.

AC/DC Speed Regulator Calibration Test

1. Access the Speed Feedback Signal on the user interface panel on the front of the drive:
    a. Use the arrow keys to scroll to the Speed Loop Category in the Main Menu.
    b. Press the ENT key.
    c. Use the arrow keys to access the Monitor Mode.
    d. Press ENT to enter the Monitor Mode.
    e. Use the arrow keys to scroll to Fbk_Vel (Speed Function).
    f. Press the ENT key to monitor the speed feedback signal.
2. Run the car in the down direction and note car speed as displayed on the display.
3. Run the car in the up direction and verify the up car speed is equal to the down car speed on the display. **If the up and down speeds are not equal check the following:**
    - Verify the velocity encoder is mounted in proper alignment with the motor shaft.
    - Verify that no vibration of the encoder is present as the car moves.
    - Use an oscilloscope to verify the uniform CH_A and CH_B signal wave forms are present at the DSP Card.

        CH_A & CH_A/NOT @ Conn. 2, Pins 26 & 27
        CH_B & CH_B/NOT @ Conn. 2, Pins 28 & 29

4. Measure the car speed at the drive sheave or on the straight part of the governor rope. Verify that the actual car speed equals the displayed speed on the drive front panel. **If measured car speed and displayed speeds are not equal check the following:**
    - Verify the pulse per revolution rating of the velocity encoder.
    - Verify that the Drive Adjustment parameter VEP setting is equal to the above encoder rating.
    - Raise or lower the Speed Loop Adjustment parameter RPM as necessary to calibrate the actual and displayed car speed readings to be the same.

Parameter Set-Up for Temporary Operation

Change the following parameters to the values indicated prior to placting the elevator on tempory construction operation:

1. Set parameter OSD to 0.500 in the CONTROL category to activate the Overspeed Detection Circuitry in the drive.
2. Set parameter FLD to 0.500 in the CONTROL category to activate the velocity encoder Feedback Loss Detection Circuitry in the drive.
3. Set the CONTROL category parameter VEL to 50.
4. Set the CONTROL category parameter MOL to the full load namepleate current value.
5. Set the SYStem category parameter RSD to 60.

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Parameter Set-Up for High Speed Adjustment

Enhance elevator operation if necessary with the following parameters:

Par.	Default Settings	Purpose of Adjustment
LPF	0	Raise or lower present setting to reduce audible noise or vibration. (minimum of 10)
NCF	0	Raise or lower the present setting to reduce audible noise or vibration.
RSF	Job Specific Formula	Increase from present setting to improve control as follows: •Monitor the Torque Command Signal in the drive using an oscilloscope and increase the MSF parameter slowly from initial setting by 0.1HZ at a time. **NOTE**: The torque command signal should be optimized to assure that it does not saturate during full load acceleration in the up direction.

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High Speed Operation and Adjustment

Introduction

The Quantum Quiet Drive for AC/DC Drives is capable of operation from a Digital Speed Pattern in conjunction with an Internal S Curve, or an External Analog Speed Pattern.

Verify proper type speed pattern is selected:

- Digital Speed Pattern Operation (See Table 16) - In this configuration the Speed Reference Category Adjustments can be accessed via the User Interface buttons on the front of the Drive.
- Analog Speed Pattern Operation (See Table 16) - In this mode the Speed Reference Category Adjustments cannot be accessed. The Speed Pattern is generated and is adjusted in the User's Controller.

System Category Settings

Par.	Job Conditions		
DCN	**Note: Add only the numbers that match your actual known job conditions to determine the number (nn) for the DCN parameter.**		
	DC Drive	=	+ 1
	AC Drive	=	+ 0
	230V Drive	=	+ 2
	460V Drive	=	+ 0
	Analog Speed Reference	=	+ 4
	Digital Speed Pattern	=	+ 0
	Regenerative Drive	=	+ 8
	Non-Regenerative Drive	=	+ 0
	Motion Direction	=	+16
	No Motion Direction	=	+0
DCN	Low Frequency (AC Gearless)	=	+32
	High Frequency (AC Geared)	=	+0
DCN	**Total**	=	nn (DCN setting)
	Example: 460V DC Drive with analog speed reference for a non-regenerative drive with motion direction **Add:** 1 + 0 + 4 + 0 + 16 = 21 DCN parameter setting **Example:** 230V AC Drive with digital speed reference for a regenerative drive with motion direction **Add:** 0 + 2 + 0 + 8 + 16 = 26 DCN parameter setting		
MAL	1		
FRS	0		

Table 16 - System Parameters

Digital Speed Pattern

The following information is provided for operation and setup of the internal digital speed pattern feature of the Quantum Quiet Drive.

To initiate car motion using the Digital Speed Pattern operation, the DEN and RUND signals must first be activated from the users controller. This in turn will create a Motor Contactor Output. Once the Motor contactor is energized and a signal from an auxiliary contact is fed back to the Drive, directional signal DNR and Digital speed inputs B0D, B1D, and B2D will determine direction and speed of the movement.

Input Signal Description

- Activating inputs, B2D, RUND, and DEN causes the speed pattern to ramp to the level set by the SR4 parameter at a rate set by the ACR parameter.
- Activating inputs B1D, RUND, and DEN, causes the speed pattern to ramp to the level set by the SR2 parameter. The SR2 value corresponds to Inspection / Maintenance Speed.
- Activating input signals B0D, RUND, and DEN. ramps the speed pattern to the level set by the SR1 parameter. The SR1 value corresponds to Leveling Speed.
- Activating inputs B0D, B1D, RUND and DEN, ramps the speed pattern to the level set by the SR3 parameter. The SR3 value corresponds to an independent One Floor Run speed when the contract speed exceeds the floor height slowdown requirements.
- The direction of the run is controlled by the user input signal DNR. When DNR is 24 VDC with respect to Drive Common, the direction will be UP, and when it is 0 VDC, the direction will be DOWN.
- To soften the speed changes and add rounding to the S-curve transitions, jerk rate adjustments J1, J2, and JL are provided. J1 controls the rounding from start into acceleration. J2 controls the rounding from acceleration into dictated speed as well as from dictated speed into deceleration. JL controls the rounding from deceleration into leveling.
- Parameter SDT is provided to give a small delay before beginning the dictation ramp on a start. This give the brake time to begin moving in the open direction before motion is achieved on the brake drum. This adjustment must be coordinated throughout the load range to give a smooth start with minimum roll back.

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Contract Speed Operation

When it is safe for the elevator to run, the controller will issue the DEN signal to the drive. When a direction preference has been established the controller will issue the RUND, B2D and B0D input signal to the drive. At slowdown the controller should de-energize the B2D input leaving B0D active which causes the speed pattern to ramp down to leveling speed set by the SR1 parameter at the rate set by DER parameter.

The direction of the run is determined by the state of the DNR input at the time the RUND is activated. When DNR is 0VDC with respect to Drive Common when the RUND signal is applied, the direction will be DOWN. If DNR is 24VDC when the RUND signal is applied, the direction will be UP.

One-Floor-Run Operation

When it is safe for the elevator to run, the controller will issue a DEN signal to the drive. When a direction preference has been established and a one floor run is required by the controller, it will issue the RUND, B1D and B0D input signal to the drive. At slowdown the controller will de-energize the B1D input leaving the B0D input active to cause the speed pattern to ramp down to leveling speed set by the SR1 parameter at the rate set by the DER parameter.

Digital Speed Pattern Adjustment

Table 17 is a list of suggested Speed Pattern Parameters and slowdown distances for given contract speeds. Actual slowdown distances are required for the Initial Speed Pattern settings listed. (This table is intended to be used as a guide only.) For slowdown distances shorter (closer to the floor) than those listed, increase the J2 and DER settings to keep the elevator from over shooting the floors and to achieve the desired 0.5 seconds of stabilized leveling prior to stopping at the floor. For slowdown distances longer (farther from the floor) than those listed, decrease the J2 and DER settings to keep the elevator from motoring too long prior to stopping at the floor.

Ride Profiles

The following ride profile waveforms are provided to show the area of control for each of the commonly used speed pattern adjustment parameters. See Figure 16 and Figure 17 and Table 18 . These waveforms are viewable at the TPA1 & TPA2 test points on the DSP Card. To view these waveforms, learn and record the address of the Cmd_Vel Monitor signal in the Speed Loop Category and the address of the Ref_Vel Monitor signal in the Speed Ref Category. Program the Diagnostic adjustment parameter TPA1 with the address of the Cmd_Vel signal and program TPA2 parameter with the address of the Ref_Vel signal. Refer to the troubleshooting section of this manual as necessary to obtain information for the programming and use of the TPA1 and TPA2 test points.

Connect both signal probes of a dual channel oscilloscope as follows:

- Connect the probe ground lead of CH 1 to the AGND test point on the DSP Motion Control Card.
- Connect the CH 1 signal probe to the TPA1 test point on the DSP Card.
- Connect the CHl 2 signal probe to the TPA2 test point on the DSP Card.

Car Speed	Actual Slowdown Distance		Suggested Initial Speed Pattern Parameter Settings					
	Above Floor	Below Floor	ACR	DER	J1	J2	JL	SR1
50	7 Inches	7 Inches	75	75	100	150	80	6
100	20 Inches	20 Inches	90	90	120	200	85	6
150	36 Inches	36 Inches	110	110	180	200	100	6
200	53 Inches	53 Inches	120	120	180	240	120	6
250	67 Inches	67 Inches	150	150	180	320	120	6
300	83 Inches	83 Inches	180	180	180	360	120	6
350	107 Inches	107 Inches	180	180	180	360	120	6
NOTE: For slowdown settings closer to the floor, increase the DER or the J2 settings as needed.								

Table 17 - Speed Pattern Parameters

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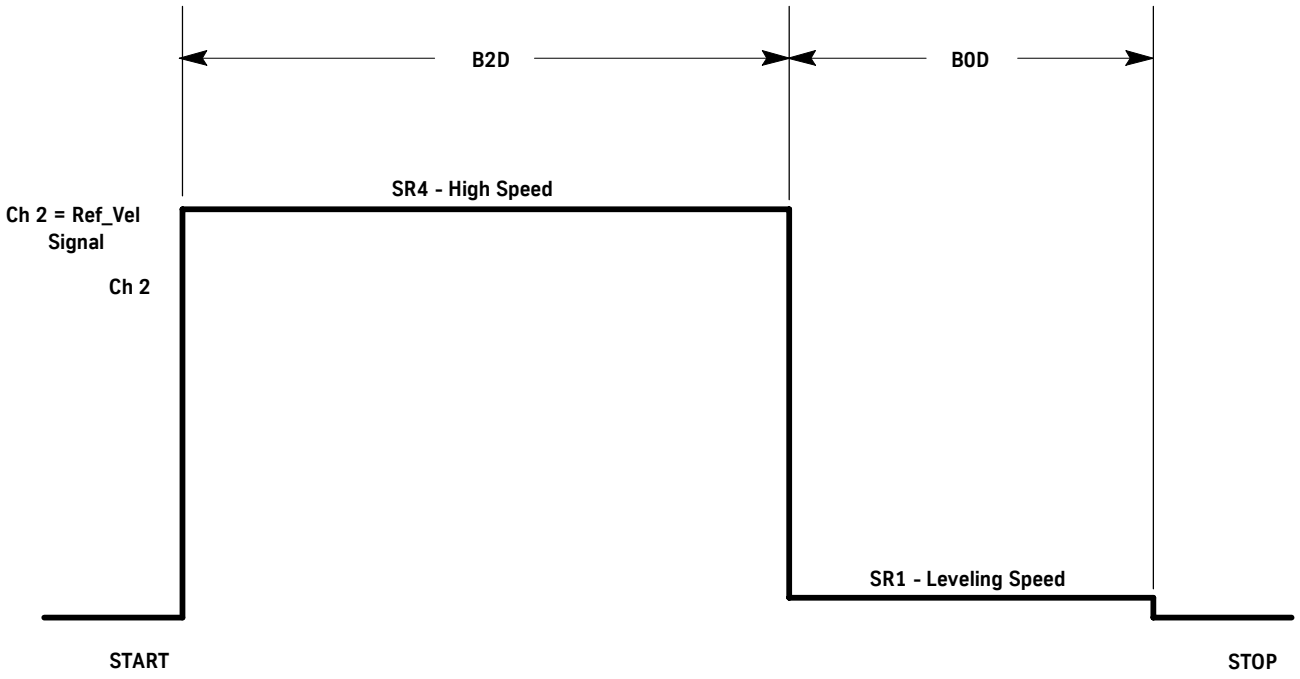

Figure 16 - Digital Speed Pattern Adjustments

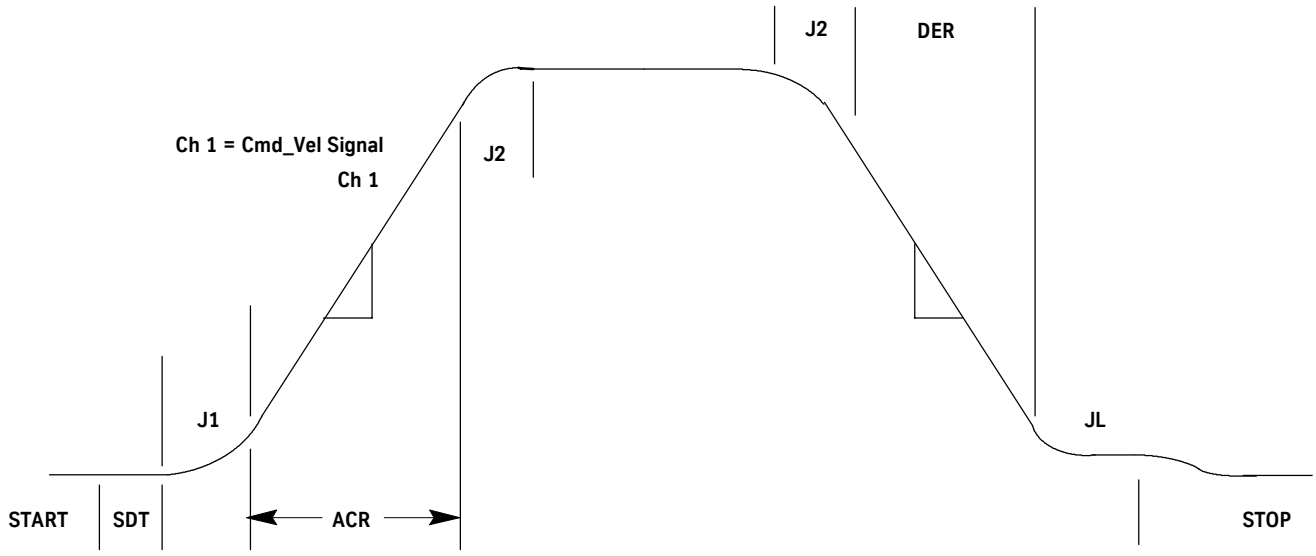

Figure 17 - Digital Speed Pattern Adjustments

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Speed Pattern Reference Adjustments

Adjustment	Unit	Range	Default	Description / Definition
ACR	Fpm/Sec	75 – 300	120	**Acceleration Rate:** Adjusts the linear slope of the speed pattern when ramping up to contract speed. Increase ACR for faster acceleration rate.
DER	Fpm/Sec	75 – 300	120	**Deceleration Rate:** Adjusts the linear slope of the speed pattern when ramping down from contract speed to leveling speed. Increase DER for faster deceleration rate.
J1	Fpm/s/s	100 – 800	360	**Jerk Rate 1:** Adjusts the amount of rounding during initial start of the speed pattern to constant acceleration. Decreasing J1 provides more rounding for a smoother transition.
J2	Fpm/s/s	100 – 800	360	**Jerk Rate 2:** Adjusts the amount of rounding from constant acceleration to contract speed and also from contract speed to constant deceleration. Decreasing J2 provides more rounding in both areas of the speed pattern for a smoother ride.
JL	Fpm/s/s	100 – 800	360	**Jerk Rate Into Leveling:** Adjusts the amount of rounding from constant deceleration into the final leveling speed dictation as the car approaches the floor. Decreasing JL provides more rounding into the final leveling speed. Improves consistency of final approach through load range.
SR1	Fpm	0 – 450	0	**Speed Reference Level 1:** Sets the speed pattern dictation level for the final approach leveling speed. Parameter SR1 is active when the B0D drive input is activated, (Low). Increasing the SR1 setting increases leveling speed.
SR2	Fpm	0 – 450	0	**Speed Reference Level 2:** Sets the speed pattern dictation level for Inspection Operation. Parameter SR2 is active when the B1D drive input is activated, (Low). Increasing the SR2 setting increases inspection speed.
SR3	Fpm	0 – 450	0	**Speed Reference Level 3:** Sets the speed pattern dictation level for One–Floor–Run Operation. Parameter SR3 is active when both the B1D & B0D inputs are activated, (Low).. Increasing the SR3 setting increases the One–Floor–Run speed.
SR4	Fpm	0 – 450	0	**Speed Reference Level 4:** Sets the speed pattern dictation level for contract speed of the elevator. Parameter SR4 is active when the B2D input is Activated, (Low). Increasing the SR4 setting increases the contract speed.
SR5	Fpm	0 – 450	0	**Speed Reference Level 5:** Controls the pattern dictation level when both the B0D & B2D inputs are active, (Low).
SR6	Fpm	0 – 450	0	**Speed Reference Level 6:** Controls the pattern dictation level when both the B1D & B2D inputs are active, (Low).
SR7	Fpm	0 – 450	0	**Speed Reference Level 7:** Controls the pattern dictation level when all three inputs B0D, B1D & B2D are active, (Low).
SDT	Sec	0 – 5.0	0	**Start Delay Time:** Adjusts the time delay before the speed pattern dictation begins, (J1), after the run signal has been initiated. This time delay is used to allow the brake to lift prior to ramping the speed pattern into acceleration. Increasing the SDT setting provides longer start delay time for smoother starts with possibility of roll back.

Table 18 - Speed Reference Adjustments

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Analog Speed Pattern Operation

The following information is provided for setup and adjustment of the Quantum Drive when using the Analog Speed input feature.

To initiate car motion using an external Analog Speed Pattern, the DEN and RUND signals must first be activated from the users controller. This in turn will create a Motor Contactor Output. Once the Motor contactor is energized and a signal from an auxiliary contact is fed back into the M_Aux input, the Drive will activate the DRUN output to indicate the drive is ready to run. At this time the controller should energize the brake and output the analog speed pattern (S–curve) to the drive.

Input Signal Description

When the DRUN signal has been issued by the Drive indicating that it is ready to run, the controller should lift the brake and output an S-curve to the drive terminals VEL+ and VEL–. The direction is determined by the polarity of the S-curve signal. When VEL+ is positive with respect to VEL–, the direction is UP and when it is negative the direction is DOWN.

This signal should be routed to the drive in a shielded twisted pair cable. The shield should be connected at the DSP end only. VEL+ and VEL– is an isolated differential input and has a maximum rating of 10 volts. A typical S-curve pattern is shown in Figure 18.

The speed of the car will be determined by the amplitude of the S-curve signal compared to the AFS, RPM, and CTS parameters in the Speed Loop Category and the VEP parameter in the Drive Category. See Table 19.

When possible contract speed should be set at something less than 10 volts to allow for the ability to overspeed the car for testing purposes.

Analog Speed Pattern Signal

The user's analog speed pattern connects to the VEL+ and VEL$^-$ inputs on the Drive. The signal should be routed to the drive via two leads twisted shielded pair cable. The VEL$^+$ Signal connects to Conn. 2 Pin 21 and signal VEL$^-$ connects to Conn. 2 Pin 22 with the shield lead connected to Conn. 2 Pin 20, on the DSP Card. The Analog S-Curve signal should be a bipolar DC waveform with a maximum amplitude of 10 volts. When the VEL$^+$ Input is positive with respect to the VEL$^-$ Input, the drive will initiate a run to move the elevator in the up direction. When the VEL$^-$ Input is positive with respect to VEL$^+$ Input, the drive will initiate a run to move the elevator in the down direction. The car speed will be determined by the amplitude of the S-Curve signal compared to the AFS, RPM and CTS parameter settings in the Speed Loop Category and the VEP parameter setting in the Drive Category. See Table 19.

Analog Speed Pattern Adjustment

All speed pattern rate, rounding and slowdown adjustments are to be made in the elevator controller. Refer to the documentation provided by the controller manufacturer for information on the setup of the S-Curve waveform applied to the Drive VEL$^+$ and VEL$^-$ Inputs.

Verify the following parameters have been calibrated properly for the actual job requirements.

Par.	Category	Setting
AFS	Speed Loop	Set for contract speed voltage of the applied S-Curve. (V) NOTE: As the maximum voltage level for the VEL+ and VEL– pattern circuitry is 10 volts. It is recommended to scale the applied speed pattern signal for a contract speed level in the range of 7 to 8 volts to allow for overspeed testing of the elevator.
CTS	Speed Loop	Set to the contract speed rating of the elevator. (fpm)
RPM	Speed Loop	Set to actual motor speed when running at contract speed. (rpm)
VEP	Drive	Set to the Pulse per revolution rating of the shaft driven velocity encoder. (cmts/rev)

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Signal Input at VEL+ and VEL– Drive input terminals

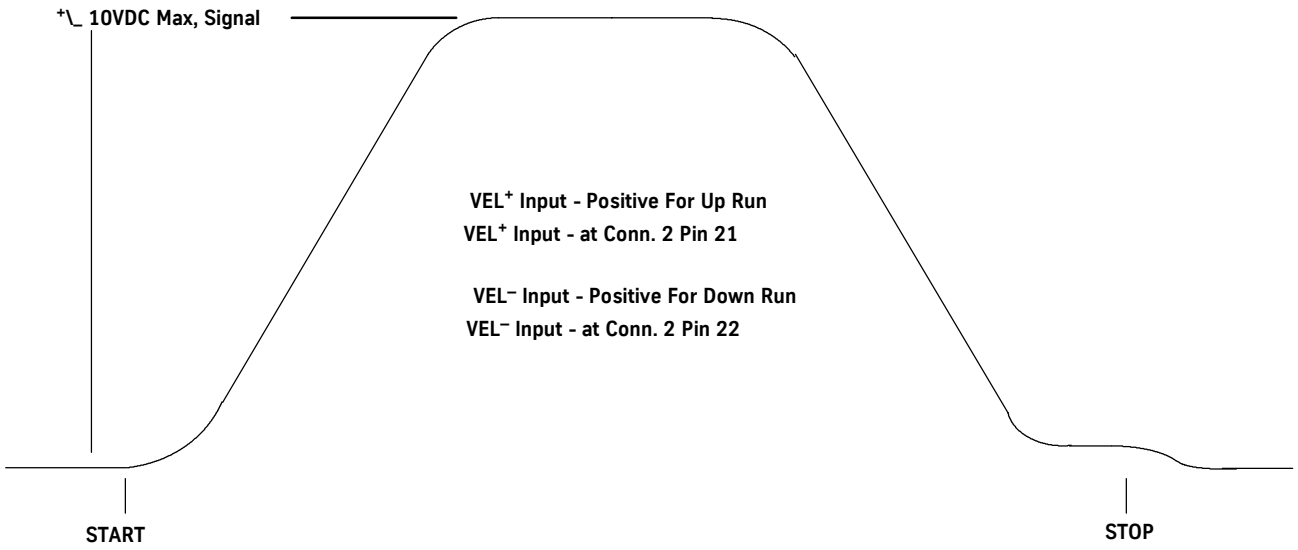

Figure 18 - Analog Speed Pattern (S-Curve), Signal

Par.	Category	Settings	Units
AFS*	Speed Loop	Set for the contract speed voltage of the applied S-Curve	V
CTS	Speed Loop	Set to the contract speed rating of the elevator	FPM
RPM	Speed Loop	Set to actual motor speed when running at contract speed.	RPM
VEP	Drive	Set tot he Pulse per revolution rating of the shaft driven motor encoder. (Velocity Encoder)	Cnts / Rev
***Note:** The maximum voltage level for the VEL+ and VEL– pattern circuitry is 10 volts. Scale the applied speed pattern signal for a contract speed level in the range of 7 to 8 volts to allow for overspeed testing of the elevator.			

Table 19

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Parameter Enhancement for High Speed Operation

The following parameters may be tuned to enhance elevator operation if necessary.

Par.	Default Setting	Purpose of Adjustment
LPF	0	Raise or lower present setting to reduce audible noise or vibration.
NCF	0	Raise or lower present setting to reduce audible noise or vibration.
RSF	Job Specific Formula	Increase from present setting to improve control as follows: Increase slowly from initial setting by 0.1HZ at a time while monitoring the torque command signal in the drive suing an oscilloscope. The torque signal should be optimized to assure that it does not saturate during full load acceleration in the up direction.
Notes: Before adjusting the RSF parameter, verify the correct header jumper configuration of the Current Regular Card. Refer to the Current Regulator Card Heaer Jumper Configuration section of the manual to assure proper setup.		

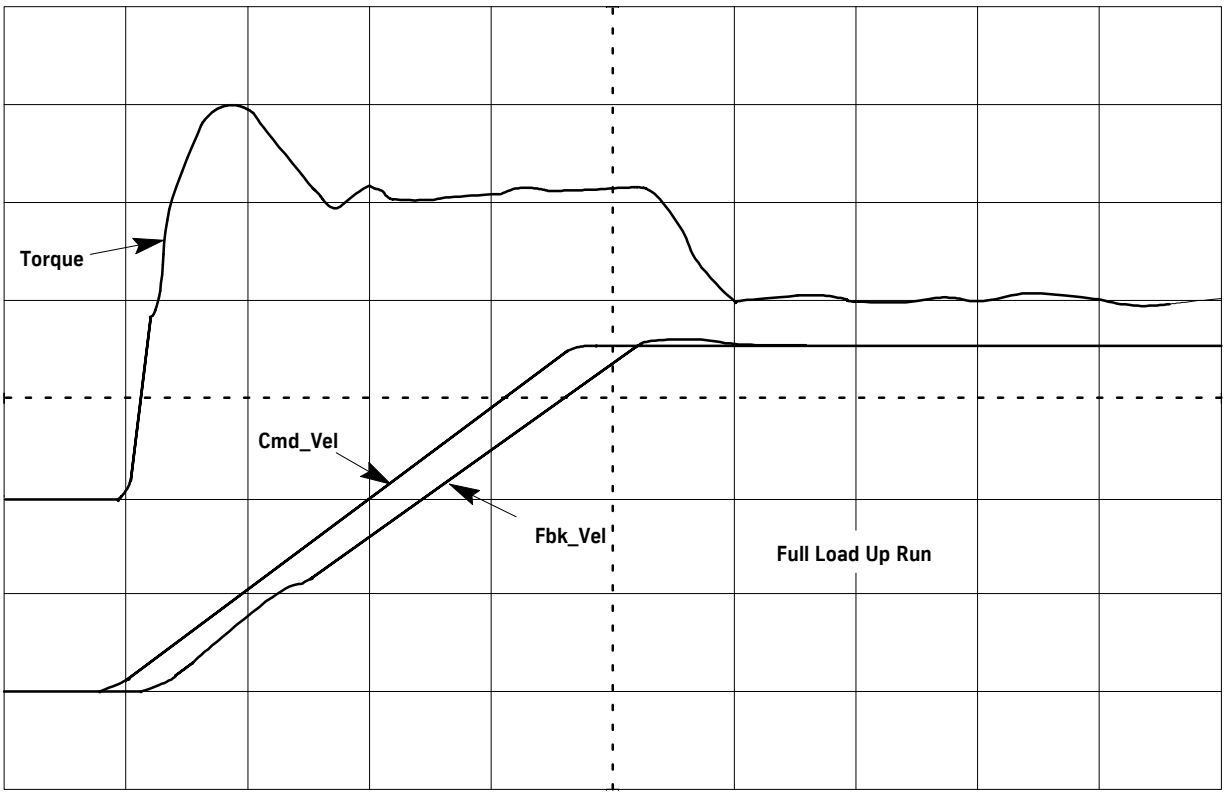

Figure 19 - Typical Signal Waveforms at 350FPM

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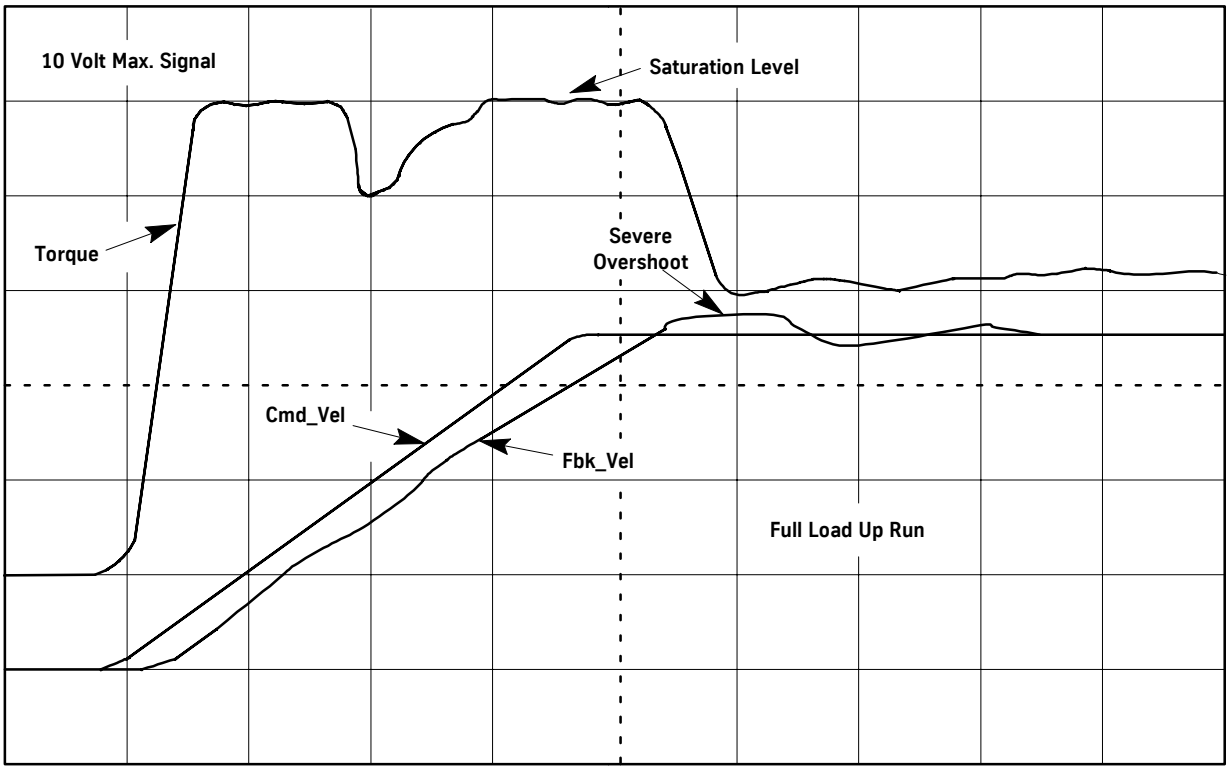

Figure 20 - Saturated Torque Signal - Car Speed 350FPM

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USER INTERFACE

Introduction

This document describes the user interface implemented in the Quantum Quiet AC/DC drive. The system to be described is accessed via the front panel keypad/LCD display unit, or an RS232 serial terminal (optional).

The interface is subdivided into six major categories:

- Drive
- Speed Loop
- Speed Reference - Internal S-Curve setting only.
- Control
- System
- Diagnostics

There are up to three sub–categories available under each of the major categories. The sub–categories are:

- Adjust (ADJ)
- Monitor (MON)
- Command (CMD)

In each sub–category, several items are accessible for editing (ADJ), display (MON), or execution (CMD).

There are three menu access levels of varying complexity available to the user via the adjustable MAL parameter in the SYSTEM category. These access levels are:

- 0 – Standard – Used for normal adjusting and operation.
- 1 – Adjuster – Used for troubleshooting and more complicated adjusting.
- 2 – Advanced – Used for advanced troubleshooting and adjusting.

Menus

On power–up, a banner is displayed and the LCD backlight is off. Pressing any key enters the menu system. Upon entry to the menu system, the banner display is replaced with the MAIN MENU indication on the top line, the current major category on the bottom line, and the LCD backlight is turned on.

Menu Navigation

Access to the various menu major categories, sub–categories and items is achieved using the four buttons on the front panel keypad. These keys are:

- The up arrow key,
- The down arrow key,
- The “ESCape” key,
- The “ENTer” key.

The operation of these keys is dependent on the current menu level that is active. The ENT & ESC keys control movement between the major categories, sub–categories and items. In general, pressing the ENT key will select the item indicated on the bottom line of the display, and the ESC key will return to the next higher level. The up and down arrow keys control movement within a level.

Navigation at the Main Menu Level

The top line of the display will show MAIN MENU when operating the interface in the main menu level. The bottom line will indicate the current major category item. The next major category may be selected by pressing the down arrow key and the previous major category may be selected by pressing the up arrow key. The menu selection will wrap–around from bottom to top or top to bottom when the end of the list is reached.

The user exits the menu system by pressing the ESC key. The menu system will remember the last major category selection on exit so that on re–entry to the menu, the user is returned to the same state. This memory is maintained as long as the drive has power applied.

When the desired major category is displayed on the bottom line, pressing the ENT key will move the user into the sub–category selection menu under the selected major category.

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Navigation at the Sub–Category Level

The top line of the display will indicate the current major menu category when operating in the sub–category level. The bottom line indicates the current menu sub–category item. The next menu sub–category item, if it exists, may be selected by pressing the down arrow key and the previous menu sub–category item may be selected by pressing the up arrow key. The sub–category level will wrap–around at each end.

Pressing the ESC key returns the user to the main menu level. The menu system will remember the last sub–category selection on exit so that on re–entry to the major menu category, the user is returned to the state at exit. This memory is maintained as long as the drive has power applied.

When the desired menu sub–category is displayed on the bottom line, pressing the ENT key will move the user into the sub–category item selection menu. The top line of the display will now indicate both the major menu category and the menu sub–category.

The bottom line of the display shows the adjustment name on the left and the current value on the right. Pressing the up or down arrow keys scrolls through the list of adjustment parameters accessible in the current menu selection. The adjustment list will wrap–around from end to end.

Pressing the ESC key returns the user to the sub–category selection menu. The menu system remembers the last adjustment parameter selected on exit from the adjust sub–category level. If the adjust sub–category is re–entered, the selection state will be restored. This memory is volatile and will be lost if power is removed.

Pressing the ENT key will place the system in parameter edit mode. This is indicated by an asterisk (*) preceding the parameter value. If the password protect feature is active, a message will appear on the display to indicate the need to unlock the adjustments.

Parameter Edit Mode

In the parameter edit mode, the up and down arrow keys change the value of the selected adjustment parameter. When either key is pressed continuously, the adjustment will, after a delay, scroll in the desired direction at an initially slow pace. After a four second delay, the scroll rate will increase by a factor of 8. After an additional four second delay, the scroll rate will increase by an additional factor of 8. Once the key is released, the process starts again. This scroll acceleration feature is useful when a large change in the value is required.

Pressing the ENT key will store the new value and perform appropriate parameter updates if the new value is in the proper range, otherwise, the original value is retained as indicated on the display. The system will not accept adjustments while the drive is running. If the ENT key is pressed while the drive is running, the new value will be rejected.

Pressing the ESC key exits the edit mode and returns to the adjust sub–category level. If the ENT key has not been pressed after editing prior to pressing the ESC key, the original parameter value will be restored.

Monitor Sub–Category Level

The bottom line of the display shows the name of the variable to display in the monitor selection menu. Pressing the up and down arrow keys scrolls through the list of variables available for display. The list will wrap–around at the ends.

When the ESC key is pressed, the menu system returns the user to the sub–category selection menu. The menu system will remember the last variable selected in this sub–category and restore the state on re–entry to this sub–category. This memory is volatile and will be lost if power is removed.

Pressing the ENT key causes the selected variable to be displayed in an appropriate format on the bottom line of the display. The name of the variable is moved to the top line of the display while the variable is being displayed.

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Monitor Display Mode

Pressing the up or down arrow key or the ESC key will cause an exit from the display mode. If the up arrow key is pressed, the previous selection in the menu list is indicated. If the down arrow key is pressed, the next selection in the menu list is indicated. When the ESC key is pressed, no change is made to the selection indicated.

When the ENT key is pressed while in monitor display mode, the display will show the address of the selected variable until the next key–press occurs. When the next key–press occurs, the system exits from the display mode with no change to the selection indicated. This feature is useful for finding the address of a variable for use with the analog testpoints.

Command Sub–Category Level

Pressing the up or down arrow key in this level scrolls through the command(s) available in the current category. The list will wrap–around at the ends.

Pressing the ESC key returns to the sub–category selection menu. The system remembers the last selected command on exit. This memory is volatile and will be lost if power is removed.

Pressing the ENT key invokes the selected command. The operation in each command is unique to the command.

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User Interface Map

NOTE: An asterisk (*) beside an adjustment name indicates that the adjustment can be changed while running.

Drive

	Item	Range	Default	Actual	Quantum Drive	Description
Adjustments	MDC	MNC - 800	99		AC & DC	Max Drive Current (Arms)
	MFC*	0-MNC	0		AC	Motor Field Current (Arms)
	RSF*	0-20	0			Motor Slip Frequency (Hz)
	MTP	0-16	4			MoTor Poles
	MSTR*	0-2	0			Motor Stator Resistance (Ohm)
	MSL*	0-50	0			Test Torque (%)Motor Stator Leakage (mH)
	MNC	MFC-MDC	38			Motor Nameplate Current (Arms)
	MNV	10-999	460			Motor Nameplate Voltage (Vrms)
	MNF	10-120	60			Motor Nameplate Frequency (Hz)
	NRPM*	0-3600	1780			Nameplate RPM
	FRKP	0-6.0	0			Flux Regulator Proportional Gain
	DM0	0-2048	2048		AC & DC	Dac Multiplier 0
	DM1	0-2048	2048			Dac Multiplier 1
	DZ0	-1228-1228	0			Dac Zero 0
	DZ1	-1228-1228	0			Dac Zero 1
	UTL*	0-100	100			Upid Torque Limit (%)
	VEP	0-~	2048			Velocity Encoder Pulses per revolution
	VEI	0-1	0			Velocity Encoder Invert
	BDT*	0-2.0	.2			Brake Delay Time (Sec.)
	CDT*	0-2.0	0			Current Delay Time (Sec.)
	FFC	0-~	5.00		DC	Forced Field Current (Amps)
	WFC*	SFC-100	50			Weakened Field Current (%)
	SFC*	0-WFC	20			Standing Field Current (%)
	FFR*	0-1500	100			Field Forcing Rate (% per Sec.)
	WFR*	0-1500	50			Weaken Field Rate (% per Sec.)
	CTR	100-7015	1000			Current Transformer Ratio motor field regulator See Table 15.
Mon	AC Torque	-	-		AC	Torque Command (% of motor torque rating)
	I_d	-	-			Id Current Command (Arms)
	I_q	-	-			Iq Current Command (Arms)
	V_motor	-	-			Motor Voltage (Vrms)
	Mot_freq	-	-			Motor Frequency (Hz)
	V_bus	-	-		AC & DC	Bus Voltage (Volts)
	PWM_Torque	-	-		DC	PWM Torque Command (% of Motor rating)
	I_a	-	-			Motor Armature Current Feedback (Adc)
	I_f	-	-			Motor Field Current Feedback (Adc)
Cmd	Drive Autotune	-	-		AC	Press Enter key to start AC autotune procedure.

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Speed Loop

	Item	Range	Default	Actual	Drive Type	Description
Adjustments	CTS	0-2000	200		AC & DC	Contract Top Speed (Fpm)
	RPM	0-7200	1750			Motor Rpm @ top speed
	AFS*	0-10.0	7.0			Analog Full Scale (V) **Note: Only for Analog Speed Reference configuration.**
	KVD*	0-~	0			Velocity Derivative gain
	KVP*	0-~	0			Velocity Proportional gain
	KVI*	0-~	300			Velocity Integral gain
	KFP*	0-45.0	0			Feedback Proportional gain
	KFD*	0-~	0			Feedback Derivative gain
	KRE	0-1	0			RE integrator enable
	LPO	1-2	1			Low Pass Order
	LPF	0-255	0			Low Pass Frequency (Hz)
	LPQ	0-32	0			Low Pass Q
	NCF	0-255	0			Notch Center Frequency (Hz)
	NCQ	0-32	0			Notch Center Q
	N2F	0-255	0			Notch 2 Frequency (Hz)
	N2Q	0-32	0			Notch 2 Q
	REV	0-1	0			REVerse motor rotation
	APT*	1.0-9.0	7.0			Analog Pre-Torque (V)
Mon	An_in	-	-			Analog Speed Reference In (Vdc) Note: Displayed only when the drive is setup for an external Analog Speed Pattern via the DCN parameter.
	Lref_in	-	-			Torque load reference input. (Vdc)
	Cmd_Vel	-	-			Speed Reference (Fpm)
	Fbk_Vel	-	-			Speed Feedback (Fpm)

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Speed Reference

	Item	Range	Default	Actual	Drive Type	Description
Adjustments	ACR	75-300	120		AC & DC	Acceleration Rate (Fpm / Sec.)
	DER	75-300	120			Deceleration Rate (Fpm / Sec.)
	J1	100-800	360			Jerk rate rounding area 1 (Fpm / Sec. / Sec.)
	J2	100-800	360			Jerk rate rounding area 2 (Fpm / Sec. / Sec.)
	JL	60-300	120			Jerk rate rounding into Leveling (Fpm / Sec. / Sec.)
	SR1*	0-450	0			Speed Ref 1 (Fpm)
	SR2*	0-450	0			Speed Ref 2 (Fpm)
	SR3*	0-450	0			Speed Ref 3 (Fpm)
	SR4*	0-450	0			Speed Ref 4 (Fpm)
	SR5*	0-450	0			Speed Ref 5 (Fpm)
	SR6*	0-450	0			Speed Ref 6 (Fpm)
	SR7*	0-450	0			Speed Ref 7 (Fpm)
	SDT*	0-5.0	0			Start Delay Time (Sec.)
Mon	Ref_Vel	-	-			Velocity Reference (Fpm)

Control

	Item	Range	Default	Actual	Drive Type	Description
Adjustments	FLD*	0-1.000	.250		AC & DC	Feedback Loss Delay (Sec.)
	OSD*	0-2.000	0			Over Speed Delay (Sec.)
	OSP*	100-125	110			Over Speed level (%)
	RAD*	0-1.000	0			Run Away Delay (Sec.)
	RAL*	0-100	5			Run Away Limit (Fpm)
	VEL*	0-100	10			Velocity Error Limit (Fpm)
	VED	0-.250	0			Velocity Error Delay (Sec.)
	MOL	0~	0			Motor Overload Limit (Arms)
	OLT	0-300	30			OverLoad Time (Sec.)
	IBM0	~~	-1			Invert Bit Mask 0
	DBM0	~~	-1			Debounce Bit Mask 0
	MTH*	1.1-25.0	1.1			Motion Threshold (Fpm)
Mon	P_in_0	-	-			Digital Inputs
	P_out	-	-			Digital Outputs
	MC_state	-	-			Motion Control State
	Drv_state	-	-			Drive Interface State

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System

	Item	Range	Default	Actual	Drive Type	Description
Adjustments	DCN	0-63	0		AC & DC	Drive Configuration Number
	FRS	0-1	0			Fault Reset Source (1 – Int)
	RSD*	0-120	6			fault ReSet Delay (Sec.)
	RPH*	0-10	3			fault Resets Per Hour
	FMT*	0-7	0			Fsched Medium Tic
	FSP	0-~	1024			Sampling Frequency (Hz)
	UPM	1-~	2			Upid Multiple
	DRM	1-~	4			Drive Multiple
	MAL*	0-2	0			Menu Access Level
	SBR*	3-1152	96			Serial Baud Rate (/ 100)
	SCS*	0-31	1			Serial Character Setting
Mon	SW_v_r	-	-			Software Version – Revision
Cmd	Password Con-	-	-			
	Stack Usage	-	-			

Diagnostic

	Item	Range	Default	Actual	Drive Type	Description
Adjustments	DZ2	.203-203	0		AC & DC	Dac Zero 2
	DZ3	-203-203	0			Dac Zero 3
	TPA1*	0-3071	256			Test Point Address 1
	TPA2*	0-3071	256			Test Point Address 2
	TPM1*	0-~	1			Test Point Multiplier 1
	TPM2*	0-~	1			Test Point Multiplier 2
	TPD1*	0-~	0			Test Point Divider 1
	TPD2*	0-~	0			Test Point Divider 2
	TPL1*	0-1	0			Test Point Length 1
	TPL2*	0-1	0			Test Point Length 2
Mon	TP1_out	-	-			Test Point 1 Output (Volts)
	TP2_out	-	-			Test Point 2 Output (Volts)
	TP1s_in	-	-			Test Point 1 Short In
	TP2s_in	-	-			Test Point 2 Short In
	TPll_in	-	-			Test Point 1 Long In
	TP2l_in	-	-			Test Point 2 Long In
Cmd.	Display Faults	-	-			Press ENTER Key to display drive faults.
	Clear Faults	-	-			Press ENTER Key to clear drive faults.

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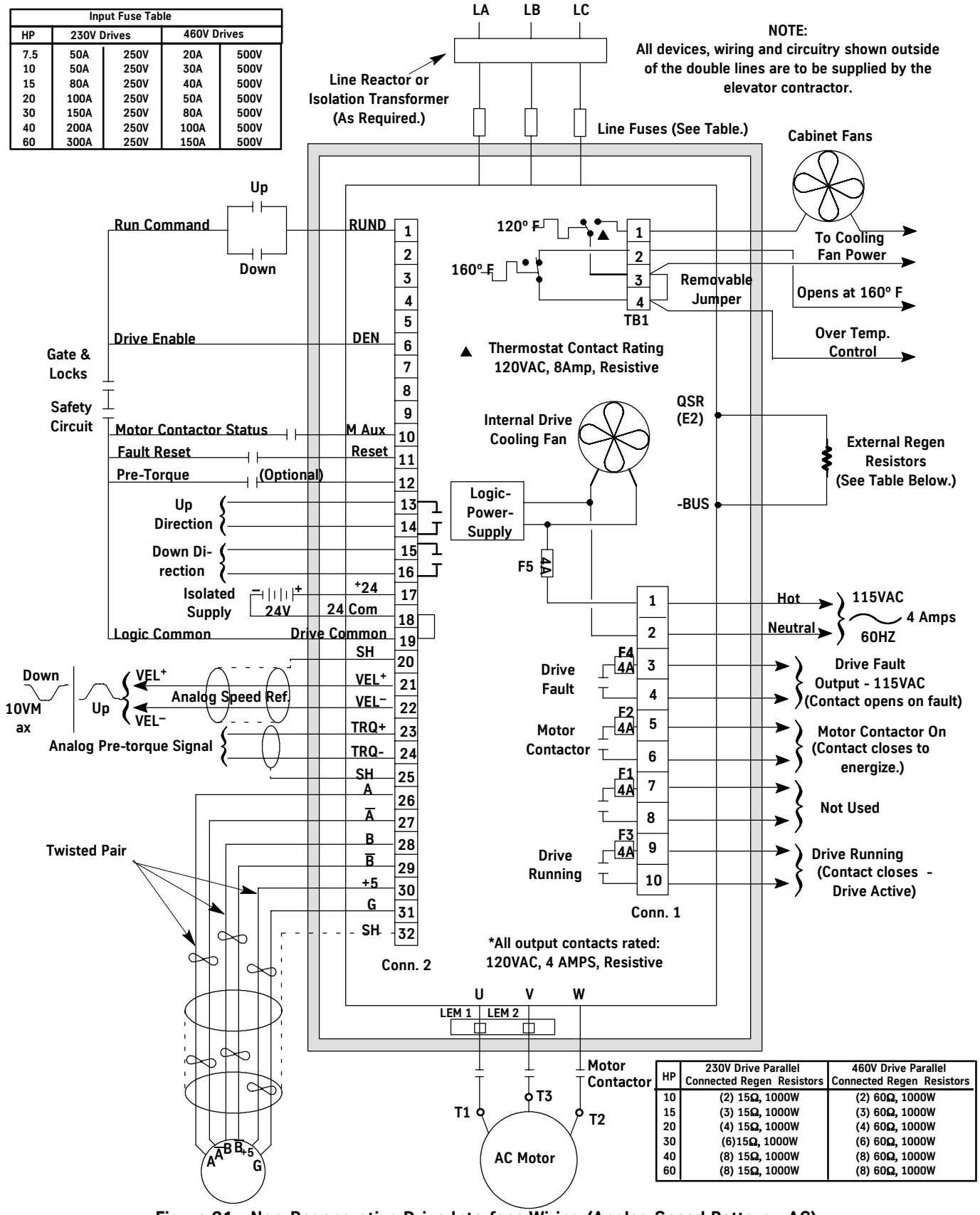
System Block Diagrams (AC Motors)

Input Fuse Table				
HP	230V Drives		460V Drives	
7.5	50A	250V	20A	500V
10	50A	250V	30A	500V
15	80A	250V	40A	500V
20	100A	250V	50A	500V
30	150A	250V	80A	500V
40	200A	250V	100A	500V
60	300A	250V	150A	500V



HP	230V Drive Parallel Connected Regen Resistors	460V Drive Parallel Connected Regen Resistors
10	(2) 15Ω, 1000W	(2) 60Ω, 1000W
15	(3) 15Ω, 1000W	(3) 60Ω, 1000W
20	(4) 15Ω, 1000W	(4) 60Ω, 1000W
30	(6)15Ω, 1000W	(6) 60Ω, 1000W
40	(8) 15Ω, 1000W	(8) 60Ω, 1000W
60	(8) 15Ω, 1000W	(8) 60Ω, 1000W

Figure 21 - Non-Regenerative Drive Interface Wiring (Analog Speed Pattern - AC)

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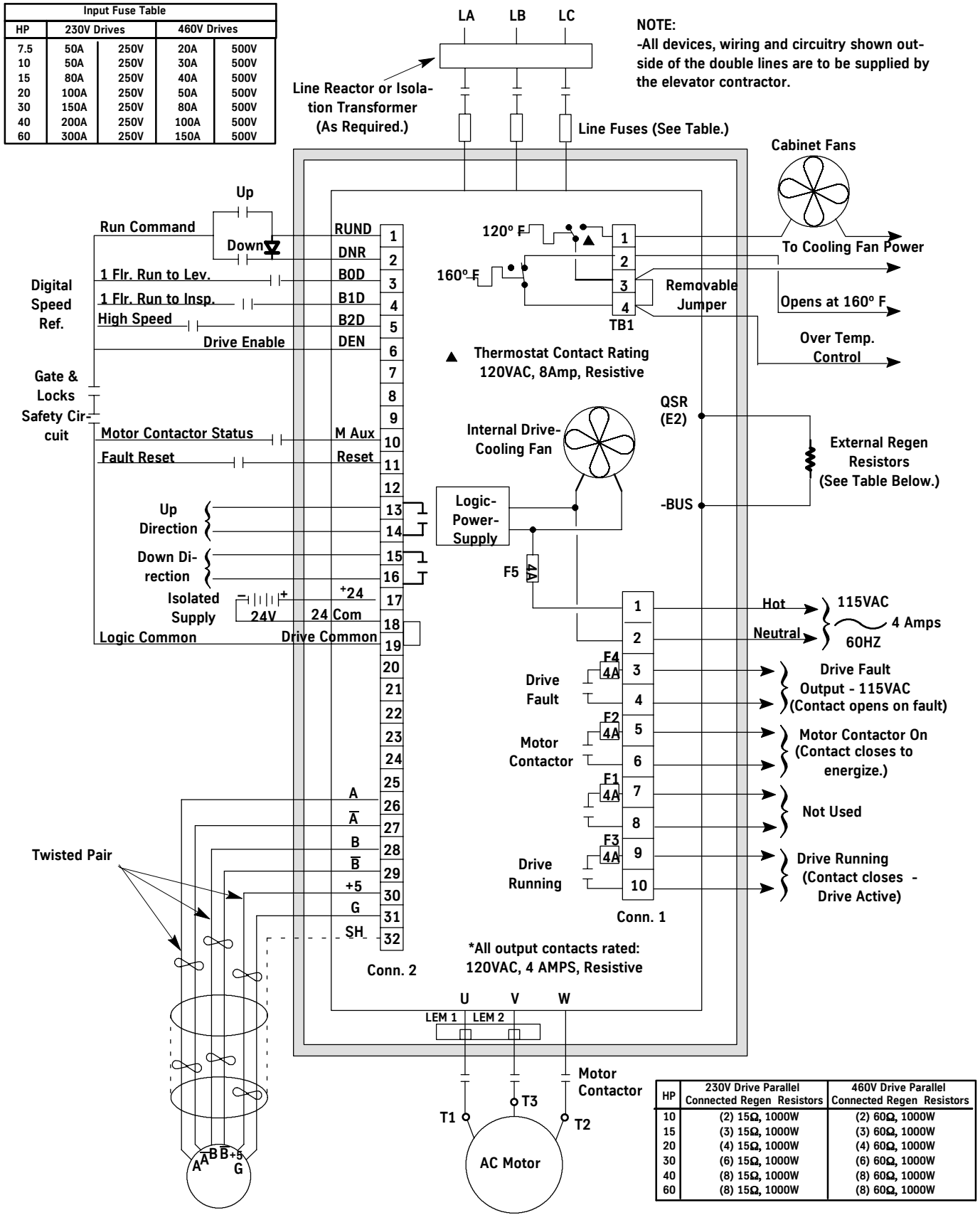

Figure 22 - Non-Regenerative Drive Interface Wiring (Digital Speed Pattern - AC)

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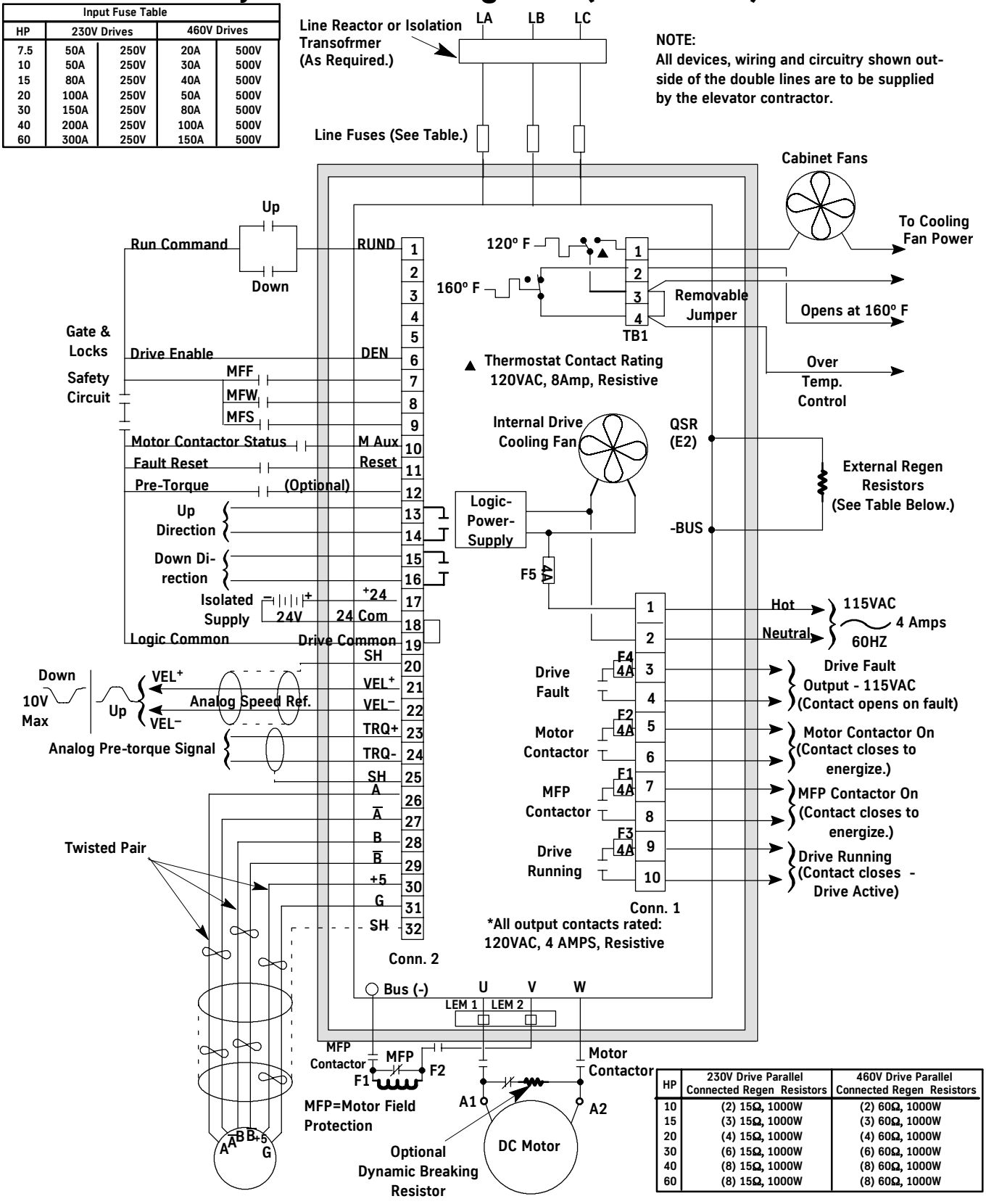
System Block Diagrams (DC Motors)

Input Fuse Table				
HP	230V Drives		460V Drives	
7.5	50A	250V	20A	500V
10	50A	250V	30A	500V
15	80A	250V	40A	500V
20	100A	250V	50A	500V
30	150A	250V	80A	500V
40	200A	250V	100A	500V
60	300A	250V	150A	500V



HP	230V Drive Parallel Connected Regen Resistors	460V Drive Parallel Connected Regen Resistors
10	(2) 15Ω, 1000W	(2) 60Ω, 1000W
15	(3) 15Ω, 1000W	(3) 60Ω, 1000W
20	(4) 15Ω, 1000W	(4) 60Ω, 1000W
30	(6) 15Ω, 1000W	(6) 60Ω, 1000W
40	(8) 15Ω, 1000W	(8) 60Ω, 1000W
60	(8) 15Ω, 1000W	(8) 60Ω, 1000W

Figure 23 - Non-Regenerative Drive Interface Wiring (Analog Speed Pattern - DC)

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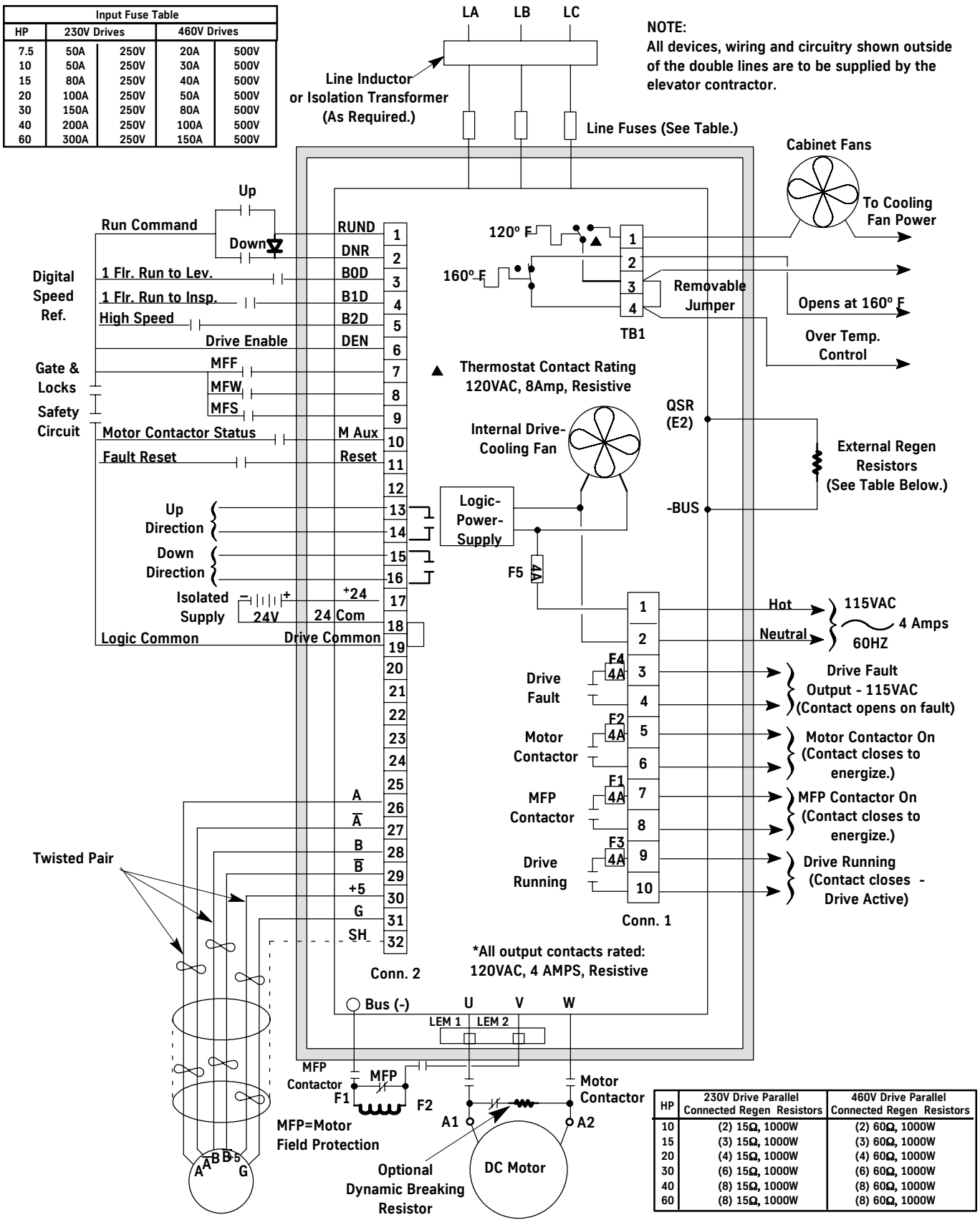

Figure 24 - Non-Regenerative Drive Interface Wiring (Digital Speed Pattern-DC)

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System Block Diagrams (DC Motors)

Input Fuse Table				
HP	230V Drives		460V Drives	
30	150A	250V	80A	500V
40	200A	250V	100A	500V
60	300A	250V	150A	500V
80		250V	200A	500V
120		250V	300A	500V

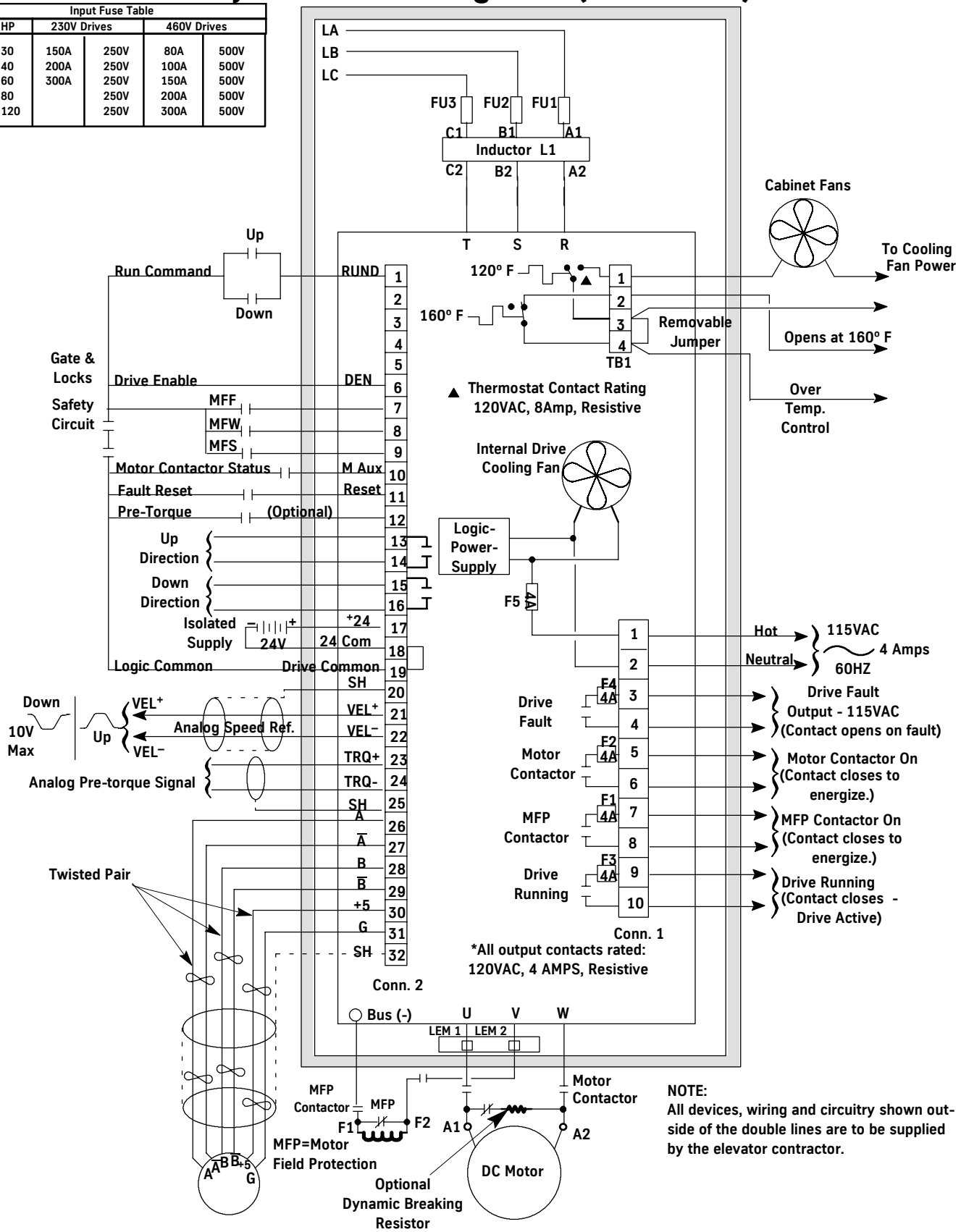

Figure 25 - Quantum Regenerative Drive Interface Wiring (Analog Speed Pattern - DC)

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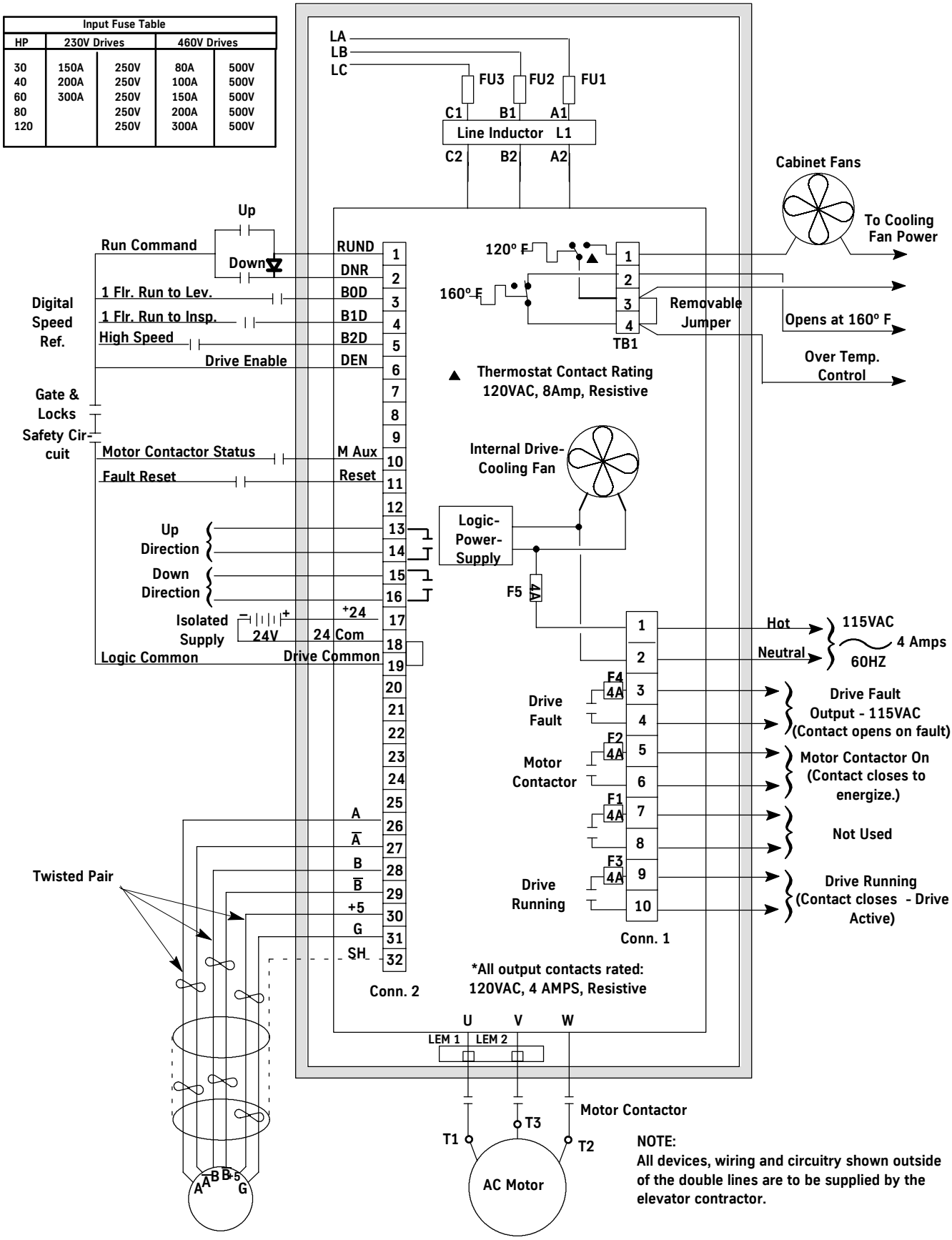

Figure 26 - Quantum Regenerative Drive Interface Wiring (Digital Speed Pattern - AC)

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Drive System Overview

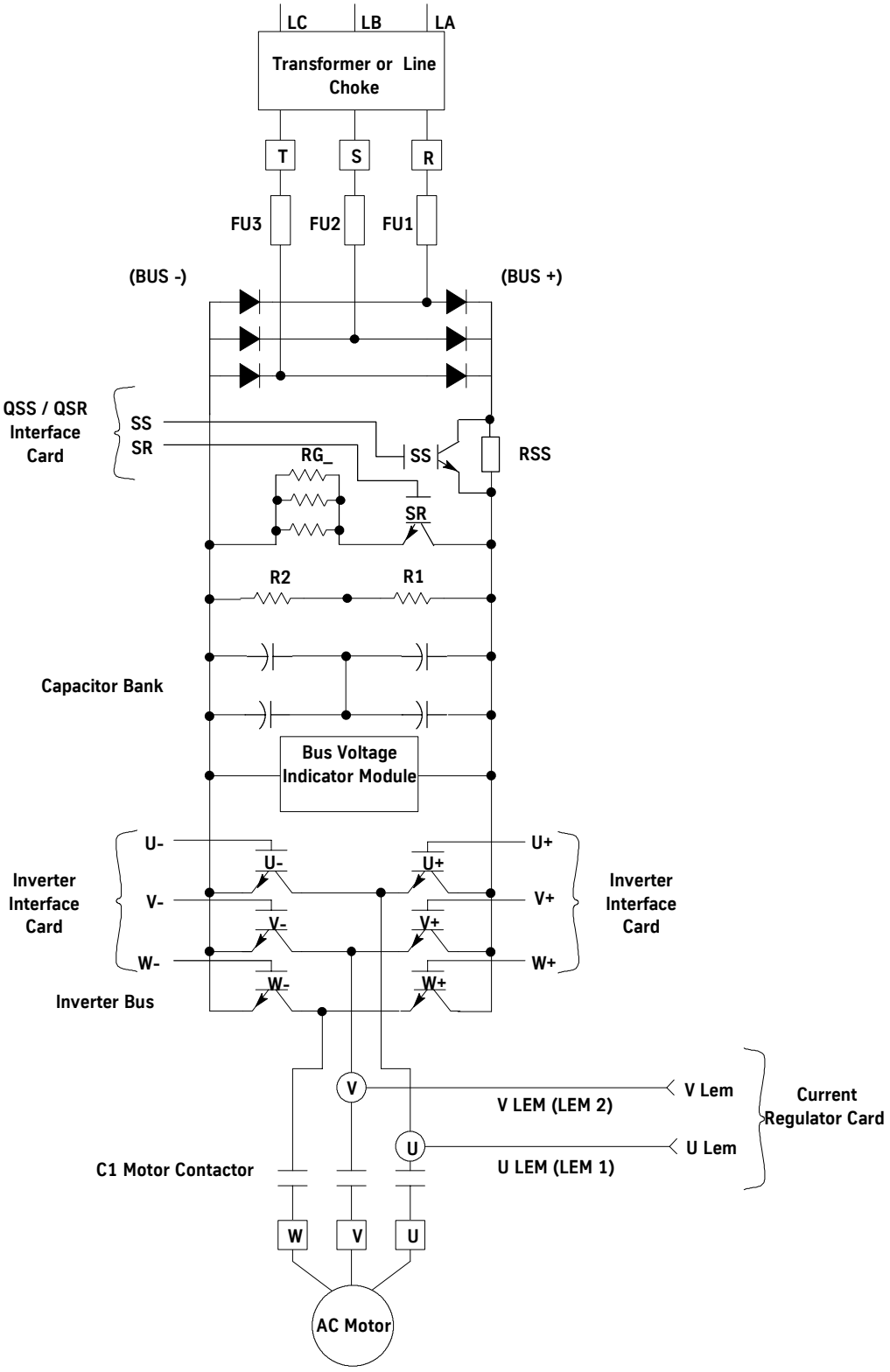

Figure 27 - Quantum Quiet AC Drive (Non-Regenerative)

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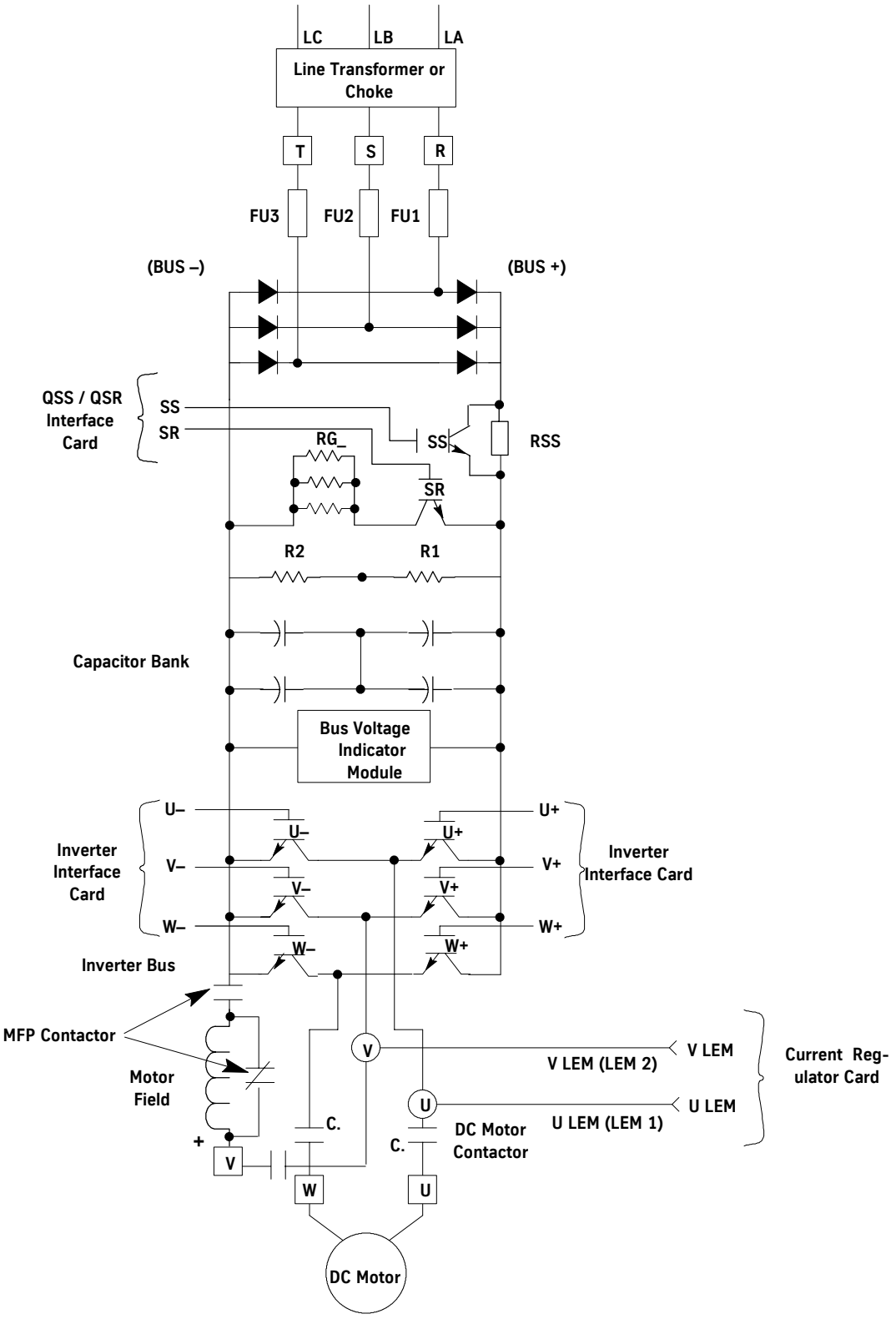

Figure 28 - Quantum Quiet DC Drive (Non-Regenerative)

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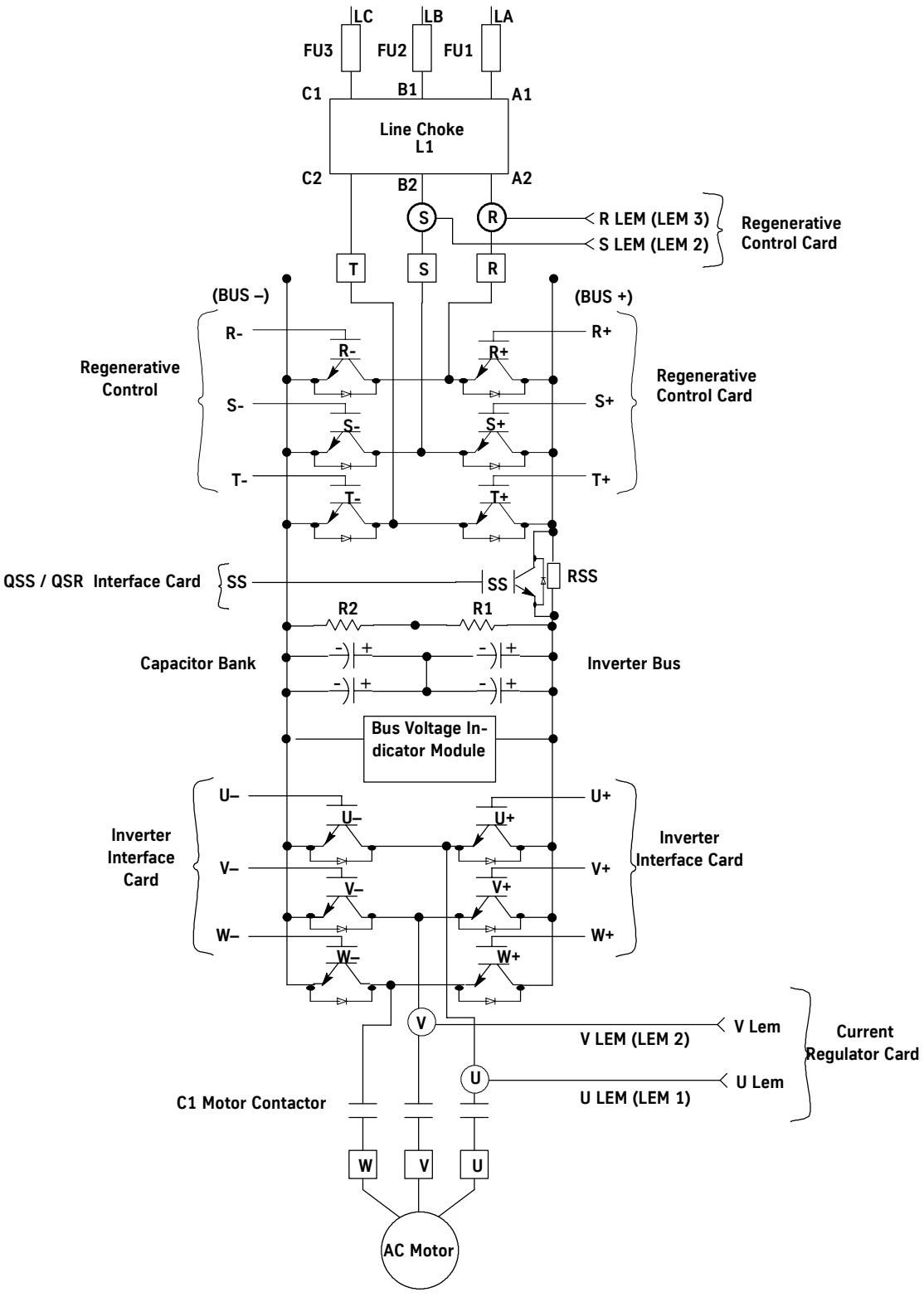

Figure 29 - Quantum Quiet Regenerative AC Drive

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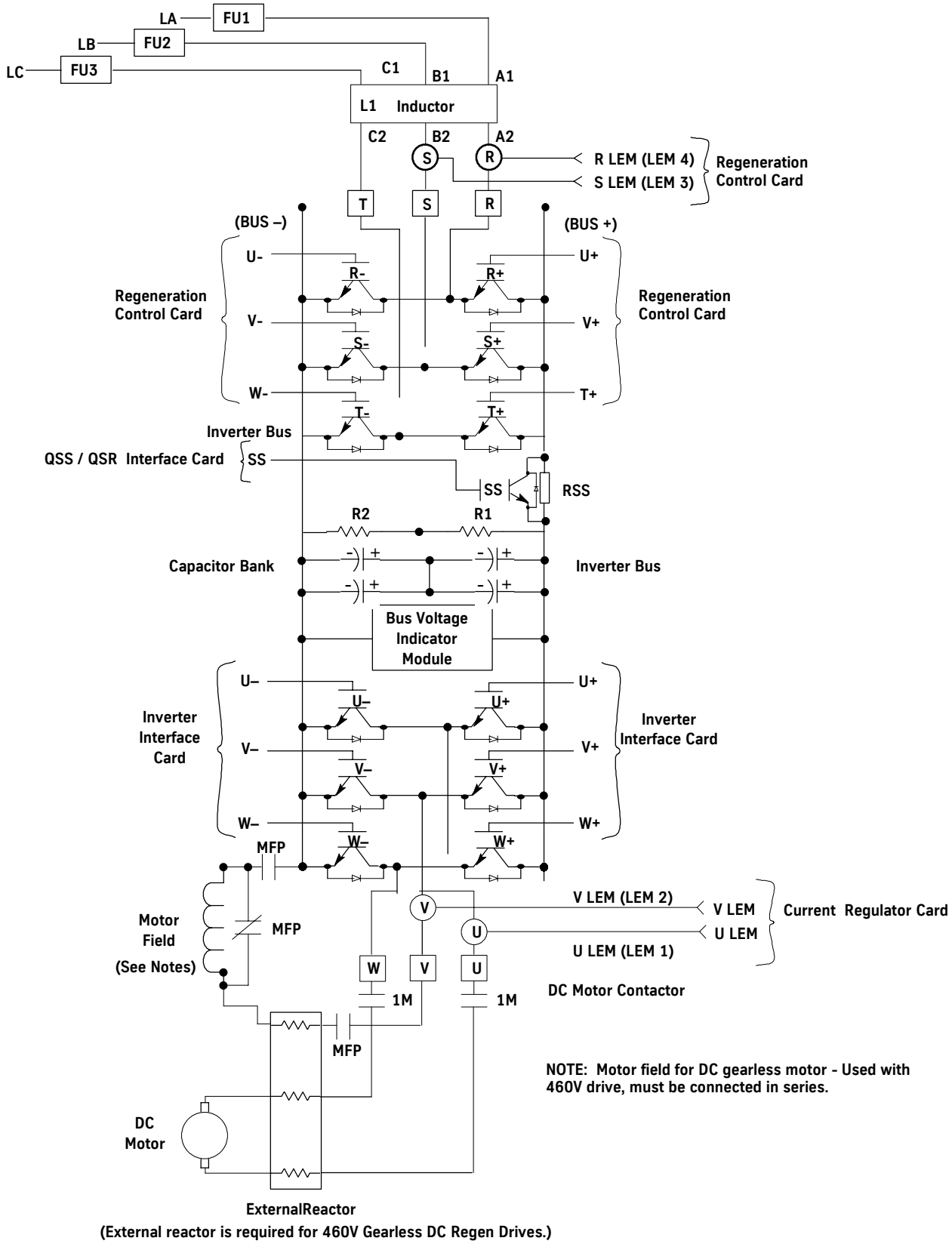

Figure 30 - Quantum Quiet Regenerative DC Drive

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Interconnect Diagram for Quantum Quiet Drive With 6–Pack IGBT's

(7.5 hp. thru 30 hp.)

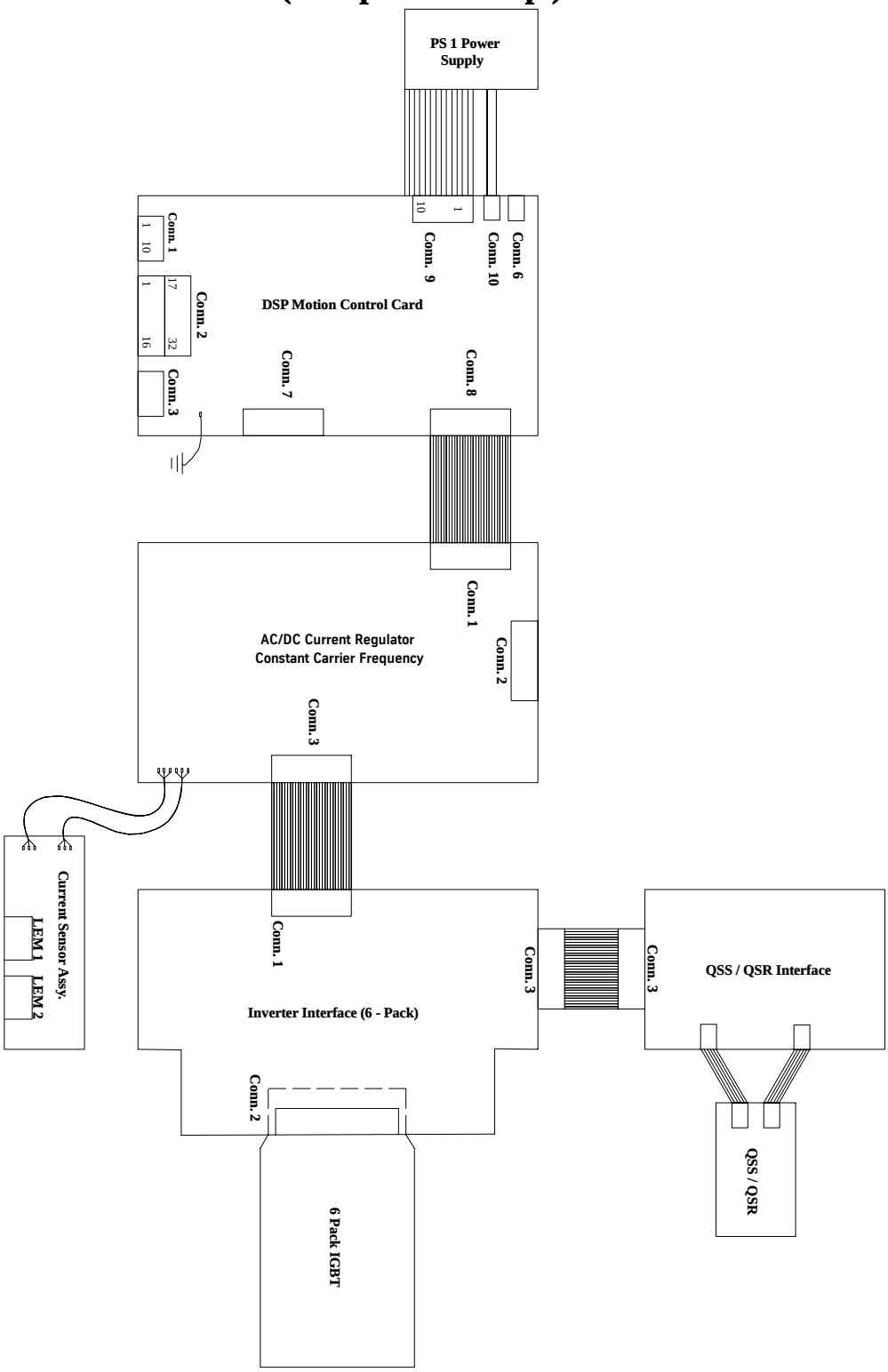

Figure 31

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Interconnect Diagram for Quantum Quiet Drive With Dual Pack IGBT's

(40 hp. thru 60 hp.)

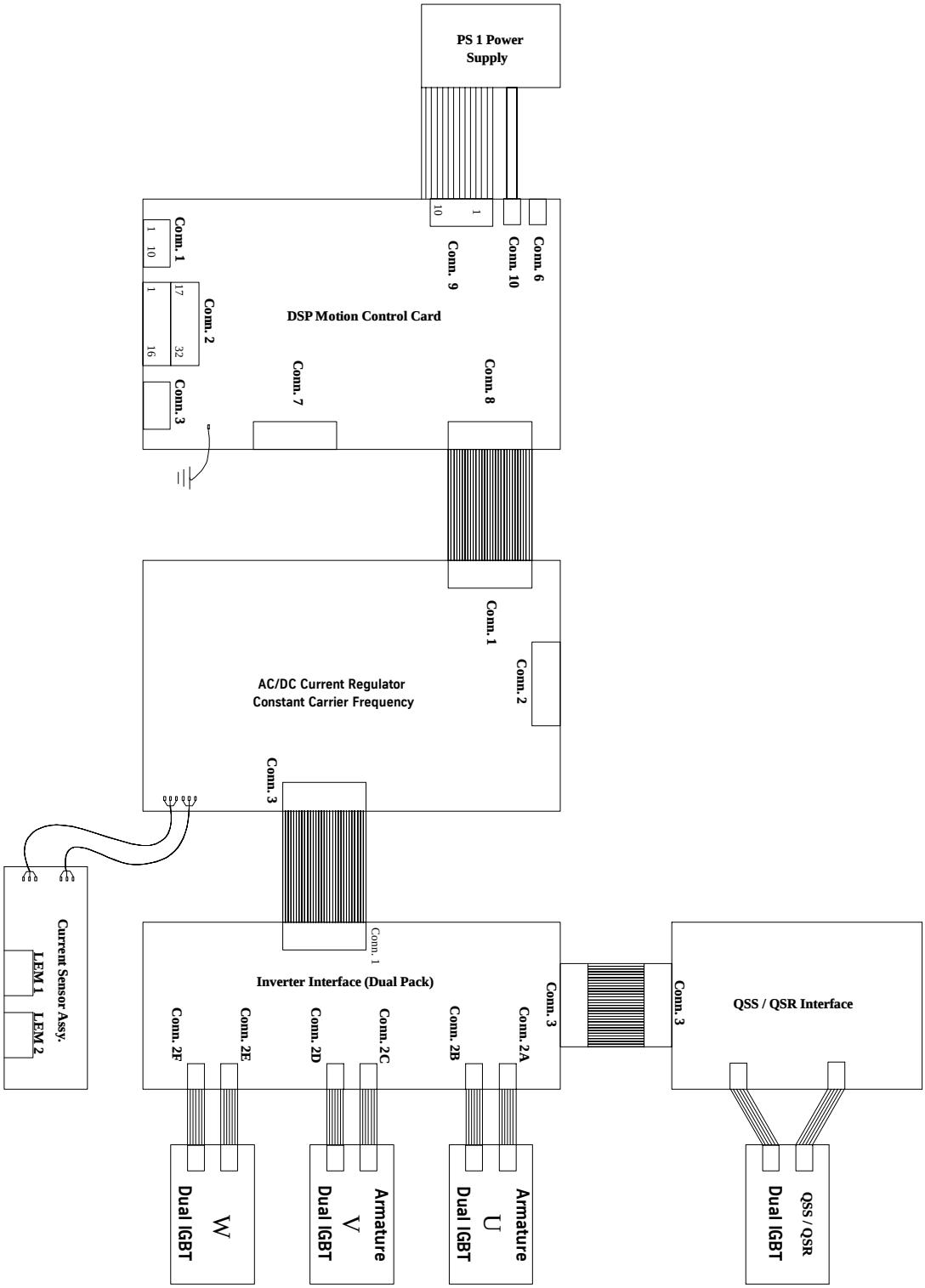

Figure 32

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Diagnostics

Fault	Quantum Drive	Description
AC_PARAM_FLT	AC & DC	Vector Control Parameter fault—Drive has detected a command to run when either the MFC or the MSF parameters are set to 0. PWM Control Parameter fault - Drive has detected a command to run with FFC, WFC or SFC parameter(s) set to 0. • Incorrect parameter adjustment. • Defective DSP Motion Control Card.
ADC_FAULT	AC & DC	Analog to Digital converter failure—Internal component failure on the DSP Motion Control Card. • Defective DSP Motion Control Card.
ADC_OFFSET_FAULT	AC & DC	Excessive A/D converter offset—Issued on drive power up when DSP Card detects an A/D offset of more than one volt. • Defective DSP Motion Control Card.
C1_AUX_FLT	AC & DC	Motor Contactor Auxiliary Contact fault—Drive detected the M aux. Input (Conn2, Pin 10) did not de–energize 250 msec. after the drive commanded the Motor Contactor to drop. Resets a minimum of 6 seconds after the fault condition has cleared. • Defective aux contact on the motor Contactor. • Defective DSP Motion Control Card. • Defective Motor Contactor.
CONFIG_FLT	AC & DC	Drive Configuration fault—Issued on power up. The DSP Card has read an incorrect configuration setting, (as set by the DCN parameter), for the type of drive in use. • Incorrect DCN parameter adjustment. • Defective DSP Motion Control Card. • Defective Current Regulator Card
DAC_FAULT	AC & DC	Digital to analog converter failure—Internal component failure on the DSP Motion Control Card. • Defective DSP Motion Control Card.
DCR_ID_CHG_FLT	AC & DC	Current Regulator AC / DC Configuration Change fault • Improper setting of header jumper J13 on the Current Regulator Card. • Defective Current Regulator Card. • Defective DSP Motion Control Card.
DCR_ID_FLT	AC & DC	Current Regulator ID fault—Issues fault on power up. Card hardware configuration does not agree with drive requirements. • Incorrect version Current Regulator Card installed in the drive. • Defective Current Regulator Card. • Defective DSP Motion Control Card
FBK_LOSS_FLT	AC & DC	Speed Feedback Loss fault—Drive has detected the loss of the Velocity Encoder signals during a run. • Loose wiring connections on the Velocity encoder or the DSP Motion Control Card. • Velocity Encoder improperly installed or coupled to motor armature. • Defective Velocity Encoder. • Defective Motion Control Card.
FIELD_FAIL_FLT	AC & DC	Field Overcurrent fault (PWM)
FIELD_LOSS_FLT	DC	Field Current Loss fault—Indicates the motor field current has fallen 50% or more below the SFC setting. • Loose motor field wiring connections or open field coils. • Low input voltage to the drive. • Blown drive input fuse. (Low Bus Voltage) • Defective Bus Rectifier. (Low Bus Voltage) • Defective LEM Module or loose wiring connections. • Defective V phase IGBT. • Defective Inverter Interface Card. • Defective Current Regulator Card. • Defective DSP Motion Control Card.

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Fault	Quantum Drive	Description
HARDWARE_FLT	AC & DC	Current Regulator Hardware fault—Current Regulator Card reporting internal conflicting data. • Improper power supply voltage levels on the Current Regulator Card. • Defective Current Regulator Card.
LOAD_REF_FLT		Excessive Pre-Torque Analog Voltage fault
MONG_FLT	AC & DC	Current Regulator Motor ON Grant fault—Current Regulator failed to turn off after a run. Resets a minimum of 6 seconds after the fault condition has cleared. • Defective Current Regulator Card. • Defective DSP Motion Control Card.
MOTOR_CONN_FLT	AC & DC	Motor Connection Fault
NEG_LIM_FLT	AC & DC	Negative Torque Limit Fault—Indicates the drive has exceeded the torque limit set by the UTL parameter in the negative direction. • Improper UTL parameter setting. • Motor field current set too low. (DC drives only.) • Incorrect counter weight. • ACR or DER parameter settings too high. • Encoder leads reversed. • Shorted or grounded motor windings. • Shorted or grounded motor loop wiring or components. • Mechanical binding of the machine or in hoistway. • Loose connections to the LEM modules. • Defective LEM Module. • Defective Current Regulator Card.
OVER_SPD_FLT	AC & DC	Overspeed fault—Drive detected from the Velocity Encoder signal, the car speed exceeded the value set by parameter OSP for a greater period of time set by the OSD parameter. • Loose wiring connections on the Velocity encoder or the DSP Motion Control Card. • Velocity Encoder improperly installed or coupled to motor armature. • Improperly counter weighted car. • ACR or DER parameters set too high. • Improper motor parameter settings on AC drives. • Improper motor field adjustment or operation on DC drives. • Defective Velocity encoder. • Defective DSP Motion Control Card & assoc. wiring. • Defective Current Regulator Card & associated wiring harnesses. • Defective Inverter Interface Card or IGBT wiring.
OVERCURRENT_FLT	AC & DC	Instantaneous Drive Overcurrent—Indicates the output current exceeded 115% of the drive rating. • Intermittent motor wiring or Motor Contactor operation. • Shorted or grounded motor windings. • Shorted or grounded motor loop wiring or components. • Mechanical binding of the machine or in hoistway. • Loose connections to the LEM modules. • Defective LEM Module. • Loose or intermittent wiring harness connection on the Inverter interface card or Current Regulator Card. • Defective Inverter Interface Card. • Defective Current Regulator Card.
OVERVOLTAGE_FLT	AC & DC	Drive Bus Overvoltage—Bus voltage exceeded 400 VDC – 230 volt drives or Bus voltage exceeded 800 VDC – 460 volt drives • High building supply voltage. • Open regenerative resistor circuit. • Excessive regeneration caused by too much counter weight. • Defective QSR IGBT. • Defective QSS / QSR Inverter Interface Card or assoc. wiring harness. • Defective Current Regulator Card.
PHASE_LOSS_FLT	AC & DC	Incoming Loss of Phase Voltage fault

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Fault	Quantum Drive	Description
POS_LIM_FLT	AC & DC	Positive Torque Limit Fault—Indicates the drive has exceeded the torque limit set by the UTL parameter in the positive direction. • Improper UTL parameter setting. • Motor field current set too low. DC drives only. • Incorrect counter weight. • ACR or DER parameter settings too high. • Encoder leads reversed. • Shorted or grounded motor windings. • Shorted or grounded motor loop wiring or components. • Mechanical binding of the machine or in hoistway. • Loose connections to the LEM modules. • Defective LEM Module. • Defective Current Regulator Card.
QSS_IGBT_FLT	AC & DC	QSS IGBT fault—Indicates the QSS IGBT has detected excessive current through the junction, over temperature or gate under voltage when commanded to be turned on. • Loose or defective wiring harness to the QSS IGBT. • Defective QSS / QSR Snubber Card. • Defective QSS IGBT. • Open RSS Resistor. • Shorted or grounded bus • Defective QSS / QSR Interface Card. • Defective Inverter Interface Card. • Defective Current Regulator Card.
QSR_IGBT_FLT	AC & DC	QSR IGBT fault—Indicates the QSR IGBT has detected excessive current through the junction, over temperature or gate under voltage when commanded to be turned on. • Loose or defective wiring harness to the QSR IGBT. • Defective QSS / QSR Snubber Card. • Defective QSR IGBT. • Shorted or grounded regenerative resistor circuit. • Defective QSS/QSR Interface card. • Defective Inverter Interface Card. • Defective Current Regulator Card.
REGEN_6-PACK NEG._FLT	AC & DC	Regenerative Sixpack Negative IGBT fault
REGEN_CONF_FLT	AC & DC	Regenerative Configuration Fault - DCN parameter is incorrect.
REGEN_OVC_FLT	AC & DC	Instantaneous Regenerative Ovvercurrent fault
RGEN_VOLTAGE_FLT	AC & DC	Regenerative Voltage Configuration fault
R_NEG_IGBT_FLT	AC & DC	R Negative IGBT fault
R_POS_IGBT_FLT	AC & DC	R Positive IGBT fault
RUNAWAY_FLT	AC & DC	Drive Runaway fault—Drive detected car movement via the Velocity encoder signals when the Command Velocity Signal was at 0 volts. • Improper brake adjustment. • Improper adjustment of RAL & RAD Parameters. • Defective Velocity encoder. • Electrical noise induced on the Velocity encoder wiring. • Defective Motion Control Card.
S_NEG_IGBT_FLT	AC & DC	S Negative IGBT fault
S_POS_IGBT_FLT	AC & DC	S Positive IGBT fault

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Fault	Quantum Drive	Description
TIMED_OVC_FLT	AC & DC	Drive Overload fault—Drive output current has exceeded the rated drive current or rated motor current (MOL), whichever is less for an excessive amount of time (OLT). • Excessive load placed on the elevator. • Too high ACR or DER Setting. • Incorrect counter weighting. • Mechanical binding in the elevator machine or in the hoistway. • Improper LEM scaling jumper setting on the Current Regulator Card. • Loose or intermittent header jumper installed on the Current Regulator Card. • Defective (Current Regulator) Card. • AC drives only – Loss of velocity encoder signal. • DC drives only – Improper motor field adjustment or operation.
T_NEG_IGBT_FLT	AC & DC	T Negative IGBT fault
T_POS_IGBT_FLT	AC & DC	T Positive IGBT fault
U_NEG_IGBT_FLT	AC & DC	U– IGBT fault—Indicates the U– IGBT has detected excessive current through the junction, over temperature or gate under voltage when commanded to be turned on. • Excessive binding in the machine or load on the elevator. • Grounded or shorted motor loop wiring or components. • Inverter Interface Card to IGBT wiring harness. • Defective IGBT. • Defective Inverter Interface Card. • Defective Current Regulator Card.
U_POS_IGBT_FLT	AC & DC	U+ IGBT fault—Indicates the U+ IGBT has detected excessive current through the junction, over temperature or gate under voltage when commanded to be turned on. •See Causes listed for above U– IGBT fault.
UNDEFINED_FLT	AC & DC	Undefined fault—Drive has detected a problem usually associated with some external hardware device. • Loose wiring harness cable connections between cards or power devices. • Loose field or factory connections on plug connectors. • Defective Motion Control Card. • Defective, Current Regulator Card.
UNDER_VOLT_FLT	AC & DC	Drive Buss Undervoltage—Bus Voltage sagged below 260 Vdc. on 230 Vac drives or Bus voltage sagged below 520 Vdc. on 460 Vac. drives. • Low building supply voltage. • Blown AC Supply fuse to the drive. • Defective bus rectifier. • Shorted or grounded bus capacitors. • Defective Inverter Interface Card. • Defective QSS/QSR Interface Card • Defective PS1 power supply. • Defective Current Regulator Card. • Defective DSP Motion Control Card.
UNKNOWN_FLT	AC & DC	Displayed with 3 digit number. Drive has flagged an internal unassigned fault. This fault will be displayed with a three digit code number defining the logic area where the fault has occurred. • Call Factory for Engineering Support to define the three digit term for troubleshooting the drive.
UPDATE_LIM_FLT	AC & DC	Parameter Adjustment Miss–match—. The DSP Motion Control Card has detected an improper combination of parameter settings. • DSP parameter adjustment incorrectly. • Defective DSP Motion Control Card.
V_NEG_IGBT_FLT	AC & DC	V– IGBT fault—Indicates the V– IGBT has detected excessive current through the junction, over temperature or gate under voltage when commanded to be turned on. • Excessive binding in the machine or load on the elevator. • Grounded or shorted motor loop wiring or components. • Inverter Interface Card to IGBT wiring harness. • Defective IGBT. • Defective Inverter Interface Card. • Defective Current Regulator Card.
V_POS_IGBT_FLT	AC & DC	V+ IGBT fault—Indicates the V+ IGBT has detected excessive current through the junction, over temperature or gate under voltage when commanded to be turned on. • See Causes listed for above V– IGBT fault.

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Fault	Quantum Drive	Description
VEL_ERR_FLT	AC & DC	Velocity Tracking fault—Drive has detected excessive error between the Command Velocity and Velocity Encoder signals as set by parameter VEL. • Improper adjustment of parameters VEP, VEI, or RPM. • Improper motor parameter settings on AC drives. • Improper motor field adjustment or operation on DC drives. • Loose wiring connections on the Velocity encoder or the DSP Motion Control Card. • Velocity Encoder improperly installed or coupled to motor armature. • Improperly counter weighted car. • Defective Velocity encoder. • Defective DSP Motion Control Card & assoc. wiring. • Defective Current Regulator Card & associated wiring harnesses.
VOLT_CONFIG_FLT	AC & DC	Drive Voltage Configuration fault—Issued on power up. Drive detected the DCN parameter and the ID code read from the Current Regulator Card do not agree. • Incorrect version Current Regulator Card installed in the drive. • Incorrect setting of the DCN parameter.
W_NEG_IGBT_FLT	AC & DC	W– IGBT fault—Indicates the W– IGBT has detected excessive current through the junction, over temperature or gate under voltage when commanded to be turned on. • Excessive binding in the machine or load on the elevator. • Grounded or shorted motor loop wiring or components. • Inverter Interface Card to IGBT wiring harness. • Defective IGBT. • Defective Inverter Interface Card. • Defective Current Regulator Card.
W_POS_IGBT_FLT	AC & DC	W+ IGBT fault—Indicates the W+ IGBT has detected excessive current through the junction, over temperature or gate under voltage when commanded to be turned on. • See Causes listed for above W– IGBT fault.
5V_SUPPLY_FLT	AC & DC	Current Regulator 5 Vdc. Supply fault—P5 voltage lost or low on the Current Regulator Card. • Verify the PS1 wiring connections to conn 3 on the DSP Motion Control Card. • Defective PS1 power supply. • Defective Current Regulator Card. • Defective DSP Motion Control Card.
6PK_NEG_IGBT_FLT	AC & DC	Sixpack Negative IGBT fault—Indicates the Power Bridge six pack IGBT has detected excessive current through one or more of the internal junctions or excessive voltage across one or more of the IGBT junctions when commanded to be turned on. • See Causes given for W–IGBT fault.

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DSP Motion Control Card–Technical Information

DSP Connector Signal Descriptions

Connector	Pin	Signal
1	1	AC1 (Hot)
	2	AC2 (Gnd)
	3	Drive Fault Contact – (Fused)
	4	Drive Fault Contact
	5	Motor Contactor – (Fused)
	6	Motor Contactor
	7	Line Contactor – (Fused)
	8	Line Contactor
	9	Drive Running – (Fused)
	10	Drive Running
2	1	Run Command
	2	Direction
	3	Leveling Speed
	4	Inspection Speed
	5	High Speed
	6	Drive Enable
	7	MFF
	8	MFW
	9	MFS
	10	Motor Contactor Status
	11	Fault Reset
	12	Unused Input #12
	13	U Output
	14	U Output
	15	D Output
	16	D Output
	17	+24v_Iso Input
	18	+24v_Com Input
	19	+24v_Com Output
	20	Chasis Ground (Shield)
	21	Analog Vel. Command positive
	22	Analog Vel. Command negetive
	23	Pre-Torque positive
	24	Pre-Torque negative
	25	Chasis Ground (Shield)
	26	Ch_A_Vel
	27	Ch_A_Vel – not
	28	Ch_B_Vel
	29	Ch_B_Vel – not
	30	+5v_Iso
	31	DGND_Iso
	32	Shield – (Gnd)
3	1	DGND_Iso
	2	RXD
	3	TXD
	4	DTR
	5	DGND_Iso
	6	Not Used
	7	Not Used
	8	Not Used
	9	Not Used

Connector	Pin	Signal
4	1	TMS
	2	TRST – not
	3	TDI
	4	DGND
	5	+5v
	6	Not Used
	7	TDO
	8	DGND
	9	TCK
	10	DGND
	11	TCK
	12	DGND
	13	EMU0
	14	EMU1 / OFF
5 User Interface Display Card	1	GND
	2	VDD
	3	V0
	4	RS
	5	R / W
	6	E
	7	D0
	8	D1
	9	D2
	10	D3
	11	D4
	12	D5
	13	D6
	14	D7
	15	K
	16	A
	17	↑
	18	↓
	19	ESC
	20	ENT
6	1	Heatsink Thermister
	2	AGND

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DSP Connector Signal Descriptions (cont.)

Connector	Pin	Signal
7	1	BD0
	2	IORD – not
	3	BD1
	4	IOWE – not
	5	BD2
	6	INT1 – not
	7	BD3
	8	INT2 – not
	9	BD4
	10	INT3 – not
	11	BD5
	12	+5v
	13	BD6
	14	+5v
	15	BD7
	16	+5v
	17	BD8
	18	DGND
	19	BD9
	20	DGND
	21	BD10
	22	DGND
	23	BD11
	24	+15v
	25	BD12
	26	+15v
	27	BD13
	28	AGND
	29	BD14
	30	AGND
	31	BD15
	32	AGND
	33	EXPAND1 – not
	34	–15v
	35	EXPAND2 – not
	36	–15v
	37	U10 pin 11
	38	Not Used
	39	U10 pin 13
	40	Not Used
	41	U10 pin 15
	42	EXT1
	43	U10 pin 17
	44	EXT2
8	1	VBUS
	2	
	3	VU
	4	IU
	5	VV
	6	IV
	7	VW
	8	IW
	9	IU_CM
	10	IV_CM
	11	AGND

Connector	Pin	Signal
8 (cont.)	12	DGND
	13	+15v
	14	+15v
	15	+15v
	16	+5v
	17	–15v
	18	+5v
	19	–15v
	20	–15v
	21	AGND
	22	AGND
	23	MON_R – not
	24	CREG_MOG – not
	25	FR – not
	26	CREG_FLT
	27	
	28	
	29	DGND
	30	DGND
	31	CD0
	32	CD1
	33	CD2
	34	CD3
	35	CD4
	36	CD5
	37	CD6
	38	CD7
	39	
	40	
	41	CRD – not
	42	CWA – not
	43	CA0
	44	CA1
	45	CA2
	46	CREG – not
	47	
	48	
	49	+5v
	50	+5v
9	1	–15v from PS1 – 1
	2	–15v from PS1 – 2
	3	Not Used from PS1 – 3
	4	Not Used from PS1 – 4
	5	+15v from PS1 – 5
	6	+15v from PS1 – 6
	7	AGND from PS1 – 7
	8	DGND from PS1 – 8
	9	+5v from PS1 – 9
	10	+5v from PS1 – 10
10	1	GND to PS1 – TB1 – 2
	2	115Vac. to PS1 – TB1 – 3

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DSP Card Test Point, Indicator, Switch and Fuse Decription

	Label	Function
Test Point	+ 5 V	Positive 5 Volts DC Supply Test Point
	+ 15 V	Positive 15 Volts DC Supply Test Point
	–15 V	Negative 15 Volts DC Supply Test Point
	AGND	Analog Signal Common Reference
	DGND	Digital Signal Common Reference
	IUCM	"U" phase IGBT current command signal output to the Current Regulator Card.
	IVCM	"V" phase IGBT current command signal output to the Current Regulator Card.
	IUFB	"U" phase current feedback signal input from the Current Regulator Card.
	IVFB	"V" phase current feedback signal input from the Current Regulator Card.
	IWFB	"W" phase current feedback signal input from the Current Regulator Card.
	MUX1	Not for field use: Provided for internal engineering function.
	MUX2	Not for field use: Provided for internal engineering function.
	MUX3	Not for field use: Provided for internal engineering function.
	MUX4	Not for field use: Provided for internal engineering function.
	TPA1	Analog Signal Test Point Programmable via Diagnostic Adj. Parameter TPA1
	TPA2	Analog Signal Test Point Programmable via Diagnostic Adj. Parameter TPA2
	TPD1	Digital Signal Test Point: Not for field use; Provided for engineering diagnostics.
	TPD2	Digital Signal Test Point: Not for field use; Provided for engineering diagnostics.
	VBUS	Scaled Bus Voltage: • 10 VDC. = about 800 VDC. bus voltage on 460v drives. • 10 VDC. = about 400 VDC. bus voltage on 230v drives.
Indicator	Drive_Fault	Red LED, Normally OFF: • When lit, indicates the DSP Motion Control Card has detected a fault condition in the drive.
	Power_On	Green LED, Flashing: • When flashing, indicates DSP Card power supplies are good and is functioning normally.
	Torque_Limit	Yellow LED, Normally OFF: • When lit, indicates the drive is operating at the torque limit setting. This condition will limit the drive output to the motor. This can result in speed tracking faults or loss of control.
Switch	Reset	Re–initializes the DSP Micro.
Fuse	F1	4A 125V Pico PCB Fuse: • Fused K1 relay contact output at conn. 1 pins 7 & 8. • Provides the AC Line Contactor output from the drive. • (Typically Not Used)
	F2	4A 125V Pico PCB Fuse: • Fused K2 relay contact output at conn. 1 pins 5 & 6. • Provides the Motor Contactor output from the drive.
	F3	4A 125V Pico PCB Fuse: • Fused K3 relay contact output at conn. 1 pins 9 & 10. • Provides the Drive Running output from the drive.
	F4	4A 125V Pico PCB Fuse: • Fused K4 relay contact output at conn. 1 pins 3 & 4. • Provides the Drive Fault output from the drive.
	F5	4A 125V Pico PCB Fuse: • Fused 115 Vac feed output to the PS1 Power Supply. • 115 Vac inputs at conn 1 pin 1 (Hot), and pin2 (Gnd). • The fused 115 Vac outputs at conn 10 pin 1 (Hot) and pin 2 (Gnd).

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DSP Motion Control Card Layout

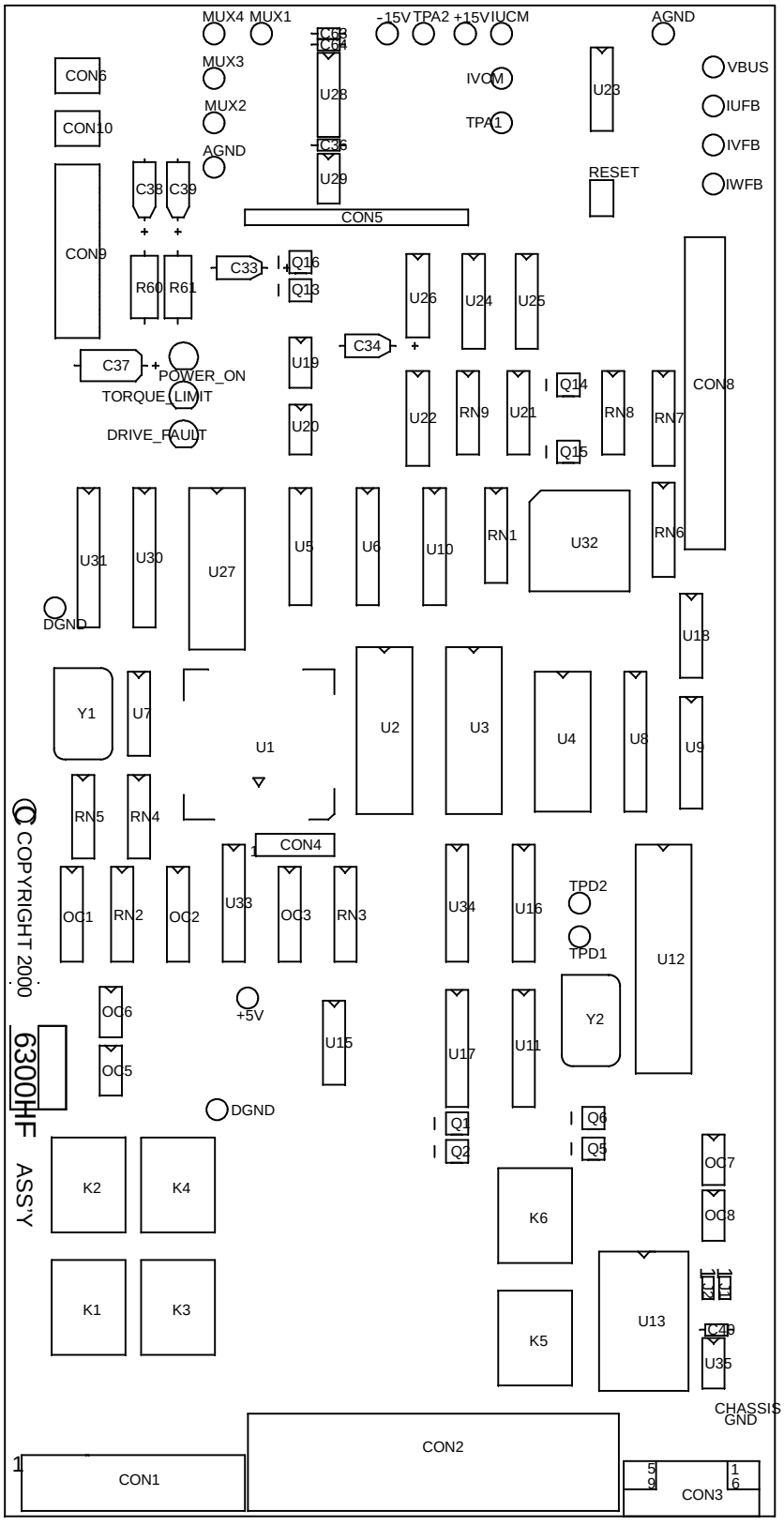

Figure 33 - 6300HF

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Current Regulator Card–Technical Information

Current Regulator Connector Signal Descriptions

Connector	Pin	Signal
1	1	VBUS
	2	Pin 1 – J14
	3	FUFBK
	4	IUFBK
	5	FVFBK
	6	IVFBK
	7	FWFBK
	8	IWFBK
	9	IUCMD
	10	IVCMD
	11	SCOM
	12	LCOM
	13	P15v
	14	P15v
	15	P15v
	16	P5v
	17	M15v
	18	P5v
	19	M15v
	20	M15v
	21	SCOM
	22	SCOM
	23	MON_R – not
	24	CREG_MOG – not
	25	FR – not
	26	CREG_FLT
	27	RESET – not
	28	CREG_WT – not
	29	LCOM
	30	LCOM
	31	CD0
	32	CD1
	33	CD2
	34	CD3
	35	CD4
	36	CD5
	37	CD6
	38	CD7
	39	CBS – not
	40	COSC – not
	41	CR0 – not
	42	CWR – not
	43	CA0
	44	CA1
	45	CA2
	46	
	47	LCOM
	48	LCOM
	49	P5v
	50	P5v

Connector	Pin	Signal
2	1	COSC – not
	2	CBS – not
	3	CREG_WT – not
	4	RESET – not
	5	VBUS
	6	P5v
	7	P5v
	8	FR – not
	9	P15v
	10	P15v
	11	P15v
	12	LCOM
	13	LCOM
	14	LCOM
	15	LCOM
	16	M15v
	17	M15v
	18	M15v
	19	CREG_MOG – not
	20	CREG_FLT
	21	SPARE2
	22	SPARE3
	23	SPARE4
	24	SPARE5
	25	R+_FLT – not
	26	R–_FLT – not
	27	S+_FLT – not
	28	S–_FLT – not
	29	T+_FLT – not
	30	T–_FLT – not
	31	OVC_REG – not
	32	PHS_LOSS – not
	33	REGN_FLT – not
	34	VBUS

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Current Regulator Connector Signal Descriptions (cont.)

Connector	Pin	Signal
3	1	SSFLT
	2	LOWFLT
	3	SSDRIVE – not
	4	SRFLT
	5	SRDRIVE – not
	6	LCOM
	7	VW
	8	P5VFLT
	9	W+_ENA
	10	W+FLT
	11	W–_ENA
	12	W–FLT
	13	P5v
	14	P5v
	15	P15v
	16	P15v
	17	LCOM
	18	LCOM
	19	M15v
	20	M15v
	21	VV
	22	
	23	V+_ENA
	24	V+FLT
	25	V–_ENA
	26	V–FLT
	27	VU
	28	
	29	U+_ENA
	30	U+FLT
	31	U–_ENA
	32	U–FLT
	33	V–BUS
	34	V+–BUS
Faston Tabs		
LEM1 +		LEM1 P15v Power Supply
LEM1 M		LEM1 Signal Input
LEM1 –		LEM1 M15v Power Supply
LEM2 +		LEM2 P15v Power Supply
LEM2 M		LEM2 Signal Input
LEM2 –		LEM2 M15v Power Supply

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Current Regulator Card Test Point, Header Jumper, Indicator and Switch Description

	Label	Function
Test Points	–10V_REF	–10 VDC. Reference: • Internal regulated –10 volt source.
	+10V_REF	+10 VDC. Reference: • Internal regulated +10 volt source.
	2.49V_REF	+2.49 VDC. Reference: • Internal regulated +2.49 volt source.
	AC / DC	Signal used to configure the Current Regulator Card circuitry for AC or DC operation. • High (+15v) for DC operation. • Low (0V) for AC Operation.
	FUFBK	Flux feedback "U" Phase: • Provided for future development. • Currently not used.
	FVFBK	Flux feedback "V" Phase: • Provided for future development. • Currently not used.
	FWFBK	Flux feedback "W" Phase: • Provided for future development. • Currently not used.
	IUCMD	"U" phase current command signal input from the DSP Motion Control Card.
	IUFBK	"U" phase current feedback signal output to the DSP Motion Control Card.
	IVCMD	"V" phase current command signal input from the DSP Motion Control Card.
	IVFBK	"V" phase current feedback signal output to the DSP Motion Control Card.
	IWFBK	"W" phase current feedback signal output to the DSP Motion Control Card.
	LCOM1	Logic Common Test Point 1: • Digital signal reference feed from the DSP Motion Control Card. (DGND) • Provided as a +5 VDC. digital logic signal reference for measurement purposes. • (Also Controller Ground)
	LCOM2	Logic Common Test Point 2: • Digital signal reference feed from the DSP Motion Control Card. (DGND) • Provided as a +5 VDC. digital logic signal reference for measurement purposes. • (Also Controller Ground)
	LOW_FLT	6 Pack IGBT Fault: • High, (+15v), when a failure has been detected in one of the internal junctions, (U–, V– or W–) in the six pack IGBT package. **Note:** Not used on larger drives equipped with dual pack IGBT modules.
	M15V	PS1 Power supply, –15 VDC: • Input voltage feed from the DSP Motion Control Card.
	MOTOR_ON	High (+15v) when motor is requested to run. Enables firing of the IGBT's.
	OV_FLT	Over Voltage Fault: High, (+15v), when bus voltage exceeds • About 800 VDC on 460 VAC drives • About 400 VDC. on 230 Vac. drives.
	OVC_FLT	Over Current Fault: • High (+15v) when drive output current has exceeded the motor rating for about 20 seconds.
	P15V	PS1 Power Supply, +15 VDC • Input voltage feed from the DSP Motion Control Card.
	P5V_FLT	P5 VDC Supply Fault: • High, (+15v), when the positive 5 volt supply is lost on the Inverter Interface Card
	P5V	PS1 Power Supply: +5 VDC. input voltage feed from the DSP Motion Control card.

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Current Regulator Card Test Point, Header Jumper, Indicator and Switch Description (cont.)

	Label	Function
Test Points	REGN_FLT	Regenerative Converter Fault: • High (+15v) when ID code from the Digital Current Regulat or the Regenerative Regulator Cards fails to report the installation of the regenerative regulator when called for via the DCN parameter.
	SCOM	System Common Reference: • Analog signal common feed from the DSP Motion Control Card. (AGND) • Provided for analog signal reference for measurement purposes.
	SFDRIVE	Pulsed low signal to control the firing of the V– IGBT for DC motor field control. Used on DC Drive applications.
	SRDRIVE	QSR Drive, Quantum Quiet waveform: • When low, (0v), controls the firing of the QSR IGBT.
	SRFLT	Shunt Regulator IGBT Fault: • High, (+15v), when an internal failure has been detected by the QSR IGBT.
	SSDRIVE	QSS Drive: • Low, (0v), to control the firing of the QSS IGBT.
	SSFLT	Soft Start IGBT Fault: • High, (+15v), when an internal failure has been detected by the QSS IGBT.
	U–_ENA	U– IGBT Enable, Quantum Quiet Waveform: • When negative with respect to the U+_ENA signal; activates the firing of the U–_IGBT junction.
	U–_FLT	U– IGBT Fault: • High, (+15v), when a failure has been detected in the U– section of the U phase IGBT. **Note:** Not used on smaller drives equipped with the six pack IGBT module.
	U+_ENA	U+ IGBT Enable, Quantum Quiet Waveform: • When positive with respect to the U–_ENA signal, activates the firing of the U+ IGBT junction.
	U+_FLT	U+ IGBT Fault: • High, (+15v), when a failure has been detected in the U+ section of the U phase IGBT. Fault used in conjunction with all types of IGBT modules.
	UV_FLT	Bus Under Voltage Fault: • High, (+15), when the bus voltage sags below about 520 VDC on 460v drives. • High, (+15), when the bus voltage sags below about 260 VDC. on 230v drives.
	V Bus	Scaled Bus Voltage: • 10 VDC = about 800 VDC bus voltage on 460v drives. • 10 VDC = about 400 VDC. bus voltage on 230v drives.
	V–_ENA	V– IGBT Enable, Quantum Quiet Waveform: • When negative with respect to the V+_ENA signal, activates the firing of the V– IGBT junction.
	V–_FLT	V– IGBT Fault: • High, (+15v), when a failure has been detected in the V– section of the V phase IGBT. **Note:** Not used on smaller drives equipped with the six pack IGBT module.
	V+_ENA	V+ IGBT Enable, Quantum Quiet Waveform: • When positive with respect to the V–_ENA signal, activates the firing of the V+ IGBT junction.
	V+_FLT	V+ IGBT Fault: • High, (+15v), when a failure has been detected in the V+ section of the V phase IGBT. Fault used in conjunction with all types of IGBT modules.
	W–_ENA	W– IGBT Enable, Quantum Quiet Waveform: • When negative with respect to the W+_ENA signal, activates the firing of the W– IGBT junction.
	W–_FLT	W– IGBT Fault: • High, (+15v), when a failure has been detected in the W– section of the W phase IGBT. **Note:** Not used on smaller drives equipped with the six pack IGBT module.

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Current Regulator Card Test Point, Header Jumper, Indicator and Switch Description (cont.)

	Label	Function
Test Points	W+_ENA	W+ IGBT Enable, Quantum Quiet Waveform: • When positive with respect to the W–_ENA signal; activates the firing of the W+ IGBT junction.
	W+_FLT	W+ IGBT Fault: • High, (+15v), when a failure has been detected in the W+ section of the W phase IGBT. Fault used in conjunction with all types of IGBT modules.
Header Jumpers	J1	Horsepower Select Jumper. Scales LEM 1 Feedback Signal for: • 10 hp. 460v DC Drive Applications. • 7.5 & 10 hp. 460v AC Drive Applications.
	J2	Horsepower Select Jumper. Scales LEM 2 Feedback Signal for: • 10 through 60 hp. 230v & 460v DC Drives. • 7.5 & 10 hp. 460v AC Drive Applications.
	J3	Horsepower Select Jumper. Scales LEM 1 Feedback Signal for: • 15 hp. 460v AC & DC Drive Applications.
	J4	Horsepower Select Jumper. Scales LEM 2 Feedback Signal • 15 hp. 460v AC Drive Applications.
	J5	Horsepower Select Jumper. Scales LEM 1 Feedback Signal • 10 hp. 230v AC & DC Drive Applications. • 20 hp. 460v AC & DC Drive Applications.
	J6	Horsepower Select Jumper. Scales LEM 2 Feedback Signal • 10 hp. 230v AC Drive Applications. • 20 hp. 460v AC Drive Applications.
	J7	Horsepower Select Jumper. Scales LEM 1 Feedback Signal • 15 & 30 hp 230v AC & DC Drives. • 30 & 60 hp 460v AC & DC Drives
	J8	Horsepower Select Jumper. Scales LEM 2 Feedback Signal • 15 & 30 hp 230v AC Drive Applications. • 30 & 60 hp 460v AC Drive Applications.
	J9	Horsepower Select Jumper. Scales LEM 1 Feedback Signal • 20 & 40 hp 230v AC & DC Drives. • 40 hp. 460v DC Drive Applications. • 40 & 80 hp. 460v AC Drive Applications.
	J10	Horsepower Select Jumper. Scales LEM 2 Feedback Signal • 20 & 40 hp 230v AC Drive Applications. • 40 & 80 hp. 460v AC Drive Applications.
	J11	Horsepower Select Jumper. Scales LEM 1 Feedback Signal • 60 hp. 230v AC & DC Drive Applications. • 120 hp. 460v AC Drive Applications.
	J12	Horsepower Select Jumper. Scales LEM 2 Feedback Signal • 60 hp 230v AC Drive Applications. • 120 hp. 460v AC Drive Applications.
	J13	Installed to manually select the DC drive operation. When removed the Current Regulator Card is set up for AC drive operation.
	J14	Not used.
	J15	Configures the Current Regulator Card either for single phase 230v temporary operation or three phase normal operation. • J15 Header in the 1 to 2 position for normal three phase operation. • J15 Header in the 2 to 3 position for single phase 230v temporary operation.
	J16	Configures the Current Regulator Card either for single phase 230v temporary operation or three phase normal operation. • J16 Header in the 1 to 2 position for normal three phase operation. • J16 Header in the 2 to 3 position for single phase 230v temporary operation
Indicators	None	
Switches	None	

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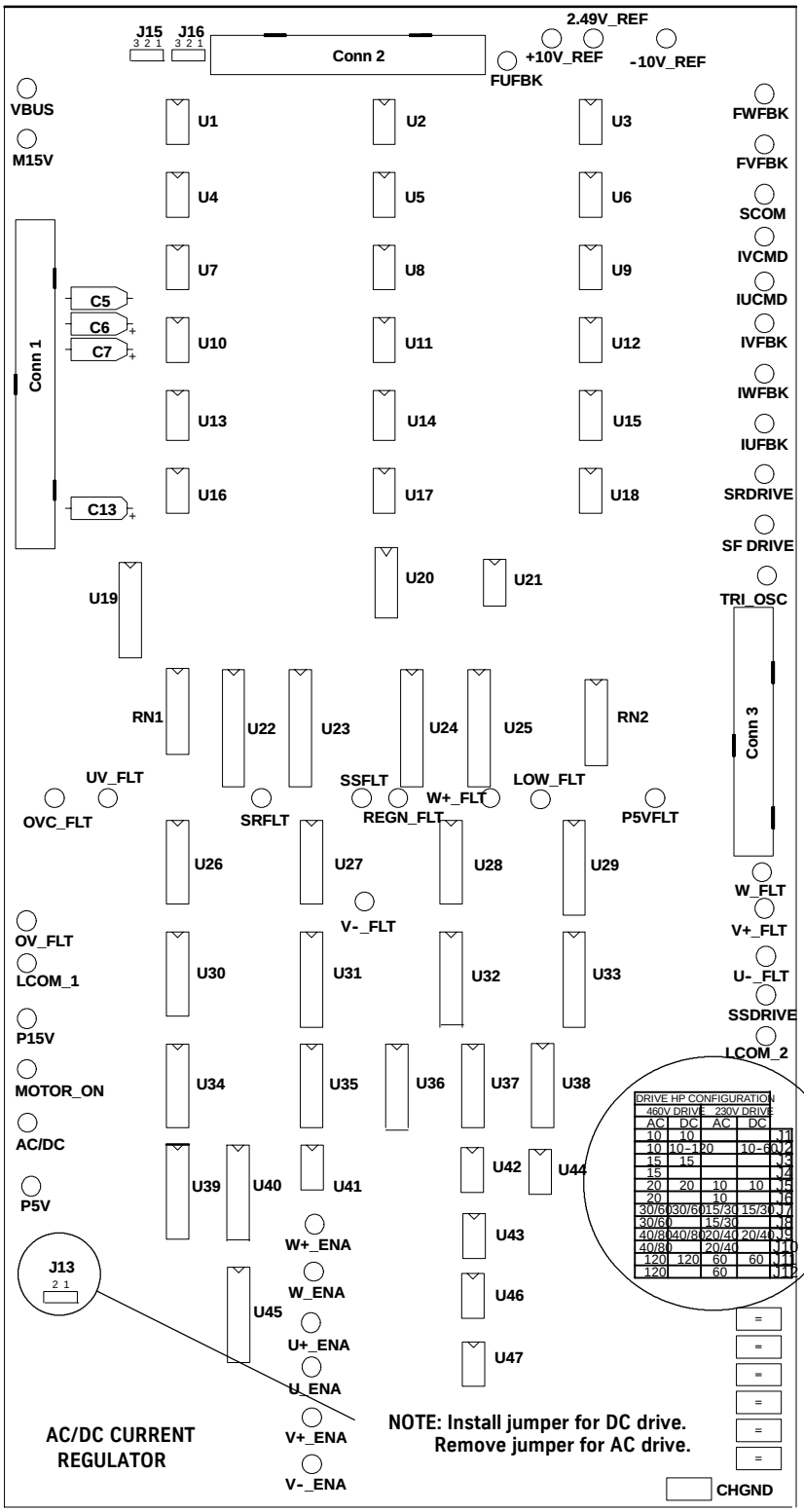
AC/DC Current Regulator Card Layout



DRIVE HP CONFIGURATION				
460V DRIVE		230V DRIVE		
AC	DC	AC	DC	
10	10			J1
10	10–120		10–60	J2
15	15			J3
15				J4
20	20	10	10	J5
20		10		J6
30/60	30/60	15/30	15/30	J7
30/60		15/30		J8
40/80	40/80	20/40	20/40	J9
40/80		20/40		J10
120	120	60	60	J11
120		60		J12

Figure 34 - 6300LR

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Inverter Interface Card–Technical Information

Inverter Interface Card (Dual Pack IGBT) Connector Signal Descriptions

Connector	Pin	Signal
1	1	SSFLT – not
	2	LCOM
	3	SSDRIVE – not
	4	SRFLT – not
	5	SRDRIVE – not
	6	LCOM
	7	VW
	8	P5VFLT
	9	W+
	10	W+FLT
	11	W–
	12	W–FLT
	13	P5v
	14	P5v
	15	P15v
	16	P15v
	17	LCOM
	18	LCOM
	19	M15v
	20	M15v
	21	VV
	22	
	23	V+
	24	V+FLT
	25	V–
	26	V–FLT
	27	VU
	28	
	29	U+
	30	U+FLT
	31	U–
	32	U–FLT
	33	V–BUS
	34	V+BUS

Connector	Pin	Signal
2A	1	U (VP1)
	2	U (SPR)
	3	U (CPI)
	4	U (VPC)
	5	U (FP0)
2B	1	U (VN1)
	2	U (SNR)
	3	U (CNI)
	4	U (VNC)
	5	U (FN0)
2C	1	V (VP1)
	2	V (SPR)
	3	V (CPI)
	4	V (VPC)
	5	V (FP0)
2D	1	V (VN1)
	2	V (SNR)
	3	V (CNI)
	4	V (VNC)
	5	V (FN0)
2E	1	W (VP1)
	2	W (SPR)
	3	W (CPI)
	4	W (VPC)
	5	W (FP0)
2F	1	W (VN1)
	2	W (SNR)
	3	W (CNI)
	4	W (VNC)
	5	W (FN0)
3	1	SSFLT – not
	2	SSDRIVE – not
	3	SRFLT – not
	4	SRDRIVE – not
	5	V+BUS
	6	P15v
	7	LCOM
	8	LCOM
	9	LCOM
	10	LCOM
	11	M15v
	12	XFR3
	13	P15SW
	14	XFR1

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Inverter Interface Card (Dual Pack IGBT) Test Point Descriptions

	Label	Function
Test Point	LCOM1	Logic Common Test Point 1: • Digital signal reference feed from the DSP Motion Control Card, (DGND), and the Digital Current Regulator Card. Provided as a logic signal reference for measurement purposes.
	LCOM2	Logic Common Test Point 2: • Digital signal reference feed from the DSP Motion Control Card, (DGND), and the Digital Current Regulator Card. Provided as a logic signal reference for measurement purposes.
	M15V	PS1 Power Supply, –15 VDC: • Input voltage feed from the DSP Motion Control and Current Regulator Cards.
	P15V	PS1 Power Supply, +15 VDC: • Input voltage feed from the DSP Motion Control and Current Regulator Cards.
	P5V	PS1 Power Supply, +5 VDC: • Input voltage feed from the DSP Motion Control and Current Regulator Cards.
	P5V_FLT	P5 VDC. Supply Fault: • High (15V) when the positive 5 volt supply is lost on the Inverter Interface Card.
	U–_FLT	U– IGBT Fault: • High (+15v) when a failure has been detected in the U– section of the U phase IGBT.
	U+_FLT	U+ IGBT Fault: • High (+15v) when a failure has been detected in the U+ section of the U phase IGBT.
	V–_FLT	V– IGBT Fault: • High (+15v) when a failure has been detected in the V– section of the V phase IGBT.
	V+_FLT	V+ IGBT Fault: • High (+15v) when a failure has been detected in the V+ section of the V phase IGBT.
	W–_FLT	W– IGBT Fault: • High (+15v) when a failure has been detected in the W– section of the W phase IGBT.
	W+_FLT	W+ IGBT Fault: • High (+15v) when a failure has been detected in the W+ section of the U phase IGBT.

Inverter Interface Card (Dual Pack IGBT) Layout

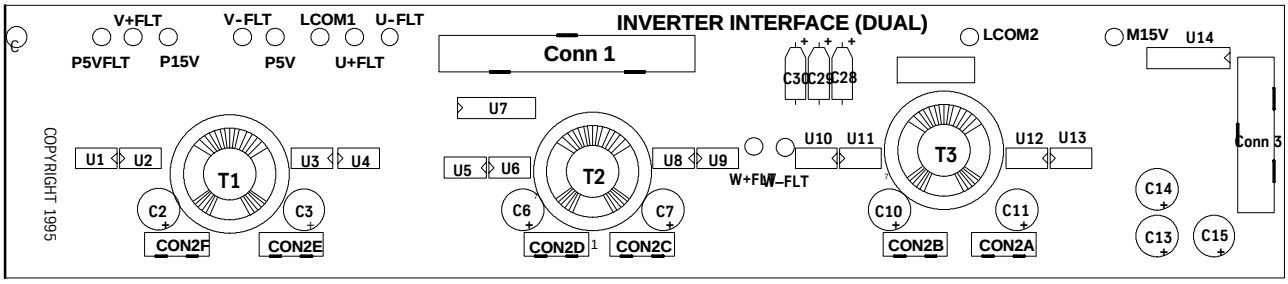

Figure 35 - Inverter Interface (Dual)

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Inverter Interface Card (Six Pack IGBT) Connector Signal Descriptions

Connector	Pin	Signal
1	1	SSFLT – not
	2	LOWFLT
	3	SSDRIVE – not
	4	SRFLT – not
	5	SRDRIVE – not
	6	LCOM
	7	VW
	8	P5VFLT
	9	W+
	10	W+FLT
	11	W–
	12	LCOM
	13	P5v
	14	P5v
	15	P15v
	16	P15v
	17	LCOM
	18	LCOM
	19	M15v
	20	M15v
	21	VV
	22	
	23	V+
	24	V+FLT
	25	V–
	26	LCOM
	27	VU
	28	
	29	U+
	30	U+FLT
	31	U–
	32	LCOM
	33	V–BUS
	34	V+BUS
2	1	WFO
	2	VWPC
	3	WP
	4	VWP1
	5	VFO
	6	VVPC
	7	VP
	8	VVP1
	9	UFO
	10	VUPC
	11	UP
	12	VUP1
	13	
	14	FO
	15	VNC
	16	VN1
	17	UUN
	18	VN
	19	WN

Connector	Pin	Signal
3	1	SSFLT – not
	2	SSDRIVE – not
	3	SRFLT – not
	4	SRDRIVE – not
	5	V+BUS
	6	P15v
	7	LCOM
	8	LCOM
	9	LCOM
	10	LCOM
	11	M15v
	12	XFR3
	13	P15SW
	14	XFR1

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Inverter Interface Card (Six Pack IGBT) Test Point Descriptions

	Label	Function
Test Point	LCOM1	Logic Common Test Point 1: • Digital signal reference feed from the DSP Motion Control Card, (DGND), and the Current Regulator Card. Provided as a logic signal reference for measurement purposes.
	LCOM2	Logic Common Test Point 2: • Digital signal reference feed from the DSP Motion Control Card, (DGND), and the Current Regulator Card. Provided as a logic signal reference for measurement purposes.
	LOW_FLT	6 Pack IGBT Fault: • High (+15v) when a failure has been detected in one of the internal junctions, (U–, V– or W–) in the six pack IGBT package.
	M15V	PS1 Power supply, –15 VDC: • Input voltage feed from the DSP Motion Control and Current Regulator Cards.
	P15V	PS1 Power Supply,+15 VDC: • Input voltage feed from the DSP Motion Control and Current Regulator Cards.
	P5V_FLT	P5 VDC. Supply Fault: • High, (+15v), when the positive 5 volt supply is lost on the Inverter Interface Card.
	U+_FLT	U+ IGBT Fault: • High, (+15v), when a failure has been detected in the U+ section of the U phase IGBT.
	V+_FLT	V+ IGBT Fault: • High, (+15v), when a failure has been detected in the V+ section of the V phase IGBT.
	V–BUS	Scaled Bus Voltage: • Minus bus voltage output to the Current Regulator Card.
	W+_FLT	W+ IGBT Fault: • High, (+15v), when a failure has been detected in the W+ section of the W phase IGBT.

Inverter Interface Card (6–Pack IGBT) Layout

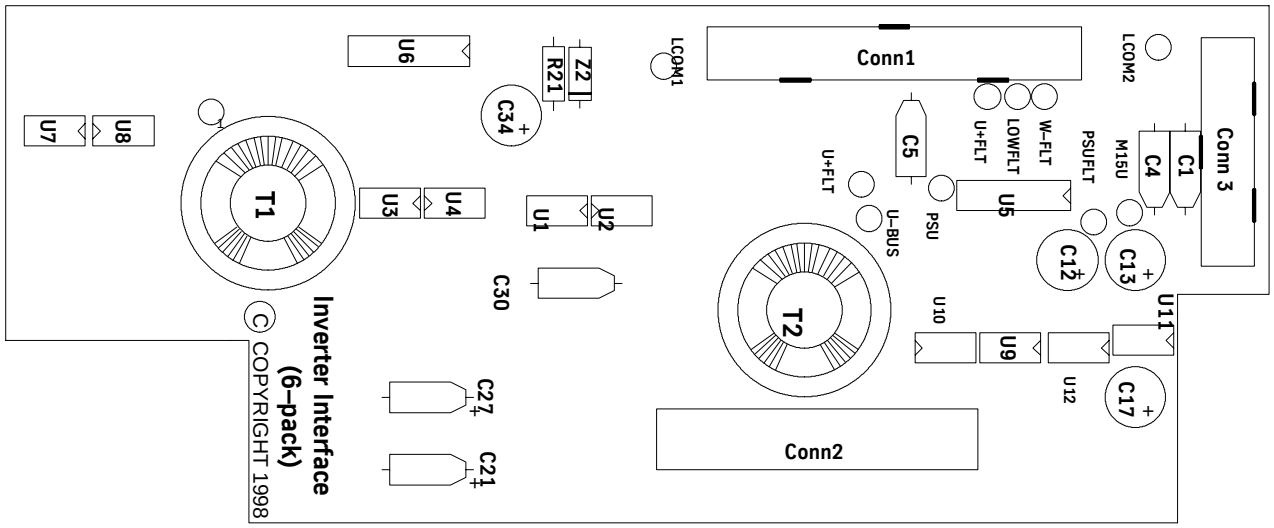

Figure 36 - Inverter Interface Card (6-Pack IGBT)

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QSS / QSR Interface Card–Technical Information

QSS / QSR Interface Card Connector Signal Descriptions

Connector	Pin	Signal
1	1	SS (VPI)
	2	SS (SPR)
	3	SS (CPI)
	4	SS (VPC)
	5	SS (FPO)
2	1	SR (VNI)
	2	SR (SNR)
	3	SR (CNI)
	4	SR (VNC)
	5	SR (FNO)

Connector	Pin	Signal
3	1	SSFLT – not
	2	SSDRIVE – not
	3	SRFLT – not
	4	SRDRIVE – not
	5	V+BUS
	6	P15v
	7	LCOM
	8	LCOM
	9	LCOM
	10	LCOM
	11	M15v
	12	XFR3
	13	XFR2
	14	XFR1

QSS / QSR Interface Card Test Point Descriptions

	Label	Function
Test Point	LCOM	Logic Common Test Point: • Digital signal reference feed from the DSP Motion Control Card, (DGND), through the Current Regulator and Inverter Interface Cards. Provided as a logic signal reference for measurement purposes.
	M15V	PS1 Power Supply, –15 VDC: • Input voltage feed from the DSP Motion Control Card through the Current Regulator and Inverter Interface Cards.
	P15V	PS1 Power Supply, +15 VDC: • Input voltage feed from the DSP Motion Control Card through the Current Regulator and Inverter Interface Cards.
	SRDRIVE	QSR Drive, WM waveform: • When low, (0v), controls the firing of the QSR IGBT.
	SRFLT	Shunt Regulator IGBT Fault: • Low, (LCOM), when an internal failure has been Detected by the QSR IGBT.
	SSDRIVE	QSS Drive: • Low, (0v), to control the firing of the QSS IGBT.
	SSFLT	Soft Start IGBT Fault: • Low, (LCOM), when an internal failure has been detected by the QSS IGBT.

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QSS /QSR Interface Card Layout

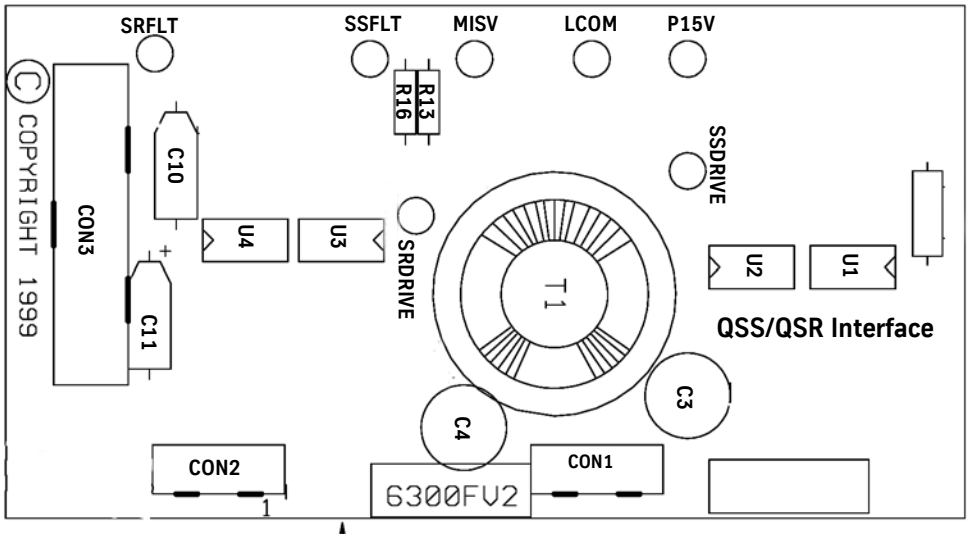

Figure 37 - QSS / QSR Interface Card

QSS /QSR Snubber Card Layout

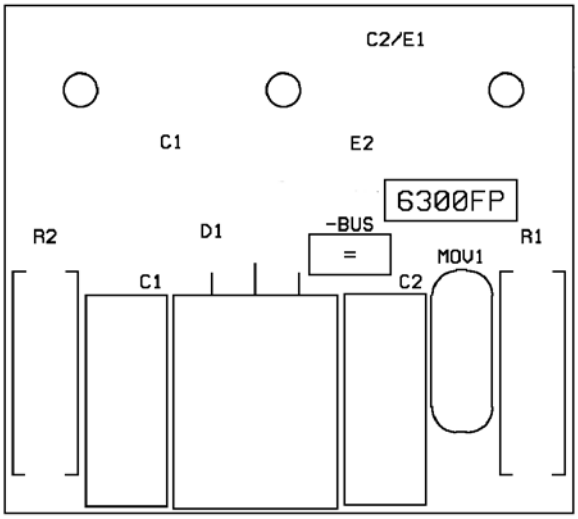

Figure 38 - QSS / QSR Snubber

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AC/DC Regenerative Card - Technical Information

AC/DC Regenerative Card Connector Signal Descriptions

Connector	Pin	Signal
1	1	
	2	
	3	
	4	
	5	
	6	LCOM
	7	
	8	
	9	W+
	10	W+FLT
	11	W-
	12	W-FLT
	13	P5V
	14	P5V
	15	P15V
	16	P15V
	17	LCOM
	18	LCOM
	19	M15V
	20	M15V
	21	
	22	
	23	V+
	24	V+FLT
	25	V-
	26	V-FLT
	27	
	28	
	29	U+
	30	U+FLT
	31	U-
	32	U-FLT
	33	
	34	

Connector	Pin	Signal
2	1	$\overline{\text{REGEN\_LOW}}$
	2	LCOM
	3	
	4	
	5	VBUS
	6	P5V
	7	P5V
	8	/FR
	9	P15V
	10	P15V
	11	P15V
	12	LCOM
	13	LCOM
	14	LCOM
	15	LCOM
	16	M15V
	17	M15V
	18	M15V
	19	$\overline{\text{CREG\_MOG}}$
	20	
	21	LCOM R
	22	LCOM
	23	LCOM
	24	LCOM
	25	$\overline{\text{R+\_FLT}}$
	26	$\overline{\text{R-\_FLT}}$
	27	$\overline{\text{S+\_FLT}}$
	28	$\overline{\text{S-\_FLT}}$
	29	$\overline{\text{T+\_FLT}}$
	30	$\overline{\text{T-\_FLT}}$
	31	OVC_REG
	32	PHS_LOSS
	33	REGN_FLT
	34	VBUS

	Label	Function
Faston Terminals	GND	Connected to controller grounding strip.
	R	High voltage phase R power line input.
	S	High voltage phase S power line input.
	T	High voltage phase T power line input.
	LEM3+	+15V control power supply for LEM3 current sensor.
	LEM3M	LEM3 current feedback for phase R line current.
	LEM3-	-15V control power supply for LEM3 current sensor.
	LEM4+	+15V control power supply for LEM4 current sensor.
	LEM4M	LEM4 current sensor feedback for phase S line current.
	LEM4-	-15V control power supply for LEM4 current sensor.
	CHGND	Not used.

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AC/DC Regenerative Card Test Point, Indicator, Switch and Fuse Decription

	Label	Function
Test Point	IRFBK	Phase R line current feedback 10V peak=max line current.
	ISFBK	Phase S line current feedback. 10V peak=max line current.
	ITFBK	Phase T line current feedback. 10V peak=max line current.
	P5V	+5V control power supply from AC/DC Current Regulator Card.
	M15V	-15V control power supply from AC/DC Current Refulator Card.
	LCOM2	Logic common test point.
	+10V_REF	Internal +10V reference source.
	-10V_REF	Internal -10V reference source.
	P15V	+15V control power supply from AC/DC Current Regulator Card.
	U+_ENABLE	PWM enabled switching signal for phase R converter.
	V+_ENABLE	PWM enabled switching signal for phase S converter.
	VERR	Bus voltage error signal for bus voltage regulator.
	W+_ENABLE	PWM enabled switching signal for phase T converter.
	LCOM1	Logic common test point.
	IRCMD	Phase R line current command. 10V peak=max line current.
	ISCMD	Phase S line current command. 10V peak=max line current.
	TP_R	Scaled phase R line voltage signal. 10V peak=nominal line voltage.
	TP_S	Scaled phase S line voltage signal. 10V peak=nominal line voltage.
	VLINE	Scaled 3-phase line voltage signal. 4.60 VDC=nominal line voltage.
	TP_T	Scaled phase T line voltage signal. 10V peak=nominal line voltage.
Potentiometer	R73	Provided to adjust VERR test point for desired DC bus voltage level.

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AC/DC Regenerative Control Card Layout

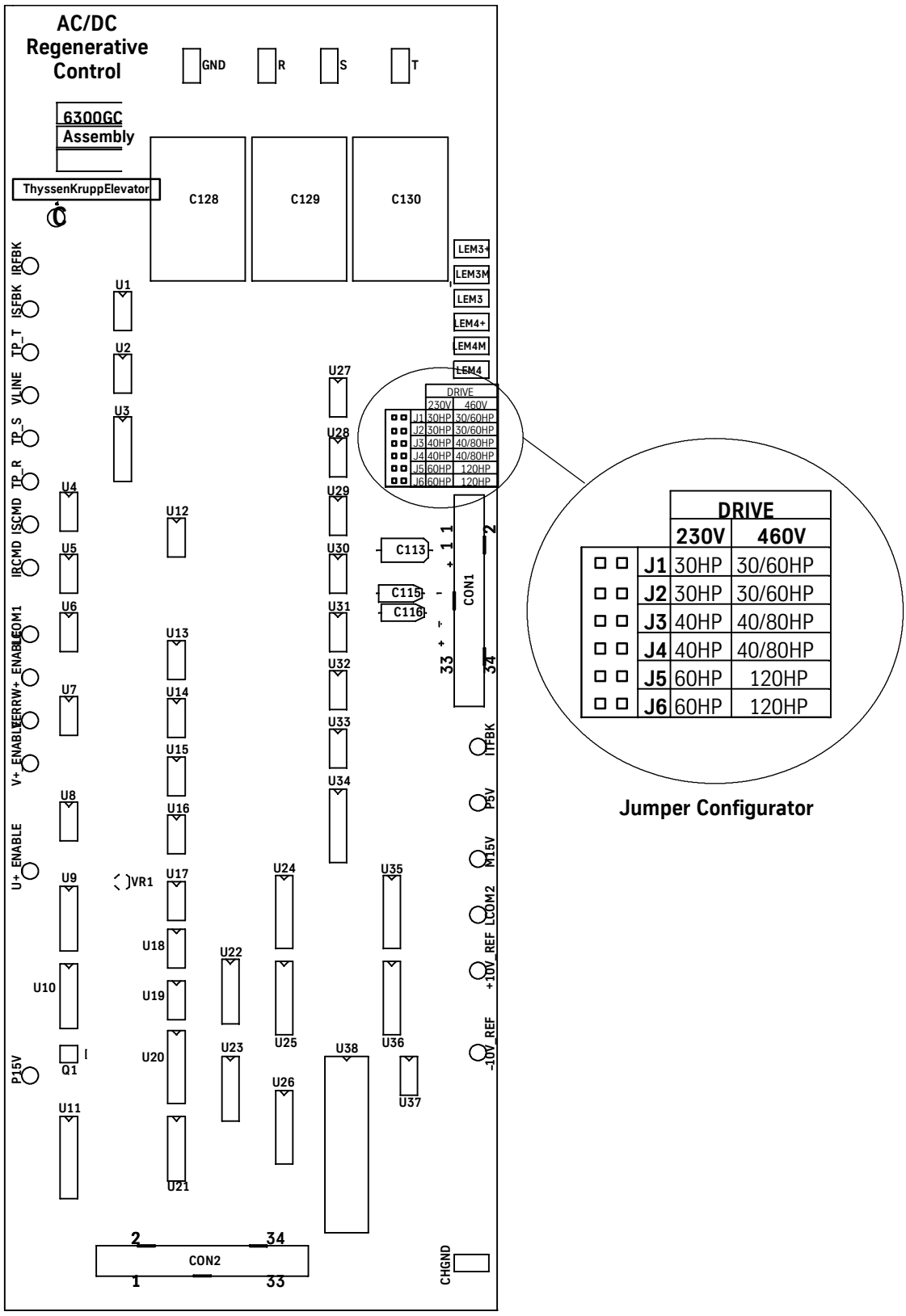

Figure 39 - AC/DC Regenerative Control Card

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PS1 Power Supply

PS1 Power Supply Connector Signal Descriptions

Connector	Pin	Signal
TB 1	1	Not Used
	2	AC2 (Gnd)
	3	AC1 (115Vac.)
TB 2	1	–15v
	2	–15v
	3	Not Used
	4	Not Used
	5	+15v
	6	+15v
	7	AGND
	8	DGND
	9	+5v
	10	+5v

PS1 Power Supply Layout

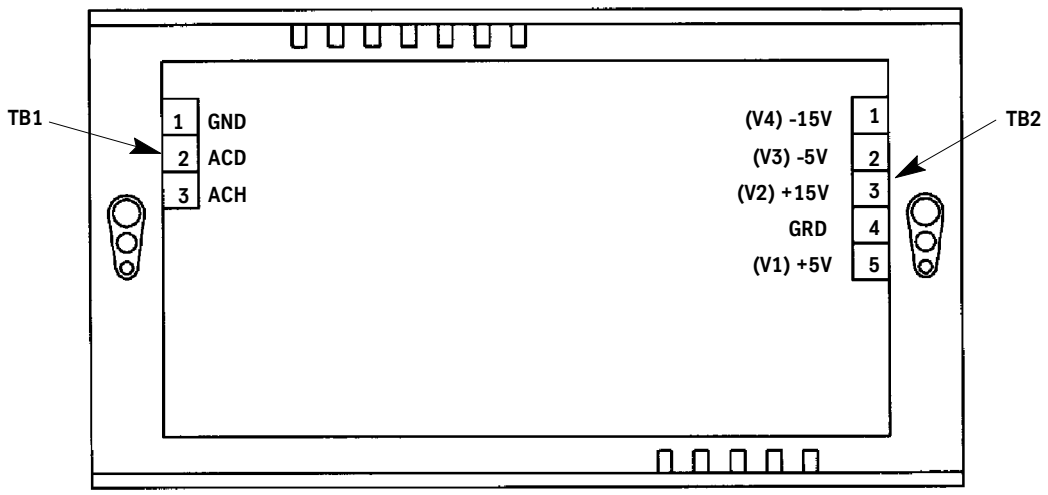

Figure 40 - PS1 Power Supply

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User Interface Card–Technical Information

User Interface Card Indicator and Switch Description

	Label	Function
Indicator	LCD Display	Backlit 16 Character x 2 Line LCD Display: • The bottom line shows the current selected category, function or parameter to be edited. Pressing the ENT key will select this item for monitoring or editing. • The top line indicates the next higher level category or function the system will switch to when the ESC key is pressed.
Switches	↑	Up Arrow Key: Pressing this button, • Scrolls the present displayed menu item to the next higher function. • Increases the selected parameter value in the adjustment mode.
	↓	Down Arrow Key: Pressing this button, • Scrolls the present displayed menu item to the next lower function. • Decreases the selected parameter value in the adjustment mode.
	ESC	Escape Key: Pressing this button, • Ends the current task or switches to the next high menu item.
	ENT	Enter Key: Pressing this button, • Selects the displayed item or function on the bottom line of the display. • Saves a new parameter setting.

User Interface Card Layout

Figure 41 User Interface Card

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Bus Voltage Indicator Card–Technical Information

Bus Voltage Card Indicator Description

	Label	Function
Indicator	LED 1	Lit to indicate the presence of dangerous voltage on the DC Bus in the drive. After removing power from the controller, wait until the LED is completely off before working on the internal drive circuitry.

Warning!

Always verify buss voltage has completely discharged by connecting a volt meter to terminate buss- to buss+ before touching any buss components.

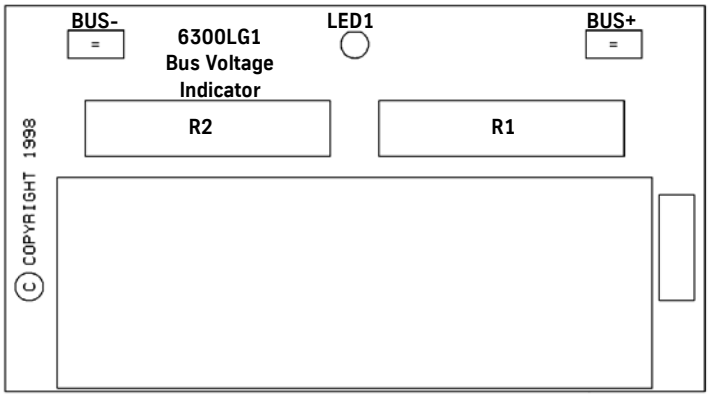

Figure 42

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LEM Current Sensor Card–Technical Information

LEM Current Sensor Card Connector Signal Description

Connector	Pin	Signal
Faston Tabs		
LEM1 +		LEM1 P15v Power Supply
LEM1 M		LEM1 Signal Output
LEM1 –		LEM1 M15v Power Supply
LEM2 +		LEM2 P15v Power Supply
LEM2 M		LEM2 Signal Output
LEM2 –		LEM2 M15v Power Supply

LEM Current Sensor Card Layout

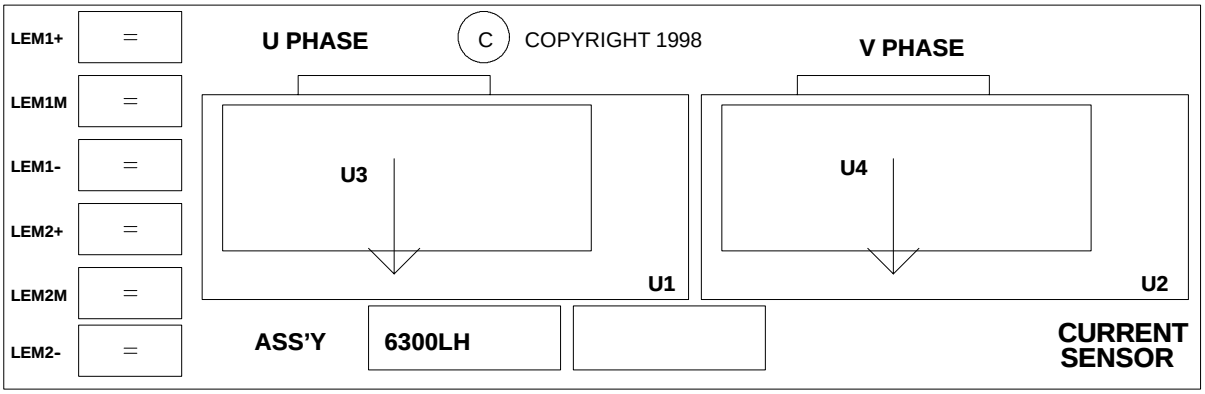

Figure 43 - LEM Current Sensor Card

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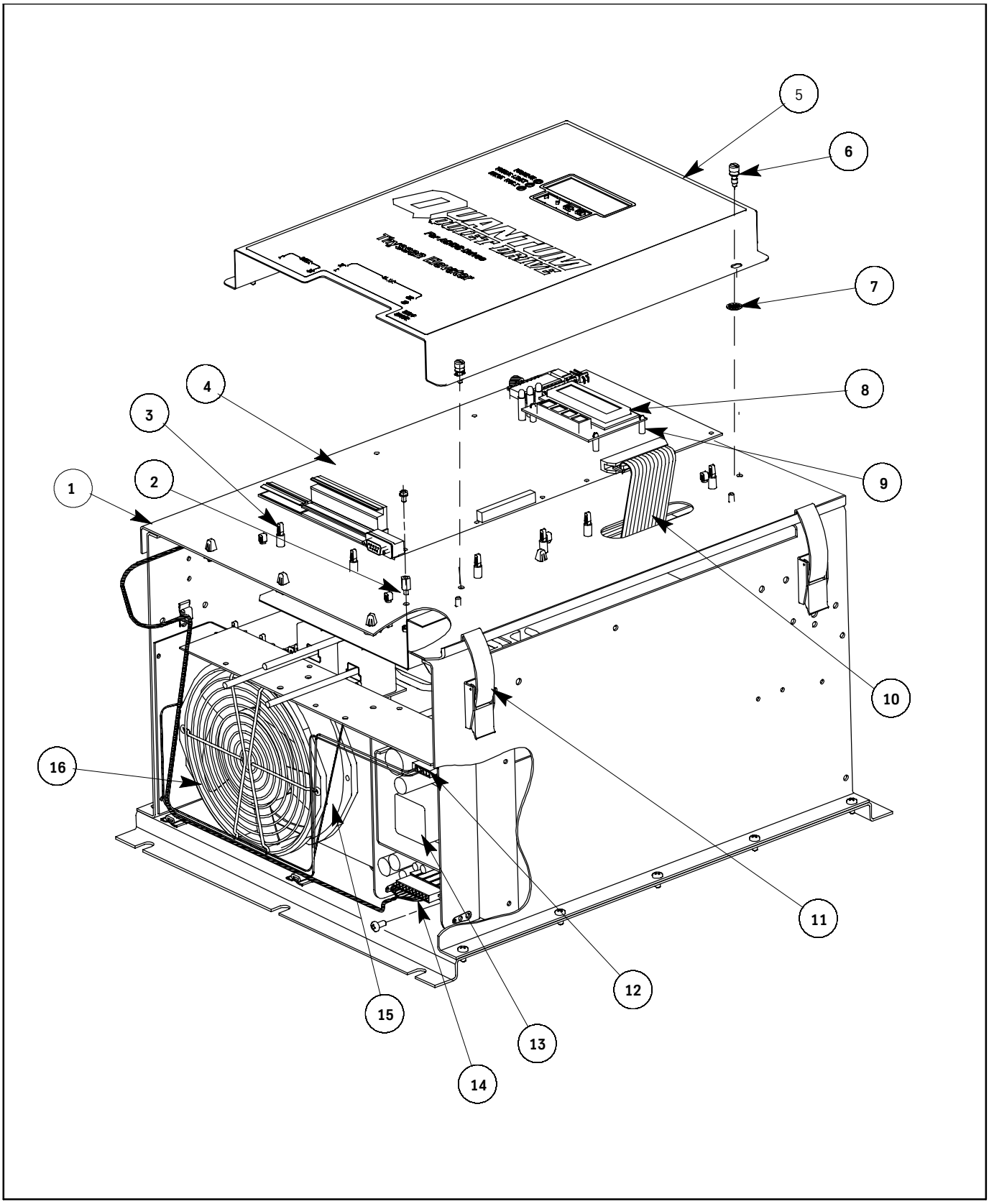

Figure 44 - 2109AP, 230V, Stand Alone, Non-Regenerative, Drive Assembly

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2109AP, 7.5-60HP, 230V, VVVF, Non-Regenerative, Stand Alone, Drive Assembly

ITEM	PART NO.	PRINT NO.	2109AP1 7.5/10HP	2109AP2 15HP	2109AP3 20HP	2109AP4 30HP	2109AP5 40HP	2109AP6 60HP	DESCRIPTION
1		2109AM1	1						Drive Ass'y Quantum AC/DC
		2109AM2		1					Drive Ass'y Quantum AC/DC
		2109AM3			1				Drive Ass'y Quantum AC/DC
		2109AM4				1			Drive Ass'y Quantum AC/DC
		2109AM5					1		Drive Ass'y Quantum AC/DC
		2109AM6						1	Drive Ass'y Quantum AC/DC
2		786BK1	1	1	1	1	1	1	Standoff , Current Regulator
3		141787	9	9	9	9	9	9	Standoff , DSP
4		6300HF2	1	1	1	1	1	1	Card, DSP Motion Control
5		320FR1	1	1	1	1	1	1	Cover
6		396GP1	4	4	4	4	4	4	FS Screw Captive Knurled
7		711DJ1	4	4	4	4	4	4	Retainer Screw Captive
8		6300HL1	1	1	1	1	1	1	User Interface Assembly
9		786AR1	4	4	4	4	4	4	Standoff , User Interface
10		220BE2	1	1	1	1	1	1	Cable, Flat, 50 Conductor
11		166AC1	2	2	2	2	2	2	Spring, Draw Catch
12		462HF1	1	1	1	1	1	1	Cable, Power Supply
13		672BM3	1	1	1	1	1	1	Power Supply
14		462HE1	1	1	1	1	1	1	Cable, Control Supply
15		378AH1	1	1	1	1	1	1	Fan, 6″, 120VAC
16		442AD1	1	1	1	1	1	1	Grille, Wire Fan, 6″

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2109AP, 7.5-60HP, 230V, PWM DC, Non-Regenerative, Stand Alone, Drive Assembly

ITEM	PART NO.	PRINT NO.	2109AP7 7.5/10HP	2109AP8 15HP	2109AP9 20HP	2109AP10 30HP	2109AP11 40HP	2109AP12 60HP	DESCRIPTION
1		2109AM7	1						Drive Ass'y Quantum AC/DC
		2109AM8		1					Drive Ass'y Quantum AC/DC
		2109AM9			1				Drive Ass'y Quantum AC/DC
		2109AM10				1			Drive Ass'y Quantum AC/DC
		2109AM11					1		Drive Ass'y Quantum AC/DC
		2109AM12						1	Drive Ass'y Quantum AC/DC
2		786BK1	1	1	1	1	1	1	Standoff , Current Regulator
3		141787	9	9	9	9	9	9	Standoff , DSP
4		6300HF2	1	1	1	1	1	1	Card, DSP Motion Control
5		320FR1	1	1	1	1	1	1	Cover
6		396GP1	4	4	4	4	4	4	FS Screw Captive Knurled
7		711DJ1	4	4	4	4	4	4	Retainer Screw Captive
8		6300HL1	1	1	1	1	1	1	User Interface Assembly
9		786AR1	4	4	4	4	4	4	Standoff , User Interface
10		220BE2	1	1	1	1	1	1	Cable, Flat, 50 Conductor
11		166AC1	2	2	2	2	2	2	Spring, Draw Catch
12		462HF1	1	1	1	1	1	1	Cable, Power Supply
13		672BM3	1	1	1	1	1	1	Power Supply
14		462HE1	1	1	1	1	1	1	Cable, Control Supply
15		378AH1	1	1	1	1	1	1	Fan, 6″, 120VAC
16		442AD1	1	1	1	1	1	1	Grille, Wire Fan, 6″

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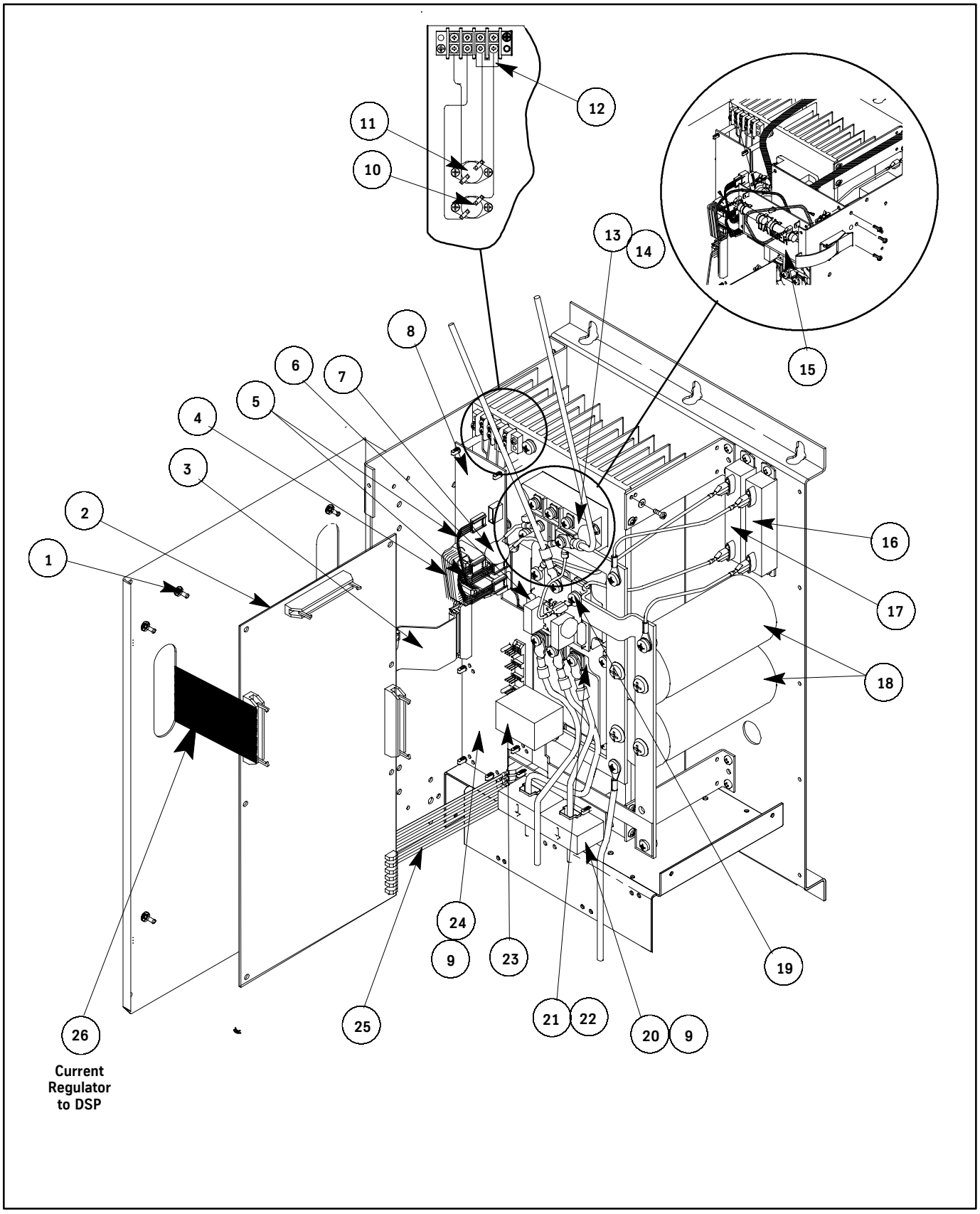

Figure 45 - 2109AM - 7.5–30HP, 230V Stand Alone, Non-Regenerative, Drive Assembly

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2109AP1, 2109AP2, 2109AP3, 2109AP4, 230V, 10HP-30HP, VVVF, Non-Regenerative, Stand Alone, Drive Assembly

ITEM	PART NO.	PRINT NO.	2109AM1 7.5/10HP	2109AM2 15HP	2109AM3 20HP	2109AM4 30HP	DESCRIPTION
1		141787	11	11	11	11	Standoff, Current Regulator
2		6300LR21	1	1	1	1	AC/DC Current Regulator Card (CCF)
3		220BG2	1	1	1	1	Cable , Flat, 34 Conductor (Current Regulator to Interface)
4		220CE1				1	Cable, Flat, 14 Conductor (QSS/QSR to Inverter Snubber)
5		462EW1	2	2	2	2	IGBT/Inverter Interface Harness
6		6300FP2	1	1	1	1	Card, QSS/QSR Snubber, 230V
7		804BK1	1				ZNR Assembly
		804BK2		1			ZNR Assembly
		804BK3			1	1	ZNR Assembly
8		6300FV2	1	1	1	1	Card, QSS/QSR Inverter Interface
9		786BJ1	13				Standoff, Locking, M4 X .875 LG.
		786BJ2		13	13		Standoff, Locking, M4 X 1.00 LG.
		786BJ3				13	Standoff, Locking, M4 X 1.125 LG.
10		844AC1	1	1	1	1	Thermostat, 160°F
11		844AD1	1	1	1	1	Thermostat, 120°F
12		141675	1	1	1	1	Jumper, 2 Position
13		344BT1	1				Diode Module, 3–phase Bridge, 60A, 800V
		344BV1		1			Diode Module, 3–phase Bridge, 100A, 800V
		344BW1			1	1	Diode Module, 3–phase Bridge, 150A, 800V
14		472BG3		1			Thermostrate Pad (Diode Module 344BV1)
		472BG6			1	1	Thermostrate Pad (Diode Module 344BW1)
		472BG16	1				Thermostrate Pad (Diode Module 344BT1)
15		6300LG1	1	1	1	1	Bus Voltage Indicator Card
16		699AV2	2	2	2	2	Resistor, 3.6K Ohm, 100W
17		699AV4	1	1	1	1	Resistor, 50 Ohm, 100W
18		238BT1	2	2	3	3	Capacitor Elec., 3600μF, 450VDC
19		155CN1	1	1	1	1	IGBT Dual (QSS/QSR 400A, 600V
20		6300LH2	1	1	1		Current Sensor Ass'y, 150A Board
		6300LH2				1	Current Sensor Ass'y, 200A Board
21		155CJ1	1				IGBT, 6-pack,100A, 600V
		155CK1		1			IGBT, 6-pack, 150A, 600V
		155CL1			1		IGBT, 6-pack, 200A, 600V
		155CM1				1	IGBT, 6-pack, 300A, 600V
22		472BG11	1				Thermostrate Pad for 155CJ1
		472BG12		1	1		Thermostrate Pad for 155CL1 & 155CK1
		472BG7				1	Thermostrate Pad for 155CM1
23		241BD1	1	1			Capacitor, Film, 600V, IGBT Snub. 2.0μF
		241BD2			1		Capacitor, Film, 600V, IGBT Snub. 3.3μF
		241BD3				1	Capacitor, Film, 600V, IGBT Snub. 4.7μF
24		6300LF1	1	1	1	1	Card, Inverter Interface, 6-pack
25		462EX1	2	2	2	2	Harness, AC/DC Current Reg., to Current Sensor
26		220BE1	1	1	1	1	Cable Current Regulator to Conn 8 DSP

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2109AP7, 2109AP8, 2109AP9, 2109AP10, 230V, 10HP-30HP, PWM-DC, Non-Regenerative, Stand Alone Drive Assembly

ITEM	PART NO.	PRINT NO.	2109AM7 7.5/10HP	2109AM8 15HP	2109AM9 20HP	2109AM10 30HP	DESCRIPTION
1		141787	11	11	11	11	Standoff, Current Regulator
2		6300LR21	1	1	1	1	AC/DC Current Regulator Card (CCF)
3		220BG2	1	1	1	1	Cable , Flat, 34 Conductor (Current Regulator to Interface)
4		220CE1				1	Cable, Flat, 14 Conductor (QSS/QSR to Inverter Snubber)
5		462EW1	2	2	2	2	IGBT/Inverter Interface Harness
6		6300FP2	1	1	1	1	Card, QSS/QSR Snubber, 230V
7		804BK1	1				ZNR Assembly
		804BK2		1			ZNR Assembly
		804BK3			1	1	ZNR Assembly
8		6300FV2	1	1	1	1	Card, QSS/QSR Incerter Interface
9		786BJ1	13				Standoff, Locking, M4 X .875 LG.
		786BJ2		13	13		Standoff, Locking, M4 X 1.00 LG.
		786BJ3				13	Standoff, Locking, M4 X 1.125 LG.
10		844AC1	1	1	1	1	Thermostat, 160°F
11		844AD1	1	1	1	1	Thermostat, 120°F
12		141675	1	1	1	1	Jumper, 2 Position
13		344BT1	1				Diode Module, 3–phase Bridge, 60A, 800V
		344BV1		1			Diode Module, 3–phase Bridge, 100A, 800V
		344BW1			1	1	Diode Module, 3–phase Bridge, 150A, 800V
14		472BG3		1			Thermostrate Pad (Diode Module 344BV1)
		472BG6			1	1	Thermostrate Pad (Diode Module 344BW1)
		472BG16	1				Thermostrate Pad (Diode Module 344BT1)
15		6300LG1	1	1	1	1	Bus Voltage Indicator Card
16		699AV2	2	2	2	2	Resistor, 3.6K Ohm, 100W
17		699AV4	1	1	1	1	Resistor, 50 Ohm, 100W
18		238BT1	2	2	3	3	Capacitor Elec., 3600μF, 450VDC
19		155CN1	1	1	1	1	IGBT Dual (QSS/QSR 400A, 600V
20		6300LH2	1	1	1		Current Sensor Ass'y, 150A Board
		6300LH2				1	Current Sensor Ass'y, 200A Board
21		155CJ1	1				IGBT, 6-pack,100A, 600V
		155CK1		1			IGBT, 6-pack, 150A, 600V
		155CL1			1		IGBT, 6-pack, 200A, 600V
		155CM1				1	IGBT, 6-pack, 300A, 600V
22		472BG11	1				Thermostrate Pad for 155CJ1
		472BG12		1	1		Thermostrate Pad for 155CL1 & 155CK1
		472BG7				1	Thermostrate Pad for 155CM1
23		241BD1	1	1			Capacitor, Film, 600V, IGBT Snub. 2.0μF
		241BD2			1		Capacitor, Film, 600V, IGBT Snub. 3.3μF
		241BD3				1	Capacitor, Film, 600V, IGBT Snub. 4.7μF
24		6300LF1	1	1	1	1	Card, Inverter Interface, 6-pack
25		462EX1	2	2	2	2	Harness, AC/DC Current Reg., to Current Sensor
26		220BE1	1	1	1	1	Cable Current Regulator to Conn 8 DSP.

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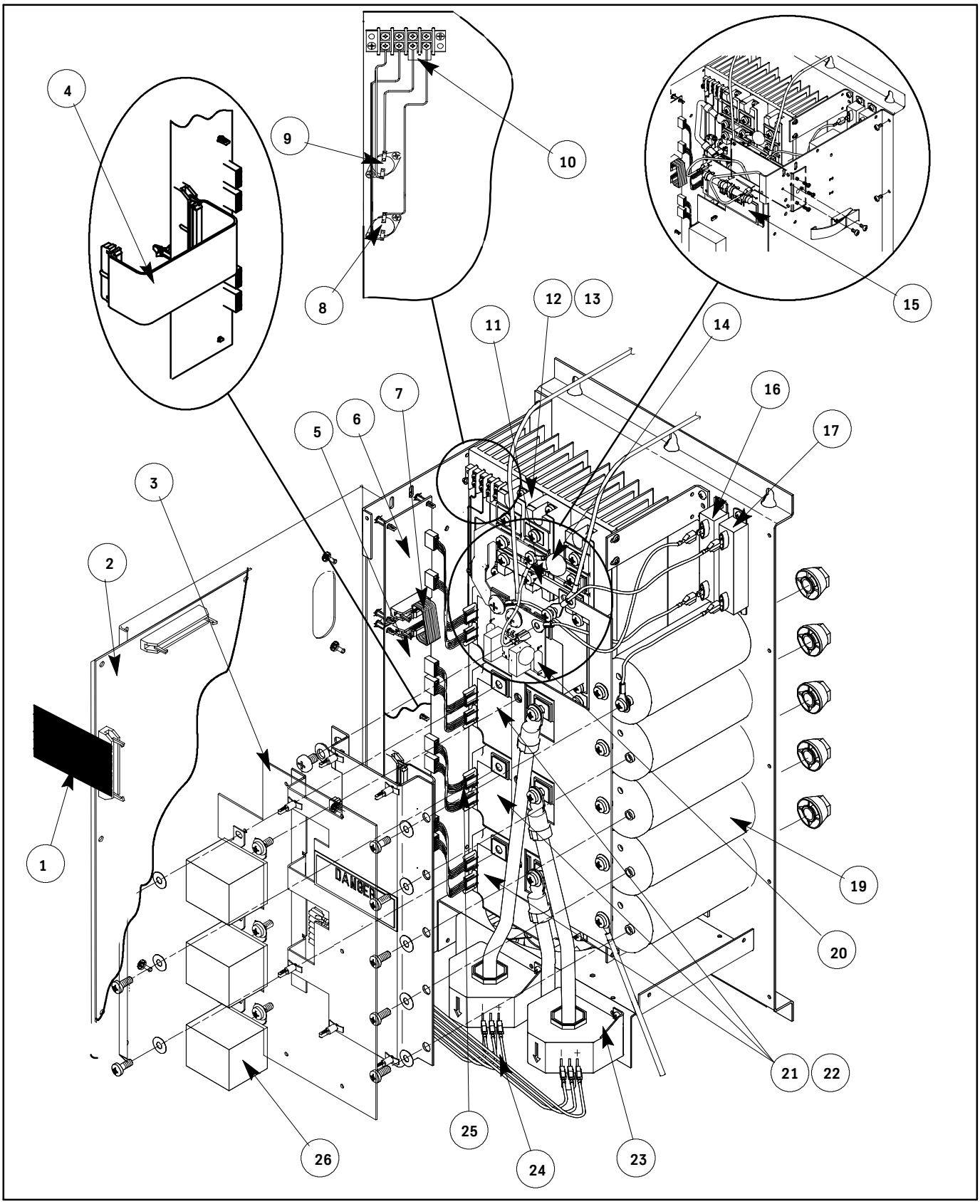

Figure 46 - 2109AM, 40-60 HP, 230V, Stand Alone, Non-Regenerative, Drive Assembly,

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2109AP5, 2109AP6, 230V, 40-60HP, VVVF, Non-Regenerative, Stand Alone, Drive Assembly

ITEM	PART NO.	PRINT NO.	2109AM5 40HP	2109AM6 60HP	DESCRIPTION
1		220BE1	1	1	Cable, DCR to DSP Conn 8
2		6300LR21	1	1	Card, AC/DC Current Regulator (CCF)
3		451AR3	1	1	Guard, Plastic, Bus Bar
4		220BG2	1	1	Cable, Flat, 34 Conductor, (Current Regulator to Inverter Interface Card)
5		6300FK2	1	1	Card, Inverter Interface
6		6300FV2	1	1	Card, QSS/QSR Interface
7		220CE1	1	1	Cable, Flat 14 Conductor (QSS/QSR to Inverter Interface Card)
8		844AD1	1	1	Thermostat, 120°F
9		844AC1	1		Thermostat, 160°F
10		141675	1	1	Jumper Strip, 2 Position
11		207BK1	1	1	Bus Bar Bridge, AC/DC
12		344BX1	3		Diode Module, Dual Bridge, 100A, 800V
		344BY1		3	Diode Module, Dual Bridge, 160A, 800V
13		472BG17	3		Thermostrate Pad (For Diode Module,.BX1)
		472BG18		3	Thermostrate Pad (For Diode Module,.BY1)
14		804BK2	1		ZNR Assembly
		804BK3		1	ZNR Assembly
15		6300LG1	1	1	Card, Bus Voltage Indicator
16		699AV4	1	1	Resistor, 50 Ohm, 100W
17		699AV2	1	1	Resistor, 3.6K Ohm, 100W
18		141787	27	27	Standoff, .375 (Current Regulator) (not shown)
19		238BT1	4	5	Capacitor Elec., 3600μF, 450VDC
20		6300FP2	1	1	QSS/QSR Snubber Board Assembly
21		155CN1	4		IGBT, Dual, 400A, 600V
		155CP1		4	IGBT, Dual, 600A, 600V (U, V, W & QSS/QSR)
22		472BG14	3		Thermostrate Pad (For IGBT, 155CN1)
		472BG15		3	Thermostrate Pad (For IGBT, 155CP1)
23		736AN1	2		Sensor, Current, 200A
		736AT1		2	Sensor, Current, 300A
24		462EX1	2	2	Harness, Current Regulator, to Current Sensor
25		462EW1	8	8	IGBT/Inverter Interface Card Harness
26		241BD2	3		Capacitor, 600V, IGBT, Snub, 3.3μF
		241BD3		3	Capacitor, 600V, IGBT, Snub, 4.7μF

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2109AP11, 2109AP12, 230V, 40-60HP, PWM-DC, Non-Regenerative, Stand Alone, Drive Assembly

ITEM	PART NO.	PRINT NO.	2109AM11 40HP	2109AM12 60HP	DESCRIPTION
1		220BE1	1	1	Cable, DCR to DSP Conn 8
2		6300LR21	1	1	Card, AC/DC Current Regulator
3		451AR3	1	1	Guard, Plastic, Bus Bar
4		220BG2	1	1	Cable, Flat, 34 Conductor, (Current Regulator to Inverter Interface Card)
5		6300FK2	1	1	Card, Inverter Interface
6		6300FV2	1	1	Card, QSS/QSR Interface
7		220CE1	1	1	Cable, Flat 14 Conductor (QSS/QSR to Inverter Interface Card)
8		844AD1	1	1	Thermostat, 120°F
9		844AC1	1		Thermostat, 160°F
10		141675	1	1	Jumper Strip, 2 Position
11		207BK1	1	1	Bus Bar Bridge, AC/DC
12		344BX1	3		Diode Module, Dual Bridge, 100A, 800V
		344BY1		3	Diode Module, Dual Bridge, 160A, 800V
13		472BG17	3		Thermostrate Pad (For Diode Module,.BX1)
		472BG18		3	Thermostrate Pad (For Diode Module,.BY1)
14		804BK2	1		ZNR Assembly
		804BK3		1	ZNR Assembly
15		6300LG1	1	1	Card, Bus Voltage Indicator
16		699AV4	1	1	Resistor, 50 Ohm, 100W
17		699AV2	1	1	Resistor, 3.6K Ohm, 100W
18		141787	27	27	Standoff, .375 (Current Regulator) (not shown)
19		238BT1	4	5	Capacitor Elec., 3600μF, 450VDC
20		6300FP2	1	1	QSS/QSR Snubber Board Assembly
21		155CN1	4		IGBT, Dual, 400A, 600V
		155CP1		4	IGBT, Dual, 600A, 600V (U, V, W & QSS/QSR)
22		472BG14	3		Thermostrate Pad (For IGBT, 155CN1)
		472BG15		3	Thermostrate Pad (For IGBT, 155CP1)
23		736AN1	2		Sensor, Current, 200A
		736AT1		2	Sensor, Current, 300A
24		462EX1	2	2	Harness, Current Regulator, to Current Sensor
25		462EW1	8	8	IGBT/Inverter Interface Card Harness
26		241BD2	3		Capacitor, 600V, IGBT, Snub, 3.3μF
		241BD3		3	Capacitor, 600V, IGBT, Snub, 4.7μF

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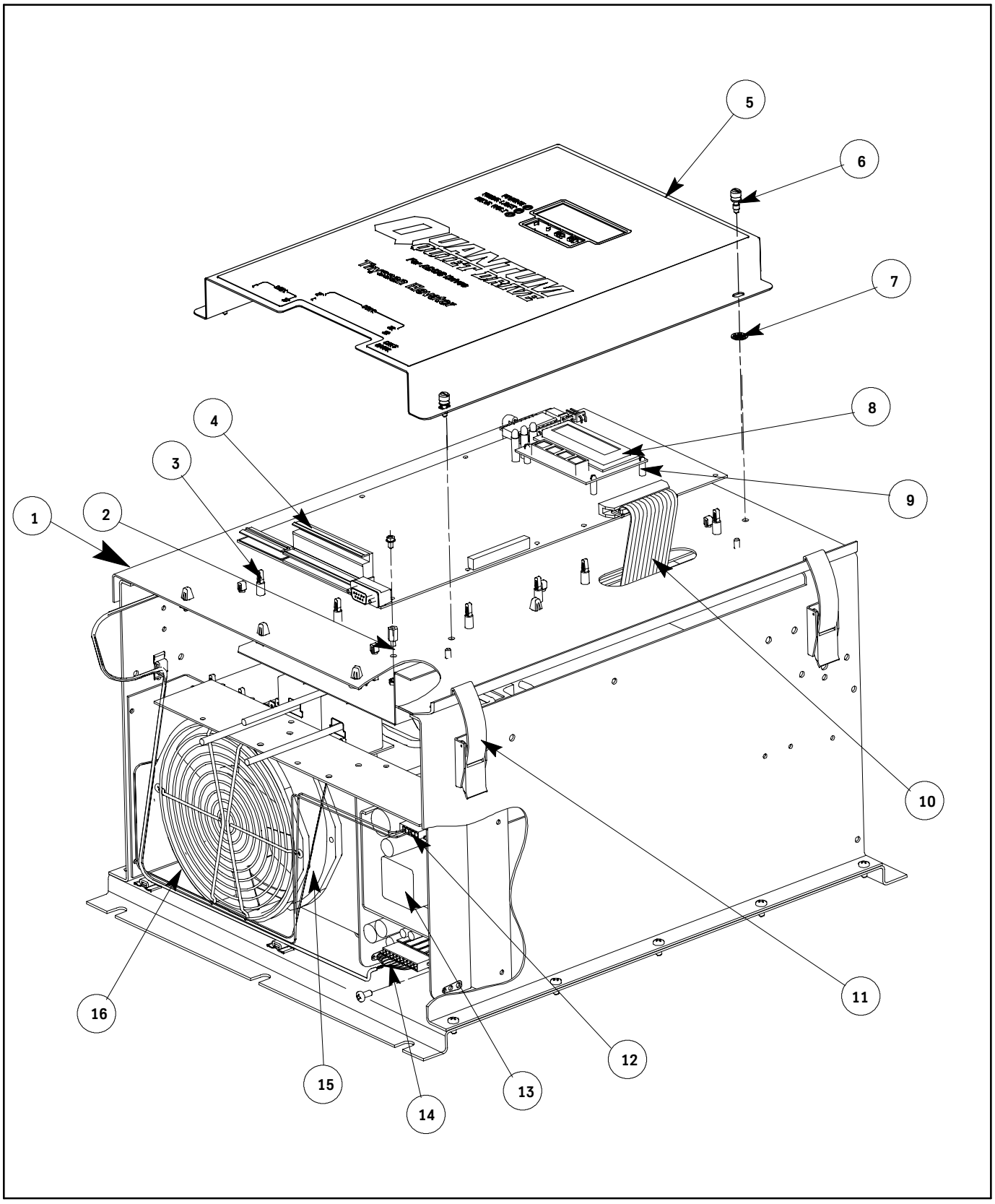

Figure 47 - 2109AN, 460V, Stand Alone, Non-Regenerative, Drive Assembly

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2109AN, 7.5-60HP 460V, VVVF, Non-Regenerative, Stand Alone, Drive Assembly

ITEM	PART NO.	PRINT NO.	2109AN1 7.5/10HP	2109AN2 15HP	2109AN3 20HP	2109AN4 30HP	2109AN5 40HP	2109AN6 60HP	DESCRIPTION
1		2109AL1	1						Drive Ass'y Quantum AC/DC
		2109AL2		1					Drive Ass'y Quantum AC/DC
		2109AL3			1				Drive Ass'y Quantum AC/DC
		2109AL4				1			Drive Ass'y Quantum AC/DC
		2109AL5					1		Drive Ass'y Quantum AC/DC
		2109AL6						1	Drive Ass'y Quantum AC/DC
2		786BK1							Standoff , Current Regulator
3		141787	9	9	9	9	9	9	Standoff , DSP
4		6300HF2	1	1	1	1	1	1	Card, DSP Motion Control
5		320FR1	1	1	1	1	1	1	Cover, Plastic
6		396GP1	4	4	4	4	4	4	FS Screw Captive Knurled
7		711DJ1	4	4	4	4	4	4	Retainer Screw Captive
8		6300HL1	1	1	1	1	1	1	User Interface Card Assembly
9		786AR1	4	4	4	4	4	4	Standoff , User Interface
10		220BE1	1	1	1	1	1	1	Cable, Flat, 50 Conductor
11		166AC1	2	2	2	2	2	2	Spring, Draw Catch
12		462HF1	1	1	1	1	1	1	Cable, Power Supply
13		672BM3	1	1	1	1	1	1	Power Supply
14		462HE1	1	1	1	1	1	1	Cable, Control Supply
15		378AH1	1	1	1	1	1	1	Fan, 6″, 120VAC
16		442AD1	1	1	1	1	1	1	Grille, Wire Fan, 6″

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2109AN, 7.5-60HP 460V, PWM-DC, Non-Regenerative, Stand Alone, Drive Assembly

ITEM	PART NO.	PRINT NO.	2109AN7 7.5/10HP	2109AN8 15HP	2109AN9 20HP	2109AN10 30HP	2109AN11 40HP	2109AN12 60HP	DESCRIPTION
1		2109AL7	1						Drive Ass'y Quantum AC/DC
		2109AL8		1					Drive Ass'y Quantum AC/DC
		2109AL9			1				Drive Ass'y Quantum AC/DC
		2109AL10				1			Drive Ass'y Quantum AC/DC
		2109AL11					1		Drive Ass'y Quantum AC/DC
		2109AL12						1	Drive Ass'y Quantum AC/DC
2		786BK1							Standoff , Current Regulator
3		141787	9	9	9	9	9	9	Standoff , DSP
4		6300HF2	1	1	1	1	1	1	Card, DSP Motion Control
5		320FR1	1	1	1	1	1	1	Cover, Plastic
6		396GP1	4	4	4	4	4	4	FS Screw Captive Knurled
7		711DJ1	4	4	4	4	4	4	Retainer Screw Captive
8		6300HL1	1	1	1	1	1	1	User Interface Card Assembly
9		786AR1	4	4	4	4	4	4	Standoff , User Interface
10		220BE1	1	1	1	1	1	1	Cable, Flat, 50 Conductor
11		166AC1	2	2	2	2	2	2	Spring, Draw Catch
12		462HF1	1	1	1	1	1	1	Cable, Power Supply
13		672BM3	1	1	1	1	1	1	Power Supply
14		462HE1	1	1	1	1	1	1	Cable, Control Supply
15		378AH1	1	1	1	1	1	1	Fan, 6″, 120VAC
16		442AD1	1	1	1	1	1	1	Grille, Wire Fan, 6″

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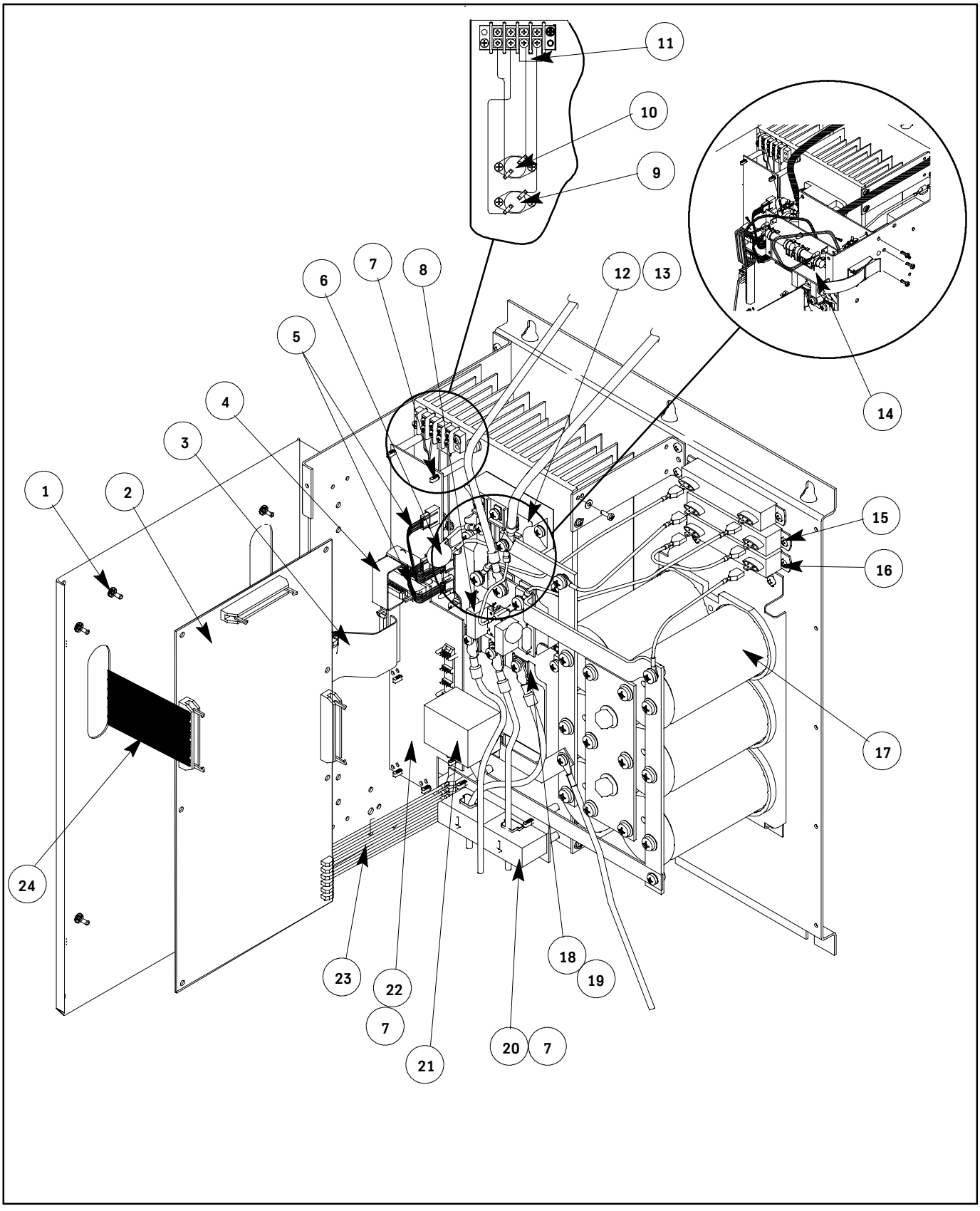

Figure 48 - 2109AL, 7.5-30HP, 460V, Stand Alone, Non-Regenerative, Drive Assembly

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2109AN1, 2109AN2, 2109AN3, 2109AN4, 460V, 7.5HP-30HP, VVVF, Non-Regenerative, Stand Alone, Drive Assembly

ITEM	PART NO.	PRINT NO.	2109AL1 7.5/10HP	2109AL2 15HP	2109AL3 20HP	2109AL4 30HP	DESCRIPTION
1		141787	11	11	11	11	Standoff, Current Regulator
2		6300LR3	1	1	1	1	AC/DC Current Regulator Card
3		220BG2	1	1	1	1	Cable , Flat, 34 Conductor (Current Regulator to Interface)
4		220CE1	1	1	1	1	Cable, Flat, 14 Conductor (QSS/QSR to Inverter Snubber)
5		462EW1	2	2	2	2	IGBT/Inverter Interface Harness
6		804BH2	1	1	1	1	ZNR Ass'y (Diode Module Assy.)
7		786BJ1	13				Standoff, Locking, M4 X .875 LG.
		786BJ2		13	13		Standoff, Locking, M4 X 1.00 LG.
		786BJ3				13	Standoff, Locking, M4 X 1.125 LG.
8		6300FP1	1	1	1	1	QSS/QSR Snubber Board, 460V
9		844AC1	1	1	1	1	Thermostat, 160°F
10		844AD1	1	1	1	1	Thermostat, 120°F
11		141675	1	1	1	1	Jumper, 2 Position
12		344AN1	1	1	1		Diode Module, 3–phase Bridge, 60A, 1600V
		344AN2				1	Diode Module, Dual Bridge, 100A, 1600V
13		472BG3	1	1	1	1	Thermostrate Pad for AN1 & AN2
14		6300LG1	1	1	1	1	Bus Voltage Indicator Card
15		699AV2	2	2	2	2	Resistor, 3.6K Ohm, 100W
16		699AV4	1	1	1	1	Resistor, 50 Ohm, 100W
17		238AW1	4	4	4	6	Capacitor, 2000μF, 450VDC
18		155CY1	1				IGBT, 6-pack, 50A, 1200V
		155CR1		1			IGBT, 6-pack, 75A, 1200V
		155CT1			1		IGBT, 6-pack, 100A, 1200V
		155CV1				1	IGBT, 6-pack, 150A, 1200V
19		472BG11	1				Thermostrate Pad for 155CY1 (U, V, W)
		472BG12		1	1		Thermostrate Pad for 155CR1/155CT1 (U, V, W)
		472BG7				1	Thermostrate Pad for 155CV1 (U, V, W)
20		6300LH1	1	1			Current Sensor Ass'y, 50A
		6300LH2			1	1	Current Sensor Ass'y, 150A
21		241BE1	1	1			Capacitor, Film, 1200V, IGBT Snub. 1.0μF
		241BE3			1		Capacitor, Film, 1200V, IGBT Snub. 2.0μF
22		6300LF1	1	1	1	1	Inverter Interface Card, 6-pack
23		462EX1	2	2	2	2	Harness, Current Regulator, to Current Sensor
24		220BE1	1	1	1	1	Cable Current Regulator to DSP Conn 8
25		804AV2	1	1	1	1	Suppressor Assembly, Transient, 460V (Not shown)

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2109AN7, 2109AN8, 2109AN9, 2109AN10, 460V, 7.5HP-30HP, PWM-DC, Non-Regenerative, Stand Alone, Drive Assembly

ITEM	PART NO.	PRINT NO.	2109AL7 7.5/10HP	2109AL8 15HP	2109AL9 20HP	2109AL10 30HP	DESCRIPTION
1		141787	11	11	11	11	Standoff, Current Regulator
2		6300LR3	1	1	1	1	AC/DC Current Regulator Card
3		220BG2	1	1	1	1	Cable , Flat, 34 Conductor (Current Regulator to Interface)
4		220CE1	1	1	1	1	Cable, Flat, 14 Conductor (QSS/QSR to Inverter Snubber)
5		462EW1	2	2	2	2	IGBT/Inverter Interface Harness
6		804BH2	1	1	1	1	ZNR Ass'y (Diode Module Assy.)
7		786BJ1	13				Standoff, Locking, M4 X .875 LG.
		786BJ2		13	13		Standoff, Locking, M4 X 1.00 LG.
		786BJ3				13	Standoff, Locking, M4 X 1.125 LG.
8		6300FP1	1	1	1	1	QSS/QSR Snubber Board, 460V
9		844AC1	1	1	1	1	Thermostat, 160°F
10		844AD1	1	1	1	1	Thermostat, 120°F
11		141675	1	1	1	1	Jumper, 2 Position
12		344AN1	1	1	1		Diode Module, 3–phase Bridge, 60A, 1600V
		344AN2				1	Diode Module, Dual Bridge, 100A, 1600V
13		472BG3	1	1	1	1	Thermostrate Pad for AN1 & AN2
14		6300LG1	1	1	1	1	Bus Voltage Indicator Card
15		699AV2	2	2	2	2	Resistor, 3.6K Ohm, 100W
16		699AV4	1	1	1	1	Resistor, 50 Ohm, 100W
17		238AW1	4	4	4	6	Capacitor, 2000μF, 450VDC
18		155CY1	1				IGBT, 6-pack, 50A, 1200V
		155CR1		1			IGBT, 6-pack, 75A, 1200V
		155CT1			1		IGBT, 6-pack, 100A, 1200V
		155CV1				1	IGBT, 6-pack, 150A, 1200V
19		472BG11	1				Thermostrate Pad for 155CV1 (U, V, W)
		472BG12		1	1		Thermostrate Pad for 155CR1/155CT1 (U, V, W)
		472BG7				1	Thermostrate Pad for 155CV1 (U, V, W)
20		6300LH1	1	1			Current Sensor Ass'y, 50A
		6300LH2			1	1	Current Sensor Ass'y, 150A
21		241BE1	1	1			Capacitor, Film, 1200V, IGBT Snub. 1.0μF
		241BE3			1		Capacitor, Film, 1200V, IGBT Snub. 2.0μF
22		6300LF1	1	1	1	1	Inverter Interface Card 6-pack
23		462EX1	2	2	2	2	Harness, Current Regulator, to Current Sensor
24		220BE1	1	1	1	1	Cable Current Regulator to DSP Conn 8
25		804AV2	1	1	1	1	Suppressor Assembly, Transient, 460V (not shown)

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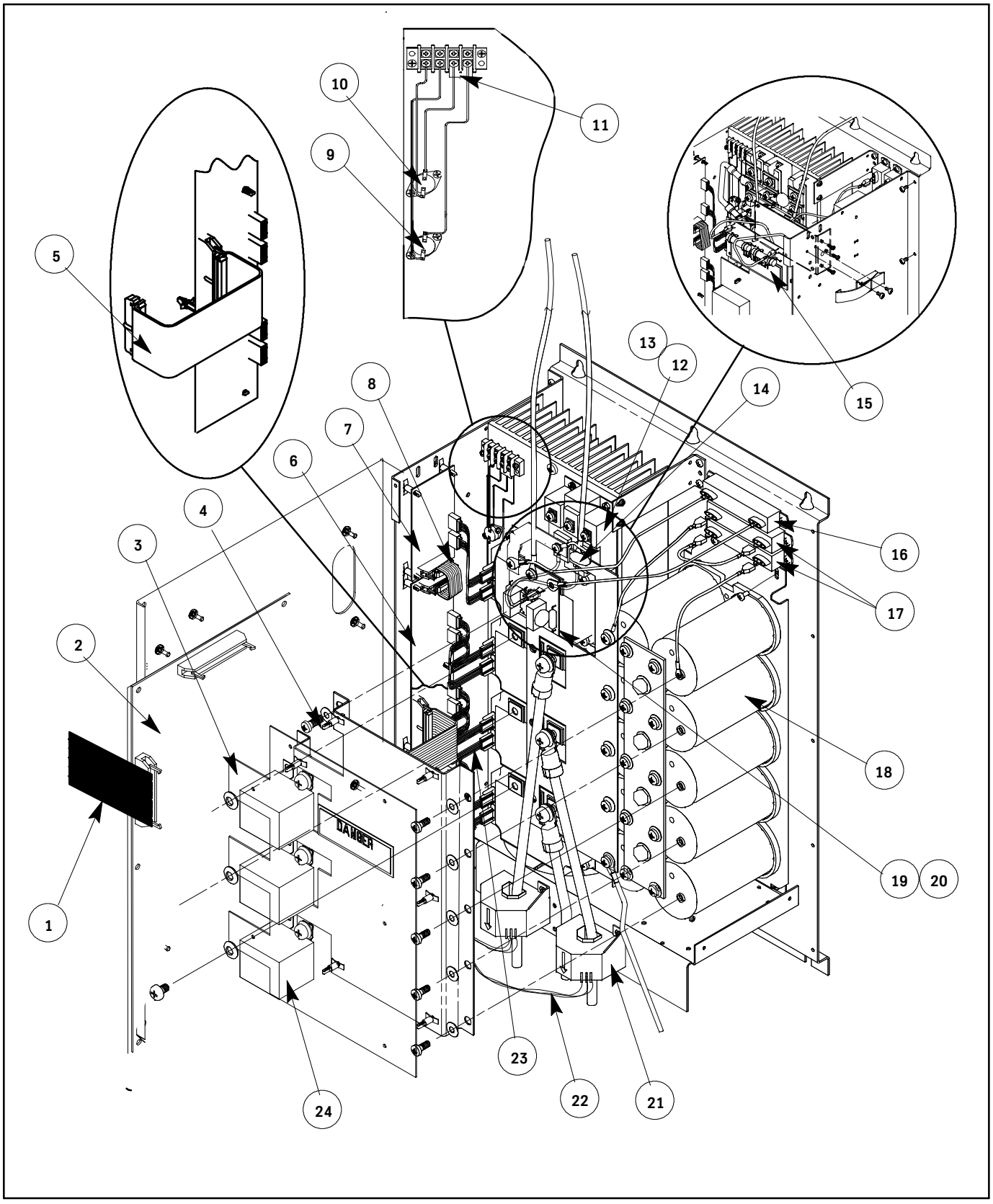

Figure 49 - 2109AL, 40-60HP, 460V, Stand Alone, Non-Regenerative, Drive Assembly

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2109AN5, 2109AN6, 460V, 40-60HP, VVVF, Non-Regenerative, Stand Alone, Drive Assembly

	PART NO.	PRINT NO.	2109AL5 40HP	2109AL6 60HP	DESCRIPTION
1		220BE1	1	1	Cable, Current Regulator to DSP Conn 8
2		6300LR3	1	1	AC/DC Current Regulator Card
3		451AR2	1	1	Guard, Plastic, Bus Bar
4		141787	27	27	Standoff, .375
5		220BG2	1	1	Cable, Flat, 34 Conductor, (Current Regulator to Inverter Interface Card)
6		6300FK2	1	1	Card, Inverter Interface
7		6300FV2	1	1	Card, QSS/QSR Interface
8		220CE1	1	1	Cable, Flat 14 Conductor
9		844AD1	1	1	Thermostat, 120°F
10		844AC1	1	1	Thermostat, 160°F
11		141675	1	1	Jumper Strip, 2 Position
12		344AY1	1	1	Diode Module, Dual Bridge, 150A, 1600V
13		472BG6	1	1	Heatsink Thermostrate Pad (For Diode Module 344AY1)
14		804BH1		1	ZNR Assm'y
15		6300LG1	1	1	Card, Bus Voltage Indicator
16		699AV4	1	1	Resistor, 50 Ohm, 100W
17		699AV2	2	2	Resistor, 3.6K Ohm, 100W
18		238AW1	8	10	Capacitor Elec., 2000μF, 450VDC
19		155CW1	4		IGBT, Dual, 200A, 1200V
		155CX1		4	IGBT, Dual, 300A, 1200V
20		472BG14	3		Heatsink Thermostrate Pad for 155CW1 (QSS/QSR)
		472BG15		3	Heatsink Thermostrate Pad for 155CX1 (QSS/QSR)
21		736AN1		2	Current Sensor, 200A
		6300LH2	1		Current Sensor Ass'y, 300A
22		462EX1	2	2	Harness, Current Regulator, to Current Sensor
23		462EW1	8	8	IGBT/Inverter Interface Card Harness
24		241BE2	3		Capacitor Film, 600V, IGBT, Snub, 1.5μF
		241BE3		3	Capacitor Film, 600V, IGBT, Snub, 2.0μF

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2109AN11, 2109AN12 460V, 40-60HP, PWM-DC, Non-Regenerative, Stand Alone, Drive Assembly

	PART NO.	PRINT NO.	2109AL11 40HP	2109AL12 60HP	DESCRIPTION
1		220BE1	1	1	Cable, Current Regulator to DSP Conn 8
2		6300LR3	1	1	AC/DC Current Regulator Card
3		451AR2	1	1	Guard, Plastic, Bus Bar
4		141787	27	27	Standoff, .375
5		220BG2	1	1	Cable, Flat, 34 Conductor, (Current Regulator to Inverter Interface Card)
6		6300FK2	1	1	Card, Inverter Interface
7		6300FV2	1	1	Card, QSS/QSR Interface
8		220CE1	1	1	Cable, Flat 14 Conductor
9		844AD1	1	1	Thermostat, 120°F
10		844AC1	1	1	Thermostat, 160°F
11		141675	1	1	Jumper Strip, 2 Position
12		344AY1	1	1	Diode Module, Dual Bridge, 150A, 1600V
13		472BG6	1	1	Thermostrate Pad (For Diode Module 344AY1)
14		804BH1		1	ZNR Assm'y
15		6300LG1	1	1	Card, Bus Voltage Indicator
16		699AV4	1	1	Resistor, 50 Ohm, 100W
17		699AV2	2	2	Resistor, 3.6K Ohm, 100W
18		238AW1	8	10	Capacitor Elec., 2000μF, 450VDC
19		155CW1	4		IGBT, Dual, 200A, 1200V
		155CX1		4	IGBT, Dual, 300A, 1200V
20		472BG14	3		Thermostrate Pad for 155CW1 (QSS/QSR)
		472BG15		3	Thermostrate Pad for 155CX1 (QSS/QSR)
21		736AN1		2	Current Sensor, 200A
		6300LH2	1		Current Sensor Ass'y, 300A
22		462EX1	2	2	Harness, Current Regulator, to Current Sensor
23		462EW1	8	8	IGBT/Inverter Interface Card Harness
24		241BE2	3		Capacitor Film, 600V, IGBT, Snub, 1.5μF
		241BE3		3	Capacitor Film, 600V, IGBT, Snub, 2.0μF

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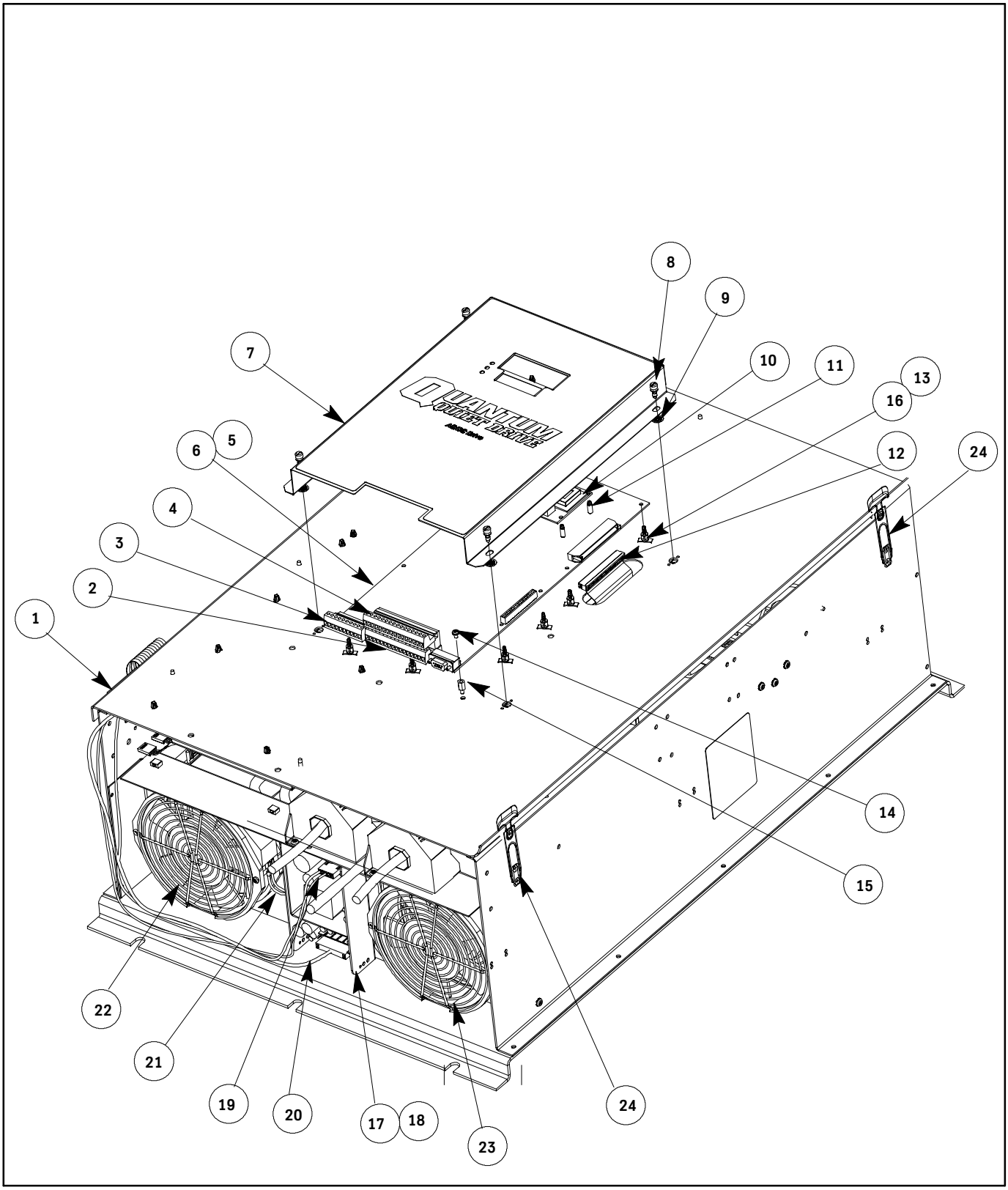

Figure 50 - 2109AV, 30-60 HP, 230V, Stand Alone, Regenerative Drive

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2109AV1, 2109AV2, 2109AV3, 30/40/60HP, 230V, VVVF, Regenerative, Stand Alone, Drive Assembly

ITEM	PART NO.	PRINT NO.	2109AV1 30HP	2109AV2 40HP	2109AV3 60HP	DESCRIPTION
1		2109AR1	1			Drive Ass'y Quantum VVVF
		2109AR2		1		Drive Ass'y Quantum VVVF
		2109AR3			1	Drive Ass'y Quantum VVVF
2		661AA8	1	1	1	Plug Terminal Strip
3		661AA10	1	1	1	Plug Terminal Strip
4		661AA13	1	1	1	Plug Terminal Strip
5		6300HF2	1	1	1	Card, DSP Motion Control
6		141787	9	9	9	Standoff , DSP
7		320FR1	1	1	1	Cover
8		396GP1	4	4	4	Screw, Captive Knurled
9		711DJ1	4	4	4	Screw, Retainer Captive
10		600HL1	1	1	1	User Interface Card Assembly
11		786AR1	4	4	4	Standoff , User Interface
12		220BE2	1	1	1	Cable, Flat, 50 Conductor
13		395AF1	8	8	8	Rivet, Pop
14		700503	1	1	1	Screw
15		393AT5	2	2	2	Nut
16		393CR1	4	4	4	Nut, Receptable
17		672BM3	1	1	1	Power Supply
18		101275	2	2	2	Screw, Power Supply Mount
19		462HF2	1	1	1	Cable, Power Supply
20		462HE2	1	1	1	Cable, Control Supply
21		900AC108	2	2	2	Wire Ass'y, 18 ga.
22		378AH1	1	1	1	Fan, 6″, 120VAC
23		442AD1	1	1	1	Grille, Wire Fan, 6″
24		166AJ1	2	2	2	Catch, Flexible, Draw

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2109AV 30/40/60HP, 230V, PWM-DC, Regenerative Stand Alone, Drive Assembly

ITEM	PART NO.	PRINT NO.	2109AV4 30HP	2109AV5 40HP	2109AV6 60HP	DESCRIPTION
1		2109AR4	1			Drive Ass'y Quantum PWM-DC
		2109AR5		1		Drive Ass'y Quantum PWM-DC
		2109AR6			1	Drive Ass'y Quantum PWM-DC
2		661AA8	1	1	1	Plug Terminal Strip
3		661AA10	1	1	1	Plug Terminal Strip
4		661AA13	1	1	1	Plug Terminal Strip
5		6300HF2	1	1	1	Card, DSP Motion Control
6		141787	9	9	9	Standoff , DSP
7		320FR1	1	1	1	Cover
8		396GP1	4	4	4	Screw, Captive Knurled
9		711DJ1	4	4	4	Screw, Retainer Captive
10		600HL1	1	1	1	User Interface Card Assembly
11		786AR1	4	4	4	Standoff , User Interface
12		220BE2	1	1	1	Cable, Flat, 50 Conductor
13		395AF1	8	8	8	Rivet, Pop
14		700503	1	1	1	Screw
15		393AT5	2	2	2	Nut
16		393CR1	4	4	4	Nut, Receptable
17		672BM3	1	1	1	Power Supply
18		101275	2	2	2	Screw, Power Supply Mount
19		462HF2	1	1	1	Cable, Power Supply
20		462HE2	1	1	1	Cable, Control Supply
21		900AC108	2	2	2	Wire Ass'y, 18 ga.
22		378AH1	1	1	1	Fan, 6″, 120VAC
23		442AD1	1	1	1	Grille, Wire Fan, 6″
24		166AJ1	2	2	2	Catch, Flexible, Draw

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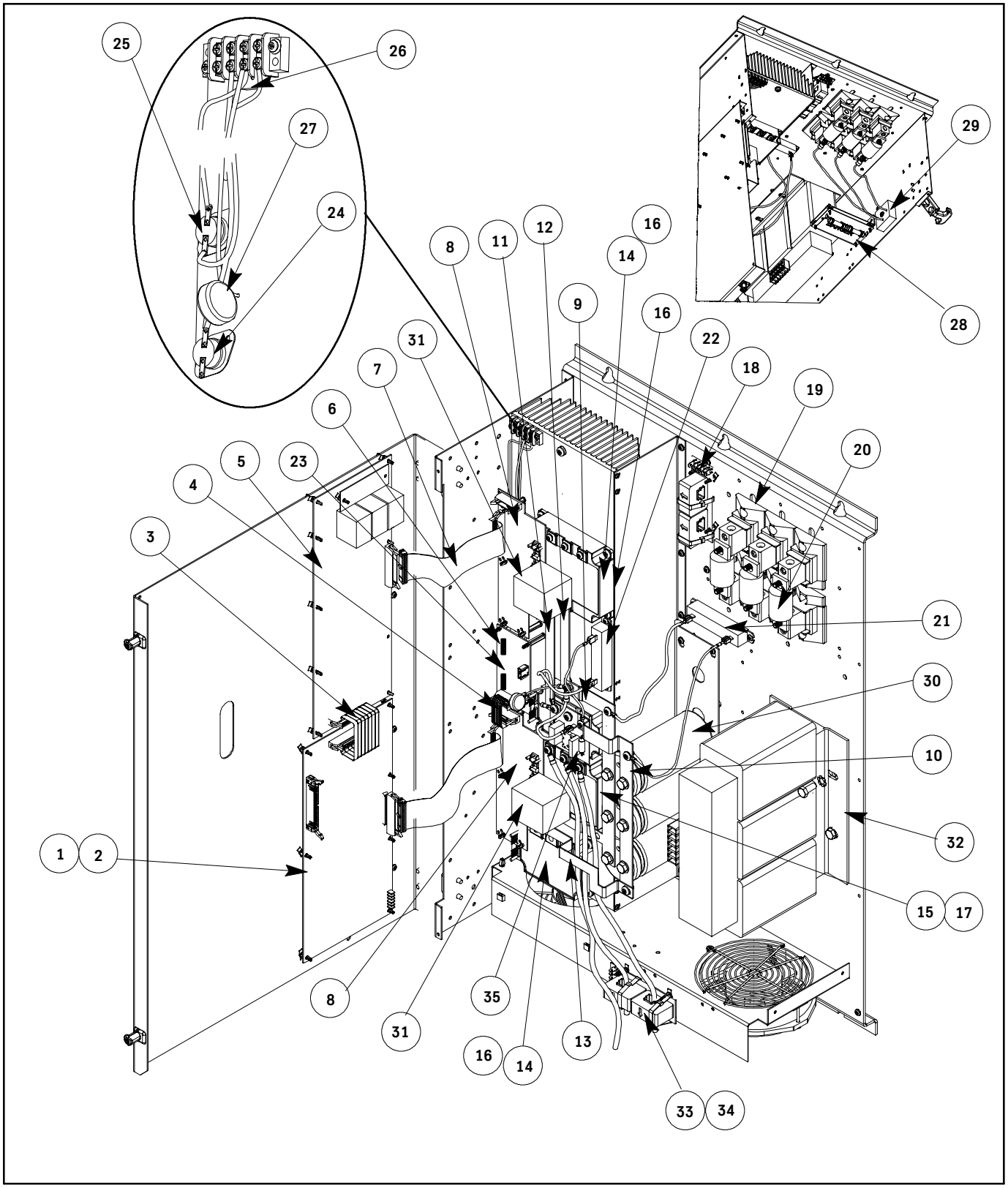

Figure 51 - 2109AR, 30HP, 230V, Stand Alone, Regenerative Drive

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2109AV1, 30HP, 230V, VVVF, Regenerative, Stand Alone, Drive Assembly

ITEM	PART NO.	PRINT NO.	2109AR1 30HP	DESCRIPTION
1		6300LR21	1	Card, AC/DC Current Regulator
2		141787	7	Standoff, Current Regulator
3		220BG2	1	Cable , Flat, 34 Conductor, Current Reg. to Regen Control Card (4″ long)
4		220CE1	1	Cable Assembly Flat, 14 Conductor
5		6300GC20	1	Card, Regenerative Control, 230V
6		462EW1	2	Harness, IGBT/Inverter Interface Board
7		220BG1	2	Cable Assembly Flat, 34 Conductor, DCR & Regen Control to Inv. Interface Card
8		6300LF1	2	Card, Inverter Interface 6 pack
9		207CA1	1	Bus Bar, Cap, Negative,
10		207BV1	1	Bus Bar, Cap,. Positive
11		207CW1	1	Bus Bar, Positive
12		207CY1	1	Bus Bar, Negative
13		207BT1	1	Bus Bar, Pos. Cap to IGBT
14		155CM1	2	IGBT, 6-Pack, 300A, 600V (U, V, W) (T, S, R)
15		155CN1	1	IGBT, Dual, 400A, 600V (QSS, QSR)
16		472BG7	2	Thermostrate Pad for 155CM1 (U, V, W) (T, S, R)
17		472BG14	1	Thermostrate Pad for 155CN1 (QSS, QSR)
18		462EX1	4	Harness, DCR to Current Sensor
19		412AT1	3	Fuseblock, Modular, Stud-type
20		409BT11	3	Fuse, 150A, 250V, Semiconductor, FU1-3
21		699AV2	1	Resistor, 3.6K Ohm, 100W
22		699AV4	1	Resistor, 50K Ohm, 100W
23		6300FV2	1	Card, QSS/QSR Interface
24		844AC1	1	Thermostrate, 160°F
25		844AD1	1	Thermostrate, 120°F
26		141675	1	Jumper, 2 Position
27		804BK3	1	ZNR Assembly, 350 VDC
28		6300LG1	1	Card, Bus Voltage Indicator
29		804BM3	1	Suppressor Assembly, Transient, 230V
30		238BT1	3	Capacitor, 3600μF, 450VDC
31		241BD3	2	Capacitor 600V, IGBT Snub 4.7μF
32		486AD5	1	Choke, 3 phase, L1 60A/.4mh/138W
33		6300LH3	2	Sensor Current Ass'y, 200A
34		786AH3	2	Standoff, Locking, 1.250
35		6300FP2	1	Card, QSS/QSR Snubber Assembly

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2109AV4, 30HP, 230V, PWM-DC, Regenerative, Stand Alone, Drive Assembly

ITEM	PART NO.	PRINT NO.	2109AR4 30HP	DESCRIPTION
1		6300LR21	1	Card, AC/DC Current Regulator
2		141787	7	Standoff, Current Regulator
3		220BG2	1	Cable, Flat, 34 Conductor, Current Reg. to Regen. Control Card (4″ long)
4		220CE1	1	Cable Assembly Flat, 14 Conductor
5		6300GC20	1	Card, Regenerative Control, 230V
6		462EW1	2	Harness, IGBT/Inverter Interface Board
7		220BG1	2	Cable Assembly Flat, 34 Conductor, DCR & Regen Control to Inv. Interface Card
8		6300LF1	2	Card, Inverter Interface 6 pack
9		207CA1	1	Bus Bar, Cap, Negative,
10		207BV1	1	Bus Bar, Cap,. Positive
11		207CW1	1	Bus Bar, Positive
12		207CY1	1	Bus Bar, Negative
13		207BT1	1	Bus Bar, Pos. Cap to IGBT
14		155CM1	2	IGBT, 6-Pack, 300A, 600V (U, V, W) (T, S, R)
15		155CN1	1	IGBT, Dual, 400A, 600V (QSS, QSR)
16		472BG7	2	Thermostrate Pad IGBT 155CM1 (U, V, W) (T, S, R)
17		472BG14	1	Thermostrate Pad IGBT 155CN1 (QSS, QSR)
18		462EX1	4	Harness, DCR to Current Sensor
19		412AT1	3	Fuseblock, Modular, Stud-type
20		409BT11	3	Fuse, 150A, 250V, Semiconductor, FU1-3
21		699AV2	1	Resistor, 3.6K Ohm, 100W
22		699AV4	1	Resistor, 50K Ohm, 100W
23		6300FV2	1	Card, QSS/QSR Interface
24		844AC1	1	Thermostat, 160°F
25		844AD1	1	Thermostat, 120°F
26		141675	1	Jumper, 2 Position
27		804BK3	1	ZNR Assembly, 350 VDC
28		6300LG1	1	Card, Bus Voltage Indicator
29		804BM3	1	Suppressor Assembly, Transient, 230V
30		238BT1	3	Capacitor, 3600μF, 450VDC
31		241BD3	2	Capacitor 600V, IGBT Snub 4.7μF
32		486AD5	1	Choke, 3 phase, L1 60A/.4mh/138W
33		6300LH3	2	Sensor Current Ass'y, 200A
34		786AH3	2	Standoff, Locking, 1.250
35		6300FP2	1	Card, QSS/QSR Snubber Assembly

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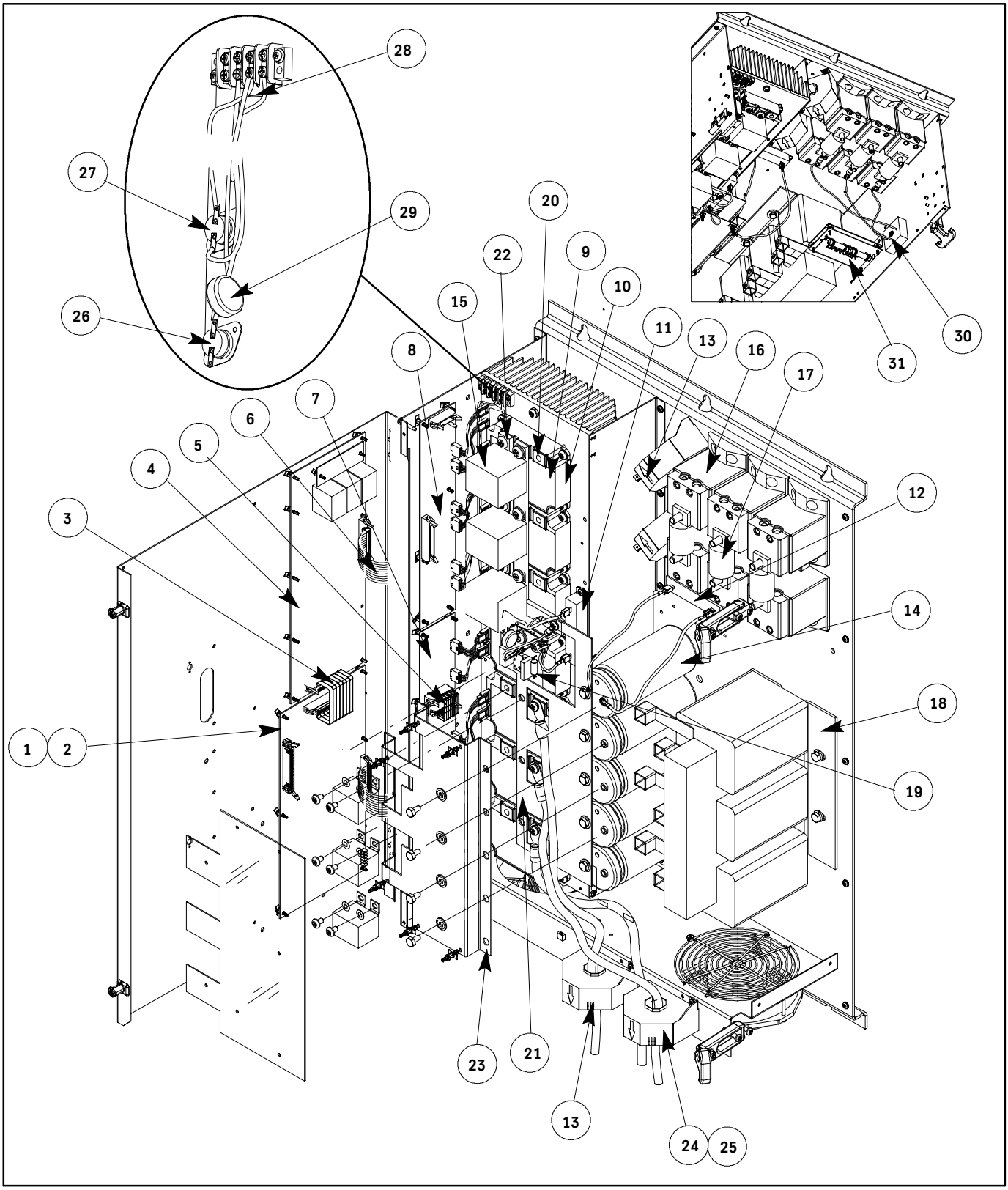

Figure 52 - 2109AR, 40/60HP, 230V, Stand Alone, Regenerative Drive

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2109AV2, 2109AV3, 40-60HP, 230V, VVVF, Regenerative, Stand Alone Drive Assembly

ITEM	PART NO.	PRINT NO.	2109AR2 40HP	2109AR3 60HP	DESCRIPTION
1		141787	7	7	Standoff, Current Regulator
2		6300LR21	1	1	AC/DC Current Regulator Card
3		220BG2	1	1	Cable, Flat, 34 Conductor, Current Reg. to Regen Control Card (4″ long)
4		6300GC20	1	1	Card, Regenerative Control
5		220CE1	1	1	Cable Assembly, Flat, 14 Conductor QSS/QSR to Inverter Snubber
6		220BG1	2	2	Cable, Flat, 34 Conductor, DCR & Regen Control to Inv. Interface Card
7		6300FV2	1	1	Card, QSS/QSR Interface
8		6300FK2	2	2	Card, Inverter Interface
9		155CN1	7		IGBT, Dual, 400A, 600V
		155CP1		7	IGBT, Dual, 600A, 600V
10		472BG14	7		Thermostrate Pad for IGBT 155CN1 (QSS/QSR)
		472BG15		7	Thermostrate Pad for IGBT 155CP1 (QSS/QSR)
11		699AV4	1	1	Resistor, 50K Ohm, 100W
12		699AV2	1	1	Resistor, 3.6K Ohm, 100W
13		462EX1	4	4	Harness DCR, to Current Sensor
14		238BT1	4	5	Capacitor, 3600μF, 450VDC
15		241BD2	3		Capacitor Film 600V, IGBT Snub 3.3μF
		241BD4		3	Capacitor Film 600V, IGBT Snub 4.7μF
16		412AY1	3		Fuseblock, Modular
		412AY2		3	Fuseblock, Modular
17		409BT13	3		Fuse, 200A, 250V, Semiconductor, FU1-3
		409BT17		3	Fuse, 300A, 250V, Semiconductor, FU1-3
18		486AR41	1		Choke, 3 phase, L1, 100 Amps/150Watts/.30mh
		486AR42		1	Choke, 3 phase, L1 240 Amps/160Watts/.150mh
19		6300FP2	1	1	Card, QSS/QSR Snubber Assembly
20		207DB1	1	1	Bus Bar Negative 230V
21		207BE1	1	1	Bus Bar Negative, 230V
22		207DA1	1	1	Bus Bar Positive 230V/460V
23		207BF1	1	1	Bus Bar Positive, 230V
24		6300LH3	2		Current Sensor Ass'y, 200A
		736AN1		4	Current Sensor 200A
25		786AH3	2	2	Standoff, Locking, 1.250
26		844AC1	1	1	Thermostat, 160°F
27		844AD1	1	1	Thermostat, 120°F
28		141675	1	1	Jumper, 2 Position
29		804BK3	1	1	ZNR Assembly, 350 VDC
30		804BM3	1	1	Suppressor Assembly, Transient, 230V
31		6300LG1	1	1	Bus Voltage Indicator

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2109AV5, 2109AV6, 40-60HP, 230V, PWM-DC, Regenerative, Stand Alone Drive Assembly

ITEM	PART NO.	PRINT NO.	2109AR5 40HP	2109AR6 60HP	DESCRIPTION
1		141787	7	7	Standoff, Current Regulator
2		6300LR21	1	1	AC/DC Current Regulator Card
3		220BG2	1	1	Cable, Flat, 34 Conductor, Current Reg. to Regen. Control Card (4″ long)
4		6300GC20	1	1	Card, Regenerative Control
5		220CE1	1	1	Cable Assembly, Flat, 14 Conductor QSS/QSR to Inverter Snubber
6		220BG2	2	2	Cable, Flat, 34 Conductor DCR & Regen Control to Inv. Interface Card
7		6300FV2	1	1	Card, QSS/QSR Interface
8		6300FK2	2	2	Card, Inverter Interface
9		155CN1	7		IGBT, Dual, 400A, 600V
		155CP1		7	IGBT, Dual, 600A, 600V
10		472BG14	7		Thermostrate Pad for IGBT 155CN1 (QSS/QSR)
		472BG15		7	Thermostrate Pad for IGBT 155CP1 (QSS/QSR)
11		699AV4	1	1	Resistor, 50K Ohm, 100W
12		699AV2	1	1	Resistor, 3.6K Ohm, 100W
13		462EX1	4	4	Harness DCR, to Current Sensor
14		238BT1	4	5	Capacitor, 3600μF, 450VDC
15		241BD2	3		Capacitor Film 600V, IGBT Snub 3.3μF
		241BD4		3	Capacitor Film 600V, IGBT Snub 4.7μF
16		412AY1	3		Fuseblock, Modular
		412AY2		3	Fuseblock, Modular
17		409BT13	3		Fuse, 200A, 250V, Semiconductor, FU1-3
		409BT17		3	Fuse, 300A, 250V, Semiconductor, FU1-3
18		486AR41	1		Choke, 3 phase, L1, 100 Amps/150Watts/.30mh
		486AR42		1	Choke, 3 phase, L1 240 Amps/160Watts/.150mh
19		6300FP2	1	1	Card, QSS/QSR Snubber Assembly
20		207DB1	1	1	Bus Bar Negative 230V
21		207BE1	1	1	Bus Bar Negative, 230V
22		207DA1	1	1	Bus Bar Positive 230V/460V
23		207BF1	1	1	Bus Bar Positive, 230V
24		6300LH3	2		Current Sensor Ass'y, 200A
		736AN1		4	Current Sensor 200A
25		786AH3	2	2	Standoff, Locking, 1.250
26		844AC1	1	1	Thermostat, 160°F
27		844AD1	1	1	Thermostat, 120°F
28		141675	1	1	Jumper, 2 Position
29		804BK3	1	1	ZNR Assembly, 350 VDC
30		804BM3	1	1	Suppressor Assembly, Transient, 230V
31		6300LG1	1	1	Bus Voltage Indicator

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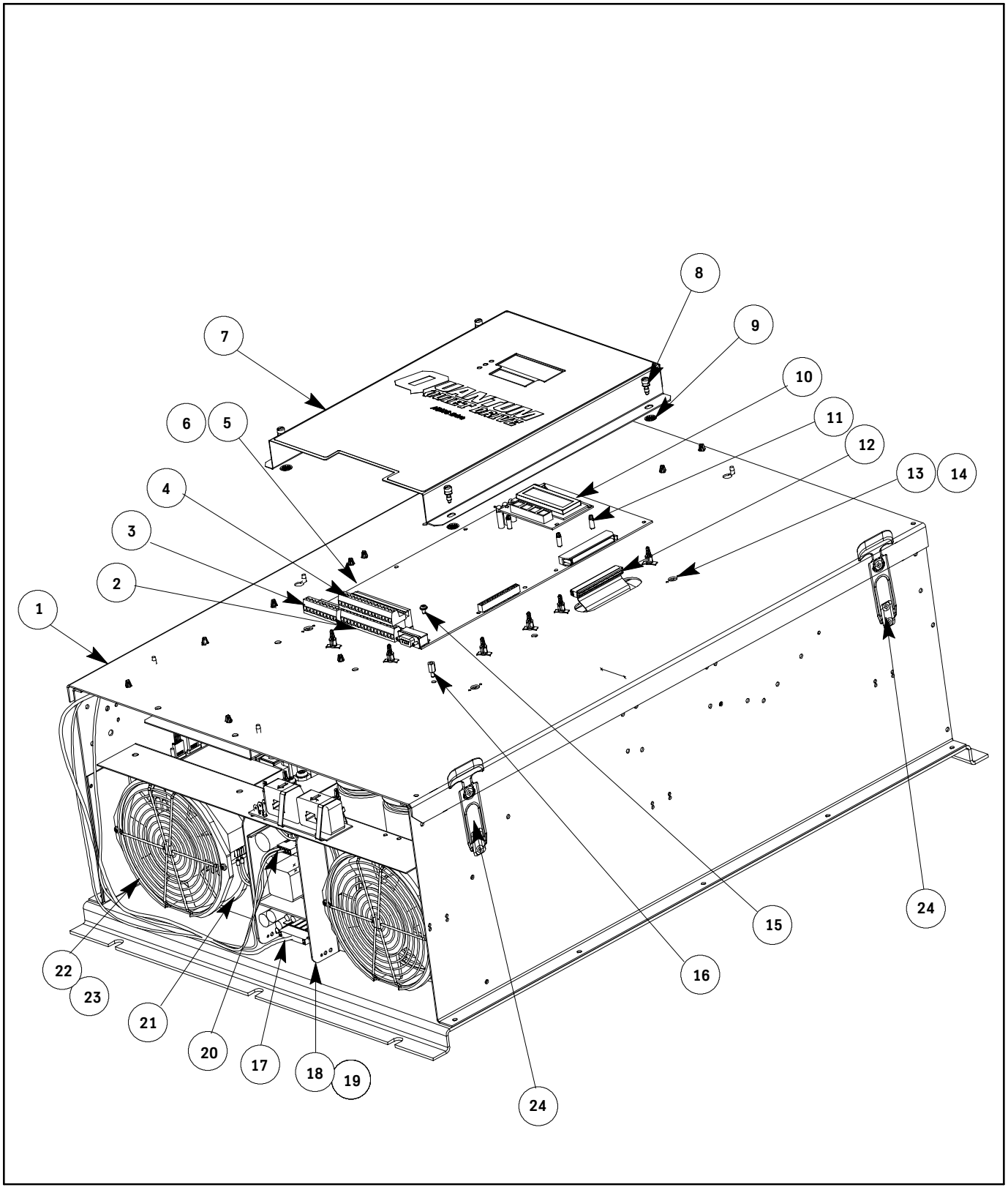

Figure 53 - 2109AW, 30-60 HP, 460V, Stand Alone, Regenerative Drive

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2109AW, 30-60HP, 460V, VVVF, Regenerative, Stand Alone Drive Assembly

ITEM	PART NO.	PRINT NO.	2109AW1 30HP	2109AW2 40HP	2109AW3 60HP	DESCRIPTION
1		2109AT1	1			Drive Ass'y Quantum AC/DC
		2109AT2		1		Drive Ass'y Quantum AC/DC
		2109AT3			1	Drive Ass'y Quantum AC/DC
2		661AA8	1	1	1	Plug Terminal Strip
3		661AA10	1	1	1	Plug Terminal Strip
4		661AA13	1	1	1	Plug Terminal Strip
5		6300HF2	1	1	1	Card, DSP Motion Control
6		141787	9	9	9	Standoff , DSP
7		320FR1	1	1	1	Cover
8		396GP1	4	4	4	Screw, Captive Knurled
9		711DJ1	4	4	4	Screw, Retainer Captive
10		6300HL1	1	1	1	User Interface Card Assembly
11		786AR1	4	4	4	Standoff , User Interface
12		220BE2	1	1	1	Cable, Flat, 50 Conductor
13		393CR1	4	4	4	Nut, Receptable
14		395AF1	8	8	8	Rivet, Pop
15		700503	1	1	1	Screw
16		393AT5	2	2	2	Nut
17		462HF2	1	1	1	Cable, Power Supply
18		672BM3	1	1	1	Power Supply
19		101275	2	2	2	Screw, Power Supply Mount
20		462HE2	1	1	1	Cable, Control Supply
21		900AC108	2	2	2	Wire Ass'y, 18 ga.
22		378AH1	1	1	1	Fan, 6″, 120VAC
23		442AD1	1	1	1	Grille, Wire Fan, 6″
24		166AJ1	2	2	2	Catch, Flexible, Draw

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2109AW, 30-60HP 460V, PWM-DC, Regenerative, Stand Alone Drive Assembly

ITEM	PART NO.	PRINT NO.	2109AW4 30HP	2109AW5 40HP	2109AW6 60HP	DESCRIPTION
1		2109AT4	1			Drive Ass'y Quantum AC/DC
		2109AT5		1		Drive Ass'y Quantum AC/DC
		2109AT6			1	Drive Ass'y Quantum AC/DC
2		661AA8	1	1	1	Plug Terminal Strip
3		661AA10	1	1	1	Plug Terminal Strip
4		661AA13	1	1	1	Plug Terminal Strip
5		6300HF2	1	1	1	Card, DSP Motion Control
6		141787	9	9	9	Standoff , DSP
7		320FR1	1	1	1	Cover
8		396GP1	4	4	4	Screw, Captive Knurled
9		711DJ1	4	4	4	Screw, Retainer Captive
10		6300HL1	1	1	1	User Interface Assembly
11		786AR1	4	4	4	Standoff , User Interface
12		220BE2	1	1	1	Cable, Flat, 50 Conductor
13		393CR1	4	4	4	Nut, Receptable
14		395AF1	8	8	8	Rivet, Pop
15		700503	1	1	1	Screw
16		393AT5	2	2	2	Nut
17		462HF2	1	1	1	Cable, Power Supply
18		672BM3	1	1	1	Power Supply
19		101275	2	2	2	Screw, Power Supply Mount
20		462HE2	1	1	1	Cable, Control Supply
21		900AC108	2	2	2	Wire Ass'y, 18 ga.
22		378AH1	1	1	1	Fan, 6″, 120VAC
23		442AD1	1	1	1	Grille, Wire Fan, 6″
24		166AJ1	2	2	2	Catch, Flexible, Draw

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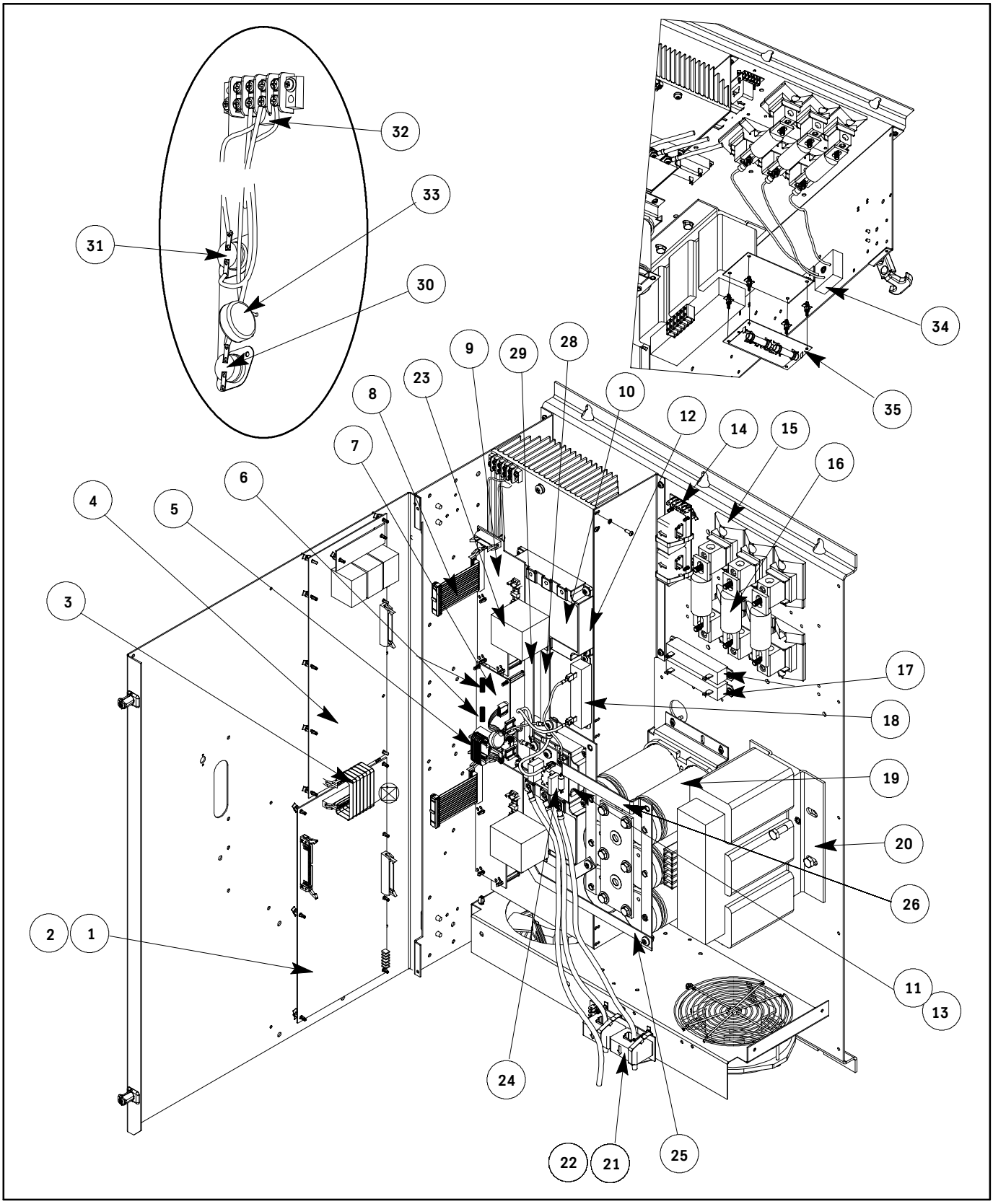

Figure 54 - 2109AT, 30HP, 460V, Stand Alone, Regenerative Drive

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2109AW1, 30HP, 460V, VVVF, Regenerative, Stand Alone, Drive Assembly

ITEM	PART NO.	PRINT NO.	2109AT1 30HP	DESCRIPTION
1		6300LR3	1	AC/DC Current Regulator Card
2		141787	7	Standoff, Current Regulator
3		220BG2	1	Cable, Flat, 34 Conductor, Current Reg to Regen. Control Card (4″ long)
4		6300GC2	1	Card, Regenerative Control, 230V
5		220CE1	1	Cable Assembly 14 Conductor QSS/QSR to Inverter Snubber
6		462EW1	2	Harness IGBT/Inverter Interface Card
7		6300FV2	1	Card, QSS/QSR Interface
8		220BG1	2	Cable, Flat, 34 Conductor DCR & Regen. Control to Inv. Interface Card
9		6300LF1	2	Card, Inverter Interface - 6 pack
10		155CV1	2	IGBT, 6-Pack, 150A, 1200V
11		155CW1	1	IGBT Dual, 200A, QSS/QSR
12		472BG7	1	Heatsink Thermostrate Pad for IGBT 6-pack (U, V, W)
13		472BG14	1	Heatsink Thermostrate Pad for IGBT Dual (QSS, QSR)
14		462EX1	4	Harness DCR, to Current Sensor
15		412AT1	3	Fuseblock, Modular, Stud-type
16		409AX6	3	Fuse, 80A, 700V, Semiconductor, FU1-3
17		699AV2	1	Resistor, 3.6K Ohm, 100W
18		699AV4	2	Resistor, 50K Ohm, 100W
19		238AW1	3	Capacitor, 2000μF, 450WVDC
20		486AD13	1	Choke, 3 phase, L1, 45Amps/1.2mh/65Watts
21		6300LH2	2	Current Sensor Ass'y, 200A
22		786AH3	2	Standoff, Locking, 1.250
23		241BE1	2	Capacitor Film 1200V, IGBT Snub 2.0μF
24		6300FP1	1	Card, QSS/QSR Snubber Assembly
25		207CL1	1	Bus Bar Cap Negative,
26		207CM1	1	Bus Bar Cap. Positive
27		207CD1	1	Bus Bar Pos. Cap to IGBT
28		207CY1	1	Bus Bar Negative
29		207CW1	1	Bus Bar Positive
30		844AC1	1	Thermostat, 160°F
31		844AD1	1	Thermostat, 120°F
32		141675	1	Jumper, 2 Position
33		804BH1	1	ZNR Assembly, 670 VDC
34		804AV2	1	Suppressor Assembly, Transient, 460V
35		6300LG1	1	Bus Voltage Indicator

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2109AW4, 30HP, 460V, PWM-DC, Regenerative, Stand Alone, Drive Assembly

ITEM	PART NO.	PRINT NO.	2109AT4 30HP	DESCRIPTION
1		6300LR3	1	AC/DC Current Regulator Card
2		141787	7	Standoff, Current Regulator
3		220BG2	1	Cable, Flat, 34 Conductor, Current Reg to Regen. Control Card (4″ long)
4		6300GC2	1	Card, Regenerative Control, 230V
5		220CE1	1	Cable Assembly 14 Conductor QSS/QSR to Inverter Snubber
6		462EW1	2	Harness IGBT/Inverter Interface Card
7		6300FV2	1	Card, QSS/QSR Interface
8		220BG1	2	Cable, Flat, 34 Conductor DCR & Regen. Control to Inv. Interface Card
9		6300LF1	2	Card, Inverter Interface - 6 pack
10		155CV1	2	IGBT, 6-Pack, 150A, 1200V
11		155CW1	1	IGBT Dual, 200A, QSS/QSR
12		472BG7	1	Thermostrate Pad for 155CV1 (U, V, W)
13		472BG14	1	Thermostrate Pad for 155CW1 (QSS, QSR)
14		462EX1	4	Harness DCR, to Current Sensor
15		412AT1	3	Fuseblock, Modular, Stud-type
16		409AX6	3	Fuse, 80A, 700V, Semiconductor, FU1-3
17		699AV2	1	Resistor, 3.6K Ohm, 100W
18		699AV4	2	Resistor, 50K Ohm, 100W
19		238AW1	3	Capacitor, 2000μF, 450WVDC
20		486AD13	1	Choke, 3 phase, L1, 45Amps/1.2mh/65Watts
21		6300LH2	2	Current Sensor Ass'y, 200A
22		786AH3	2	Standoff, Locking, 1.250
23		241BE1	2	Capacitor Film 1200V, IGBT Snub 2.0μF
24		6300FP1	1	Card, QSS/QSR Snubber Assembly
25		207CL1	1	Bus Bar Cap Negative,
26		207CM1	1	Bus Bar Cap. Positive
27		207CD1	1	Bus Bar Pos. Cap to IGBT
28		207CY1	1	Bus Bar Negative
29		207CW1	1	Bus Bar Positive
30		844AC1	1	Thermostat, 160°F
31		844AD1	1	Thermostat, 120°F
32		141675	1	Jumper, 2 Position
33		804BH1	1	ZNR Assembly, 670 VDC
34		804AV2	1	Suppressor Assembly, Transient, 460V
35		6300LG1	1	Bus Voltage Indicator

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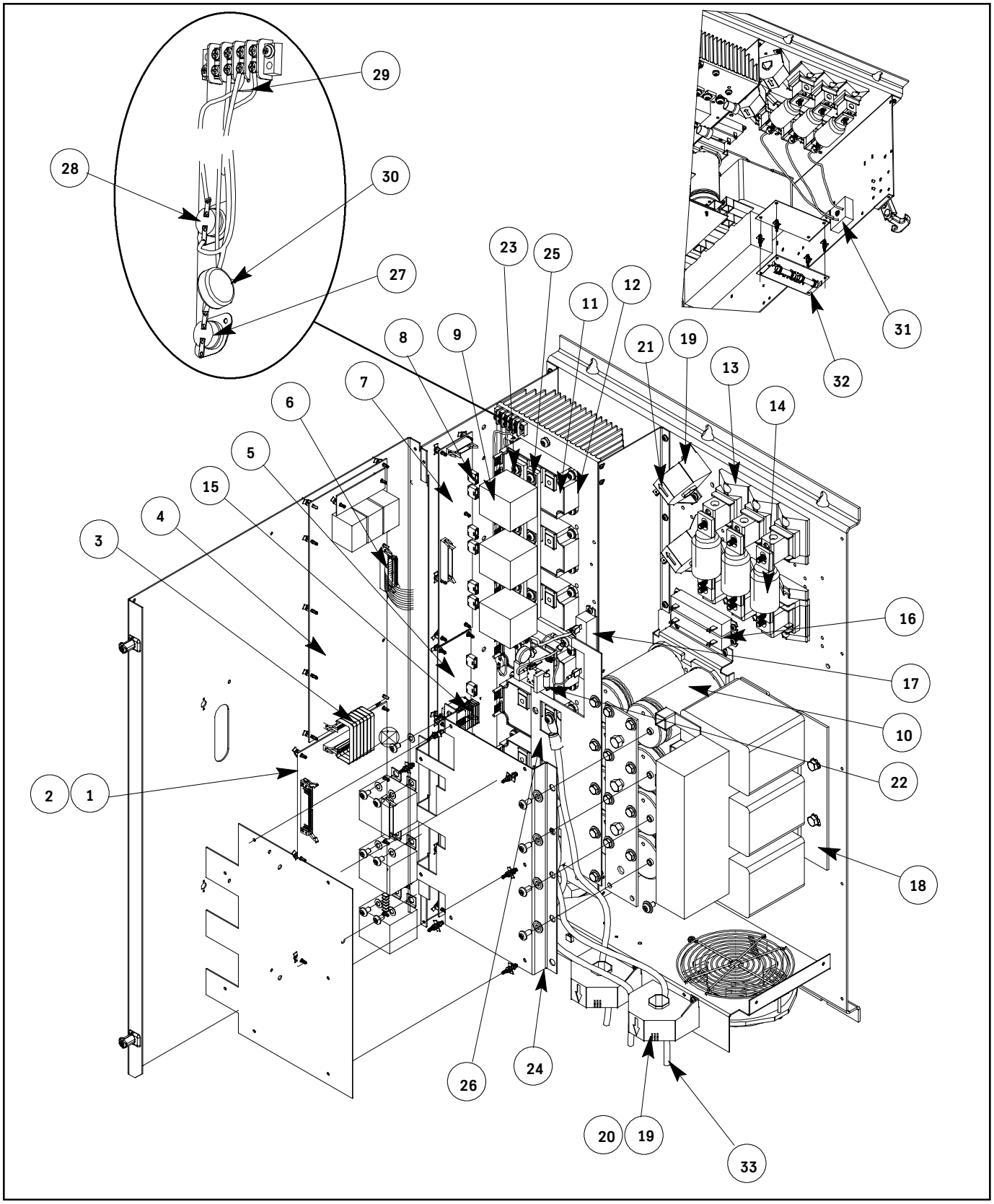

Figure 55 - 2109AT, 40/60HP, 460V, Stand Alone, Regenerative Drive

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2109AW2, 2109AW3, 40-60HP, 460V, VVVF, Regenerative, Stand Alone, Drive Assembly

ITEM	PART NO.	PRINT NO.	2109AT2 40HP	2109AT3 60HP	DESCRIPTION
1		6300LR3	1	1	AC/DC Current Regulator
2		141787	7	7	Standoff, Current Regulator
3		220BG2	1	1	Cable, Flat, 34 Conductor, Current Reg. to Regen Control Card (4″ long)
4		6300GC2	1	1	Card, Regenerative Control
5		6300FV2	1	1	Card, QSS/QSR Interface
6		220BG1	2	2	Cable, Flat, 34 Conductor, DCR & Regen. Control to Inv. Interface Card
7		6300FK2	2	2	Card, Inverter Interface
8		462EW1	14	14	Harness, IGBT/Inverter Interface Card
9		241BE2	3		Capacitor Film 1200V, IGBT Snub 1.5μF
		241BE4		3	Capacitor Film 1200V, IGBT Snub 2.0μF
10		238BT1	8	10	Capacitor, 2000μF, 450VDC
11		155CW1	7		IGBT, Dual, 200A, 1200V
		155CX1		7	IGBT, Dual, 300A, 1200V
12		472BG14	7		Thermostrate Pad for 155CW1 (QSS/QSR)
		472BG15		7	Thermostrate Pad for 155CX1 (QSS/QSR)
13		412AT1	3	3	Fuseblock, Modular, Stud-Type
14		409AX7	3		Fuse, 100A, 700V, Semiconductor, FU1-3
		409AX8		3	Fuse, 150A, 700V, Semiconductor, FU1-3
15		220CE1	1	1	Cable Assembly, Flat, 14 Conductor QSS/QSR to Inverter Snubber
16		699AV2	2	2	Resistor, 3.6K Ohm, 100W
17		699AV4	1	1	Resistor, 50K Ohm, 100W
18		486AD9	1		Choke, 3 phase, L1, 55 Amps/127 Watts/.85mh
		486AD10		1	Choke, 3 phase, L1 80 Amps/164Watts/.70mh
19		6300LH2	2		Current Sensor Assembly 200A Card
		736AN1		4	Current Sensor 200A
20		786AH2	2	2	Standoff, Locking, 1.250
21		462EX1	4	4	Harness DCR, to Current Sensor
22		6300FP1	1	1	Card, QSS/QSR Snubber Assembly
23		207DB1	1	1	Bus Bar Negative 230V
24		207BH1	1	1	Bus Bar Negative, 460V
25		207DA1	1	1	Bus Bar Positive 230/460V
26		207BJ1	1	1	Bus Bar Positive, 460V
27		844AC1	1	1	Thermostat, 160°F
28		844AD1	1	1	Thermostat, 120°F
29		141675	1	1	Jumper, 2 Position
30		804BH1	1	1	ZNR Assembly, 670 VDC
31		804AV1	1	1	Suppressor Assembly, Transient, 460V
32		6300LG1	1	1	Bus Voltage Indicator Card

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2109AW5, 2109AW6, 40-60HP, 460V, PWM-DC, Regenerative, Stand Alone, Drive Assembly

ITEM	PART NO.	PRINT NO.	2109AT5 40HP	2109AT6 60HP	DESCRIPTION
1		6300LR3	1	1	AC/DC Current Regulator
2		141787	7	7	Standoff, Current Regulator
3		220BG2	1	1	Cable, Flat, 34 Conductor, Current Reg. to Regen. Control Card (4″ long)
4		6300GC2	1	1	Card, Regenerative Control
5		6300FV2	1	1	Card, QSS/QSR Interface
6		220BG1	2	2	Cable, Flat, 34 Conductor, DCR & Regen Control to Inv. Interface Card
7		6300FK2	2	2	Card, Inverter Interface
8		462EW1	14	14	Harness, IGBT/Inverter Interface Card
9		241BE2	3		Capacitor Film 1200V, IGBT Snub 1.5μF
		241BE4		3	Capacitor Film 1200V, IGBT Snub 2.0μF
10		238BT1	8	10	Capacitor, 2000μF, 450VDC
11		155CW1	7		IGBT, Dual, 200A, 1200V
		155CX1		7	IGBT, Dual, 300A, 1200V
12		472BG14	7		Thermostrate Pad for 155CW1 (QSS/QSR)
		472BG15		7	Thermostrate Pad for 155CX1 (QSS/QSR)
13		412AT1	3	3	Fuseblock, Modular, Stud-Type
14		409AX7	3		Fuse, 100A, 700V, Semiconductor, FU1-3
		409AX8		3	Fuse, 150A, 700V, Semiconductor, FU1-3
15		220CE1	1	1	Cable Assembly, Flat, 14 Conductor QSS/QSR to Inverter Snubber
16		699AV2	2	2	Resistor, 3.6K Ohm, 100W
17		699AV4	1	1	Resistor, 50K Ohm, 100W
18		486AD9	1		Choke, 3 phase, L1, 55 Amps/127 Watts/.85mh
		486AD10		1	Choke, 3 phase, L1 80 Amps/164Watts/.70mh
19		6300LH2	2		Current Sensor Assembly 200A Card
		736AN1		4	Current Sensor 200A
20		786AH2	2	2	Standoff, Locking, 1.250
21		462EX1	4	4	Harness DCR, to Current Sensor
22		6300FP1	1	1	Card, QSS/QSR Snubber Assembly
23		207DB1	1	1	Bus Bar Negative 230V
24		207BH1	1	1	Bus Bar Negative, 460V
25		207DA1	1	1	Bus Bar Positive 230/460V
26		207BJ1	1	1	Bus Bar Positive, 460V
27		844AC1	1	1	Thermostat, 160°F
28		844AD1	1	1	Thermostat, 120°F
29		141675	1	1	Jumper, 2 Position
30		804BH1	1	1	ZNR Assembly, 670 VDC
31		804AV1	1	1	Suppressor Assembly, Transient, 460V
32		6300LG1	1	1	Bus Voltage Indicator Card
33		900AD106	1		Wire Assembly, 14 Ga. Frmo V IGBT thru V Lem to 1 M Contactor PWM-DC (5 turns thru V Lem
		900AV55		1	Wire Assembly , 10 Ga. Frmo V IGBT thru V Lem to 1 M Contactor PWM-DC (5 turns thru V Lem
34		900AV9	1	1	Wire Assembly, 10 Ga.

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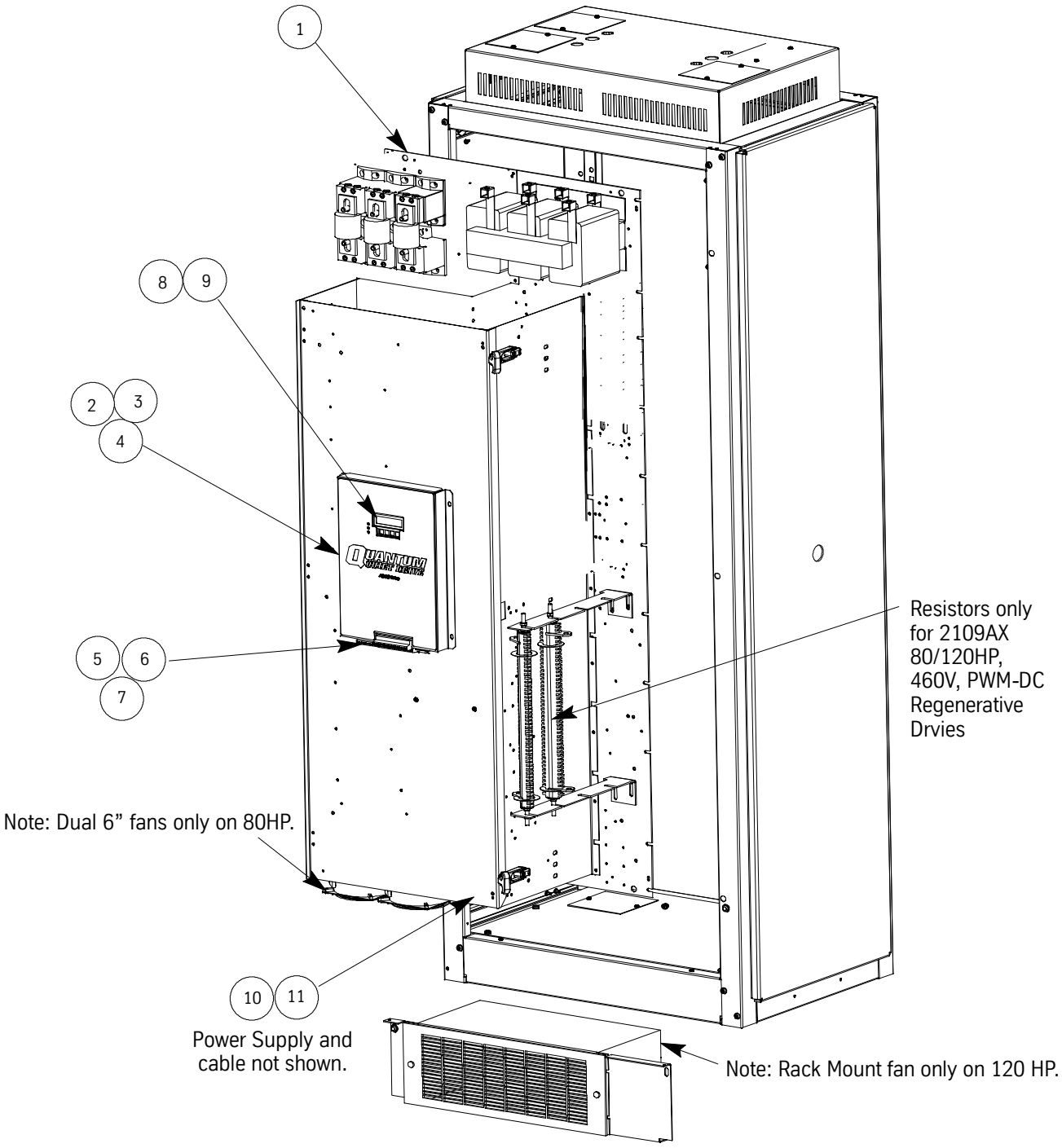

Figure 56 - 2109BA, 80-120HP, 460V, VVVF, Stand Alone, Regenerative Drive
2109AX, 80-120HP, 460V, PWM-DC, Stand Alone, Regenerative Drive

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2109BA1, 2109BA2, 80-120HP, 460V, VVVF, Regenerative
2109AX1, 2109AX2, 80-120HP, 460V, PWM-DC, Regenerative
Stand Alone, Drive Assembly

ITEM	PART NO.	PRINT NO.	2109BA1 80HP	2109BA2 120HP	2103AX1 80HP	2103AX2 120HP	DESCRIPTION
1		2103AN3	1				Rear Panel Assembly, 80HP, VVVF
		2103AN4		1			Rear Panel Assembly, 120HP, VVVF
		2103BG3			1		Rear Panel Assembly, 80HP, PWM-DC
		2103BG4				1	Rear Panel Assembly, 120HP, PWM-DC
2		6300HF2	1	1	1	1	Card, DSP Motion Control
3		141787	9	9	9	9	Standoff, .375
4		786BK1	1	1	1	1	Standoff, .250 Hex x .375 Long, #6
5		661AA13	1	1	1	1	Plug, Terminal Strip
6		661AA8	1	1	1	1	Plug, Terminal Strip
7		661AA10	1	1	1	1	Plug, Terminal Strip
8		6300HL1	1	1	1	1	User Interface Assembly
9		786AR1	1	1	1	1	Standoff, .156
10		672BM3	1	1	1	1	Power Supply (Not Shown)
11		462HF1	1	1	1	1	Cable, Power Supply, Stand Alone (Not Shown)

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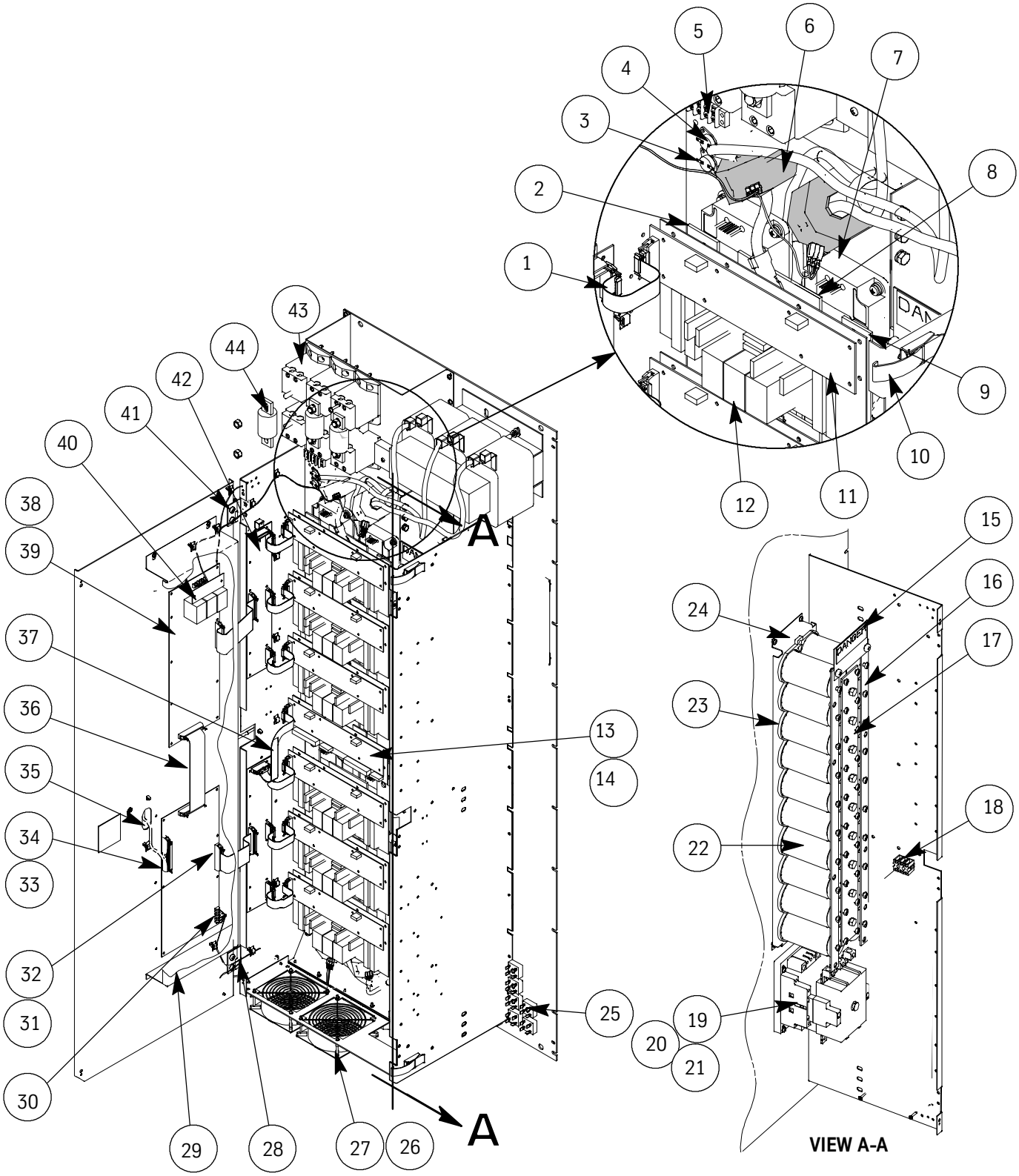

Figure 57 - 2103AN, 80-120HP, 460V, VVVF Stand Alone, Regenerative Drive

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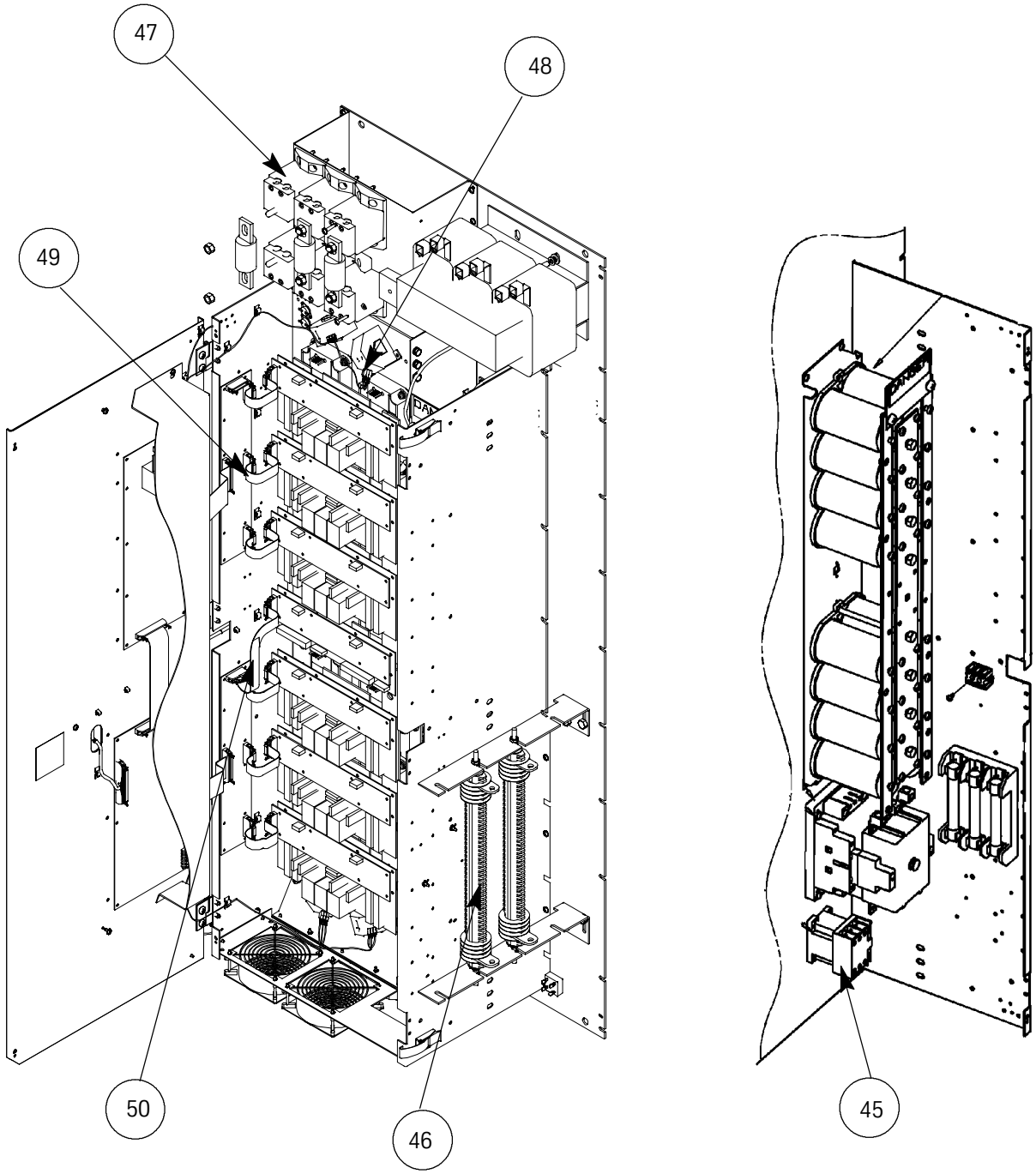

Figure 58 - 2103BG, 80-120HP, 460V, PWM-DC, Stand Alone, Regenerative Drive

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2109BA1, 2109BA2, 80-120HP, 460V, VVVF, Regenerative, Stand Alone, Drive Assembly

ITEM	PART NO.	PRINT NO.	2103AN3 80HP	2103AN4 120HP	DESCRIPTION
1	9834850	220CE1	1	1	Harness Assy, 14 Conductor Ribbon. 3″ (SPS to Inverter Interface Board)
2		207AX1	1	1	Bus Bar, Negative, IGBT, 80HP
		207AX2	1	1	Bus Bar, Negative, IGBT, 120HP
3	9834941	844AC1	1	1	Thermostat, 160F, TS2
4	9834953	844AD1	1	1	Thermostat, 120F, TS1
5		834AM4	1	1	Terminal Block, 4 Pos., TB1 (for thermostat connections)
6	9755603	736AN1	4	4	Sensor, Current, 200A, LEM 1 thru 4, 80HP
		736AT1	4	4	Sensor, Current, 300A, LEM 1 thru 4, 120HP
7		155CE1	13	13	IGBT, Single, 400A, 1200V, R, S, T, U, V, W, QSS, 80HP
		472BG9	13	13	Thermostrate Pad, IGBT, 80HP
		155CD1	13	13	IGBT, Single, 600A, 1200V, R, S, T, U, V, W, QSS, 120HP
		472BG10	13	13	Thermostrate Pad, IGBT, 120HP
8		207BC1	6	6	Bus Bar, Center
9		207BB1	1	1	Bus Bar, Positive, RST, 80HP
		207BB2	1	1	Bus Bar, Positive, RST, 120HP
10		166AJ1	2	2	Catch, Cover, Spring, Draw
11		6300HC2	6	6	Inverter Interface Board
12		6300HD3	6	6	Inverter Snubber Board, 80HP
		6300HD4	6	6	Inverter Snubber Board, 120HP
13		6300HG3	1	1	QSS/QSR Interface Board
14		6300HJ3	1	1	QSS/QSR Snubber Board
15	9755329	6300EM2	1	1	Bus Voltage Indicator Board
16		207AY1	2	2	Bus Bar, Capacitor, Narrow
17		207AG5	1	1	Bus Bar, Capacitor, Wide
18		834BL3	2	2	Terminal Block, 3 Pole, 50A
19	9804420	804AC1	1	1	Surge, Suppressor, C1
20	9834618	298AH10	1	1	Contactor, 3 Phase, C1, 80HP, VVVF only
	9834620	298AH11	1	1	Contactor, 3 Phase, C1, 120HP, VVVF only
21	9774737	297AH4	1	1	Contact, Aux., C1, 80HP
	9834631	297AH5	1	1	Contact, Aux., C1, 120HP
22	9755196	238AW1	14		Capacitor, 2000MFD, 450WVDC 80HP
				20	Capacitor, 2000MFD, 450WVDC 120HP
23		596AX1	7		Mount, Capacitor, Dual, Plastic 80HP
				10	Mount, Capacitor, Dual, Plastic 120HP
24		196LC1	1	1	Bracket, Capacitor
25	9853510	689AA1	1	1	Rectifier, Full-wave, 35A, DB1, DB2, BD
26	9719180	378AE1	2	2	Fan, AC, Muffin, 100CFM, 4″ (80HP, 120HP)
		378AH1	2	2	Fan, AC, 220CFM, 6″ (80HP)

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2109BA1, 2109BA2, 80-120HP, 460V, VVVF, Regenerative, Stand Alone, Drive Assembly (cont.)

ITEM	PART NO.	PRINT NO.	2103AN3 80HP	2103AN4 120HP	DESCRIPTION
27		442AA1	2	2	Finger Guard, 4″ (80HP, 120HP)
		442AD1	2	2	Finger Guard, 6″ (80HP)
28		141936	1	1	Hinge, Lift-off, RH
		141935	2	2	Hinge, Lift-off, LH
29		165LA1	1	1	Shield, Elect. Noise, CR, RCB
30	9834898	462EX1	4	4	Harness, CR/RCB to Current Sensor
31	9834825	220BG1	2	2	Cable Assembly, Flat, 34 Conductor, 4.25″ Lg (CR/SPS; RCB/SPS)
32		221AJ1	2	2	Cable Clamp, Nylon, Hinged
33		6300LR3	1	1	Current Regulator Board
34		132221	41	41	Standoff, $^{5}/_{8}$″ (Mount CR, RCB, SPS)
35	9834849	220CB1	1	1	Cable Assembly, (CR/DSP)
36		220BG2	1	1	Cable Assembly, Flat, 34 Conductor, 9″ Lg (CR/RCB)
37		220CE2	1	1	Harness Assy, 14 cond. ribbon, 7″ (SPS to QSS/QSR Interface Card)
38		6300GC2	1	1	Regenerative Control Board
39		786AH3	2	2	Standoff, Locking, $1^{1}/_{4}$″ (For mtg. RCB guard)
40		451AT1	1	1	Guard, Plastic, High Voltage (RCB guard)
41		462EF2	1	1	Harness, Regen Control to 3 Phase, 80HP
		462EF3	1	1	Harness, Regen Control to 3 Phase, 120HP
42		6300HE1	2	2	Switching Power Supply
43		412AY1	3		Fuseblock, Modular, Stud-type (For FU1 - 3), 80HP
		412AY2		3	Fuseblock, Modular, Stud-type (For FU1 - 3), 120HP
44	9721897	409AX9	3		Fuse, 200A, 700V, Semicond., FU1-3, 80HP
	9721903	409AX10		3	Fuse, 300A, 700V, Semicond., FU1-3, 120HP
45		298BA2	1	1	Contactor 3 Pole 500V, N. O., 160V NC, PWM-DC Only
46		708AG4	2	2	Resistor 3.5 Ohms, 14.1A (W / mtg. rod and hwd) PWM-DC Only
47	9755615	804AV1	1		Suppressor Assembly, 80HP
		804AV3		1	Suppressor Assembly, 120HP
48	9834886	462EW1	13	13	Harness, IGBT/IIB
49		220CE1	6	6	Harness, 14 conductor ribbon, 3", SPS to Inverter Interface Board
50		200CE2	1	1	Harness, 14 conductor ribbon, 7", SPS to QSS/QSR Interface Board
51	9818546	699AV4	2	2	Resistor, 50 OHM, 100 W, RSS1, RSS2 (not shown)
52	9818534	699AV2	2	2	Resistor, 3.6K OHM, 100 W, R1, R2 (not shown)
53		207AX1	1		Bus Bar, Negative (not shown)
		207AX2		1	Bus Bar, Negative (not shown)
54		207BB!	1		Bus Bar, Positive, RST (not shown)
55		207BB2		1	Bus Bar, Positive, RST (not shown)
56		207BC1	6	6	Bus Bar, Center (not shown)
57		207BA1	1		Bus Bar, Positive, UVW, 80HP (not shown)
58		207BA2		1	Bus Bar, Positive, UVW, 120HP (not shown)
59		781AX2	27	27	Spacer, Copper, .750 O.D., .875 Lg (not shown)
60		462FR1	1	1	Harness, fan (not shown)

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2109AX1, 2109AX2, 80-120HP, 460V, PWM-DC, Regenerative, Stand Alone, Drive Assembly

ITEM	PART NO.	PRINT NO.	2103BG3 80HP	2103BG4 120HP	DESCRIPTION
1	9834850	220CE1	1	1	Harness Assy, 14 Conductor Ribbon. 3″ (SPS to Inverter Interface Board)
2		207AX1	1	1	Bus Bar, Negative, IGBT, 80HP
		207AX2	1	1	Bus Bar, Negative, IGBT, 120HP
3	9834941	844AC1	1	1	Thermostat, 160F, TS2
4	9834953	844AD1	1	1	Thermostat, 120F, TS1
5		834AM4	1	1	Terminal Block, 4 Pos., TB1 (for thermostat connections)
6	9755603	736AN1	4	4	Sensor, Current, 200A, LEM 1 thru 4, 80HP
		736AT1	4	4	Sensor, Current, 300A, LEM 1 thru 4, 120HP
7		155CE1	13	13	IGBT, Single, 400A, 1200V, R, S, T, U, V, W, QSS, 80HP
		472BG9	13	13	Thermostrate Pad, IGBT, 80HP
		155CD1	13	13	IGBT, Single, 600A, 1200V, R, S, T, U, V, W, QSS, 120HP
		472BG10	13	13	Thermostrate Pad, IGBT, 120HP
8		207BC1	6	6	Bus Bar, Center
9		207BB1	1	1	Bus Bar, Positive, RST, 80HP
		207BB2	1	1	Bus Bar, Positive, RST, 120HP
10		166AJ1	2	2	Catch, Cover, Spring, Draw
11		6300HC2	6	6	Inverter Interface Board
12		6300HD3	6	6	Inverter Snubber Board, 80HP
		6300HD4	6	6	Inverter Snubber Board, 120HP
13		6300HG3	1	1	QSS/QSR Interface Board
14		6300HJ3	1	1	QSS/QSR Snubber Board
15	9755329	6300EM2	1	1	Bus Voltage Indicator Board
16		207AY1	2	2	Bus Bar, Capacitor, Narrow
17		207AG5	1	1	Bus Bar, Capacitor, Wide
18		834BL3	2	2	Terminal Block, 3 Pole, 50A
19	9804420	804AC1	1	1	Surge, Suppressor, C1
20	9834618	298AH10	1	1	Contactor, 3 Phase, C1, 80HP, VVVF only
	9834620	298AH11	1	1	Contactor, 3 Phase, C1, 120HP, VVVF only
21	9774737	297AH4	1	1	Contact, Aux., C1, 80HP
	9834631	297AH5	1	1	Contact, Aux., C1, 120HP
22	9755196	238AW1	14		Capacitor, 2000MFD, 450WVDC 80HP
				20	Capacitor, 2000MFD, 450WVDC 120HP
23		596AX1	7		Mount, Capacitor, Dual, Plastic 80HP
				10	Mount, Capacitor, Dual, Plastic 120HP
24		196LC1	1	1	Bracket, Capacitor
25	9853510	689AA1	1	1	Rectifier, Full-wave, 35A, DB1, DB2, BD
26	9719180	378AE1	2	2	Fan, AC, Muffin, 100CFM, 4″ (80HP, 120HP)
		378AH1	2	2	Fan, AC, 220CFM, 6″ (80HP)

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2109AX1, 2103AX2, 80-120HP, 460V, PWM-DC, Regenerative Stand Alone, Drive Assembly (cont.)

ITEM	PART NO.	PRINT NO.	2103BG3 80HP	2103BG4 120HP	DESCRIPTION
27		442AA1	2	2	Finger Guard, 4″ (80HP, 120HP)
		442AD1	2	2	Finger Guard, 6″ (80HP)
28		141936	1	1	Hinge, Lift-off, RH
		141935	2	2	Hinge, Lift-off, LH
29		165LA1	1	1	Shield, Elect. Noise, CR, RCB
30	9834898	462EX1	4	4	Harness, CR/RCB to Current Sensor
31	9834825	220BG1	2	2	Cable Assembly, Flat, 34 Conductor, 4.25″ Lg (CR/SPS; RCB/SPS)
32		221AJ1	2	2	Cable Clamp, Nylon, Hinged
33		6300LR3	1	1	Current Regulator Board
34		132221	41	41	Standoff, $^{5}/_{8}$″ (Mount CR, RCB, SPS)
35	9834849	220CB1	1	1	Cable Assembly, (CR/DSP)
36		220BG2	1	1	Cable Assembly, Flat, 34 Conductor, 9″ Lg (CR/RCB)
37		220CE2	1	1	Harness Assy, 14 cond. ribbon, 7″ (SPS to QSS/QSR Interface Card)
38		6300GC2	1	1	Regenerative Control Board
39		786AH3	2	2	Standoff, Locking, $1^{1}/_{4}$″ (For mtg. RCB guard)
40		451AT1	1	1	Guard, Plastic, High Voltage (RCB guard)
41		462EF2	1	1	Harness, Regen Control to 3 Phase, 80HP
		462EF3	1	1	Harness, Regen Control to 3 Phase, 120HP
42		6300HE1	2	2	Switching Power Supply
43		412AY1	3		Fuseblock, Modular, Stud-type (For FU1 - 3), 80HP
		412AY2		3	Fuseblock, Modular, Stud-type (For FU1 - 3), 120HP
44	9721897	409AX9	3		Fuse, 200A, 700V, Semicond., FU1-3, 80HP
	9721903	409AX10		3	Fuse, 300A, 700V, Semicond., FU1-3, 120HP
45		298BA2	1	1	Contactor 3 Pole 500V, N. O., 160V NC, PWM-DC Only
46		708AG4	2	2	Resistor 3.5 Ohms, 14.1A (W / mtg. rod and hwd) PWM-DC Only
47	9755615	804AV1	1		Suppressor Assembly, 80HP
		804AV3		1	Suppressor Assembly, 120HP
48	9834886	462EW1	13	13	Harness, IGBT/IIB
49		220CE1	6	6	Harness, 14 conductor ribbon, 3", SPS to Inverter Interface Board
50		200CE2	1	1	Harness, 14 conductor ribbon, 7", SPS to QSS/QSR Interface Board
51	9818546	699AV4	2	2	Resistor, 50 OHM, 100 W, RSS1, RSS2 (not shown)
52	9818534	699AV2	2	2	Resistor, 3.6K OHM, 100 W, R1, R2 (not shown)
53		207AX1	1		Bus Bar, Negative (not shown)
		207AX2		1	Bus Bar, Negative (not shown)
54		207BB!	1		Bus Bar, Positive, RST (not shown)
55		207BB2		1	Bus Bar, Positive, RST (not shown)
56		207BC1	6	6	Bus Bar, Center (not shown)
57		207BA1	1		Bus Bar,Positive, UVW, 80HP (not shown)
58		207BA2		1	Bus Bar,Positive, UVW, 120HP (not shown)
59		781AX2	27	27	Spacer, Copper, .750 O.D., .875 Lg (not shown)
60		462FR1	1	1	Harness, fan (not shown)

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Drive Sequencing Diagram

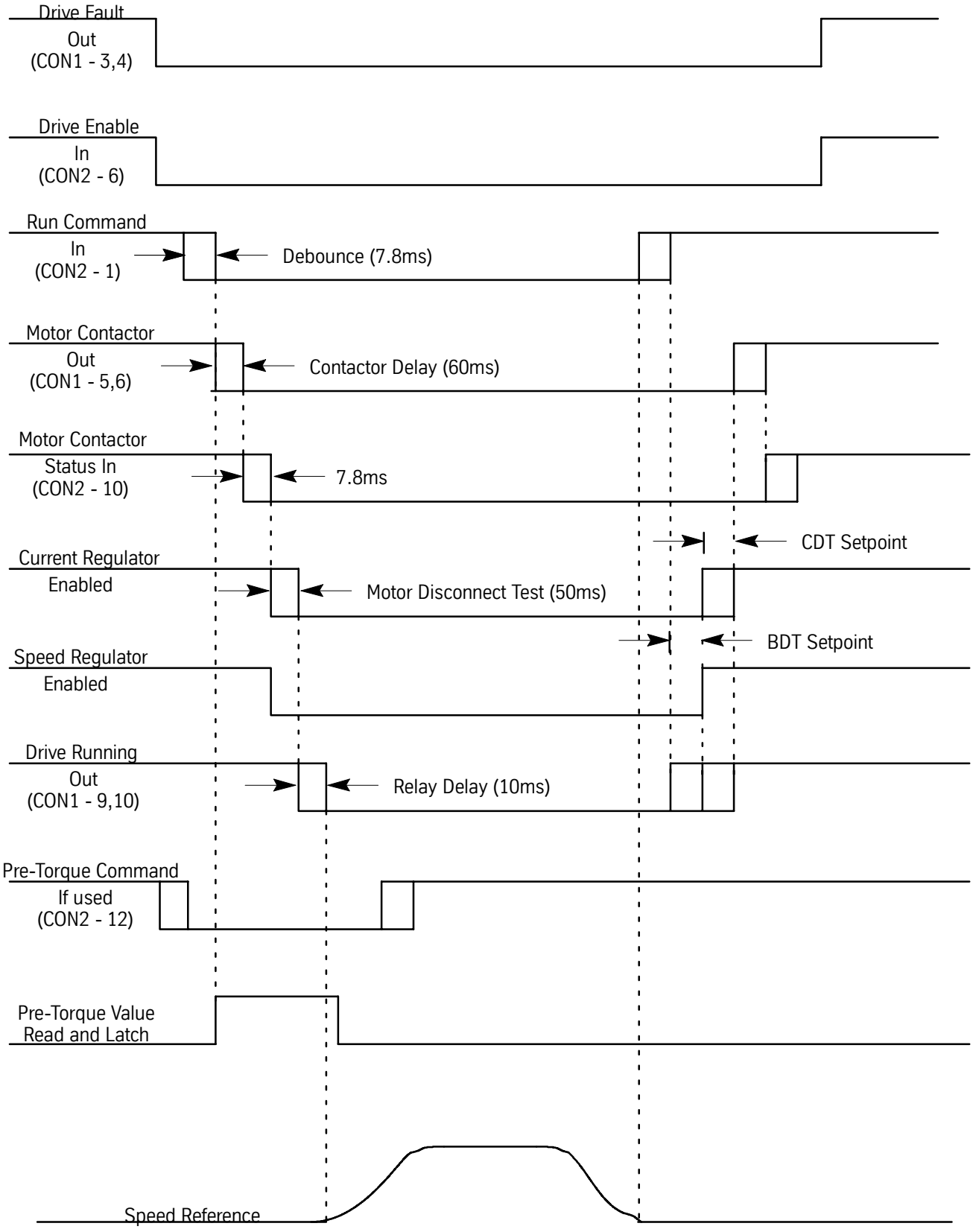

Figure 59

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AC Autotune

Introduction

This document describes the autotune facility implemented in the Stand Alone Drive. This facility allows the user to determine the motor parameters for proper motor operation with the elevator attached. There is no need to hang the car to perform the tuning operation.

The Autotune command is accessed from the Drive menu and performs the following operations:

- Opening banner and navigation information screens
- Motor data setup screens (Nameplate Data)
- Analog Autonull (ADC's & DAC's)
- Motor Stator Resistance measurement
- Motor Stator Leakage Inductance measurement
- Motor Field Current setting
- Motor Slip Frequency setting.

The system is designed to prompt the user through the operation with a minimum amount of manual references required.

NOTES:

- Balanced load may be necessary for the motor field setting step and the screen will prompt for this at the appropriate time.
- Proper encoder/motor phasing is assumed for the autotuning procedure. This condition should be achieved before the car is moved. (AC Motor Start-up and direction check)
- The maximum drive current adjustment must also be set correctly prior to starting the autotune procedure. Adjust MDC to the appropriate value for the drive prior to startup. (See Table 11 for AC motor.)
- The Speed Loop scaling should be set properly for the Field Current and Slip Frequency setting steps. Adjust the CTS and RPM parameters before performing these steps. (See Table 7 and Table 19.)

Tuning Operation

1. Enter the Drive Autotune Utility from the Drive/CMD menu. An opening banner will display "Auto Tune Utility" for a short time and then move to the next informative screen.

2. The instructional screen indicates which key to push to proceed with the utility (ENT) or to exit the utility (ESC). Push the ENT key to continue.

3. The instructional screen now indicates which key to push to skip a step (V = down arrow). Push ENT key to continue.

4. The next steps prompt the user for data from the motor nameplate and then make some initial estimates for motor operating parameters if they have not been set before. The motor data & parameters are:
   - Mtr Amps – Motor Nameplate Current
   - Mtr Volts – Motor Nameplate Voltage
   - Mtr Freq – Motor Nameplate Frequency
   - Mtr RPM – Motor Nameplate RPM
   - Mtr Poles – Number of Motor Poles
   - I Field – Motor Field Current
   - Slip Freq – Motor Slip Frequency

5. Perform an auto-null operation first on the A/D converter and then on the D/A converters. The user will be prompted to energize the drive at the beginning of this procedure. Once the drive is energized, the screen will indicate the progress of the auto-null process.

6. The next step measures the motor stator resistance. Push the ENT key to start the measurement process. The screen will prompt the user to energize the drive. When the process is completed, the resistance will be displayed briefly before moving on to the next auto-tune procedure. De-energize the drive after the measurement is completed.

7. Next, the auto-tune will, if selected, measure the stator transient leakage inductance. Push the ENT key to start the measurement process. As before, the results will be displayed briefly. De-energize the drive after the measurement is completed.

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8. At this point the system will set the field current level. The loading on the drive should be minimized (i.e. Balanced Load). Push the ENT key to select this process. The screen will prompt the user to balance the load on the elevator. The elevator may be moved as needed to load or unload weights. Push the ENT key to start the process. The screen will prompt the user to move the elevator at a test speed determined by the motor data and speed loop adjustments. The elevator should be moved on inspection control at the indicated speed. The screen will display the progress of the process as the system tries different field current settings to achieve the desired flux level in the motor. The final setting will be displayed briefly before moving on to the next auto-tune selection.

9. The final adjustment made by the auto-tune system will set the motor slip frequency. For this test, the elevator loading should be unbalanced to generate a torque requirement to cause slip in the motor. Push the ENT key to select this process. The user will now be prompted to unbalance the load on the elevator. Move the elevator as required to accomplish the desired loading. Empty car is recommended for this test. Push the ENT key to start this procedure. The user will again be prompted to move the elevator at the proper test speed. The screen will display the progress of the process as the system tries different slip frequencies on the motor. The final slip frequency setting will be displayed briefly before indicating the completion of the auto-tune process.

The results of the tuning process will be stored in the drive adjustments. These adjustments may be viewed or edited in the normal manner as desired.

Conclusion

The drive parameter values derived from the autotune process should be sufficient for motor operation. If distortion in the feedback current is seen after the motor heats up, the field current may be reduced and/or the slip frequency may be increased slowly to eliminate distortion.

Current Regulator Boards For AC Autotune Application

Board assembly numbers:

- 6300LR1/6300LR2: 460V drives with AC geared motors only.
- 6300LR3: 460V drives with AC geared or gearless motors. On board jumper selectable as follows:
  - -For AC geared motor: connect J19 pin 1-2, J20 pin 1-2.
  - -For AC gearless motor: connect J19 pin 2-3, J20 pin 2-3 (remember to add 32 to DCN parameter).

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230V AC Non-Regen Drives And Accessories

		AC DRIVES					
	QTY/DRIVE	10HP	15HP	20HP	30HP	40HP	60HP
DRIVE ASSEMBLY	1	2109AP1	2109AP2	2109AP3	2109AP4	2109AP5	2109AP6
AC LINE FUSES	3	409BT4	409BT7	409BT9	409BT11	409BT13	409BT17
AC FUSE BLOCKS	3	412AT1	412AT1	412AT1	412AT1	412AT1	412AT1
AC CHOKES	1	486AR22	486AR25	486AR28	486AR31	486AR34	486AR40
REGEN RESISTORS		708AT2	708AT2	708AT2	708AT2	708AT2	708AT2
(RESISTORS/DRIVE)		2	3	4	6	8	8
(RES BRACKET - LEFT)		196PL3	196PL3	196PL3	196PL3	196PL3	196PL3
(BRACKETS/DRIVE)		1	1	2	2	3	3
(RES BRACKET - RIGHT)		196PL4	196PL4	196PL4	196PL4	196PL4	196PL4
(BRACKETS/DRIVE)		1	1	2	2	3	3
AC MOTOR CONTACTOR	1	298AH2	298AH3	298AH4	298AH5	298AH10	298AH11

230V AC Regen Drives And Accessories

		AC DRIVES		
	QTY/DRIVE	30HP	40HP	60HP
DRIVE ASSEMBLY	1	2109AV1	2109AV2	2109AV3
AC MOTOR CONTACTOR	1	298AH5	298AH10	298AH11

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460V AC Non-Regen Drives And Accessories

		AC DRIVES					
	QTY/DRIVE	10HP	15HP	20HP	30HP	40HP	60HP
DRIVE ASSEMBLY	1	2109AN1	2109AN2	2109AN3	2109AN4	2109AN5	2109AN6
AC LINE FUSES	3	409AV1	409AV1	409AV2	409AV3	409AV4	409AV5
AC FUSE BLOCKS	3	412AT1	412AT1	412AT1	412AT1	412AT1	412AT1
AC CHOKES	1	486AD7	486AD1	486AD2	486AD3	486AD4	486AD5
REGEN RESISTORS		708AT1	708AT1	708AT1	708AT1	708AT1	708AT1
(RESISTORS/DRIVE)		2	3	4	6	8	8
(RES BRACKET - LEFT)		196PL3	196PL3	196PL3	196PL3	196PL3	196PL3
(BRACKETS/DRIVE)		1	1	2	2	3	3
(RES BRACKET - RIGHT)		196PL4	196PL4	196PL4	196PL4	196PL4	196PL4
(BRACKETS/DRIVE)		1	1	2	2	3	3
AC MOTOR CONTACTOR	1	298AH7	298AH1	298AH2	298AH3	298AH4	298AH5

460V AC Regen Drives And Accessories

		AC DRIVES					
	QTY/DRIVE	30HP	40HP	60HP	80HP	120HP	
DRIVE ASSEMBLY	1	2109AW1	2109AW2	2109AW3	2109BA1	2109BA2	
AC MOTOR CONTACTOR	1	298AH3	298AH4	298AH5			

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230V DC Non-Regen Drives And Accessories

		DC DRIVES					
	QTY/DRIVE	10HP	15HP	20HP	30HP	40HP	60HP
DRIVE ASSEMBLY	1	2109AP7	2109AP8	2109AP9	2109AP10	2109AP11	2109AP12
AC LINE FUSES	3	409BT4	409BT7	409BT9	409BT11	409BT13	409BT17
AC FUSE BLOCKS	3	412AT1	412AT1	412AT1	412AT1	412AT1	412AT1
AC CHOKES	1	486AR22	486AR25	486AR28	486AR31	486AR34	486AR40
REGEN RESISTORS		708AT2	708AT2	708AT2	708AT2	708AT2	708AT2
(RESISTORS/DRIVE)		2	3	4	6	8	8
(RES BRACKET - LEFT)		196PL3	196PL3	196PL3	196PL3	196PL3	196PL3
(BRACKETS/DRIVE)		1	1	2	2	3	3
(RES BRACKET - RIGHT)		196PL4	196PL4	196PL4	196PL4	196PL4	196PL4
(BRACKETS/DRIVE)		1	1	2	2	3	3
AC MOTOR CONTACTOR	1						
DC ARM. CONTACTOR	1	298AL5	298AL5	298AL5	298AL5	298AL3	298AL4
DC FIELD CONTACTOR	1	298BA1	298BA1	298BA1	298BA1	298BA1	298BA1

230V DC Regen Drives And Accessories

		DC DRIVES		
	QTY/DRIVE	30HP	40HP	60HP
DRIVE ASSEMBLY	1	2109AV4	2109AV5	2109AV6
AC MOTOR CONTACTOR	1			
DC ARM. CONTACTOR	1	298AL5	298AL3	298AL4
GEARLESS DB RESISTOR	2	708AG5	708AG5	708AG5
(DB RESISTOR BRACKET)	2	196EK2	196EK2	196EK2
DC FIELD CONTACTOR	1	298BA1	298BA1	298BA1

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460V DC Non-Regen Drives And Accessories

		DC DRIVES					
	QTY/DRIVE	10HP	15HP	20HP	30HP	40HP	60HP
DRIVE ASSEMBLY	1	2109AN7	2109AN8	2109AN9	2109AN10	2109AN11	2109AN12
AC LINE FUSES	3	409AV1	409AV1	409AV2	409AV3	409AV4	409AV5
AC FUSE BLOCKS	3	412AT1	412AT1	412AT1	412AT1	412AT1	412AT1
AC CHOKES	1	486AD7	486AD1	486AD2	486AD3	486AD4	486AD5
REGEN RESISTORS		708AT1	708AT1	708AT1	708AT1	708AT1	708AT1
(RESISTORS/DRIVE)		2	3	4	6	8	8
(RES BRACKET - LEFT)		196PL3	196PL3	196PL3	196PL3	196PL3	196PL3
(BRACKETS/DRIVE)		1	1	2	2	3	3
(RES BRACKET - RIGHT)		196PL4	196PL4	196PL4	196PL4	196PL4	196PL4
(BRACKETS/DRIVE)		1	1	2	2	3	3
DC ARM. CONTACTOR	1	298AL5	298AL5	298AL5	298AL5	298AL5	298AL5
DC FIELD CONTACTOR	1	298BA2	298BA2	298BA2	298BA2	298BA2	298BA2

460V DC Regen Drives And Accessories

				DC DRIVES		
	QTY/DRIVE	30HP	40HP	60HP	80HP	120HP
DRIVE ASSEMBLY	1	2109AW4	2109AW5	2109AW6	2109AX1	2109AX2
AC MOTOR CONTACTOR	1					
DC ARM. CONTACTOR	1	298AL5	298AL5	298AL5		
GEARLESS DB RESISTOR	2	708AG4	708AG4	708AG4		
(DB RESISTOR BRACKET)	2			196EK2		
FILTER CHOKE (GEARLESS)	1	486AX27	486AX30	486AX33	486AX36	486AX42
DC FIELD CONTACTOR	1	298BA2	298BA2	298BA2		

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NOTES:

NOTES:

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