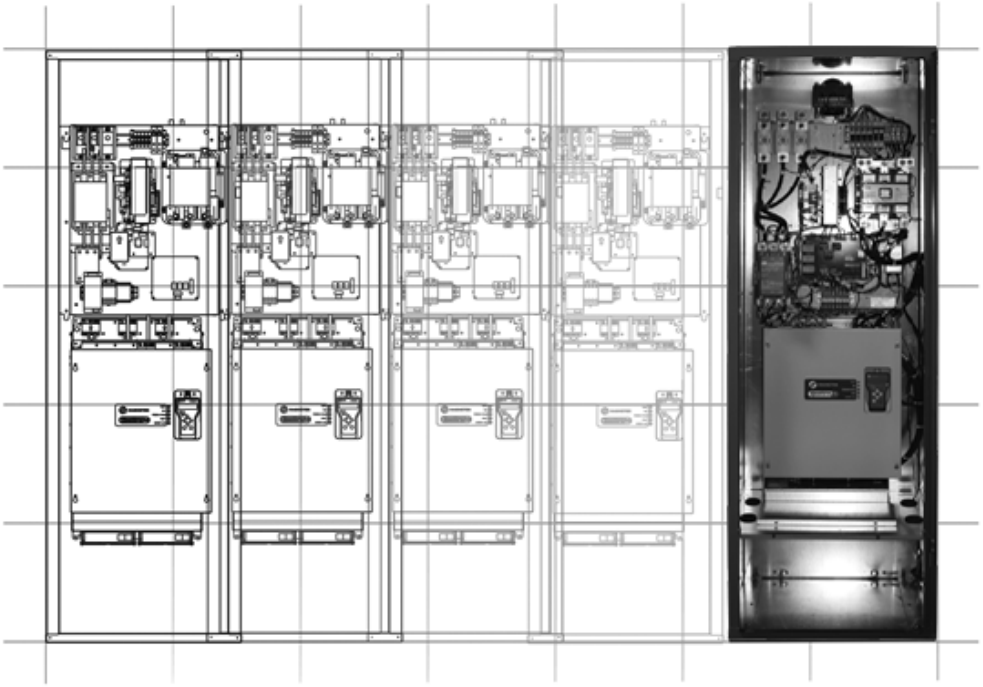
MAGNETEK
ELEVATOR

Quattro™ DC



Quattro™ DC Elevator Drive

Technical Manual

To properly use the product, read this manual thoroughly and retain for easy reference, inspection, and maintenance. Ensure that the end user receives this manual.

TM7337 rev 23

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Quattro™ Startup guide

1. Prior to applying any voltage to the drive complete the following steps.
2. Record the following motor data;
    a. Rated Motor Volts, Amps, Field amps forcing, Field amps running
    b. Rated motor RPM, Rated encoder PPR, Elevator speed (ft/min, m/sec, mm/sec)
    c. If using a friction wheel, find the ratio between wheel and the surface it is riding on
3. Disconnect the motor armature wires and the field wires from the drive;
    a. Using a megger at 500 – 1000V, a good reading is 2Mohms or larger.
        i. Armature
            1. Check A1 to ground
            2. Check A2 to ground
            3. If a breakdown is detected this **must** be addressed before proceeding.
        ii. Field
            1. Check F1 to ground
            2. Check F2 to ground
            3. If a breakdown is detected this **must** be addressed before proceeding.
        iii. Armature - Field
            1. Check A1 /2 to F1 / 2
            2. If a breakdown is detected this must be addressed before proceeding.
    b. Measure the total field resistance (F1 – F2) with a DVOM, record this number.
    c. Measure the resistance of each individual field coil.
    d. Perform an AC drop test on the field coils.
        i. Apply 120 / 240VAC to F1 and F2, measure the AC voltage on each coil.
            1. These numbers should be similar for each coil.
4. Is Quattro configured with the standard field module or the alternate low voltage version?
    a. High voltage module generates motor field current from 1 – 40A. This module will work for all cases and has no additional switches or jumpers to set.
    b. Low voltage module is design for to separate ranges; 1- 20A and 20 -40A. The hardware requires two separate hardware setups to set the range. This module can be identified by the addition of a transformer plugged in at location J3, for the low range this must be located in the ‘A’ position and the high range would be the ‘B’. In addition JP1 jumper must be installed in the ‘A’ location for low and ‘B’ for the high range.

If using the low voltage supply, this quick check should be completed to verify it will work on this specific motor;
Calculate both **Vbus** (DC bus voltage) and **Vf** (voltage required on the motor field to reach full field amps).
Vbus = (Vin x SQRT 2) + DC Bus Voltage Boost (A5), where Vin is the three phase AC voltage applied to the Quattro, if an auto-transformer is used then this would be measured at the secondary, SQRT 2 = 1.41, DC Bus Voltage Boost (A5) is defaulted to 30 and has the range of 15 – 75.
Vf = Full FLD Current (A6) x Field resistance, where the Full FLD Current is the maximum DC current which will be applied to the motor fields, field resistance is obtained by disconnecting the motor field wires at TB3 – 1 and TB3 -2 and measuring the resistance. A typical number for this would be 5 – 100 ohms.
These are the two condition which are being tested;

a. Full FLD Current (A6) less than or equal to 20
    a. **Vbus** / 2 must be greater than or equal to (**Vf** x 1.5)
b. Full FLD Current (A6) greater than 20
    a. **Vbus** / 4 must be greater than or equal to (**Vf** x 1.5)

If either of these conditions are <u>not</u> true then the standard field module must be used

5. Input voltage requirements.

   These are the two equations to calculate to determine the minimum AC voltage applied to the drive based on the conditions;

   - Rated drive amps is the current rating of the Quattro DC drive 125, 150, 200, 250, 300.
   - Full Load Motor Volts is the required voltage to run at contract speed up at full load. If this isn't know use the motor nameplate volts.

   a. V L-L = (((Full Load Motor Voltage X 1.3) – 75) / 1.41)

      Equation 1. Nominal Line to Line voltage

   b. V L-L = ((Rated motor current X Full Load Motor voltage x 0.92) / rated drive amps)

      Equation 2. Nominal Line to Line voltage

The drive will require the larger of the values from Equation 1 and 2. This determines minimum voltage required to operate that motor. If the actual voltage is less than this calculation, then it would be required that the voltage be stepped up. Magnetek has optional Auto transformers specifically designed for this purpose and will fit within the Quattro drive enclosure. If the actual voltage applied to the Quattro exceeds 1.5 x rated motor voltage, then it would be recommended that the voltage be stepped down to closer to 1 to 1.1 times rated motor voltage. The chart shown below provides a method to select an auto transformer.

SUGGESTED AUTO TRANSFORMER OPTIONS FROM MAGNETEK

*** NOTE: MOST TRANSFOMERS ARE 60 HZ ONLY ***

	Building System Vac											
Motor	**200**	**208**	**230**	**240**	**380**	**400**	**415**	**460**	**480**	**550**	**575**	**600**
150 or less	-- (200)	-- (208)	-- (230)	-- (240)	D (208)	Q (232)	Q (240)	F (198)	F (208)	N (220)	N (230)	P (150)
151 - 200	-- (200)	-- (208)	-- (230)	-- (240)	E (240)	Q (232)	Q (240)	F (198)	F (208)	N (220)	N (230)	N (240)
201 - 250	K (252)	K (262)	-- (230)	-- (240)	E (240)	Q (232)	Q (240)	G (230)	G (240)	N (220)	N (230)	N (240)
251 - 300	5 (365)	5 (380)	6 (364)	6 (380)	-- (380)	3/J (316)	3/J (328)	3/J (364)	3/J (380)	4 (363)	4 (380)	M (380)
301 - 350	5 (365)	5 (380)	6 (364)	6 (380)	-- (380)	-- (400)	-- (415)	3/J (364)	3/J (380)	4 (363)	4 (380)	M (380)
351 - 400	5 (365)	5 (380)	6 (364)	6 (380)	-- (380)	-- (400)	-- (415)	-- (460)	3/J (380)	4 (363)	4 (380)	M (380)
401 - 450	EXTERNAL TRANSFORMER ONLY CONTACT MAGNETEK				9/K (480)	-- (400)	-- (415)	-- (460)	-- (480)	C (459)	C (480)	L (480)
451 - 500					9/K (480)	A (480)	B (480)	-- (460)	-- (480)	C (459)	C (480)	L (480)
>500					9/K (480)	A (480)	B (480)	-- (460)	-- (480)	C (459)	C (480)	L (480)

x <-- Indicates transformer option number and primary/secondary wiring connections
(nnn) <-- Indicates actual secondary volts with selected transformer as applied

ID	pri	sec	Hz
L	600	480	60 Hz
M	600	380	60 Hz
N	600	240	60 Hz
P	600	150	60 Hz
C	575	480	60 Hz
4	575	380	60 Hz
H	480	400	60 Hz
I	480	415	60 Hz
3	480	380	60 Hz
J	480	380	50/60 Hz
G	480	240	50/60 Hz
F	480	208	60 Hz
B	415	480	50/60 Hz
Q	415	240	50/60 Hz
A	400	480	50/60 Hz
9	380	480	50/60 Hz
K	380	480	60 Hz
E	380	240	60 Hz
D	380	208	60 Hz
5	208	380	60 Hz
6	240	380	60 Hz

6. Open the fuse holders in the drive labeled F1, 2, 3, 4
7. Apply three phase power to the drive, measure the 230V control power on the line side of F1, F2. This should be between 220 and 240Vac.
8. Turn off the three phase power and close the F1, F2 fuse holders. Re-apply the three phase power. Locate the LV Power Distribution PCB (A10), verify the low voltage DC levels;

    a. Check TP1 +5V, TP3 +15V, TP4 -15V, Reference TP2 COM, TP5 +24V, reference TP6 C_24V.
9. Verify all of the drive parameters are set according to the controller manufacturers recommendations.
10. Close the F3, F4 fuse holders, and clip the meter leads on those same points. Set the meter on DC voltage. Push the PCM relay in for about 1s **(damage will occur if held in longer!!),** then release, the meter should read the line voltage x 1.41. Dropping slowly is normal, quick is not a good condition.
11. Once, the drive has passed all of the steps, the drive is ready to run the auto tune. To start the process, go to the selection 'A4 AUTO TUNE MOTOR'. If it completes with no faults, then go into the A4 menu and select the gain selection method 'Use self-tune', the drive is ready to run the elevator.
12. Next, the field current can be adjusted.
    a. In the A6 menu, there is forcing current, running current and standing current. The forcing current may be on the motor N.P. or perhaps the field voltage is available (FFA = FFV / Field R). After that step is complete, run the elevator from bottom to top at 100% contract speed, adjust the weak field amps until the armature volts measure nameplate. Standing field can be set to 10 – 25% of the forcing current.
13. At balanced load run the elevator from bottom to top, then top to bottom. Look in the D1 menu and locate the Estimated Inertia, enter this as the new inertia in the A1 menu.

Table of Contents

Sub menu	Parameter	Units	Range	Default	Site Setting
A1	***Drive A1 Submenu – See Drive A1 submenu on page 41.***				
A1	CONTRACT CAR SPD	fpm	0.0 – 1500.0	100.0	
		m/s	0.000 – 8.000	2.000	
A1	CONTRACT MTR SPD	RPM	30.0 – 3000.0	50.0	
A1	RESPONSE	rad/sec	1.0 – 20.0	5.0	
A1	INERTIA	sec	0.25 – 10.00	2.00	
A1	INNER LOOP XOVER	rad/sec	0.1 – 20.0	2.0	
A1	CURRENT LIMIT	%	0.0 – 300.0	250.0	
A1	GAIN REDUCE MULT	%	10 – 100	100	
A1	GAIN CHNG LEVEL	% of rated spd	0.0 – 100.0	100.0	
A1	TACH FILTER BW	rad/sec	1 – 100	100	
A1	TACH RATE GAIN	none	0.0 – 30.0	0.0	
A1	SPD PHASE MARGIN	degrees	45 – 90	80	
A1	RAMPED STOP TIME	sec	0.00 – 2.50	0.20	
A1	CONTACT FLT TIME	sec	0.10 – 5.00	0.50	
A1	BRAKE PICK TIME	sec	0.00 – 5.00	1.00	
A1	BRAKE HOLD TIME	sec	0.00 – 5.00	0.50	
A1	OVERSPEED LEVEL	% of contract spd	90.0 – 150.0	115.0	
A1	OVERSPEED TIME	sec	0.00 – 9.99	0.10	
A1	OVERSPEED MULT	%	100.0 – 150.0	125.0	
A1	ENCODER PULSES	PPR	600 – 20000	5000	
A1	ENC RATIO MULT	none	0.001 – 32.000	1.000	
A1	SPD DEV LO LEVEL	% of contract spd	0.1 – 20.0	10.0	
A1	SPD DEV TIME	sec	0.00 – 9.99	0.50	
A1	SPD DEV HI LEVEL	% of contract spd	0.0 – 99.9	10.0	
A1	SPD COMMAND BIAS	volts	-6.00 – +6.00	0.00	
A1	SPD COMMAND MULT	none	0.90 – 5.00	1.00	
A1	EXT TORQUE BIAS	volts	-6.00 – +6.00	0.00	
A1	EXT TORQUE MULT	none	-10.00 – +10.00	1.00	
A1	PRE TORQUE TIME	sec	0.00 –10.00	0.00	
A1	ZERO SPEED LEVEL	% of contract spd	0.00 – 99.99	1.00	
A1	ZERO SPEED TIME	sec	0.00 – 9.99	0.10	
A1	UP/DWN THRESHOLD	% of contract spd	0.00 – 9.99	1.00	
A1	ANA 1 OUT OFFSET	%	-99.9 – +99.9	0.0	
A1	ANA 2 OUT OFFSET	%	-99.9 – +99.9	0.0	
A1	ANA 1 OUT GAIN	none	0.0 – 10.0	1.0	
A1	ANA 2 OUT GAIN	none	0.0 – 10.0	1.0	
A1	FLT RESET DELAY	sec	0 – 120	5	
A1	FLT RESETS/HOUR	faults	0 – 10	3	
A1	UP TO SPD. LEVEL	% of contract spd	0.00 – 110.00	90.00	
A1	RUN DELAY TIMER	sec	0.00 – 0.99	0.00	
A1	AB ZERO SPD LEV	%	0.00 – 2.00	1.00	
A1	AB OFF DELAY	sec	0.00 – 9.99	0.00	
A1	CONTACTOR DO DLY	sec	0.00 – 5.00	0.00	
A1	TRQ LIM MSG DLY	sec	0.00 – 10.00	0.50	
A1	ARB MODE	none	0 - 2	0	
A1	ARB BANDWIDTH	RAD	1.00 – 15.00	6.00	
A1	ARB DAMPING	none	0.01 – 20.00	2.00	
A1	ARB SPEED THRESHOLD	none	0.00 – 10.00	0.00	
A1	NOTCH FILTER FRQ	Hz	5 – 60	20	
A1	NOTCH FILT DEPTH	%	0 – 100	0	
A1	STNDBY FLD TIME	sec	0 – 999	5	

Sub menu	Parameter	Units	Range	Default	Site Setting
A1	DSPR TIME	min	0 – 546	10	
A1	FULL FIELD FLT TIME	min	0 – 99	1	
A1	SER2 INSP SPD	ft/s2	0 – 100	30	
		m/s2	**0 – 0.500**	0.150	
A1	SER2 RS CRP SPD	ft/s2	0 – 300	10	
		m/s2	0 – 1.540	0.050	
A1	SER2 RES CRP TIME	Sec	0 – 200.0	180	
A1	SER2 FLT TOL	Sec	0 – 2.00	0.5	
A2	***S-Curves A2 Submenu – See S-Curves A2 submenu on page 51.***				
A2	ACCEL RATE 0	ft/s^2	0.00 – 7.99	7.99	
		m/s^2	0.000 – 3.999	2.000	
A2	DECEL RATE 0	ft/s^2	0.00 – 7.99	7.99	
		m/s^2	0.000 – 3.999	2.000	
A2	ACCEL JERK IN 0	ft/s^3	0.0 – 29.9	0.0	
		m/s^3	0.00 – 9.99	0.00	
A2	ACCEL JERK OUT 0	ft/s^3	0.0 – 29.9	0.0	
		m/s^3	0.00 – 9.99	0.00	
A2	DECEL JERK IN 0	ft/s^3	0.0 – 29.9	0.0	
		m/s^3	0.00 – 9.99	0.00	
A2	DECEL JERK OUT 0	ft/s^3	0.0 – 29.9	0.0	
		m/s^3	0.00 – 9.99	0.00	
A2	ACCEL RATE 1	ft/s^2	0.00 – 7.99	7.00	
		m/s^2	0.000 – 3.999	0.090	
A2	DECEL RATE 1	ft/s^2	0.00 – 7.99	3.00	
		m/s^2	0.000 – 3.999	0.090	
A2	ACCEL JERK IN 1	ft/s^3	0.0 – 29.9	8.0	
		m/s^3	0.00 – 9.99	2.40	
A2	ACCEL JERK OUT 1	ft/s^3	0.0 – 29.9	8.0	
		m/s^3	0.00 – 9.99	2.40	
A2	DECEL JERK IN 1	ft/s^3	0.0 – 29.9	8.0	
		m/s^3	0.00 – 9.99	2.40	
A2	DECEL JERK OUT 1	ft/s^3	0.0 – 29.9	8.0	
		m/s^3	0.00 – 9.99	2.40	
A2	ACCEL RATE 2	ft/s^2	0.00 – 7.99	3.00	
		m/s^2	0.000 – 3.999	0.090	
A2	DECEL RATE 2	ft/s^2	0.00 – 7.99	3.00	
		m/s^2	0.000 – 3.999	0.090	
A2	ACCEL JERK IN 2	ft/s^3	0.0 – 29.9	8.0	
		m/s^3	0.00 – 9.99	2.40	
A2	ACCEL JERK OUT 2	ft/s^3	0.0 – 29.9	8.0	
		m/s^3	0.00 – 9.99	2.40	
A2	DECEL JERK IN 2	ft/s^3	0.0 – 29.9	8.0	
		m/s^3	0.00 – 9.99	2.40	
A2	DECEL JERK OUT 2	ft/s^3	0.0 – 29.9	8.0	
		m/s^3	0.00 – 9.99	2.40	
A2	ACCEL RATE 3	ft/s^2	0.00 – 7.99	3.00	
		m/s^2	0.000 – 3.999	0.090	
A2	DECEL RATE 3	ft/s^2	0.00 – 7.99	3.00	
		m/s^2	0.000 – 3.999	0.090	
A2	ACCEL JERK IN 3	ft/s^3	0.0 – 29.9	8.0	
		m/s^3	0.00 – 9.99	2.40	
A2	ACCEL JERK OUT 3	ft/s^3	0.0 – 29.9	8.0	
		m/s^3	0.00 – 9.99	2.40	
A2	DECEL JERK IN 3	ft/s^3	0.0 – 29.9	8.0	
		m/s^3	0.00 – 9.99	2.40	

Sub menu	Parameter	Units	Range	Default	Site Setting
A2	DECEL JERK OUT 3	ft/s^3	0.0 – 29.9	8.0	
		m/s^3	0.00 – 9.99	2.40	
A2	ACCEL RATE 4	ft/s^3	0.0 – 7.99	5	
		m/s^3	0.000 – 3.999	1.52	
A2	DECEL RATE 4	ft/s^3	0.0 – 7.99	5	
		m/s^3	0.000 – 3.999	1.52	
A2	ACCEL JERK IN 4	ft/s^3	0.0 – 29.9	0	
		m/s^3	0.00 – 9.99	0	
A2	ACCEL JERK OUT 4	ft/s^3	0.0 – 29.9	0	
		m/s^3	0.00 – 9.99	0	
A2	DECEL JERK IN 4	ft/s^3	0.0 – 29.9	0	
		m/s^3	0.00 – 9.99	0	
A2	DECEL JERK OUT 4	ft/s^3	0.0 – 29.9	0	
		m/s^3	0.00 – 9.99	0	
A3	***Multistep Ref A3 Submenu – See Multistep Ref A3 submenu on page 53.***				
A3	SPEED COMMAND 1	ft/min	-3000.0 – +3000.0	0.0	
		m/sec	-16.000 – +16.000	0.000	
A3	SPEED COMMAND 2	ft/min	-3000.0 – +3000.0	0.0	
		m/sec	-16.000 – +16.000	0.000	
A3	SPEED COMMAND 3	ft/min	-3000.0 – +3000.0	0.0	
		m/sec	-16.000 – +16.000	0.000	
A3	SPEED COMMAND 4	ft/min	-3000.0 – +3000.0	0.0	
		m/sec	-16.000 – +16.000	0.000	
A3	SPEED COMMAND 5	ft/min	-3000.0 – +3000.0	0.0	
		m/sec	-16.000 – +16.000	0.000	
A3	SPEED COMMAND 6	ft/min	-3000.0 – +3000.0	0.0	
		m/sec	-16.000 – +16.000	0.000	
A3	SPEED COMMAND 7	ft/min	-3000.0 – +3000.0	0.0	
		m/sec	-16.000 – +16.000	0.000	
A3	SPEED COMMAND 8	ft/min	-3000.0 – +3000.0	0.0	
		m/sec	-16.000 – +16.000	0.000	
A3	SPEED COMMAND 9	ft/min	-3000.0 – +3000.0	0.0	
		m/sec	-16.000 – +16.000	0.000	
A3	SPEED COMMAND 10	ft/min	-3000.0 – +3000.0	0.0	
		m/sec	-16.000 – +16.000	0.000	
A3	SPEED COMMAND 11	ft/min	-3000.0 – +3000.0	0.0	
		m/sec	-16.000 – +16.000	0.000	
A3	SPEED COMMAND 12	ft/min	-3000.0 – +3000.0	0.0	
		m/sec	-16.000 – +16.000	0.000	
A3	SPEED COMMAND 13	ft/min	-3000.0 – +3000.0	0.0	
		m/sec	-16.000 – +16.000	0.000	
A3		ft/min	-3000.0 – +3000.0	0.0	

Sub menu	Parameter	Units	Range	Default	Site Setting
	SPEED COMMAND 14	m/sec	-16.000 – +16.000	0.000	
A3	SPEED COMMAND 15	ft/min	-3000.0 – +3000.0	0.0	
		m/sec	-16.000 – +16.000	0.000	

Sub menu	Parameter	Units	Range	Default	Site Setting
A4	***Motor Side Power Convert A4 Submenu – See Motor Side Power Convert on page 55.***				
A4	ARM INDUCTANCE	mH	0.01 – 327.67	10.00	
A4	ARM RESISTANCE	ohm	0.0001 – 2.9999	0.1000	
A4	MOTOR FIELD RES	ohm	0.0 – 3276.7	9.0	
A4	MOTOR FIELD TC	sec	0.000 – 32.767	0.607	
A4	AUTO TUNE MOTOR	none	Start Autotune?	-	
A4	GAIN SELECTION	none	– manual – use saved par – use self-tune	MANUAL	
A4	GAIN BANDWIDTH A	rad/sec	– 100 – 2000	500	
A4	GAIN BANDWIDTH F	rad/sec	1 – 40	5	
A4	SPD MODEFILT BW	rad/sec	5 – 110	100	
A4	PWM FREQUENCY	kHz	2.5 – 16.0	6.0	
A4	UV ALARM LEVEL	%	80 – 99	90	
A4	UV FAULT LEVEL	%	50 – 99	80	
A4	FLD CARRIER FRQ	kHz	3 – 40	3	
A5	***Line Side Power converter A5 Submenu – See Line Side Power Converter on page 57.***				
A5	Id REG PROP GAIN	none	0 – 9.99	0.30	
A5	Id REG INTGRL GAIN	none	0 – 999	10	
A5	Iq REG PROP GAIN	none	0.00 – 9.99	0.30	
A5	Iq REG INTGRL GAIN	none	0 – 999	40	
A5	DC BUS REG P GAIN	none	0.00 – 9.99	3.00	
A5	DC BUS REG I GAIN	none	0 – 999	40	
A5	INPUT L-L VOLTS	volts	150 – 480	200	
A5	INITIAL L FREQ	Hz	50 – 60	55	
A5	DC BUS V BOOST	volts	15 – 75	30	
A5	SW BUS OV LEVEL	volts	100 – 850	850	
A5	BUS VREF SOURCE	none	– track line v trk vin param	TRACK LINE V	
A5	PLL FILTER FC	Hz	– 20.0 – 150.0	40.0	
A5	POLE FILTER	kHz	0.1 – 3.0	2.2	
A5	PRE CHGE THRESH	none	1 – 60	28	
A5	LS PWM FREQUENCY	kHz	8.0 – 12.0	10.0	

Sub menu	Parameter	Units	Range	Default	Site Setting
A6	***Motor A6 Submenu – See Motor Parameters A6 submenu on page 59.***				
A6	MOTOR ID	None	-	-	
A6	RATED MOTOR CURR	amps	1.0 – 400.0	0.0	
A6	ARMATURE VOLTAGE	volts	55 – 600	0	
A6	FULL FLD CURRENT	amps	1.0 – 40.0	0.0	
A6	WEAK FLD CURRENT	amps	1.0 – 40.0	0.0	
A6	STANDBY FIELD	amps	0.0 – 40.0	0.0	
A6	FLUX CONFIRM LEV	%	25.0 – 99.0	85.0	
A6	ARMATURE IR DROP	%	0.0 – 25.0	0.0	
A6	TACH VOLT SENSE	%	0.1 – 60.0	25.0	
A6	TACH SPEED SENSE	%	0.1 – 40.0	5.0	
A6	OVLD START LEVEL	%	100 – 150	110	
A6	OVLD TIME OUT	sec	5.0 – 120.0	60.0	
A6	SAVE MEAS ARM L	mH	0.00 – 327.67	0.00	
A6	SAVE IR DROP	%	0.0 – 3276.7	0.0	
A6	SAVE MEAS ARM R	ohm	0.0000 – 3.2767	0.0000	
A6	SAVE FIELD RES	ohm	0.0 – 3276.7	0.00	
A6	SAVE FIELD TC	sec	0.000 – 32.767	0.000	
C1	***User Switches C1 Submenu – See User Switches C1 submenu on page 64.***				
C1	SPD COMMAND SRC	none	– serial – multi-step – ser mult step – analog input	MULTI-STEP	
C1	RUN COMMAND SRC	none	– external tb – serial – serial+extrn	EXTERNAL TB	
C1	FIELD ENA SOURCE	none	– external tb – serial – enable on run – 2-bit serial	ENABLE ON RUN	
C1	HI/LO GAIN SRC	none	– internal – external tb – serial	INTERNAL	
C1	SPEED REG TYPE	none	– elev spd reg – pi speed reg – external reg – cemf reg	ELEV SPD REG	
C1	MOTOR ROTATION	none	– forward – reverse	FORWARD	
C1	ENCODER CONNECT	none	– forward – reverse	FORWARD	
C1	SPD REF RELEASE	none	– reg release – brake picked	REG RELEASE	
C1	*CONT CONFIRM SRC*	*none*	*external tb*	*EXTERNAL TB*	*fixed*
C1	TACH FILTER	none	– Off – On	OFF	
C1	PreTorque SOURCE	none	– none – analog input – serial	NONE	
C1	PreTorque LATCH	none	– latched – not latched	NOT LATCHED	
C1	PTorq LATCH CLCK	none	– external tb – serial	EXTERNAL TB	
C1	OVERSPD TEST SRC	none	– external tb – serial	EXTERNAL TB	

Sub menu	Parameter	Units	Range	Default	Site Setting
C1	**User switches C1 Submenu continued …**				
C1	FAULT RESET SRC	none	– external tb – serial – automatic	EXTERNAL TB	
C1	BRAKE PICK SRC	none	– internal – serial	INTERNAL	
C1	BRAKE PICK CNFM	none	– none – external tb – internal time – on speed cmd	NONE	
C1	BRAKE HOLD SRC	none	– internal – serial	INTERNAL	
C1	RAMPED STOP SEL	none	– none – ramp on stop	NONE	
C1	RAMP DOWN EN SRC	none	– external tb – run logic – serial	EXTERNAL TB	
C1	BRK PICK FLT ENA	none	– disable – enable	DISABLE	
C1	BRK HOLD FLT ENA	none	– disable – enable	DISABLE	
C1	EXT TORQ CMD SRC	none	– none – serial – analog input	NONE	
C1	DIR CONFIRM	none	– disabled – enabled	DISABLED	
C1	S-CURVE ABORT	none	– disabled – enabled	DISABLED	
C1	PRIORITY MESSAGE	none	– disable – enable	ENABLE	
C1	STOPPING MODE	none	– immediate – ramp to stop	IMMEDIATE	
C1	AUTO STOP	none	– enable – disable	DISABLE	
C1	DSPR ENABLE	none	– disable – enable	DISABLE	
C1	ARB SELECT	none	– disable – enable	DISABLE	
C1	SERIAL MODE	none	– none – mode 1 – mode 2 – mode 2 Test	NONE	
C1	SER2 FLT MODE	none	– immediate – run remove – rescue	IMMEDIATE	
C1	NTSD Mode	none	– external – 1 threshold – 2 thresholds – 3 thresholds	EXTERNAL	C1
C1	DSPR ENABLE	none	– disable – enable	DISABLE	

Sub menu	Parameter	Units	Range	Default	Site Setting
C2	***Logic Inputs C2 Submenu – See Logic Inputs C2 submenu on page 78.***				
C2	*N.C. INPUTS*	none	Hex Number	*0X01*	
C2	*LOGIC INPUT 1 TB1(1)*	– contact cfirm – ctr pwr sense – drive enable – extrn fault 1 – extrn fault 2 – extrn fault 3 – extrn /flt 4 – fault reset – field enable – low gain sel – mech brk hold – mech brk pick – no function – ospd test src – ntsd input1	– ntsd input 2 – pre-trq latch – run – run 2 – run down – run up – s-curve sel 0 – s-curve sel 1 – ser2 insp ena – step ref b0 – step ref b1 – step ref b2 – step ref b3 – trq ramp down – up/dwn	*CONTACT CFIRM*	*fixed*
	LOGIC INPUT 2 TB1(2)			*CTR PWR SENSE*	*fixed*
	LOGIC INPUT 3 TB1(3)				
	LOGIC INPUT 4 TB1(4)				
	LOGIC INPUT 5 TB1(5)				
	LOGIC INPUT 6 TB1(6)				
	LOGIC INPUT 7 TB1(7)				
	LOGIC INPUT 8 TB1(8)				
	LOGIC INPUT 9 TB1(9)				
C3	**Logic Outputs C3 Submenu – See Logic Outputs C3 submenu on page 70**				
	LOGIC OUTPUT 1 TB1(25	– alarm – alarm+flt – auto brake – b. ena status – brake hold – brake pick – brk hold flt – brk pick flt – car going dwn – car going up – charge fault – close contact – contactor flt – curr reg flt – drv overload – encoder flt – fault – flux confirm – ground fault – in low gain – motor trq lim – mtr overload – no faults	– no function – not alarm – ntsd Active – over curr flt – overspeed flt – overtemp flt – overvolt flt – ovrtemp alarm – phase fault – ramp down ena – ready 2 start – ready to run – regen trq lim – run commanded – run confirm – speed dev – speed dev low – speed ref rls – speed reg rls – undervolt flt – up to speed – uv alarm – zero speed	CLOSE CONTACT	
	LOGIC OUTPUT 2 TB1(26)			RUN COMMANDED	
	LOGIC OUTPUT 3 TB1(27)			MTR OVERLOAD	
	LOGIC OUTPUT 4 TB1(28)			ENCODER FLT	
	LOGIC OUTPUT 5 TB1(29)			FAULT	
	LOGIC OUTPUT 6 TB1(30)			SPEED REG RLS	
	LOGIC OUTPUT 7 TB1(31)			SPEED REG RLS	
	SSR1 TB1(21/22)			NO FUNCTION	
	SSR2 TB1(23/24)			NO FUNCTION	
	RELAY COIL 1 TB2(1/3/5)			NO FUNCTION	
	RELAY COIL 2 TB2(8/10/12)			NO FUNCTION	
C4	**Analog Outputs C4 Submenu – See analog Outputs C4 submenu on page 72**				
C4	ANA OUT 1 TB1-12	– analog addr2 – analog addr3 – arb state – arm current – arm voltage	– pretorque ref – motor mode – spd rg tq cmd – speed command – speed error	SPEED REF	

Sub menu	Parameter	Units	Range	Default	Site Setting
C4	ANA OUT 2 TB1-13	– aux torq cmd – bus voltage – est motor spd – field current – iarm error – ls pwr input	– speed feedbk – speed ref – tach rate cmd – tach speed – torque ref - drive overload	SPEED FEEDBK	

Menu	***Parameter***	***Unit***
D1	***Elevator Data Submenu***	
D1	Speed Command	ft/min or m/sec
D1	Speed Reference	ft/min or m/sec
D1	Speed Feedback	ft/min or m/sec
D1	Motor Speed	RPM
D1	Speed Error	ft/min or m/sec
D1	Pre-Torque Ref	% of rated torque
D1	Pre-Torq Last	% of rated torque
D1	Ext-Torque Cmd	% of rated current
D1	Spd Reg Torq Cmd	% of rated torque
D1	Tach Rate Cmd	% of rated torque
D1	Aux Torque Cmd	% of rated torque
D1	Est Inertia	Seconds
D1	Rx Com Status	1 = true; 0 = false
D1	RX Error Count	Counts
D1	Logic Outputs	1 = true; 0 = false
D1	Logic Inputs	1 = true; 0 = false
D1	Rx Logic Input	1 = true; 0 = false
D1	NTSD 1 Spd Fdbk	ft/min or m/sec
D1	NTSD 2 Spd Fdbk	ft/min or m/sec
D1	NTSD 3 Spd Fdbk	ft/min or m/sec
D2	***MS Power Data Submenu***	
D2	Armature Current	Amps
D2	Field Current	Amps
D2	Armature Voltage	Volts
D2	MS Bus Voltage	Volts
D2	Motor Mode	None
D2	Motor Overload	%
D2	Torque Ref	%
D2	Est Spd Fdbk	ft/min or m/sec
D2	Encoder Speed	ft/min or m/sec
D2	Analog Addess2	none
D2	Analog Addess3	none
D2	DS Module Temp.	°C
D2	LS Module Temp.	°C
D2	Highest Temp.	°C
D2	Field IGBT Temp.	°C
D2	Armature Cur Err	Amps
D2	Auto Meas Arm L	mH
D2	Auto Meas IRDrop	%
D2	Auto Meas Arm R	Ohm
D2	Auto Field Res	Ohm
D2	Auto Field Tc	sec
D3	***LS Power Data Submenu***	
D3	LS Power Input	kW
D3	DC Bus Volts	Volts
D3	DC Bus Volts Ref	Volts
D3	LS Overload	%
D3	LS Input Current	Amps
D3	LS D Axis I	%

Menu	***Parameter***	***Unit***
D3	LS Q Axis I	%
D3	LS D Axis V	%
D3	LS Q Axis V	%
D3	Input Hz	Hz
D3	Input Vab	Volts
D3	Input Vca	Volts
D3	LS Module Temp	°C

Menu	***Parameter***	***Unit***
U1	***Password U1 Submenu***	
U1	Enter password	-
U1	New password	-
U1	Password Lockout	-
U2	***Hidden Items U2 Submenu***	
U2	Hidden Items Enable	-
U3	***Units U3 Submenu***	
U3	Units Selection	-
U4	***Ovrspeed Test U4 Submenu***	
U4	Overspeed Test	-
U5	***Restore Dflts U5 Submenu***	
U5	Restore Motor Defaults	-
U5	Restore Drive Defaults	-
U5	Restore Utility Defaults	-
U6	***Motor Side Info U6 Submenu***	
U6	MS Type	-
U6	MS Platform	-
U6	Field Module	-
U6	MS Code Version	-
U6	MS S/W Date	-
U6	MS S/W Time	-
U6	MS PIB Module	-
U6	MS FPGA Revision	-
U6	MS Cube ID	-
U7	***Line Side Info U7 Submenu***	
U7	LS Type	-
U7	LS Code Version	-
U7	LS S/W Date	-
U7	LS S/W Time	-
U7	LS FPGA Rev	-
U7	LS Cube ID	-
U8	***Hex Monitor1 U8 Submenu***	
U8	Addr1	-
U8	Addr2&	
U8	Addr3&	
F1	***Active Faults F1 Submenu***	
F1	Display Active Faults	-
F1	Reset Active Faults	-
F2	***Faults History F2 Submenu***	
F2	Display Fault History	-
F2	Clear Fault History	-
F2	Display Fault Counters	-

Introduction

Drive Ratings and Specifications

The Quattro drive is designed for connection to a 4 wire grounded 3-phase input along with a single-phase 230 VAC control power input.

Basic Drive Specifications

- 125, 150, 200, 250, 300 amps DC armature output (Elevator Run Current) at up to 550VDC in 2 basic model sizes
- 150% overload for 60 seconds
- 250% overload for 6 seconds

- Up to 40 ADC motor field control
- <8% utility input current harmonics at full power (<5% on 125 amp unit)
- Unity Power Factor (1.0 Service Factor)
- 0–45ºC (32–115ºF) ambient temp range
- Fully regenerative operation
- Includes motor armature contactor w/ provision for armature DB resistors
- 4+ Million Start-Stop operating cycles
- (9) 24VDC Programmable Logic Inputs
- (11) Programmable Logic Outputs:
  - (7) 24VDC
  - (2) Solid-State Relays
  - (2) Relays
- 5V or 12V Isolated encoder power source w/ differential receivers

Service Conditions

- Required: 200-480 VAC, 3-phase, 50/60 Hz input power, Line Impedance Z < 6%
- Required: 220-240 VAC, single-phase control power, 50/60 Hz,2.6 amps (min).

Software Operating Features

The General Purpose Quattro-DC elevator drive is a four-quadrant torque and speed regulated motor drive with low power line harmonic currents and unity power factor. It can be configured to operate geared and gearless elevators and lifts. Basic features include...

- User choice of operating speed reference *(see pg 33)*
  - External analog reference follower
  - Serial link reference follower
  - Internal reference generator with controlled S-Curve smoothing to one of 15 preset speeds
- User choice of ft/min or m/sec speed programming and display units *(see pg 90)*
- User choice of input control logic for Run-Up / Run-Down or Run / Direction relay control with internal preset speeds *(see pg 33)*
- User choice of P-I type or MagneTek exclusive E-Reg, elevator velocity regulators *(see pages 74 and 74)*
- Optional CEMF speed regulator for use during initial construction stage start-up
- Torque Feed-Forward when available from the car controller *(see pg 33)*
- Pre-Torque at drive start to reduce roll-back *(see pg 33)*
- Controlled torque Ramp-Down to prevent elevator brake thumping at stops *(see pg 33)*
- Internal frequency notch filter to reject rope resonance interference *(see pg 49)*
- Closed loop motor field current regulator with simplified motor field weakening and stand-by adjustments
- Drive Stand-by Power Reduction *(see pg 34)*
- User selectable choices for relay logic outputs, including *(see Logic Outputs C3 submenu on pg 81)*:
  - Drive OK / No Faults relay
  - Alarms Relay
  - Drive operating, OK to release brake
  - Car above/below speed X threshold
  - Car above/below Zero speed threshold
  - Car Moving Up
  - Car Moving Down
  - Speed Error above/below X threshold for Y secs
  - Drive Standby Power Reduction (DSPR)
  - Elevator Brake actuation
- User selectable analog trace outputs for system diagnostics *(see Analog Outputs C4 submenu on pg 83)*
- Diagnostic indicator for verifying logic input and output conditions
- Programmable Alarm Relay to indicate important but non-critical conditions
  - Motor thermostat over-temperature
  - Motor Over-Load
  - Drive Over-Heating
  - Low Utility Line Input
- Safety related fault trapping with diagnostics, including:
  - Motor Over-Current
  - Motor field Malfunction
  - Contactor Failure
  - Severe Utility Line disturbances
  - Encoder Loss
  - Over-Speed Trip
- User selectable automatic or external commanded Fault Reset *(see User Switches C1 submenu on pages 64-72)*
- EN81-1 Safe Off Feature, single contactor

Drive Model Numbers

The Quattro DC drive is currently available with five different output currents and a variety of options.

The enclosure option consists of a customer I/O panel. The customer I/O panel is an optional larger width cabinet that allows for customer interfacing within the supplied cabinet. See Dimensions / Weights on page 141.

The final option section determines the type of motor contactor requested, Armature Filter, Field Filter, Low Voltage Field Supply, and Magnetek Operator. The Magnetek Operator is not required to start running, but allows for easy access to parameters, overspeed test, and auto tuning. For more information on the Low Voltage Field Supply (LV Field Supply), please see Low Voltage Field Module on page 154. For instances where the Low Voltage Field Module will work, it is recommended by Magnetek.

Part Number Definition

QDC AAA-1BCD-EE

AAA = output current rating
125 = 125A output current
150 = 150A output current
200 = 200A output current
250 = 250A output current
300 = 300A output current

B = enclosure options
6 = no customer I/O panel
7 = customer I/O panel

C = auto transformer options
0 = no Auto Transformer included
3 = 480VAC:380VAC transformer 60Hz
4 = 575VAC:380VAC transformer 60Hz
5 = 208VAC:380VAC transformer 60Hz
6 = 240VAC:380VAC transformer 60Hz
7 = 208VAC:480VAC transformer 60Hz
8 = 240VAC:480VAC transformer 60Hz
9 = 380VAC:480VAC transformer 50/60Hz
A = 400VAC:480VAC transformer 50/60Hz
B = 415VAC:480VAC transformer 50/60Hz
C = 575VAC:480VAC transformer 60Hz
D = 380VAC:208VAC transformer 60Hz
E = 380VAC:240VAC transformer 60Hz
F = 480VAC:208VAC transformer 60Hz
G = 480VAC:240VAC transformer 60Hz
H = 480VAC:400VAC transformer 50/60Hz
I = 480VAC:415VAC transformer 50/60Hz
J = 480VAC:380VAC transformer 50/60Hz
K = 380VAC:480VAC transformer 60Hz
L = 600VAC:480VAC transformer 60Hz
M = 600VAC:380VAC transformer 60Hz
N = 600VAC:240VAC transformer 60Hz
P = 600VAC:150VAC transformer 60Hz
Q = 415VAC:240VAC transformer 50/60Hz

D = control transformer options
1 = no control transformer included

D = control transformer options (cont)
3 = 208VAC input to control transformer
4 = 230VAC input to control transformer
5 = 240VAC input to control transformer
6 = 416VAC input to control transformer
7 = 460VAC input to control transformer
8 = 480VAC input to control transformer
9 = 550VAC input to control transformer
A = 575VAC input to control transformer
B = 600VAC input to control transformer

EE = options
00 = No Operator, Single Contactor, No Filters, Std Field Supply
01 = Operator, Single Contactor, No Filters, Std Field Supply
02 = No Operator, Dual Contactor, No Filters, Std Field Supply
03 = Operator, Dual Contactor, No Filters, Std Field Supply
04 = No Operator, Single Contactor, 1 Inductor Arm Filter, Std Field Supply
05 = Operator, Single Contactor, 1 Inductor Arm Filter, Std Field Supply
06 = No Operator, Dual Contactor, 1 Inductor Arm Filter, Std Field Supply
07 = Operator, Dual Contactor, 1 Inductor Arm Filter, Std Field Supply
08 = No Operator, Single Contactor, 1 Inductor Field Filter, Std Field Supply
09 = Operator, Single Contactor, 1 Inductor Field Filter, Std Field Supply
0A = No Operator, Dual Contactor, 1 Inductor Field Filter, Std Field Supply
0B = Operator, Dual Contactor, 1 Inductor Field Filter, Std Field Supply
0C = No Operator, Single Contactor, 1 Inductor Field Filter, Arm Filter, Std Field Supply
0D = Operator, Single Contactor, 1 Inductor Field Filter, Arm Filter, Std Field Supply

EE = options (cont)
0E = No Operator, Dual Contactor, 1 Inductor Field Filter, Arm Filter, Std Field Supply
0F = Operator, Dual Contactor, 1 Inductor Field Filter, Arm Filter, Std Field Supply
10 = No Operator, Single Contactor, 1 Inductor Field Filter, LV Field Supply
11 = Operator, Single Contactor, No Filters, LV Field Supply
12 = No Operator, Dual Contactor, No Filters, LV Field Supply
13 = Operator, Dual Contactor, No Filters, LV Field Supply

14 = No Operator, Single Contactor, 1 Inductor Arm Filter, LV Field Supply
15 = Operator, Single Contactor, 1 Inductor Arm Filter, LV Field Supply
16 = No Operator, Dual Contactor, 1 Inductor Arm Filter, LV Field Supply
17 = Operator, Dual Contactor, 1 Inductor Arm Filter, LV Field Supply
18 = No Operator, Single Contactor, dv/dt Arm Filter, Std Field Supply
19 = Operator, Single Contactor, dv/dt Arm Filter, Std Field Supply
20 = No Operator, Dual Contactor, dv/dt Arm Filter, Std Field Supply
21 = Operator, Dual Contactor, dv/dt Arm Filter, Std Field Supply
22 = No Operator, Single Contactor, dv/dt Field Filter, Arm Filter, Std Field Supply
23 = Operator, Single Contactor, dv/dt Field Filter, Arm Filter, Std Field Supply
24 = No Operator, Dual Contactor, dv/dt Field Filter, Arm Filter, Std Field Supply
25 = Operator, Dual Contactor, dv/dt Field Filter, Arm Filter, Std Field Supply
26 = No Operator, Single Contactor, dv/dt Arm Filter, LV Field Supply
27 = Operator, Single Contactor, dv/dt Arm Filter, LV Field Supply
28 = No Operator, Dual Contactor, dv/dt Arm Filter, LV Field Supply
29 = Operator, Dual Contactor, dv/dt Arm Filter, LV Field Supply
30 = No Operator, Single Contactor, dv/dt Field & Arm Filter, LV Field Supply
31 = Operator, Single Contactor, dv/dt Field & Arm Filter, LV Field Supply
32 = No Operator, Dual Contactor, dv/dt Field & Arm Filter, LV Field Supply
33 = Operator, Dual Contactor, dv/dt Field & Arm Filter, LV Field Supply

The drive has additional options available when it is custom configured, these include;

- **Dynamic braking** – To properly size armature dynamic braking resistors, one must supply the contract speed, capacity, rated armature voltage and rated armature amps.
-
- **Dual motor contactors** - the intention is to meet European EN81-1 and ASME A17-1 / CSA A44-07 code standards.
-
- **120V EHDB motor contactor** - the drive can be configured with the either 120V or 240V coils.
-
- **EHDB motor contactor, Dual auxiliary** - it has been proven by doubling the auxiliaries on the contactor it increases the reliability.
-
- **Long lead filter** – this filter prevents voltage ringing that occurs when the distance from the motor and the drive exceeds 70ft [20M].
-
- **EMI 3-phase Power Line Filter –** meets EN 61800-3/A11
-
- **Electrical Touch Safe Covers –** This provides a clear Lexan barrier over the AC fuses and if the auto-transformer is installed the high voltage terminals would be guarded as well.

Quattro startup guide

Initial Inspection

Unpacking

1. When unpacking, check drive for any shipping damage.
2. If Quattro needs to be lifted, see spare parts for lifting kit part number.
3. Review the technical manual.
4. Verify the proper drive model numbers and voltage ratings as specified on the purchase order.
5. Location of the Quattro is important for proper operation of the drive and normal life expectancy.

Installation

The installation should comply with the following:

- DO NOT mount in direct sunlight, rain or extreme (condensing) humidity.
- DO NOT mount where corrosive gases or liquids are present.
- AVOID exposure to vibration, airborne dust or metallic particles.
- DO NOT allow the ambient temperature around the control to exceed the ambient temperature listed in the specification.

Observe the following precautions:

1. Wiring guide lines
   - For Logic Input and Output I/O connections, use quality, multi-conductor cable or discrete stranded wire only.
   - For Encoder and Analog I/O connections, use quality, multi-conductor braided shield cable*.
   - For Communication I/O connections, use quality, multi-conductor braided shield* cable or twisted pair wire.

*Cable shields to be terminated with a 180/360 degree metal cable clamp attached to Control Tray panel flange.

2. Never connect main AC power to the output terminals
3. Never allow wire leads to contact metal surfaces. Short circuit may result.

4. SIZE OF WIRE MUST BE SUITABLE FOR CLASS I CIRCUITS.
5. Motor lead length should not exceed 20m (60 ft). If lead length must exceed this distance, contact Magnetek for proper installation procedures.
6. The following are required to be contained in individual conduit runs: 3-phase incoming power, control power, DC armature wires, and DC shunt field.
7. Use UL/CSA certified connectors sized for the selected wire gauge. Install connectors using the crimping tools specified by the connector manufacturer.
8. Control wire lead length should not exceed 20m (60 ft). Signal leads and feedback leads should be run in separate conduits from power and motor wiring.
9. Verify that the input voltage matches the drive's rating.
10. Verify that the motor is wired for the application voltage and amperage.
11. Tighten all of the three-phase power and ground connections. See Wire Terminal Specs on page 139 for torque specs.
12. Check that all control and signal terminations are also tight.

CAUTION: TO PREVENT DAMAGE TO THE DRIVE. THE FOLLOWING CHECKS MUST BE PERFORMED BEFORE APPLYING THE INPUT POWER.

- During shipping, connections may loosen; inspect all equipment for signs of damage, loose connections, or other defects.
- Ensure the three-phase line voltage is within ±10% of the nominal input voltage. Also verify the frequency (50 or 60 Hz) is correct for the elevator control system.
- Remove all shipping devices.
- Ensure all electrical connections are secure.
- Ensure all transformers are connected for proper voltage.
- Open F1 and F2 and ensure control power brought into fuse F1 and F2 is 230VAC!

IMPORTANT: Double-check all the power wires and motor wires to make sure that they are securely tightened down to their respective lugs (loose wire connections may cause problems at any time).

Motor Evaluation

The objective is to thoroughly evaluate the existing motors before any Quattro DC drives are installed. Following this evaluation guide will assist in finding any existing flaws in the motor so that they can be repaired.

Prior to doing any modernization, the motors should be tested to determine if any repair would be required prior to changing the equipment. Various tests are available to verify the integrity of the insulation system; the evaluating company should use the method of TDR (**T**ime **D**omain **R**eflectometry) to obtain the following test measurements:

1. Thoroughly vacuum and clean DC machine
    a. Vacuum exterior and interior of motor to remove carbon dust and other potential contaminants
    b. Nitro clean and vacuum DC machine, particularly armature, field coils and brush riggings
2. Visually inspect the DC machine
    a. Inspect for signs of overstress. Crumbling insulation and exposed windings are indicators of poor insulation.
    b. Inspect the commutator for signs of improper or unusual brush wear
3. Perform Electrical performance tests defined below:
    a. Resistance (IEEE Std 118-1978, IEEE 389-1996)
    b. Inductance (IEEE Std 388-1992, IEEE Std 120-1989)
    c. Impedance (IEEE Std 388-1992, IEEE Std 389-1996, IEEE Std 43-2000, IEEE Std 120-1989)
    d. Phase Angle (IEEE Std 120-1989)
    e. Frequency Response Tests (IEEE Std 389-1996)
    f. Insulation Resistance Tests (IEEE Std 43-2000)
    g. The motor field coils should have an AC drop test completed.
4. Insulation testing of the armature, brush rigging, field coils
    a. Low voltage insulation resistance should measure greater than 2 Meg ohms at 500Vac/dc.
5. Check bearing and lubrication condition.

Advanced output filter

In our continued efforts to ensure a successful modernization project from initial installation through productive life, we have concentrated our most recent efforts on developing a new series of output filters. The objective of this new technology is to further reduce the potential risk of motor field or armature winding failures over time. We chose the targeted goal of achieving ≤ 500V/µsec change in voltage with respect to time (a.k.a. dv/dt) as noted in the 2010 Edition of NEMA MG1 Part 30. This filter is available factory integrated into the Quattro at the time of assembly or can be added to drives in the field. Details on the available kits for field retrofit are in the spare parts section.

Grounding considerations

1. Encoder
    a. Encoder isolation
2. The encoder must be electrically isolated from the motor frame and the motor shaft
    a. Encoder cable
3. The cable type should be a PVC braided shielded type with three 22ga twisted pairs. A and A/, B and B/, common and V should be the signals paired together
4. The encoder shield is not to be connected at the encoder end. On the drive side of the cable a portion of PVC material 1inch [25mm] should be removed approximately 12inches [300mm] from the connection to TB36 to expose the shield material.
5. Motor frame
    a. The motor frame is required to be grounded. The bond wire should be returned to the common ground point located in the Quattro enclosure (PE).
6. Three phase power
    a. The three phase wires must be run with a ground wire. This ground wire, which is connected back to the utility ground, is required to be connected to the Quattro ground (PE).
7. Control power, 230Vac
    a. The neutral side of the control power is required to be grounded at the Quattro ground (PE).
8. Ground the motor shaft
    a. To eliminate the current flowing through bearings, it is recommended that the shaft of the motor be grounded. This can be done with the use of shaft ground brushes. See the spare parts list for available brush kits.

Initial adjustments after power up

Encoder Set-up

Electrical interference and mechanical speed modulations are common problems that can result in improper speed feedback getting to the drive. To help avoid these common problems, the following electrical and mechanical considerations are suggested.

IMPORTANT
Proper encoder speed feedback is essential for a drive to provide proper motor control.

Electrical Requirements:

- Insulate both the encoder case and shaft from the motor
- Incremental encoder type
- Use twisted pair cable with shield tied to chassis ground at drive end
- Use limited slew rate differential line drivers
- Do not allow capacitors from internal encoder electronics to case
- Do not exceed the operating specification of the encoder/drive (300Khz @ rated motor speed maximum)
- Use the proper encoder supply voltage and use the highest possible voltage available. The Quattro DC provides both 5VDC and 12VDC. Magnetek recommends using the 12VDC for the encoder supply.

Mechanical Considerations:

- Use direct motor mounting without couplings
- Use hub or hollow shaft encoder with concentric motor stub shaft
- If possible, use a mechanical protective cover for exposed encoders
- It is not advisable to use friction wheels

Enter / Verify the encoder pulses entered in the ENCODER PULSES (A1) parameter matches the encoder's nameplate.

Motor Parameter Set-up

Enter / Verify the following from the motor's nameplate:

1. Motor Current (RATED MTR CURRENT (A6))
2. Motor Voltage (RATED ARM VOLTS (A6))
3. Motor field amps, forcing (FULL FLD AMPS (A6))
4. Motor field amps, running (WEAK FLD AMPS (A6))
5. Motor field amps, standing (STNDBY FIELD (A6))

Hoist way Parameter Set-up

Enter / Verify the hoist way parameters:

1. CONTRACT CAR SPD (A1) parameter programs the elevator contract speed in ft/min or m/s.
2. CONTRACT MTR SPD (A1) parameter programs the motor speed at elevator contract speed in RPM.

Line voltage setup

Enter / Verify the line voltage parameter:

1. INPUT L-L VOLTS (A5) parameter programs the line voltage level

Auto tune Procedure

Refer to page 122 on how to implement Auto tune if desired. Auto tune will automatically measure the motor's armature inductance, armature resistance including cable resistance, field resistance, and field time constant. Auto tune will also calculate the armature resistance voltage drop at motor rated current and the armature and field regulation gains.

(C1, C2, C3, C4) configuration setup

It will be required to adjust the configuration menus to operate the Quattro as the elevator manufacturer has specified to interact with the car controller. Magnetek does not supply this data.

Low speed inspection mode

Run the drive in low speed inspection mode and…

1. Verify encoder polarity, the motor rotation should match the encoder phasing. The equivalent of swapping A and /A can be done with the ENCODER CONNECT (C1) parameter.
2. Verify proper hoist way direction. This can be reversed with the MOTOR ROTATION (C1) parameter.

WARNING

If using an external speed regulator, which produces an analog torque command to Quattro (SPEED REG TYPE (C1) = external reg and EXT TORQ CMD SRC (C1) = analog input), it is imperative that the encoder polarity matches the armature voltage. To verify polarity, insert a torque command into the analog input. Check ENCODER SPD (D2) against ARMATURE VOLTAGE (D2). Verify they are the same polarity. If not, swap A and /A or change the ENCODER CONNECT (C1) parameter.

Verify that the Safety Chain / Emergency Stop works.

Interconnections

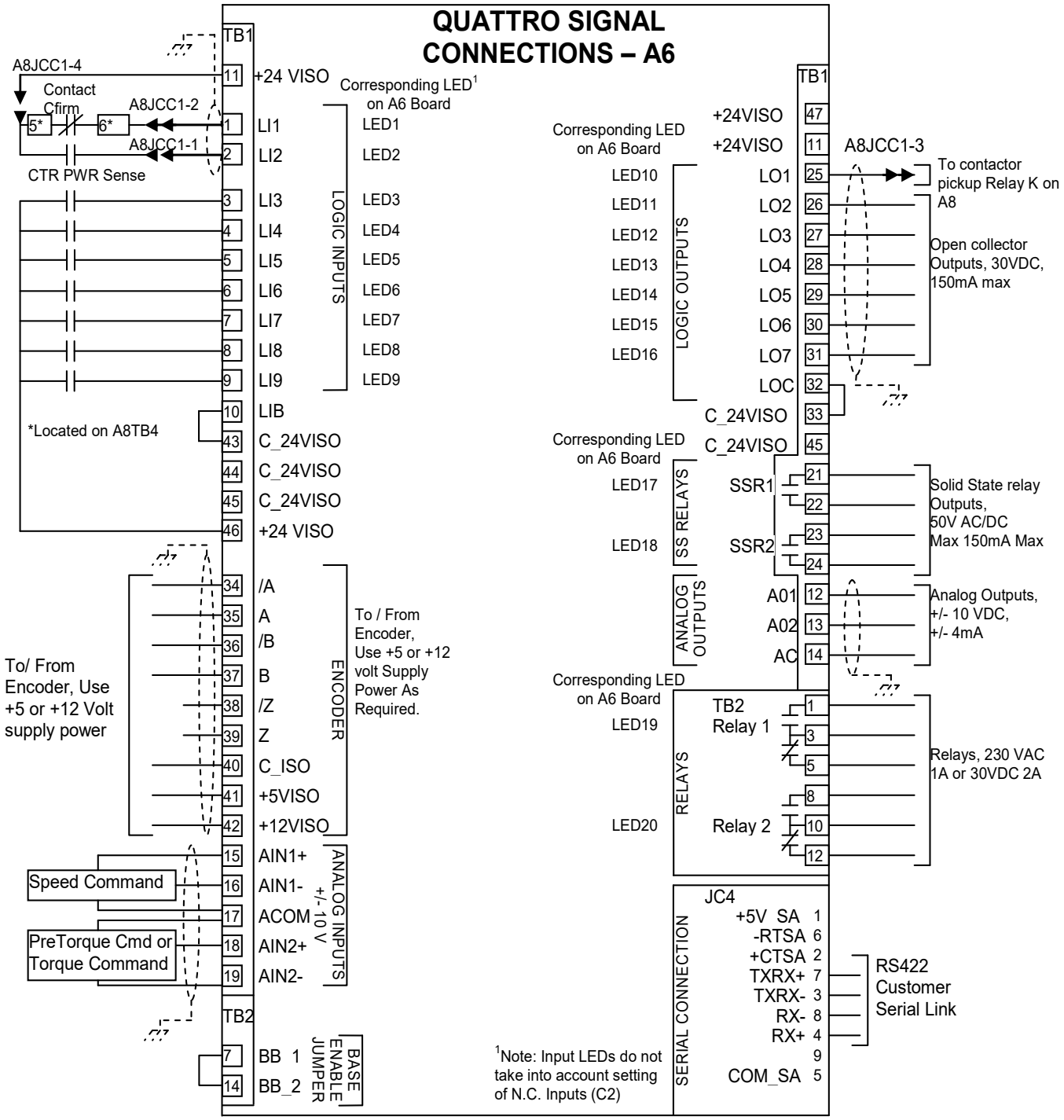
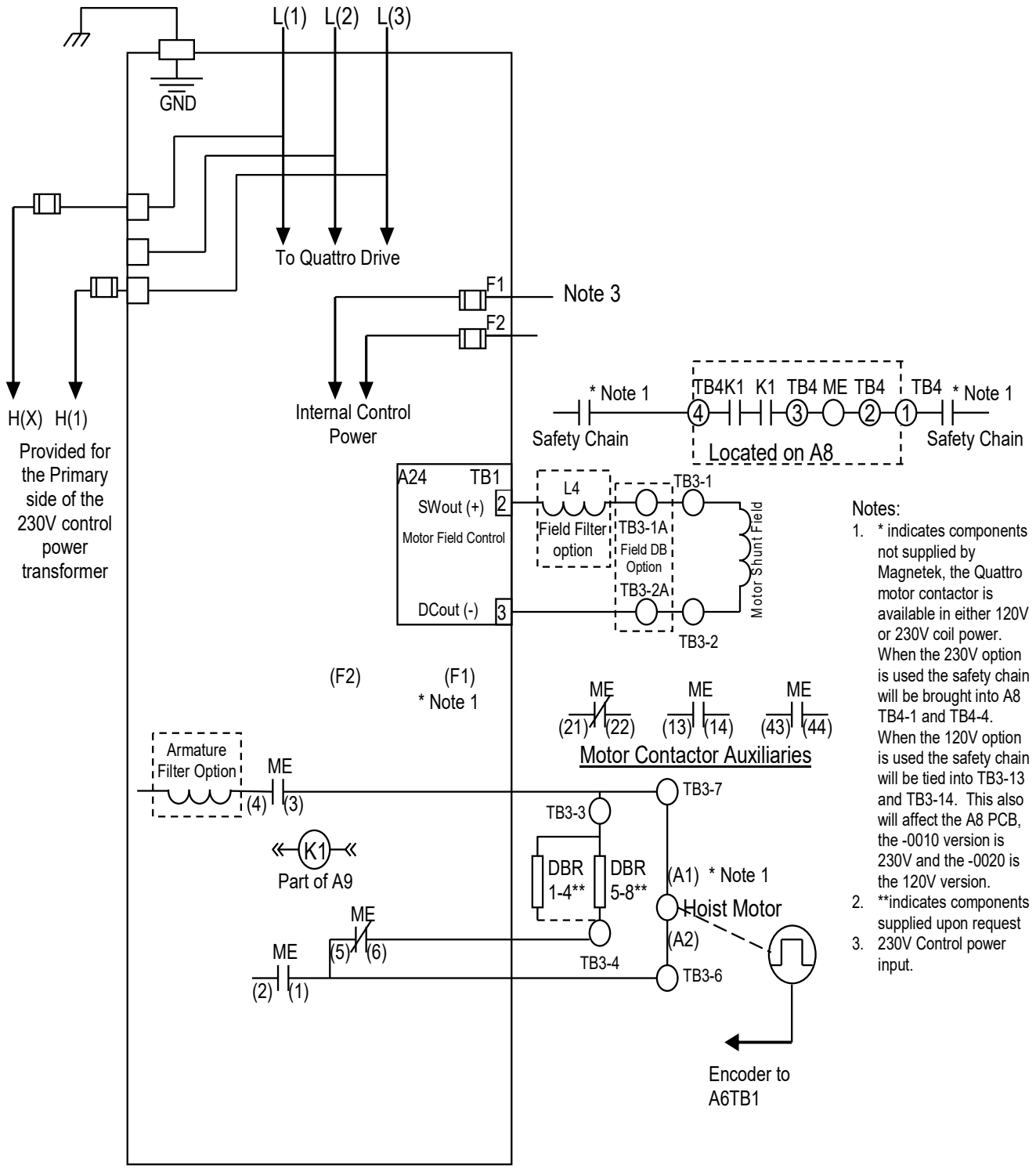


Figure 1: Interconnection Diagram



Notes:

1. * indicates components not supplied by Magnetek, the Quattro motor contactor is available in either 120V or 230V coil power. When the 230V option is used the safety chain will be brought into A8 TB4-1 and TB4-4. When the 120V option is used the safety chain will be tied into TB3-13 and TB3-14. This also will affect the A8 PCB, the -0010 version is 230V and the -0020 is the 120V version.
2. **indicates components supplied upon request
3. 230V Control power input.

Figure 2: Quattro DC Power Connections

Encoder Connections

The Quattro DC has connections for an incremental two-channel quadrature encoder.

The Quattro DC requires the use of an encoder coupled to the motor shaft. The encoder power can be either a +5VDC or +12VDC.

The encoder pulses per revolution must be entered in the ENCODER PULSES parameter in the A1 submenu.

Figure 3 shows the encoder connection terminals for non-single ended applications.

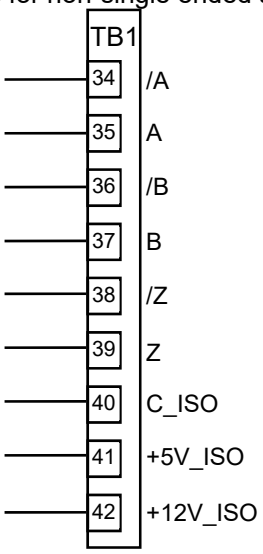


Figure 3: Encoder Connections

Below shows the connection for the encoder option card, if they are configured to be single ended. This configuration is not recommended, since, the Quattro DC encoder noise immunity circuitry is not in effect.

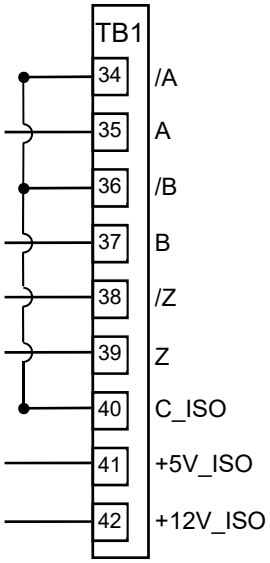


Figure 4: Encoder Connections (Single-Ended)

Logic Inputs

The Quattro DC's nine programmable logic inputs are opto-isolated. *For more information on programming logic inputs, see Logic Inputs C2 submenu on page 78.* The inputs become "true" by closing contacts or switches between the logic input terminal and voltage source common (or voltage source). The inputs are sourcing inputs – nominally sitting at common and when the contacts or switches are closed, turning "true" at 24VDC. The voltage supply for the logic inputs is 24VDC.

IMPORTANT

Internal 24VDC power supply has a capacity of 100 mA

Note: Logic input 1 and 2 are reserved and pre-wired for CONTACT CFIRM and CTR PWR SENSE respectively.

The choices for the voltage source common (or voltage source) depend on if the user is using an external voltage supply or using the internal voltage supply. See Figure 5 for internal supply example and Figure 7 for external supply example.

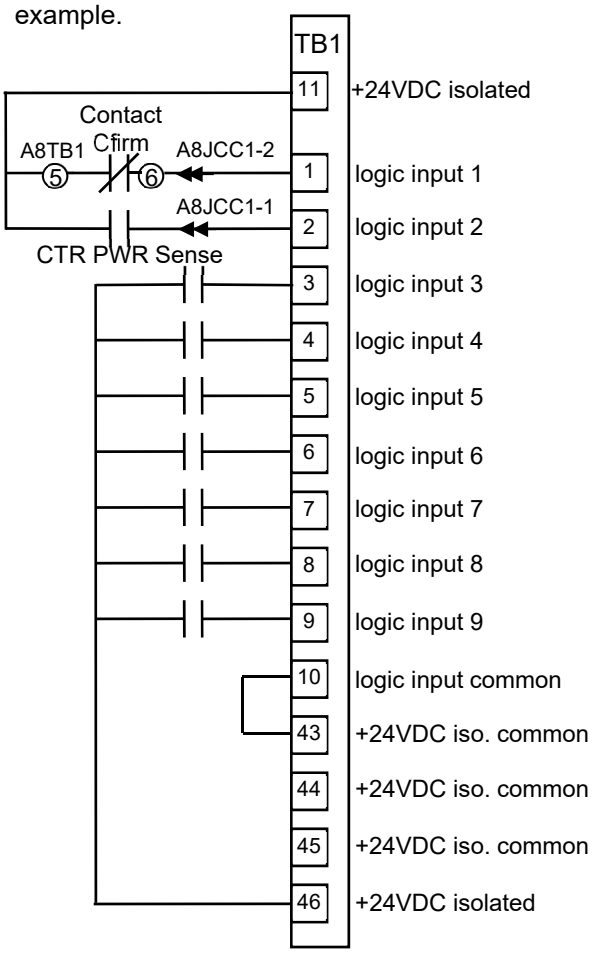


Figure 5: Logic Input Diagram (Internal Supply – true high)

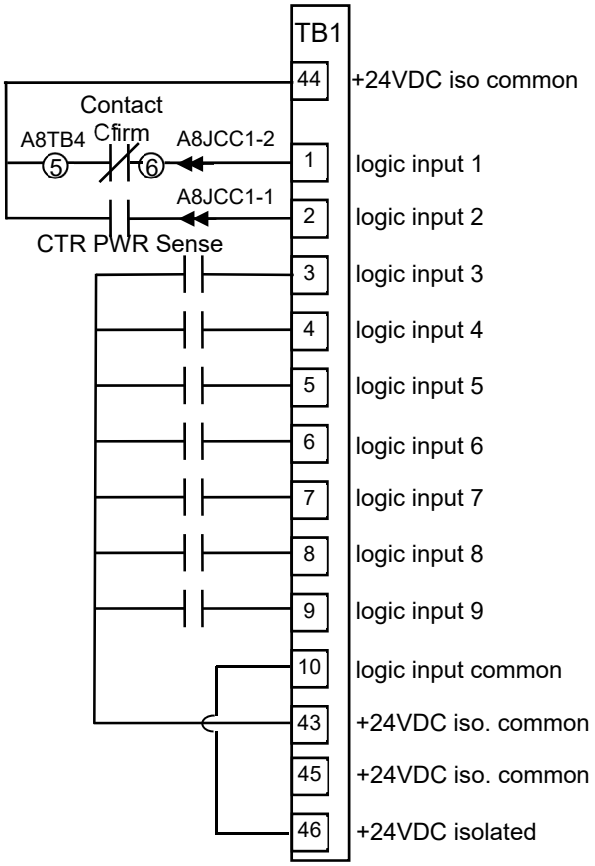


Figure 6: Logic Input Diagram (Internal Supply – true low)

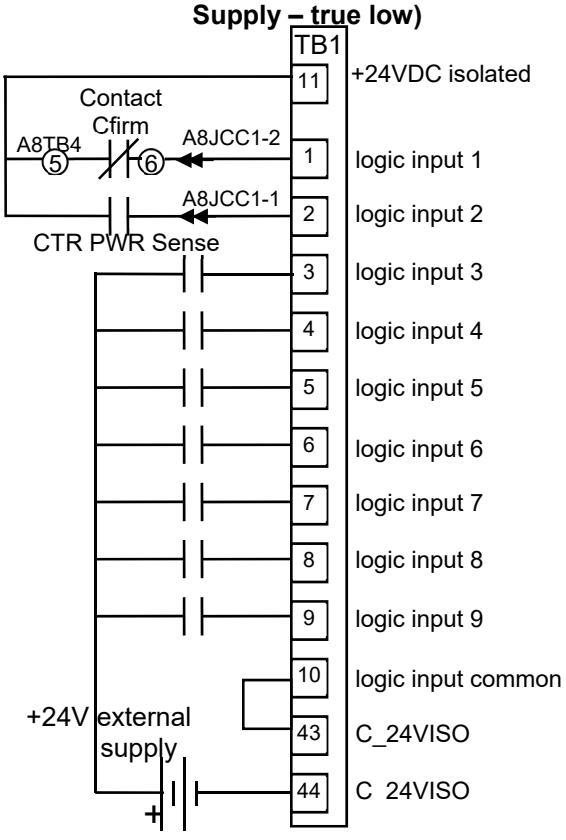


Figure 7: Logic Inputs (External Supply – true high)

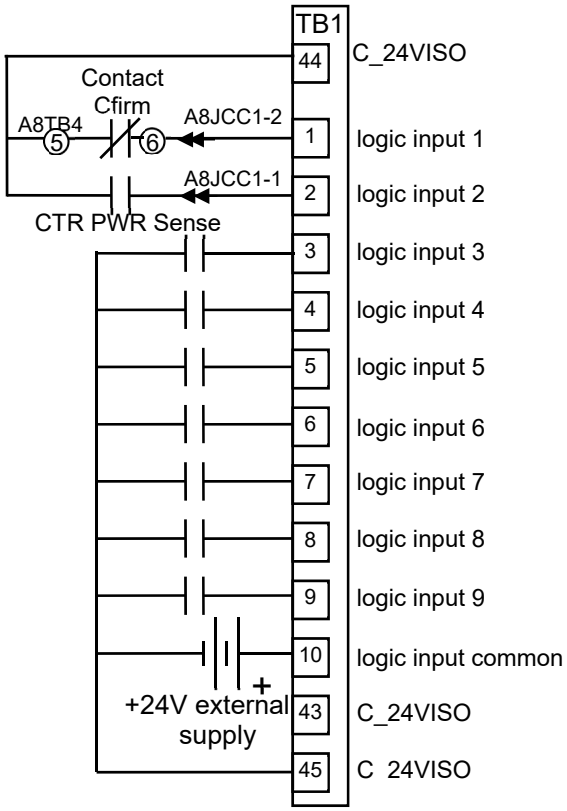


Figure 8: Logic Inputs (External Supply – true low)

Analog Inputs

The Quattro DC has two non-programmable differential analog input channels.

- Analog input channel 1 is reserved for the speed command (if used).
- Analog input channel 2 is reserved for the pre-torque command (if used) or torque command source (if used).

The analog input channels are bipolar and have a voltage range of ±10VDC.

Available with the analog channels is multiplier gain parameters (SPD COMMAND MULT and EXT TORQUE MULT) and bias parameters (SPD COMMAND BIAS and EXT TORQUE BIAS). These parameters are used to scale the user's analog command to the proper range for the drive software. The formula below shows the scaling effects of these two parameters.

$$\left(\begin{array}{c}\text{analog}\\ \text{channel}\\ \text{input}\\ \text{voltage}\end{array} - \text{BIAS}\right) \times \text{MULT} = \begin{array}{c}\text{signal}\\ \text{drive}\\ \text{software}\\ \text{uses}\end{array}$$

For more on the multiplier gain or bias parameters, see Drive A1 submenu on page 41.

The scaling of the analog input signals, with BIAS set to 0.00 and MULT set to 1.0 follows:

- Speed Command
  +10VDC = positive contract speed
  -10VDC = negative contract speed
- Pre Torque Command
  +10VDC = positive rated pre-torque of motor
  -10VDC = negative rated pre-torque of motor
- Torque Command
  +10VDC = positive rated torque of motor
  -10VDC = negative rated torque of motor

NOTE: The drive cannot recognize voltages outside of the ±10VDC on its analog input channels.

The Quattro DC provides common mode noise rejection with the differential analog inputs. The connection of these two differential inputs is shown in Figure 9.

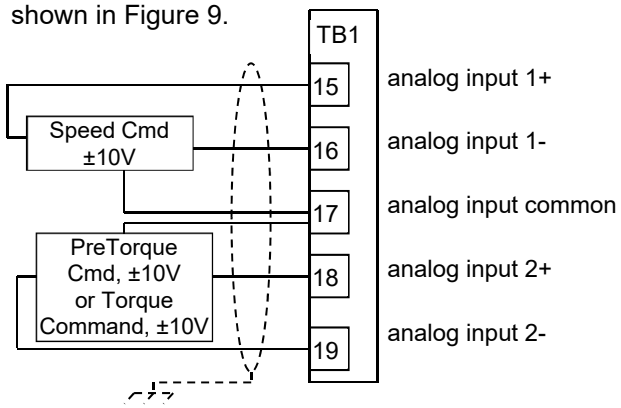


Figure 9: Analog Inputs (Differential)

Figure 10 shows the connection for the analog inputs if they are configured for single-ended connection. In this configuration, the Quattro DC noise immunity circuitry is not in effect.

Note: For prevention of ground noise interference, a twisted shielded pair must be run to the source and not connected at the board.

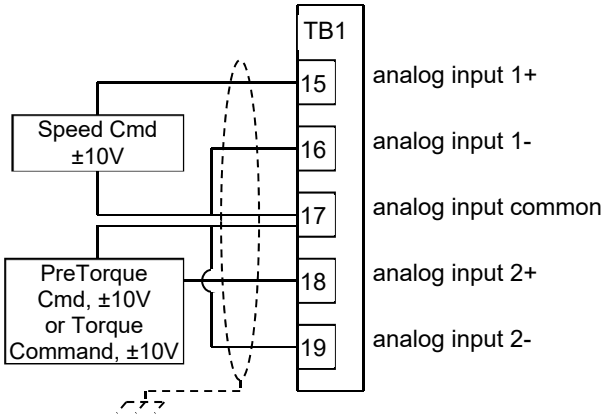


Figure 10: Analog Inputs (Single Ended)

Logic Outputs

The Quattro DC's seven programmable logic outputs are opto-isolated, open collector. The outputs are normally open and can withstand an applied maximum voltage of 30VDC. When the outputs become "true", the output closes and is capable of sinking up to 150mA between the logic output terminal and the logic output common (TB1-32). Figure 11: Logic Outputs shows the logic output terminals.

Note: Logic Output 1 is prewired for CLOSE CONTACT.

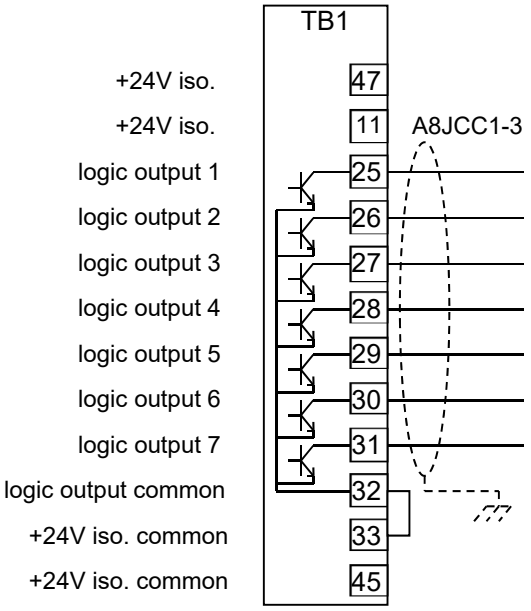


Figure 11: Logic Outputs

For more information on programming the logic outputs, see Logic Outputs C3 submenu on page 81.

Relay Outputs

The Quattro DC's two programmable relay logic outputs are Form-C relays. The have both normally open and normally closed contacts.

The specifications for each relay are as follows:

Relay 1

- 2A at 30VDC or 1A at 230VAC

Relay 2

- 2A at 30VDC or 1A at 230VAC

Figure 12: Relay Outputs shows the logic output terminals.

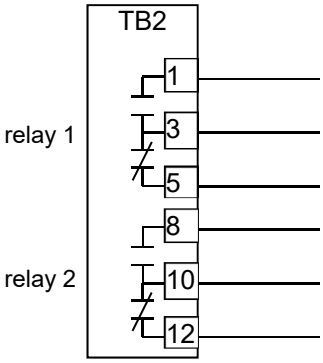


Figure 12: Relay Outputs

For more information on programming the relay outputs, see Logic Outputs C3 submenu on page 81.

Solid State Relay Outputs

The Quattro DC has two programmable solid-state relays. They have a 30 VDC max with 150mA load capability.

Figure 13: Solid State Relay Outputs shows the relay output connections.

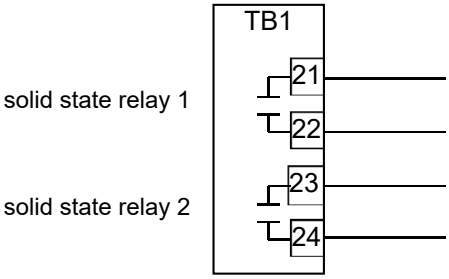


Figure 13: Solid State Relay Outputs

For more information on programming the solid-state relays, see Logic Outputs C3 submenu on page 81.

Analog Outputs

The Quattro DC has two programmable differential analog output channels. The two analog output channels were designed for diagnostic help. *For more information on programming the analog output channels, see Analog Outputs C4 submenu on page 83.*
The analog output channels are bipolar and have a voltage range of ±10VDC and current draw of +/- 4mA.
Available with the analog channels is multiplier gain parameters (ANA 1 OUT GAIN and ANA 2 OUT GAIN) and a bias or offset parameters (ANA 1 OUT OFFSET and ANA 2 OUT OFFSET). These parameters are used to scale the user's analog outputs to the proper range for the drive software. The formula below shows the scaling effects of these two parameters.

$$\left(\begin{array}{c}\text{signal}\\ \text{drive}\\ \text{software}\\ \text{creates}\end{array} - \text{OFFSET}\right) \times \text{GAIN} = \begin{array}{c}\text{analog}\\ \text{channel}\\ \text{output}\\ \text{voltage}\end{array}$$

For more on the gain or offset parameters, see section Drive A1 submenu on page 41.

The connection of these two outputs is shown in Figure 14: Analog Outputs.

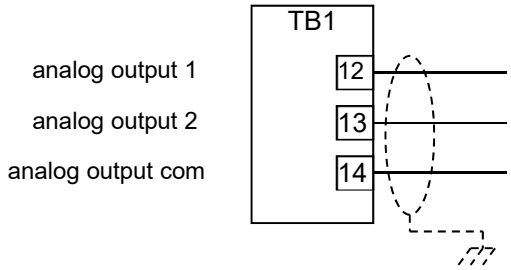


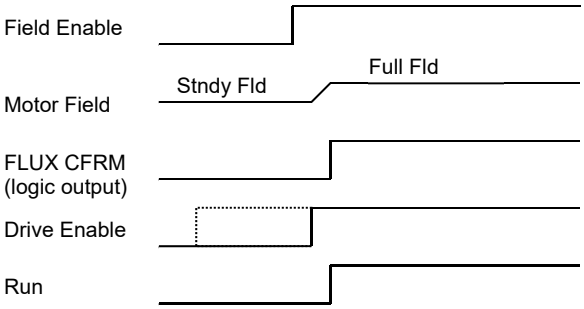
Figure 14: Analog Outputs

For more information on programming the Analog Outputs, see Analog Outputs C4 submenu on page 83.

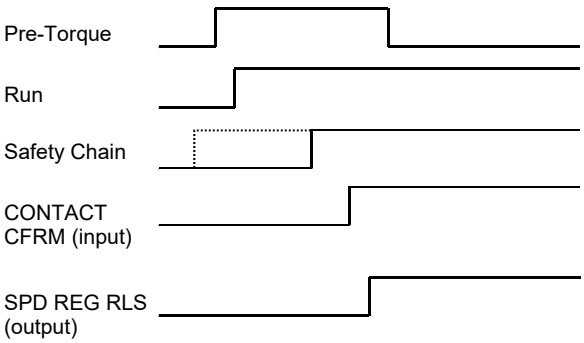
Drive Sequencing

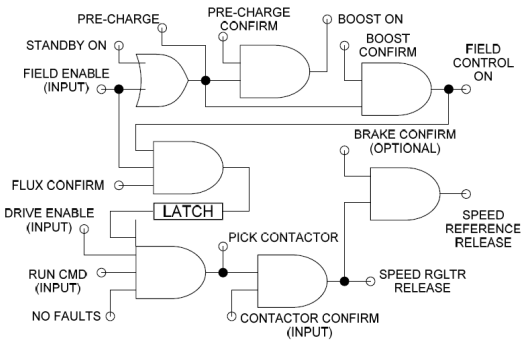
NORMAL operating sequence

1. Motor field current is at Stand-By during drive idle. The No Faults relay is active. Full-Field and Run command signals are OFF. Motor contactor Safety circuits may be open or closed. The DC bus will remain charged with regulated voltage as long as the drive is providing motor field current.
2. A Field Enable Command, programmable by FLD ENA SRC (C1), is sent to the drive. If the DC bus is not pre-charged, a pre-charge cycle will be completed before motor field current is restored. See Quattro Pre-Charge on page 32 for timing information of the Pre-Charge circuit. Motor field current will go to the Full-Field value in preparation to produce motor torque. Flux Confirm will become active when motor field current rises above the Flux Cnfrm Level (A6).

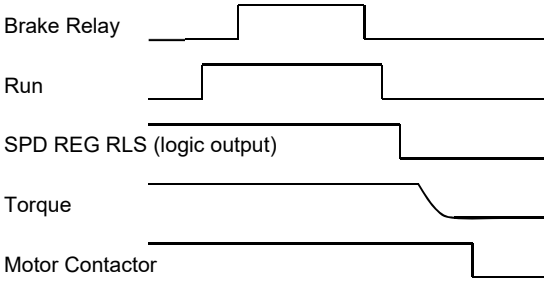


3. Pre-Torque command value is sent to the drive. It must be available before a Run command is given. If the Pre-Torque Latch is used, see Pre-Torque Latch (C1), it can be placed inactive depending on the settings of Pre-Torque Latch Clk (C1). If latching is not used, it must remain active until the SPD REG RLS output is active. Safety circuit relays are closed making power available to the contactor coil circuit.





4. The motor contactor will be told to close when motor field current rises above the Flux Confirm threshold and there are valid Enable and Run commands with no drive Faults. Once the contactor is confirmed to be closed, regulators are released, always starting with the velocity reference at zero speed and motor current at pre-torque amperes.
5. The drive will activate elevator Brake relays, if programmed to do so (or the car controller does it externally).
6. Once the Brake is confirmed to be released (by feedback or timer) the internal Speed Reference will be released and the drive will follow the external or internal velocity profile via the programmed accel/decel rate as programmed during the remainder of the elevator run cycle.
7. When at the next landing...the Drive (or car controller) de-activates elevator Brake. After the Brake has set, the Run command is removed causing...
8. The reference speed to be clamped to zero and motor torque to ramp down to aero.
9. When torque ramp-down is complete the contactor will be told to open.



10. While idle, motor field current reference will drop to Stand-By, after the Full-Field timer expires. Safety circuit relays may (or may not) open to remove contactor-actuating power. A DSPR time-out may occur while field current is at stand-by. In that case motor field current goes to zero and the AC main power contactor to the drive is opened. A pre-charge cycle and power on recovery will occur on the next command to re-establish motor field current.

ABNORMAL operating sequence

1. If a Drive Fault occurs the Drive will immediately open the motor contactor, de-energize any Brake and Drive OK Relays if so programmed. May be caused by:
   a. "Fatal Error" drive Faults including loss of serial communications
   b. Opening of the contactor power Safety circuit while the contactor is pulled in
   c. Loss of correct motor contactor or Brake Relay feedback.
2. If an Alarm occurs, the drive will signal an Alarm but continue to run. May be caused by:
   a. Drive Alarms including motor overload, and drive over temp warning
   b. Loss of correct feedback from Brake Hold relay or Brake Switches
   c. Open motor thermostat circuit
   d. Speed command is held at zero due to conflict with the analog speed command polarity and the run up/ run down logic
   e. The drive is or was being limited by the motor torque limit setting (Hit Torque Limit)
   f. Speed feedback is failing to properly track the speed reference (Speed Dev)
   g. AC input voltage drops below user specified percent of the input line to line voltage

Quattro Pre-Charge

When power is first applied to the Quattro drive, or after it has shut itself down via a DSPR time-out, the internal DC bus must be pre-charged before operation can resume. The following sequence will occur:

1. Power is applied to the Quattro drive
   a. Control power may be applied before or after 3-phase main power
   b. Drive controls should become active but no contactors should operate
2. Quattro drive receives command to 'energize'
   a. This command may be from serial link software or hardware logic command to deliver motor field current in preparation to start.
   b. AC input voltage from mains is measured and verified to be adequate according to the setting of the VAC-input adjustment parameter.
   c. Pre-charge contactor PCM is then pulled in. This provides resistor limited inrush current to DC bus capacitors from AC mains and internal rectifier.
3. DC bus is Pre-Charged
   a. With pre-charge contactor PCM closed, voltage builds up on the internal DC capacitors.
   b. DC Bus voltage is monitored during pre-charge to verify proper voltage build-up vs time. (See 6.a. below)
   c. Target bus voltage is measured input VAC X $\sqrt{2}$.
4. Mains contactor is closed
   a. As measured DC bus voltage nears target value the main utility power contactor UTM closes.
   b. Aux contact feedback from UTM indicates to controls that main utility contactor is closed.
   c. Then Pre-charge contactor PCM is opened. (See 6.b. below)
5. Boost converter is turned ON.
   a. DC bus voltage is boosted to a higher level as programmed by the Boost voltage parameter (A5) in order to achieve near unity power factor and low harmonic content of the Quattro drive.
   b. Motor field controls also turn ON to begin regulating motor field current and/or operate main motor armature circuits.
   c. The boost converter will remain ON as long as any field or armature current is being provided to the motor. (See 6.c. below) Time-out of the DSPR (Drive Stand-by Power Reduction) feature or other command may turn the Boost converter OFF when drive is idle. In that case as new pre-charge cycle must occur before drive re-start.
6. Problem prevention
   a. If DC bus voltage does not rise at the expected rate to the expected voltage level during pre-charge a "Charge Fault" is declared.
   b. UTM and PCM are interlocked with aux contacts such that UTM cannot be picked unless PCM is already closed. Once picked, an aux contact of UTM seals the same circuit allowing PCM to be dropped with UTM remaining ON.
   c. In the event of a major drive Fault, UTM will be opened to disconnect utility lines from main power devices of Quattro.

Drive Operation and Feature Overview

The Quattro DC drive is a velocity and torque regulated motor drive designed specifically for operating elevators. Many of the features described below can be selectively programmed to customize an individual application.

Analog Velocity Follower

The elevator car controller provides an analog velocity reference to the drive at A6TB1-15 and A6TB1-16. The signal may be bi-polar +/-10 VDC to indicate speed and travel direction, or a positive only unipolar signal with the direction of travel selected by logic commands. In most cases the signal profile will be adjusted by the car controller for precise landing positioning. The velocity reference passes directly to the closed loop velocity controller, except for an internal rate limiter to buffer any unexpected electrical noise. Start and Stop commands are via 24VDC logic inputs. Calibration of the analog velocity reference signal may be adjusted with separate gain and offset parameters. To set the Analog Velocity Follower, the user must set SPD COMMAND SRC (C1) to Analog Input.

Preset Speed & Profile Generator

An alternate method of speed control is that the elevator car controller provides 24VDC logic input commands to select one of 15 pre-determined running speeds. The drive generates a smooth S-Curve acceleration profile to transition between speed selections. Either of three separately adjustable ramp times may be selected. The direction of travel may be determined by either a Run command with an Up/Down command signal or by separate Run-Up / Run-Down logic commands. To set the Analog Velocity Follower, the user must set SPD COMMAND SRC (C1) to Multi-Step, then adjusting Multi-Step Speed Commands in the Multi-Step Submenu A3.

Serial Link Follower

The elevator car controller provides the equivalent of an analog reference command over a digital serial link. The drive returns operating status conditions and messages. Primary run command are 24VDC logic for redundant safety if wanted. The speed sensitivity of the serial velocity reference is adjustable. Enabling the serial link follower requires SPD COMMAND SRC (C1) to be set to SERIAL.

Pre-Torque

When enabled, the speed error integrator will be pre-conditioned by the supplied pre-torque signal before starting the regulator. This will cause motor armature current to begin at a magnitude proportional to the pre-torque command to prevent elevator motion or rollback when the elevator brake is released. The pre-torque signal will be from either an analog (wired at A6TB1-18 and A6TB1-19) or serial link digital source as selected by programming PRETORQUE SOURCE (C1). If Pre-Torque is not used, leave PRETORQUE SOURCE (C1) at the defaulted value of none. An EXT TORQUE BIAS (A1) and an EXT TORQUE MULT (A1) are available to scale the pre-torque signal. Ten volts = rated motor current with a multiplier of 1 and a bias of zero.

Torque Feed Forward

Some car controllers may calculate an accurate demand for motor torque as required to accelerate the connected load as well as hold it against gravity. The torque demand signal can be programmed to directly drive the torque control part of Quattro from either an analog or serial link input. EXT TORQ CMD SRC (C1) must be set to either analog input or serial and SPEED REG TYPE (C1) must be set to either pi speed reg, elev spd reg, or external reg. The connections for an analog external torque command source are A6TB1-18 and A6TB1-19. With an accurate torque compensating signal, the gain of the PI regulator can be reduced, to better ignore and not amplify mechanical vibrations of the hoist way. Separate adjustments are provided for torque signal gain and offset. An EXT TORQUE BIAS (A1) and an EXT TORQUE MULT (A1) are available to scale the torque signal. Ten volts = rated motor current with a multiplier of 1 and a bias of zero.

Torque/Current Ramp-Down

When the drive is told to cease operation by removal of the Run logic command, (and after Brake Drop time if that function is engaged) the armature current reference ramps down to zero at a constant rate. This allows the mechanical Brake to gently assume elevator holding torque, reducing the tendency to 'thump' the brake. When armature current ramp-down is complete, the contactor will be opened. In the event that the contactor opens unexpectedly, as reported by the feedback contact or in the event of a severe drive fault, there will be no timed delay for current ramp-down. This time may be adjusted by the function RAMPED STOP TIME (A1).

Motor Field Current Control and Field weakening

DC elevator motors have a separately excited shunt field. Adjustments include Stand-By Current, Full-Field Current and Weak-Field Current, all programmed in amperes, and a Flux Confirm Level, programmed as a % of Full-Field. With no active Full-Field or drive Run command motor field current would normally be at Stand-By amps. An active

command to provide Full Field causes field current to increase to the Full Field setting. When Field current is greater than the Full-Field threshold setting (and there are no other faults) the DC motor contactor will be enabled to pull in when told to do so by an active drive Run command. When the motor contactor is acknowledged as being closed, the motor armature current regulator is released to follow the commanded torque reference current signal. Motor field current will remain at the Full-Field value as long as the per unit (pu) reference or measured speed (whichever is greater) is less than the pu ratio of WF/FF amps. Above that speed motor field current will automatically follow the constant CEMF profile of WF/FF X 1/spd, where speed is again the greater active value of reference or measured speed. When motor speed reduces from high speed, motor field current automatically increases according to the constant CEMF calculated profile. However, field current will not increase to be more than the Full field ampere setting.

DSPR

While the drive is idle with Stand-By Current being applied to the motor field, a second timer for Drive Stand-by Power Reduction (DSPR) will be running. When/If the DPSR timer times-out, motor field current will turn completely Off and the main 3-phase power to the drive will be removed. This helps save electrical energy during long periods of non-use. Recovery of this condition will be automatic upon the receipt of the next “Full-Field” or “Run” command. At that time, recovery from a DSPR power OFF condition may take several seconds. DSPR TIME can be set in the Drive A1 Submenu.

Over-Speed Test

A reference speed multiplier is provided to help testing of the elevator governor over-speed trip. This feature will automatically return to normal at the completion of each elevator run. However, to ensure that the drive Over-Speed Trip does not interfere with the governor test, one must temporarily raise the value set for the Drive Over-Speed Trip point to a value higher than that of the governor.

Fault & Alarm Reset

An external Fault Reset command signal from the car controller may be applied to a logic input or from a serial command link. Or, an automatic Fault Reset will occur 5 seconds after a drive fault occurs, when enabled to do so. Either method may be used to enable the car controller to quickly recover from a re-settable fault. One Fault will be subtracted from a fault count accumulation every 20 minutes. The maximum number of Auto-Resets that can be accumulated is 5. The Auto-Reset function will then require a power Off/On cycle in order to recover. Faults & Alarms may also be cleared by use of the Magnetek Operator.

Electronic Motor Over-Load

An electronic motor over-load function is provided to take the place of heater type power components. Motor armature current is continuously monitored and the heating effect is calculated over time. A motor overload trip will not automatically stop the drive, but is an important alarm signal to elevator car controller to help prevent equipment damage.

Armature Voltage Feedback

This is a temporary ‘construction’ or trial mode for proving out direction orientation of the motor and operation of the encoder. Motor speed regulation is controlled by armature voltage feedback with IR compensation. Precise speed regulation is not possible. Operation above base speed of the motor is not possible since the field weakening is inhibited. However, it is still possible to monitor the feedback from the encoder although it is not used for speed regulation. Successful operation in this mode may require reduced gain settings. This is selectable by setting SPD REG TYPE (C1) to CEMF REG.

EN81-1 Safe Off Feature

The software for the Safe Off feature introduced with the Quattro AC cube and cabinet is also present in the latest Quattro DC firmware. This allows single contactor use in compliance with EN81-1. This utilizes the existing hardware in the Quattro platform, with the addition of the same I/O and sequencing adjustments in the Quattro AC; a safe off input and configurable safe off output to be monitored by the controller to verify correct switching.

Status Indicator Lights

Five status indicator lamps are provided on the front panel of the drive.

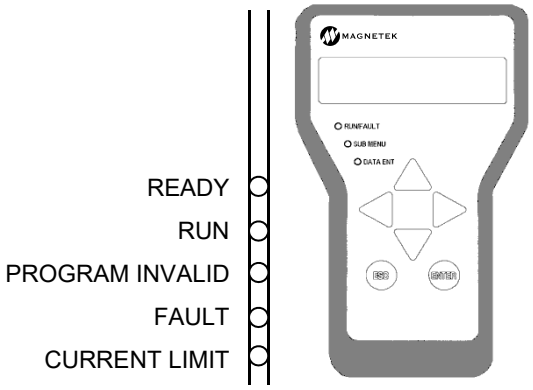
READY – (GRN) Power is applied to the drive, there are no drive Faults and drive is ready to Run when requested. The Run light will blink slowly when it is in DSPR (Drive Standby Power Reduction) Mode or not boosting, but three-phase power is applied.

RUN – (GRN) Indicates that the motor contactor is closed and the drive is following applied references operating to control torque and speed

PROGRAM INVALID – (RED) There is no valid program loaded.

FAULT – (Red) A drive Fault exists that is preventing the drive from operating

CURRENT LIMIT – (YEL) Motor current is being limited



MONITOR / Adjust / Set-up Parameters:

The values of all adjustments and set up parameters are stored locally in non-volatile drive memory. Monitoring of live data status and modification of parameter values can be accomplished by sequences over the serial link or the Magnetek Operator. They can both be attached at the same time to modify parameters or monitor drive operation. Detailed descriptions of all adjustments are located in later sections of this manual.

Parameters

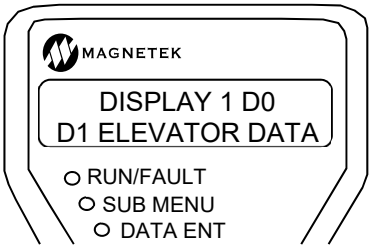
Parameter Introduction

This section describes the parameter menu structure of the Magnetek Operator, how to navigate this menu structure, and a detailed description of each parameter.

Parameters are grouped under six major menus:

- ADJUST A0
- CONFIGURE C0
- UTILITY U0
- FAULTS F0
- DISPLAY 1 D0
- DISPLAY 2 D0

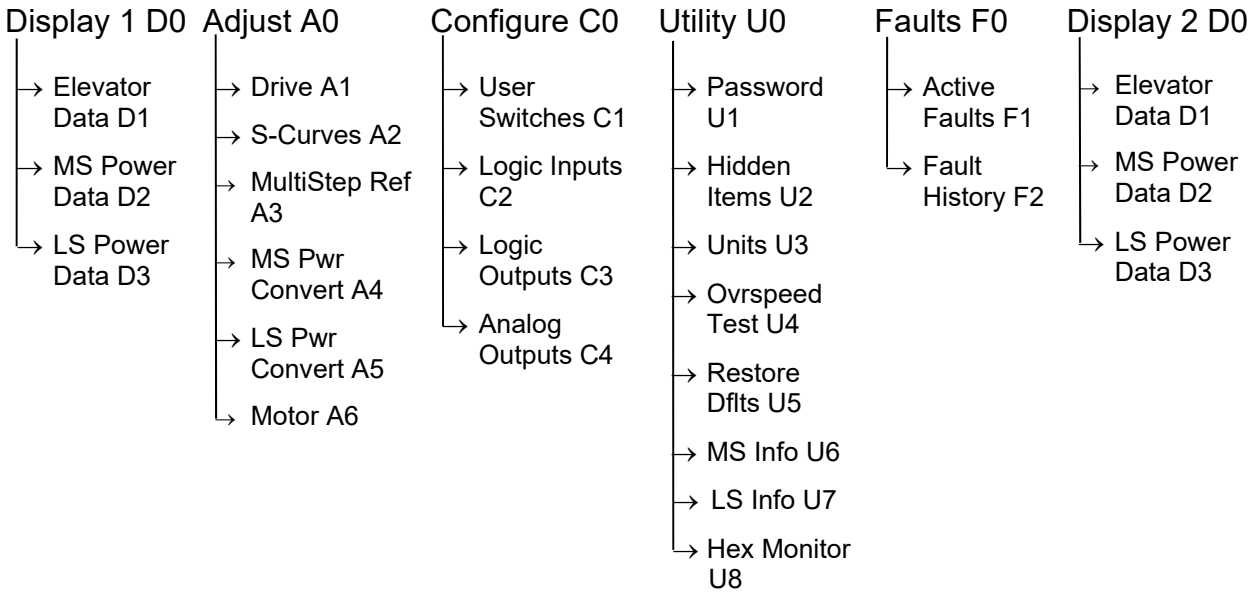
When the SUB-MENU LED is off, the currently selected menu is shown on the top line of the Digital Operator display and the currently selected sub-menu is shown on the bottom line of the Digital Operator display.



Menus

Each menu has a number of sub-menus. Following is a listing of the menus:

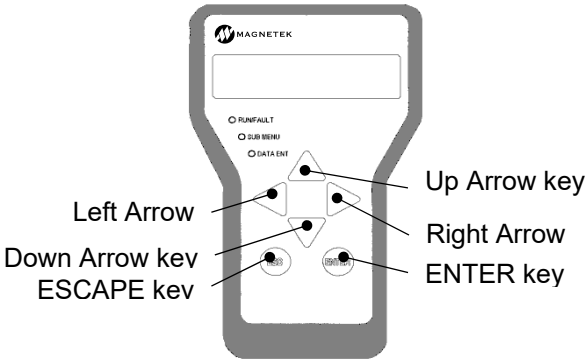
- ADJUST A0
- CONFIGURE C0
- UTILITY U0
- FAULTS F0
- DISPLAY 1 D0
- DISPLAY 2 D0



Menu/Sub-Menu Tree

Menu Navigation

The digital operator keys operate on three levels, the menu level, the sub-menu level and the entry level. At the menu level, they function to navigate between menus or sub-menus. At the sub-menu level, they navigate between sub-menus or menu items. At the entry level, they are used to adjust values or select options. Six (6) keys are used for this navigation; they are shown below:

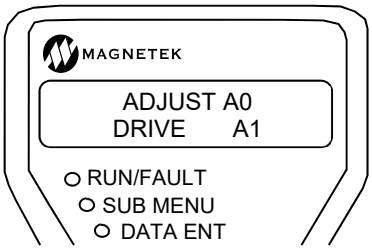


Digital Operator Keys

How these keys operate is dependent on the "level" (i.e. menu, sub-menu or entry level.) In general, the "ENTER" and "ESCAPE" keys control the level. That is the ENTER key is used to move to a lower level and the ESCAPE key is used to move to a higher level. The arrow keys control movement. The up and down arrow keys control vertical position and the left and right arrow keys control horizontal position.

Navigation at the Menu Level

At the menu level, the up and down arrow keys cause the display to show the sub-menus. The side arrow keys cause the display to select which menu is active. When the end of a menu is reached (either up, down, left or right), pressing the same key will cause a wrap around.

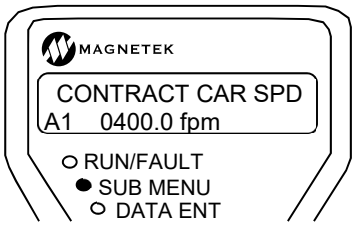


Each menu will remember the last accessed sub-menu. The left and right arrow keys will navigate between these last active sub-menus. This remembrance of last active sub-menu is volatile and will be lost at power down.

When any sub-menu is displayed, pressing the "ENTER" key will place the operator in the sub-menu level.

Navigation at the Sub-menu Level

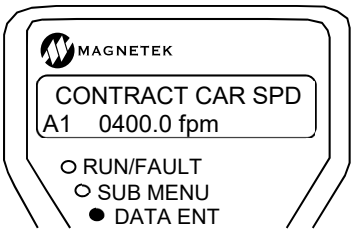
When in the sub-menu level, the SUB-MENU LED on the digital operator is lit. At the sub-menu level, the positioning keys work slightly different than they did at the menu level. The up and down arrow keys now select separate items in the sub-menu.



At any time pressing the "ESCAPE" key will return to the menu level. Upon exiting a sub-menu via the "ESCAPE" key, the last item number is "remembered". The next time this sub-menu is entered, it is entered at the "remembered" item number.

This feature can be used to obtain quick access to two monitor values. Two menus one labeled Display 1 D0 and one labeled Display 2 D0 have the same display items. One item can be selected one under the Display 1 menu and another under the Display 2 menu. The left and right arrow keys can then be used to move back and forth between these two display items. Remember, that the "remembering" of sub-menus and sub-menu items is volatile and is lost at power-down.

Navigation at the Entry Level
When in the entry level, the DATA ENT LED on the digital operator is lit. At the entry level, the function of keys are redefined. The "ESCAPE" key remains as the key used to move back to the sub-menu level. The left and right arrow keys are used as cursor positioning keys and the up and down arrow keys are used as increment and decrement keys.



Hidden Parameters
There are two types of parameters: standard and hidden. Standard parameters are available at all times. Hidden parameters are for more advanced functions and are available only if activated. Activation of the hidden parameters is accomplished by setting of a utility parameter, HIDDEN ITEMS U2.

Parameter Tree

Display D0

→ **Elevator Data D1**
- Speed Command
- Speed Reference
- Speed Feedback
- Motor Speed
- Speed Error
- Pre-Torque Ref
- Pre-Torq Last
- Ext-Torque Cmd
- Spd Reg Torq Cmd
- Tach Rate Cmd
- Aux Torque Cmd
- Est Inertia
- Rx Com Status
- Rx Error Count
- Logic Outputs
- Logic Inputs
- Rx Logic Input

→ **MS Power Data D2**
- Armature Current
- Field Current
- Armature Voltage
- MS Bus Voltage
- Motor Mode
- Torque Ref
- Est Spd Fdbk
- Encoder Speed
- Analog Addess2
- Analog Addess3
- Drive Overload
- DS Module Temp
- LS Module Temp
- Highest Temp
- Field IGBT Temp
- Armature Cur Err
- Auto Meas Arm L
- Auto Meas IRDrop
- Auto Meas Arm R
- Auto Field Res
- Auto Field TC

→ **LS Power Data D3**
- LS Pwr Input
- DC Bus Volts
- DC Bus Volts Ref
- LS Overload
- LS Input Current
- LS D Axis I
- LS Q Axis I
- LS D Axis V
- LS Q Axis V
- Input Hz
- Input Vab
- Input Vca
- LS Module Temp

Adjust A0

→ **Drive A1**
- Contract Car Spd
- Contract Mtr Spd
- Response
- Inertia
- Inner Loop Xover
- Current Limit
- Gain Reduce Mult
- Gain Chng Level
- Tach Filter BW
- Tach Rate Gain
- Spd Phase Margin
- Ramped Stop Time
- Contact Flt Time
- Brake Pick Time
- Brake Hold Time
- Overspeed Level
- Overspeed Time
- Overspeed Mult
- Encoder Pulses
- Enc Ratio Mult
- Spd Dev Lo Level
- Spd Dev Time
- Spd Dev Hi Level
- Spd Command Bias
- Spd Command Mult
- Ext Torque Bias
- Ext Torque Mult
- Pre Torque Time
- Zero Speed Level
- Zero Speed Time
- Up/Dwn Threshold
- Ana 1 Out Offset
- Ana 2 Out Offset
- Ana 1 Out Gain
- Ana 2 Out Gain
- Fault Reset Delay
- Flt Resets/Hour
- Up To Spd. Level
- Run Delay Timer
- AB Zero Spd Level
- AB Off Delay
- Contactor DO Dly
- Trq Lim Msg Dly
- ARB Mode
- ARB Bandwidth
- ARB Damping
- ARB Speed Threshold
- Notch Filter Frq
- Notch Filt Depth
- Stndby Fld Time
- DSPR Time
- FullFldFltTime
- SER2 INSP SPD
- SER2 RS CRP SPD
- SER2 RES CRP TIME
- SER2 FLT TOL

→ **S-Curves A2**
- Accel Rate 0
- Decel Rate 0
- Accel Jerk In 0
- Accel Jerk Out 0
- Decel Jerk In 0
- Decel Jerk Out 0
- Accel Rate 1
- Decel Rate 1
- Accel Jerk In 1
- Accel Jerk Out 1
- Decel Jerk In 1
- Decel Jerk Out 1
- Accel Rate 2
- Decel Rate 2
- Accel Jerk In 2
- Accel Jerk Out 2
- Decel Jerk In 2
- Decel Jerk Out 2
- Accel Rate 3
- Decel Rate 3
- Accel Jerk In 3
- Accel Jerk Out 3
- Decel Jerk In 3
- Decel Jerk Out 3

→ **Multistep Ref A3**
- Speed Command 1
- Speed Command 2
- Speed Command 3
- Speed Command 4
- Speed Command 5
- Speed Command 6
- Speed Command 7
- Speed Command 8
- Speed Command 9
- Speed Command 10
- Speed Command 11
- Speed Command 12
- Speed Command 13
- Speed Command 14
- Speed Command 15

→ **MS Pwr Convert A4**
- Arm Inductance
- Arm Resistance
- Motor Field Res
- Motor Field Tc
- AutoTune Mtr
- Gain Selection
- Gain Bandwidth A
- Gain Bandwidth F
- Spd Modefilt BW
- PWM Frequency
- UV Alarm Level
- UV Fault Level
- Fld Carrier Frq

→ **LS Pwr Convert A5**
- Id Reg Prop Gain
- Id Reg Intgrl Gain
- Iq Reg Prop Gain
- Iq Reg Intgrl Gain
- DC Bus Reg P Gain
- DC Bus Reg I Gain
- Input L-L Volts
- Initial L Freq
- DC Bus V Boost
- SW Bus OV Level
- Bus Vref Source
- PLL Filter Fc
- Pole Filter
- Pre Chge Thresh
- LS PWM Frequency

→ **Motor A6**
- Motor ID
- Rated Motor Curr
- Armature Voltage
- Full Fld Current
- Weak Fld Current
- Standby Field
- Flux Confirm Lev
- Armature IR Drop
- Tach Volt Sense
- Tach Speed Sense
- Ovld Start Level
- Ovld Time Out
- Save Meas Arm L
- Save IR Drop
- Save Meas Arm R
- Save Field Res
- Save Field Tc

Configure C0

- **User Switches C1**
  - Spd Command Src
  - Run Command Src
  - Field Ena Source
  - Hi/Lo Gain Src
  - Speed Reg Type
  - Motor Rotation
  - Encoder Connect
  - Spd Ref Release
  - Cont Confirm Src
  - Tach Filter
  - PreTorque Source
  - PreTorque Latch
  - Ptorq Latch Clck
  - Fault Reset Src
  - Overspd Test Src
  - Brake Pick Scr
  - Brake Pick Cnfm
  - Brake Hold Src
  - Ramped Stop Sel
  - Ramp Down En Src
  - Brk Pick Flt Ena
  - Brk Hold Flt Ena
  - Ext Torq Cmd Src
  - Dir Confirm
  - S-curve Abort
  - Priority Message
  - Stopping Mode
  - Auto Stop
  - DSPR Enable
  - ARB Select
  - Serial Mode
  - SER2 FLT mode
- **Logic Inputs C2**
  - N.C. Inputs
  - Logic Input 1 TB1-1
  - Logic Input 2 TB1-2
  - Logic Input 3 TB1-3
  - Logic Input 4 TB1-4
  - Logic Input 5 TB1-5
  - Logic Input 6 TB1-6
  - Logic Input 7 TB1-7
  - Logic Input 8 TB1-8
  - Logic Input 9 TB1-9
- **Logic Outputs C3**
  - Logic Output 1 TB1-25
  - Logic Output 2 TB1-26
  - Logic Output 3 TB1-27
  - Logic Output 4 TB1-28
  - Logic Output 5 TB1-29
  - Logic Output 6 TB1-30
  - Logic Output 7 TB1-31
  - SS Relay 1 TB1-21/22
  - SS Relay 2 TB1-23/24
  - Relay Coil 1 TB2-1/3/5
  - Relay Coil 2 TB2-8/10/12
- **Analog Outputs C4**
  - Analog Output 1 TB1-12
  - Analog Output 2 TB1-13

Utility U0

- **Password U1**
  - Enter Password
  - New Password
  - Password Lockout
- **Hidden Items U2**
  - Hidden Items Enable
- **Units U3**
  - Units Selection
- **Ovrspeed Test U4**
  - Overspeed Test?
- **Restore Dflts U5**
  - Restore Motor Defaults
  - Restore Drive Defaults
  - Restore Utility Defaults
- **MS Info U6**
  - MS Type
  - MS Platform
  - Field Module
  - MS Code Version
  - MS S/W Date
  - MS S/W Time
  - MS PIB Module
  - MS FPGA Rev
  - MS Cube ID
- **LS Info U7**
  - LS Type
  - LS Code Version
  - LS S/W Date
  - LS S/W Time
  - LS FPGA Rev
  - LS Cube ID
- **Hex Monitor1 U8**
  - Addr1
  - Addr2&
  - Addr3&

Faults F0

- **Active Faults F1**
  - Display Active Faults
  - Reset Active Faults
- **Fault History F2**
  - Display Fault History
  - Clear Fault History
  - Display Fault Counters

Adjust A0 menu

Drive A1 submenu

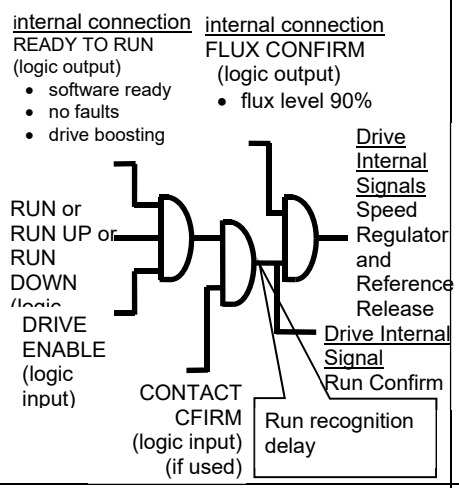
Parameter	Description	Units	Default	Range	Hidden Item	Run lock out
CONTRACT CAR SPD	(Contract Car Speed) Adjusts the elevator contract speed in feet per minute (fpm) or meters per second (m/s).	**fpm**	**100.0**	**0.0 – 1500.0**	N	Y
		m/s	**2.000**	**0.000 – 8.000**		
CONTRACT MTR SPD	(Contract Motor Speed) Sets motor rpm when commanded to run at elevator contract speed. The speed regulator actually regulates RPM x Encoder PPR pulses per second. Trim this value to fine tune actual elevator speed.	**rpm**	**50.0**	**30.0 – 3000.0**	N	Y
RESPONSE	(Response) Sets the sensitivity of the drive's speed regulator in terms of the speed regulator bandwidth in radians. The responsiveness of the drive as it follows the speed reference will increase as this number increases. If the number is too large, the motor current and speed will be jittery. If this number is too small, the motor will be sluggish.	**rad/sec**	**5.0**	**1.0 – 20.0**	N	N
INERTIA	(Per Unit System Inertia) This parameter is the inertia/torque ratio as seen by the drive. It affects internal gain of the speed regulator. This time in seconds is the time it would take the motor to accelerate a load-balanced elevator to contract speed at rated torque.	**sec**	**2.00**	**0.25 – 10.00**	N	N
INNER LOOP XOVER	(Inner Loop Crossover) This parameter is used as a stiffness factor. Higher settings make the drive more responsive to load changes and can help minimize rollback. Because of the amount of responsiveness due to a high setting, the drive is more sensitive to speed disturbances and this parameter can affect ride quality. Note: this parameter is only used when SPEED REG TYPE (C1) = ELEV SPD REG. See SPD PHASE MARGIN (A1) if using PI REG.	**rad/sec**	**2.0**	**0.1 – 20.0**	N	N
CURRENT LIMIT	(Armature Current Limit) This parameter sets armature current limit for DC motor applications.	**%**	**250.0**	**0.0 – 300.0**	N	N
GAIN REDUCE MULT	(Gain Reduce Multiplier) This parameter is the percent of 'response' the speed regulator should use in the 'low gain' mode. This value reduces the RESPONSE value when the drive is in 'low gain' mode. (i.e. setting this parameter to 100% equals no reduction in gain in the 'low gain' mode)	**%**	**100**	**10 – 100**	Y	N
GAIN CHNG LEVEL	(Gain Change Level) When the HI/LO GAIN SRC in submenu C1 is set to internal, the drive will control the high/low gain switch. This parameter sets the speed reference level, above which, the drive is in 'low gain' mode. Units in percent of rated speed. *For more information, see GAIN CHNG LEVEL on page 48.*	**%**	**100.0**	**0.0 – 100.0**	Y	N

Parameter	Description	Units	Default	Range	Hidden Item	Run lock out
TACH FILTER BW	(Tach Filter Bandwidth) This parameter sets the upper limit for a low pass filter for the tachometer / encoder feedback signal. Setting this value too low may cause irregular performance. TACH FILTER (C1) must be ON for this parameter to have effect.	**rad/sec**	**100**	**1 – 100**	Y	N
TACH RATE GAIN	(Tach Rate Gain) Used to help reduce the effects of rope resonance or rope stretch. It should be adjusted only *after* the INERTIA and RESPONSE have been set correctly.	**none**	**0.0**	**0.0 – 30.0**	Y	N
SPD PHASE MARGIN	(Speed Phase Margin) This parameter sets the phase margin of the speed regulator assuming a pure inertial load. This parameter is only in affect if SPEED REG TYPE (C1) is set to PI REG. See INNER LOOP XOVER (A1) if using ELEV SPD REG.	**degs**	**80**	**45 – 90**	Y	N
RAMPED STOP TIME	(Ramped Stop Time) This parameter is used only by the torque ramp down function during a stop and sets the time to decrease motor torque from rated torque to zero. After the elevator comes to a halt at a landing the brake is applied and the drive is told to turn off. However, components of the mechanical brake must 'set' ever so slightly in order to generate enough torque to hold the car. This small movement can cause a significant 'bump' if the transfer of torque occurs too quickly. This effect is essentially eliminated by the Torque Ramp Down function. The Ramped Stop Select function is enabled at (RAMPED STOP SEL(C1)). The Ramped Stop Time Parameter determines the rate of motor torque decay with ramped stop enabled. RAMPED STOP TIME(A1) determines the amount of time it would take for the drive to ramp from rated torque to zero torque. The actual time for torque decay to occur on a typical stop will depend on the actual amount of torque required to hold the car.	**sec**	**0.20**	**0.00 – 2.50**	Y	N
CONTACT FLT TIME	(Contactor Fault Time) Determines allowable time for motor contactor feedback to be out of sync with commanded state before a CONTACTOR FLT occurs.	**sec**	**0.50**	**0.10 – 5.00**	Y	N
BRAKE PICK TIME	(Brake Pick Time) If BRAKE PICK CNFM is set to INTERNAL TIME this parameter sets the internal time the drive waits until it assumes the brake has been picked. If BRAKE PICK CNFM is set to EXTERNAL TB, this parameter sets the time the drive waits until it receives a brake pick confirmation or a BRK PICK FLT will be declared.	**sec**	**1.00**	**0.00 – 5.00**	Y	N

Parameter	Description	Units	Default	Range	Hidden Item	Run lock out
BRAKE HOLD TIME	(Brake Hold Time) Determines the time the drive will wait until a BRK HOLD FLT is declared if a logic input is set to MECH BRK HOLD	**sec**	**0.50**	**0.00 – 5.00**	Y	N
OVERSPEED LEVEL	(Over speed Level) Sets the percentage of rated speed the drive uses (in conjunction with OVERSPEED TIME, below) to determine when an OVERSPEED fault occurs. Units in percent of contract speed	**%**	**115.0**	**90.0 – 150.0**	Y	N
OVERSPEED TIME	(Over speed Time) Sets the time that the drive can be at or above the OVERSPEED LEVEL (A1), before the drive declares an OVERSPEED FLT.	**sec**	**0.10**	**0.00 – 9.99**	Y	N
OVERSPEED MULT	(Over Speed Multiplier) Sets the percentage of CONTRACT CAR SPD (A1) for the OVERSPEED TEST (U4).	**%**	**125.0**	**100.0 – 150.0**	Y	N
ENCODER PULSES	(Encoder Pulses per Revolution, PPR) This parameter sets the pulses per revolution (per channel) the drive receives from the encoder. Set this value to agree with the pulses per revolution on the encoder nameplate if the tachometer is directly coupled to the motor shaft. If tachometer connected to rider roll to measure linear velocity, then this should be a calculated value equal to the counts expected from the encoder when the motor makes exactly one revolution. Please note, ENC RATIO MULT and ENCODER PULSES must satisfy: $\left(\begin{smallmatrix}encoder\\pulses\end{smallmatrix}\right)\times\left(\begin{smallmatrix}enc\\ratio\\mult\end{smallmatrix}\right)\langle 32{,}700$	**PPR**	**5000**	**600 – 20000**	N	Y
ENC RATIO MULT	(Encoder to Motor Ratio Multiplier) This parameter is the ratio of encoder RPM to motor RPM. If friction wheel is utilized for the encoder, the motor sheave diameter divided by the tach wheel diameter should be entered here. This value will be multiplied to the encoder pulses per revolution within the drive to obtain proper motor rpm speed feedback information for regulation. If the encoder is directly coupled to the motor shaft, this parameter should be set to 1.000. Please note, ENC RATIO MULT and ENCODER PULSES must satisfy: $\left(\begin{smallmatrix}encoder\\pulses\end{smallmatrix}\right)\times\left(\begin{smallmatrix}enc\\ratio\\mult\end{smallmatrix}\right)\langle 32{,}700$	**none**	**1.000**	**0.001 – 32.000**	N	Y
SPD DEV LO LEVEL	(Speed Deviation Lo Level) Range around the speed reference for speed deviation low logic output. Units are in percent of contract speed. See SPD DEV LO LEVEL and SPD DEV HI LEVEL on page 49.	**%**	**10.0**	**0.1 – 20.0**	Y	N

Parameter	Description	Units	Default	Range	Hidden Item	Run lock out
SPD DEV TIME	(Speed Deviation Time) This parameter defines the time the speed feedback needs to be in the range around the speed reference defined by SPD DEV LO LEVEL (A1) before the Speed Deviation Low logic output is true.	**sec**	**0.50**	**0.00 – 9.99**	Y	N
SPD DEV HI LEVEL	(Speed Deviation High Level) Level for declaring speed deviation alarm. Units are in percent of contract speed. See SPD DEV LO LEVEL and SPD DEV HI LEVEL on page 49.	**%**	**10.0**	**0.0 – 99.9**	Y	N
SPD COMMAND BIAS	(Speed Command Bias) This parameter subtracts an effective voltage to the actual analog speed command voltage signal. (analog channel#1 input voltage − SPD COMMAND BIAS) × SPD COMMAND MULT = signal drive software uses	**volts**	**0.00**	**-6.00 – +6.00**	Y	Y
SPD COMMAND MULT	(Speed Command Multiplier) This parameter scales the analog speed command. (analog channel#1 input voltage − SPD COMMAND BIAS) × SPD COMMAND MULT = signal drive software uses	**none**	**1.00**	**0.90 – 5.00**	Y	Y
EXT TORQUE BIAS	(External Torque Bias) This parameter subtracts an effective voltage to the actual analog pre torque / torque command (channel 2) voltage signal. Note: Drive automatically limits current at 300% or the value in CURRENT LIMIT (A1). For more information, see Analog Inputs on page 27 and Pre-Torque / Torque Feed Forward on page 33. (analog channel#2 input voltage − EXT TORQUE BIAS) × EXT TORQUE MULT = signal drive software uses	**volts**	**0.00**	**-6.00 – 6.00**	Y	Y
EXT TORQUE MULT	(External Torque Multiplier) This parameter scales the analog pretorque / torque command (channel 2). If this function is set to 1.00, a 10V signal will call for 100% torque. Note: Drive automatically limits current at 300% or the value in CURRENT LIMIT (A1). For more information, see Analog Inputs on page 27 and Pre-Torque / Torque Feed Forward on page 33. (analog channel#2 input voltage − EXT TORQUE BIAS) × EXT TORQUE MULT = signal drive software uses	**none**	**1.00**	**-10.00 – 10.00**	Y	Y
PRE TORQUE TIME	(Pre Torque Time) Time to ramp torque from zero to pre-torque value. When set to zero, Pre-Torque will be applied immediately. This helps eliminate the 'bump' felt upon starting caused by the torque being immediately set to rated pre-torque. Setting this parameter to zero will disable the Pre Torque Ramp Up function. With a non-zero setting for Pre Torque Time, the torque reference will be linearly ramped from zero to the value given through the Analog Input Channel or the serial channel.	**sec**	**0.00**	**0.00 – 10.00**	N	Y

Parameter	Description	Units	Default	Range	Hidden Item	Run lock out
ZERO SPEED LEVEL	(Zero Speed Level) This parameter sets the threshold for zero speed detection. This is only used to generate the zero speed logic output. Note: if DIR CONFIRM (C1) is enabled, this parameter also sets the threshold for the termination of the test to confirm the polarity of the analog speed command. Unites in percent of contract speed	**%**	**1.00**	**0.00 – 99.99**	Y	Y
ZERO SPEED TIME	(Zero Speed Time) This parameter sets the time at which the drive is measured to be at or below the ZERO SPEED LEVEL (A1) before zero speed logic output is true.	**sec**	**0.10**	**0.00 – 9.99**	Y	Y
UP/DWN THRESHOLD	(Directional Threshold) This parameter sets the threshold for the direction sense logic outputs. If speed feedback does not reach this level, the drive will not detect a directional change. This is only used to generate the direction sense logic outputs (car going up and car going down). Units in percent of contract speed.	**%**	**1.00**	**0.00 – 9.99**	Y	Y
ANA 1 OUT OFFSET	(Digital to Analog #1 Output Offset) Offset for scaling Analog Output Channel #1. (signal drive software creates − ANA OUT OFFSET) × ANA OUT GAIN = analog channel output voltage	**%**	**0.0**	**-99.9 – 99.9**	Y	N
ANA 2 OUT OFFSET	(Digital to Analog #2 Output Offset) Offset for scaling Analog Output Channel #2. (signal drive software creates − ANA OUT OFFSET) × ANA OUT GAIN = analog channel output voltage	**%**	**0.0**	**-99.9 – 99.9**	Y	N
ANA 1 OUT GAIN	(Digital to Analog #1 Output Gain) Adjusts the scaling for the Analog Output Channel #1. NOTE: value of 1.0 = 0 to 10VDC signal. (signal drive software creates − ANA OUT OFFSET) × ANA OUT GAIN = analog channel output voltage	**none**	**1.0**	**0.0 – 10.0**	Y	N
ANA 2 OUT GAIN	(Digital to Analog #2 Output Gain) Adjusts the scaling for the Analog Output Channel #2. NOTE: value of 1.0 = 0 to 10VDC signal. (signal drive software creates − ANA OUT OFFSET) × ANA OUT GAIN = analog channel output voltage	**none**	**1.0**	**0.0 – 10.0**	Y	N
FLT RESET DELAY	(Fault Reset Delay) When the drive is set for automatic fault reset, this is the time before a fault is automatically reset.	**sec**	**5**	**0 – 120**	Y	N
FLT RESETS / HOUR	(Fault Resets per Hour) When the drive is set for automatic fault reset, this is the number of faults allowed to be automatically reset per hour.	**faults**	**3**	**0 – 10**	Y	N

Parameter	Description	Units	Default	Range	Hidden Item	Run lock out
UP TO SPD. LEVEL	(Up to Speed Level) This parameter sets the threshold for the up to speed logic output. This is only used to generate the up to speed logic output. Units in percent of contract speed.	**%**	**90.00**	**0.00 –110.00**	Y	N
RUN DELAY TIMER	(Run Recognition Delay Timer) Allows the user to delay the drive's recognition of the RUN signal therefore allow more time for the motor contactor to set. This parameter allows the user to delay the drive's recognition of the RUN signal 	**sec**	**0.00**	**0.00 – 0.99**	Y	Y
AB ZERO SPD LEV	(Auto Brake Zero Speed Level) Sets the speed point that will be considered as zero speed for the auto brake function. The units are % of contract speed. In order to use the Auto Brake Function, a logic output needs to be configured for AUTO BRAKE (C3), the parameter SPD COMMAND SRC(C1) = MULTI-STEP, the parameter SPD REF RELEASE (C1) = BRAKE PICKED, and the parameter BRAKE PICK CFRM(C1) = EXTERNAL TB1.	**%**	**1.00**	**0.00 – 2.00**	Y	Y
AB OFF DELAY	(Auto Brake Off Delay) Determines the time after zero speed is reached (level determined by the AB ZERO SPD LEV (A1) parameter) that the Auto Brake logic output goes false.	**sec**	**0.00**	**0.00 – 9.99**	Y	Y
CONTACTOR DO DLY	(Contactor Drop-Out Delay) When the drive controls the motor contacts via CLOSE CONTACT logic output, this parameter allows the user to delay the drive's dropout of the motor contactor. The delay time starts when the speed regulator release signal goes false.	**sec**	**0.00**	**0.00 – 5.00**	Y	Y
TRQ LIM MSG DLY	(Torque Limit Message Delay) This parameter determines the amount of time the drive is in torque limit before the "HIT TORQUE LIMIT" alarm message is displayed.	**sec**	**0.50**	**0.00 – 10.00**	Y	Y

Parameter	Description	Units	Default	Range	Hidden Item	Run lock out
ARB MODE	Selects between 3 possible Anti-Rollback operating modes. **"0"** to disable all Anti-Rollback features. Only E-Reg will be engaged **"1"** to enable Anti-Rollback when the drive is started. **"2"** to enable Anti-Rollback when starting the drive and when the velocity again comes to a stop at the next landing.*For more information, see Anti-Rollback on page 125.*	**none**	**0**	**0 - 2**	Y	Y
ARB BANDWIDTH	Determines the gain of the velocity and position regulator when ARB is ON. This is the unity gain crossover frequency in Radians/sec. Increasing this setting will cause the position loop to respond faster with less accumulated position error. *For more information, see Anti-Rollback on page 125.*	**RAD**	**6.00**	**1.00 – 15.00**	Y	Y
ARB DAMPING	Adjusts damping of the position regulator when ARB is ON. Increasing this setting will cause a smoother but slower recovery of position error. Reducing this setting will let ARB recover a position error more quickly and abruptly. *For more information, see Anti-Rollback on page 125.*	**none**	**2.00**	**0.01 – 20.00**	Y	Y
ARB SPEED THRESHOLD	Determines the reference speed where ARB will be turned OFF and E-Reg will be engaged when the drive is started, if ARB mode is set to 1 or 2. This setting should be as low as possible to prevent regulator transfer bumps when starting, but it must be set high enough to remain engaged during re-leveling or to ignore a small analog zero reference offset when using an external analog signal reference. In percent of rated speed *For more information, see Anti-Rollback on page 125.*	**%**	**0.00**	**0.00 – 10.00**	Y	Y
NOTCH FILTER FRQ	(Notch Filter Frequency) Determines the notch filter center frequency. *For more information, see NOTCH FILTER FRQ on page 49.*	**Hz**	**20**	**5 – 60**	Y	Y
NOTCH FILT DEPTH	(Notch Filter Depth) Determines notch filter maximum attenuation. Note: A filter depth setting of zero (NOTCH FILT DEPTH (A1) = 0) removes the filter.	**%**	**0**	**0 – 100**	Y	Y
STNDBY FLD TIME	(Standby Field Delay Time) Determines the time the drive will continue to supply Full Field current after stopping and turning motor armature current control OFF. Motor field current will drop to standby amps after this time delay.	**sec**	**5**	**0 – 999**	Y	Y

Parameter	Description	Units	Default	Range	Hidden Item	Run lock out
DSPR TIME	(Drive Standby Power Reduction Time) Determines how long the drive will remain energized with motor field current at Standby amps before progressing to complete drive shutdown and utility side disconnection. Only used when DPSR ENABLE (C1) is set to ENABLE	**min**	**10**	**0 – 546**	Y	Y
FullFldFaultTime	(Full Field Fault Time) Determines the maximum time the drive can remain at Full Field without actually running. If logically held in that condition for longer than the Full field Time, a Fault will be declared to prevent potential burnout of the motor field.	**min**	**1**	**0 - 99**	Y	Y
SER RES CRP TIME	Maximum time to allow rescue operation	**Sec**	**180**	**0 - 200**	N	Y
SER2 FLT TOL	Maximum time to allow between reception of packets in serial mode 2	**Sec**	**0.5**	**0 - 200**	N	Y
SER2 Insp spd	Used to select speed during inspection mode	**ft/min**	**30**	**0 - 100**	N	Y
SER2 Insp spd	Used to select speed during inspection mode	**m/sec**	**0.150**	**0 – 0.50**	N	Y
SER2 RS CRP spd	Used to select speed during rescue mode	**ft/min**	**10**	**0 - 300**	N	Y
SER2 RS CRP spd	Used to select speed during rescue mode	**m/sec**	**0.050**	**0 – 1.54**	N	Y

Table 1: Drive A1 Submenu

Detailed descriptions

HI/LO Gain

When HI/LO GAIN SRC (C1) is set to internal, GAIN CHG LVL (A1) sets the speed reference level that controls the Hi/Lo gain switch. The velocity regulator will use normal 'high gain' when the reference speed is below this value, or 'low gain' settings when the speed reference is above this value.

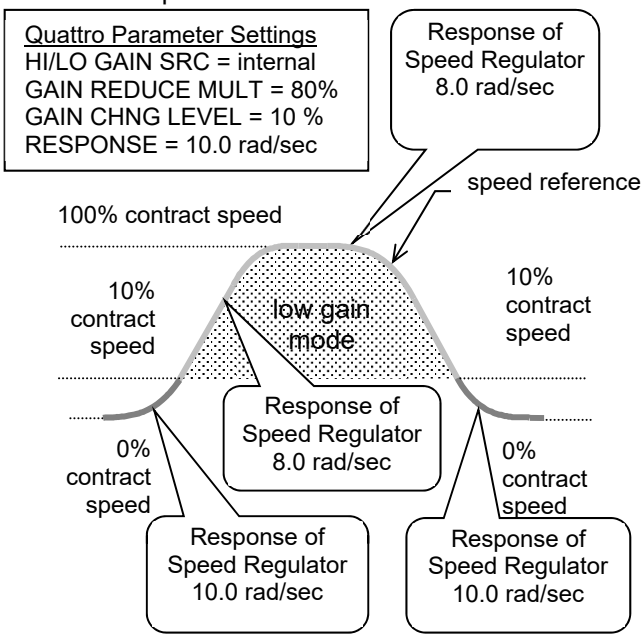
On some elevators when the speed response (gain) is set to high levels as required for good velocity tracking during acceleration, the resonant characteristics of the elevator ropes can cause car vibration while running at steady state speed. To reduce this problem, the response (gain) of the speed regulator is effectively reduced to a lower value so that the resonant characteristics of the ropes are not continuously excited. The High/Low gain switch modifies the response of the speed regulator via the gain reduce multiplier.

GAIN REDUCE MULT (A1) adjusts how much gain reduction will occur at higher speeds.

High / low gain switching may be controlled either externally or internally. The high / low gain source parameter (HI/LO GAIN SRC) in Configuration menu C0 allows for an external or automatic internal gain switch selection.

The high/low gain switch may be controlled by either:

- a logic input
- the serial channel
- the gain change level parameter (GAIN CHNG LEVEL), which defines a percentage of contract speed



High / Low Gain Example

SPD DEV LO LEVEL and SPD DEV HI LEVEL

(Speed Deviation Low / High Level)
These two functions are available to indicate how the speed feedback is tracking the speed reference.

- Speed Deviation Low – indicates that the speed feedback is tracking the speed reference within a defined range.
- Speed Deviation High – indicates that the speed feedback is failing to properly track the speed reference.

The Speed Deviation Low function has the ability to set a configurable logic output. The logic output will be true, when the speed feedback is tracking the speed reference within a defined range around the speed reference for a defined period of time (see Figure 15). The defined range is determined by the Speed Deviation Low Level parameter (SPD DEV LO LEVEL) and the defined time is determined by the Speed Deviation Time parameter (SPD DEV TIME).

The Speed Deviation High function annunciates a Speed Deviation Alarm, and has the ability to set a configurable logic output. The alarm will be annunciated and the logic output will be true, when the speed feedback is not properly tracking the speed reference and is outside a defined range around the speed reference (see Figure 15). The defined range is determined by the Speed Deviation High Level parameter

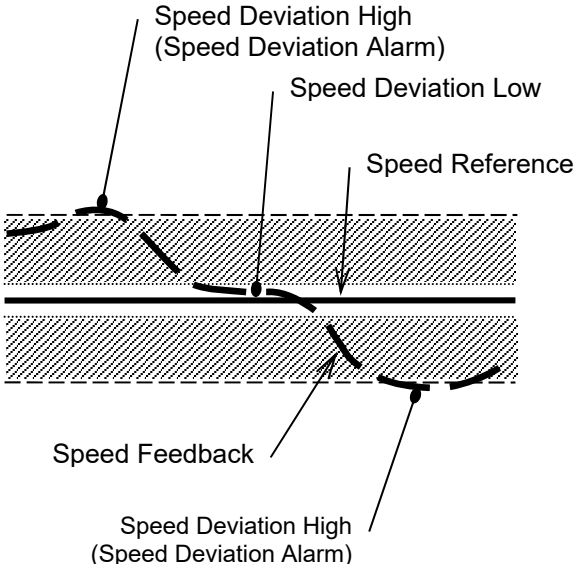


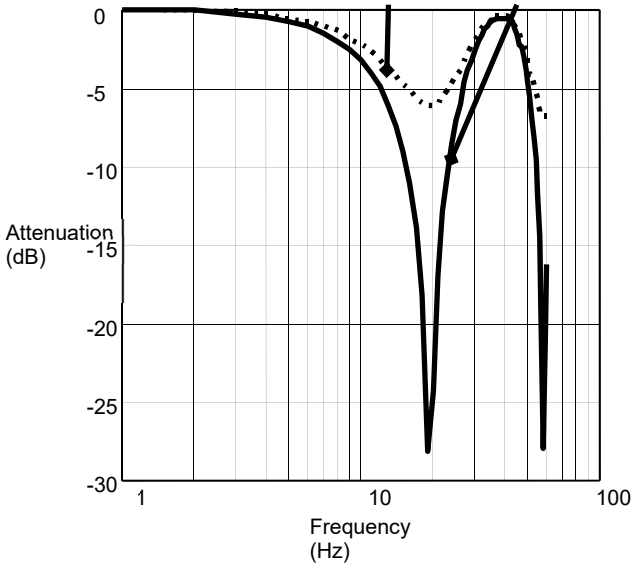
Figure 15: Speed Deviation Example

NOTCH FILTER FRQ

(Notch Filter Center Frequency)
This function helps alleviate the effects of rope resonance. This filter affects the torque command output of the speed regulator and will filter out specific frequencies. By filtering a specific frequency, the speed regulator will avoid exciting a mechanical resonance if one exists at that frequency.

There is attenuation across a range of frequencies, not just at the set frequency, but also to a lesser degree. The filter starts attenuation at frequencies lower than the notch frequency set point. When the notch frequency is set to low values (less than 10 Hz), the filter can interfere with the desired response of the drive. This can be exhibited by minor increase in the rollback of the drive at start and some deterioration in the ability of the drive to track an s-curve reference. Generally, this would not be an issue if the notch frequency were set at or above 10 Hz.

Notch Filter Example settings:
NOTCH FILTER FRQ (A1) = 20Hz
NOTCH FILT DEPTH (A1) = 50% and 100%



S-Curves A2 submenu

The drive speed command is passed through an internal S-curve in order to produce the speed reference. In general, the S curve function takes an arbitrary speed command and generates a speed reference subject to the conditions that the maximum accel, decel and jerk rates not be exceeded. The speed command is typically the target speed that the reference is headed to.

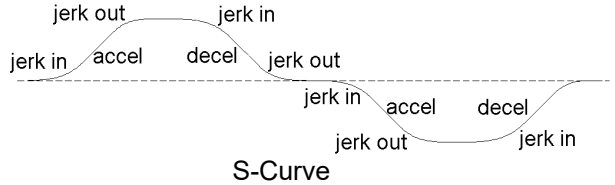
If the user gives the drive a speed dictation, either analog or serial, the S-Curve will act as a slew rate limiter on the externally generated speed dictation. For this purpose, set the jerk rates associated with the S-Curve (see Table 2 for determining which s-curve is used) to zero and the Accel Rate and Decel Rate to values faster than the maximum expected rated provided in the dictation signal.

Below shows the six parameters associated with an S-Curve data set:

- Accel - Maximum allowed acceleration rate (ft/s^2 or m/s^2)
- Decel - Maximum allowed deceleration rate (ft/s^2 or m/s^2)
- Accel Jerk In - Maximum allowed change in acceleration towards Accel (ft/s^3 or m/s^3)
- Accel Jerk Out - Maximum allowed change in acceleration from Accel (ft/s^3 or m/s^3)
- Decel Jerk In - Maximum allowed change in deceleration towards Decel (ft/s^3 or m/s^3)
- Decel Jerk Out - Maximum allowed change in deceleration from Decel (ft/s^3 or m/s^3)

The S-curves are specified by four parameters: acceleration rate (ft/s^2 or m/s^2), deceleration rate (ft/s^2 or m/s^2), leveling jerk rate (ft/s^3 or m/s^3), and jerk rate (ft/s^3 or m/s^3).

Since an adjustable jerk rate is helpful for smooth landings, the jerk rates are split for ease in elevator fine-tuning. The jerk rate parameters specify: acceleration from the floor (ACCEL JERK IN), jerk out of acceleration (ACCEL JERK OUT), jerk into deceleration (DECEL JERK IN), and the leveling into the floor (DECEL JERK OUT).



S-Curve

There are four S-curve patterns available in the drive and each S-curve is customized by six parameters:

Parameters for S-curve-0 (SC0):

- ACCEL RATE 0, DECEL RATE 0, ACCEL JERK IN 0, ACCEL JERK OUT 0, DECEL JERK IN 0, and DECEL JERK OUT 0

Parameters for S-curve-1 (SC1):

- ACCEL RATE 1, DECEL RATE 1, ACCEL JERK IN 1, ACCEL JERK OUT 1, DECEL JERK IN 1, and DECEL JERK OUT 1

Parameters for S-curve-2 (SC2):

- ACCEL RATE 2, DECEL RATE 2, ACCEL JERK IN 2, ACCEL JERK OUT 2, DECEL JERK IN 2, DECEL JERK OUT 2

Parameters for S-curve-3 (SC3):

- ACCEL RATE 3, DECEL RATE 3, ACCEL JERK IN 3, ACCEL JERK OUT 3, DECEL JERK IN 3, DECEL JERK OUT 3

S-Curve Pattern Selection

The default S-curve pattern is S-curve-0 (SC0). To make the other patterns available, the user must assign S-CURVE SEL 0 and/or S-CURVE SEL 1 as logic input(s). The logic input(s) can then be used to select one of the S-curve patterns, as follows:

Logic Inputs Assigned	S-curves Available
None	SC0 only
SEL 0 only	SC0 or SC1
SEL 1 only	SC0 or SC2
SEL 0 & SEL 1	SC0, SC1, SC2 or SC3

Table 2: S-Curve Availability

logic input S-CURVE		S-curve selected
SEL 1	SEL 0	
0	0	SCO
0	1	SC1
1	0	SC2
1	1	SC3

Table 3: Selecting S-Curves

Parameter	Description	Units	Default	Range	Hidden Item	Run lock out
ACCEL RATE 0	Acceleration rate limit	**ft/s²**	**7.99**	**0.00 – 7.99**	N	Y
		m/s²	**2.000**	**0.000 – 3.999**		
DECEL RATE 0	Deceleration rate limit	**ft/s²**	**7.99**	**0.00 – 7.99**	N	Y
		m/s²	**2.000**	**0.000 – 3.999**		
ACCEL JERK IN 0	Rate of increase of acceleration, up to ACCEL RATE, when increasing elevator speed	**ft/s³**	**0.0**	**0.0 – 29.9**	N	Y
		m/s³	**0.00**	**0.00 – 9.99**		
ACCEL JERK OUT 0	Rate of decrease of acceleration to zero when approaching contract elevator speed	**ft/s³**	**0.0**	**0.0 – 29.9**	N	Y
		m/s³	**0.00**	**0.00 – 9.99**		
DECEL JERK IN 0	Rate of increase of deceleration, up to DECEL RATE, when decreasing elevator speed	**ft/s³**	**0.0**	**0.0 – 29.9**	N	Y
		m/s³	**0.00**	**0.00 – 9.99**		
DECEL JERK OUT 0	Rate of decrease of deceleration to zero when slowing the elevator to leveling speed	**ft/s³**	**0.0**	**0.0 – 29.9**	N	Y
		m/s³	**0.00**	**0.00 – 9.99**		
ACCEL RATE 1	Acceleration rate limit	**ft/s²**	**7.00**	**0.00 – 7.99**	N	Y
		m/s²	**0.090**	**0.000 – 3.999**		
DECEL RATE 1	Deceleration rate limit	**ft/s²**	**3.00**	**0.00 – 7.99**	N	Y
		m/s²	**0.090**	**0.000 – 3.999**		
ACCEL JERK IN 1	Rate of increase of acceleration, up to ACCEL RATE, when increasing elevator speed	**ft/s³**	**8.0**	**0.0 – 29.9**	N	Y
		m/s³	**2.40**	**0.00 – 9.99**		
ACCEL JERK OUT 1	Rate of decrease of acceleration to zero when approaching contract elevator speed	**ft/s³**	**8.0**	**0.0 – 29.9**	N	Y
		m/s³	**2.40**	**0.00 – 9.99**		
DECEL JERK IN 1	Rate of increase of deceleration, up to DECEL RATE, when decreasing elevator speed	**ft/s³**	**8.0**	**0.0 – 29.9**	N	Y
		m/s³	**2.40**	**0.00 – 9.99**		
DECEL JERK OUT 1	Rate of decrease of deceleration to zero when slowing the elevator to leveling speed	**ft/s³**	**8.0**	**0.0 – 29.9**	N	Y
		m/s³	**2.40**	**0.00 – 9.99**		
ACCEL RATE 2	Acceleration rate limit	**ft/s²**	**3.00**	**0.00 – 7.99**	N	Y
		m/s²	**0.090**	**0.000 – 3.999**		
DECEL RATE 2	Deceleration rate limit	**ft/s²**	**3.00**	**0.00 – 7.99**	N	Y
		m/s²	**0.090**	**0.000 – 3.999**		
ACCEL JERK IN 2	Rate of increase of acceleration, up to ACCEL RATE, when increasing elevator speed	**ft/s³**	**8.0**	**0.0 – 29.9**	N	Y
		m/s³	**2.40**	**0.00 – 9.99**		
ACCEL JERK OUT 2	Rate of decrease of acceleration to zero when approaching contract elevator speed	**ft/s³**	**8.0**	**0.0 – 29.9**	N	Y
		m/s³	**2.40**	**0.00 – 9.99**		
DECEL JERK IN 2	Rate of increase of deceleration, up to DECEL RATE, when decreasing elevator speed	**ft/s³**	**8.0**	**0.0 – 29.9**	N	Y
		m/s³	**2.40**	**0.00 – 9.99**		
DECEL JERK OUT 2	Rate of decrease of deceleration to zero when slowing the elevator to leveling speed	**ft/s³**	**8.0**	**0.0 – 29.9**	N	Y
		m/s³	**2.40**	**0.00 – 9.99**		
ACCEL RATE 3	Acceleration rate limit	**ft/s²**	**3.00**	**0.00 – 7.99**	N	Y
		m/s²	**0.090**	**0.000 – 3.999**		
DECEL RATE 3	Deceleration rate limit	**ft/s²**	**3.00**	**0.00 – 7.99**	N	Y
		m/s²	**0.090**	**0.000 – 3.999**		
ACCEL JERK IN 3	Rate of increase of acceleration, up to ACCEL RATE, when increasing elevator speed	**ft/s³**	**8.0**	**0.0 – 29.9**	N	Y
		m/s³	**2.40**	**0.00 – 9.99**		
ACCEL JERK OUT 3	Rate of decrease of acceleration to zero when approaching contract elevator speed	**ft/s³**	**8.0**	**0.0 – 29.9**	N	Y
		m/s³	**2.40**	**0.00 – 9.99**		
DECEL JERK IN 3	Rate of increase of deceleration, up to DECEL RATE, when decreasing elevator speed	**ft/s³**	**8.0**	**0.0 – 29.9**	N	Y
		m/s³	**2.40**	**0.00 – 9.99**		
DECEL JERK OUT 3	Rate of decrease of deceleration to zero when slowing the elevator to leveling speed	**ft/s³**	**8.0**	**0.0 – 29.9**	N	Y
		m/s³	**2.40**	**0.00 – 9.99**		

Table 4: S-Curves A2 Submenu

Multistep Ref A3 submenu

The multi-step speed reference function is one possible way for the drive to accept speed command. To use this function, the user can enter up to fifteen speed commands (CMD1 – CMD15) and assign four logic inputs as speed command selections.

Note: CMD0 is reserved for zero speed, therefore is not accessible to the user for programming.

During operation, the user will encode a binary signal on the four logic inputs that determines which speed command the software should use. The user need not use all four speed command selection bits; if no logic input is specified for one of the selection bits, that bit is always zero. For instance, if no logic input is specified for the most significant bit (B3), that bit will be zero and the user can select from CMD0 - CMD7.

IMPORTANT

Since these speed commands are selected with external contacts, a new command selection must be present for 50ms before it is recognized.

logic input STEP REF				multi-step speed
B3	B2	B1	B0	command
0	0	0	0	CMD0
0	0	0	1	CMD1
0	0	1	0	CMD2
0	0	1	1	CMD3
0	1	0	0	CMD4
0	1	0	1	CMD5
0	1	1	0	CMD6
0	1	1	1	CMD7
1	0	0	0	CMD8
1	0	0	1	CMD9
1	0	1	0	CMD10
1	0	1	1	CMD11
1	1	0	0	CMD12
1	1	0	1	CMD13
1	1	1	0	CMD14
1	1	1	1	CMD15

Multi-step Selection

An example of the use of the multi-step command is as follows:

- All speed commands are positive.
- CMD0 specifies zero speed.
- CMD1 specifies leveling speed.
- CMD2 specifies inspection speed.
- CMD3 specifies an overspeed limit.
- CMD4 – CMD15 specify different top speeds depending on number of floors in the run.

For typical use, the user will have all speed commands to be positive, in which case logic inputs (UP/DWN or RUNUP & RUNDOWN) must also be specified to determine up or down direction. It is possible for the user to specify both positive and negative values for CMD1 - CMD15, in which case logic input bit(s) are not needed.

Parameter	Description	Units	Default	Range	Hidden Item	Run lockout
SPEED COMMAND 1	Multi-step speed command #1	**ft/min**	**0.0**	**-3000.0 – +3000.0**	N	Y
		m/sec	**0.000**	**-16.000 – +16.000**		
SPEED COMMAND 2	Multi-step speed command #2	**ft/min**	**0.0**	**-3000.0 – +3000.0**	N	Y
		m/sec	**0.000**	**-16.000 – +16.000**		
SPEED COMMAND 3	Multi-step speed command #3	**ft/min**	**0.0**	**-3000.0 – +3000.0**	N	Y
		m/sec	**0.000**	**-16.000 – +16.000**		
SPEED COMMAND 4	Multi-step speed command #4	**ft/min**	**0.0**	**-3000.0 – +3000.0**	N	Y
		m/sec	**0.000**	**-16.000 – +16.000**		
SPEED COMMAND 5	Multi-step speed command #5	**ft/min**	**0.0**	**-3000.0 – +3000.0**	N	Y
		m/sec	**0.000**	**-16.000 – +16.000**		
SPEED COMMAND 6	Multi-step speed command #6	**ft/min**	**0.0**	**-3000.0 – +3000.0**	N	Y
		m/sec	**0.000**	**-16.000 – +16.000**		
SPEED COMMAND 7	Multi-step speed command #7	**ft/min**	**0.0**	**-3000.0 – +3000.0**	N	Y
		m/sec	**0.000**	**-16.000 – +16.000**		
SPEED COMMAND 8	Multi-step speed command #8	**ft/min**	**0.0**	**-3000.0 – +3000.0**	N	Y
		m/sec	**0.000**	**-16.000 – +16.000**		
SPEED COMMAND 9	Multi-step speed command #9	**ft/min**	**0.0**	**-3000.0 – +3000.0**	N	Y
		m/sec	**0.000**	**-16.000 – +16.000**		
SPEED COMMAND 10	Multi-step speed command #10	**ft/min**	**0.0**	**-3000.0 – +3000.0**	N	Y
		m/sec	**0.000**	**-16.000 – +16.000**		
SPEED COMMAND 11	Multi-step speed command #11	**ft/min**	**0.0**	**-3000.0 – +3000.0**	N	Y
		m/sec	**0.000**	**-16.000 – +16.000**		
SPEED COMMAND 12	Multi-step speed command #12	**ft/min**	**0.0**	**-3000.0 – +3000.0**	N	Y
		m/sec	**0.000**	**-16.000 – +16.000**		
SPEED COMMAND 13	Multi-step speed command #13	**ft/min**	**0.0**	**-3000.0 – +3000.0**	N	Y
		m/sec	**0.000**	**-16.000 – +16.000**		
SPEED COMMAND 14	Multi-step speed command #14	**ft/min**	**0.0**	**-3000.0 – +3000.0**	N	Y
		m/sec	**0.000**	**-16.000 – +16.000**		
SPEED COMMAND 15	Multi-step speed command #15	**ft/min**	**0.0**	**-3000.0 – +3000.0**	N	Y
		m/sec	**0.000**	**-16.000 – +16.000**		

Table 5: Multi-Step Ref A3 Submenu

Motor Side Power Convert A4 submenu

Parameter	Description	Units	Default	Range	Hidden Item	Run lock out
ARM INDUCTANCE	(Armature Circuit Inductance) Affects tuning of the armature current regulator. Load this parameter with known or measured value. Only used if GAIN SELECTION (A4) is set to Manual.	**mH**	**10.00**	**0.01 – 327.67**	Y	N
ARM RESISTANCE	(Armature Circuit Resistance) Affects tuning of the armature current regulator. Load this parameter with known or measured value. Only used if GAIN SELECTION (A4) is set to Manual.	**ohm**	**0.1000**	**0.0001 – 2.9999**	Y	N
MOTOR FIELD RES	(Motor Field Resistance) Motor Field Resistance affects the tuning of the field current regulator. This parameter is used only if GAIN SELECTION (A4) is set to MANUAL.	**ohm**	**9.0**	**0.0 – 3276.7**	Y	N
MOTOR FIELD TC	(Motor Field Time Constant) Motor Field Time Constant affects the tuning of the field current regulator. This parameter is used only if GAIN SELECTION (A4) is set to MANUAL.	**sec**	**0.607**	**0.000 – 32.767**	Y	N
AUTO TUNE MOTOR	(Auto Tune Motor) Begins the procedure to calculate motor parameters. See Auto Tune Procedure on page 122.	**none**	**-**	**Start Auto Tune?**	N	Y
GAIN SELECTION	(Gain Selection) If set to MANUAL, the armature current regulator uses the values in ARM RESISTANCE (A4), ARM INDUCTANCE (A4), MOTOR FIELD RES (A4), and MOTOR FIELD TC (A4). If set to USE SELF TUNE, the armature current regulator gains are set using AUTO MEAS ARM L(D2), AUTO MEAS IR DROP (D2), AUTO MEAS ARM R (D2), AUTO FIELD RES (D2), and AUTO FIELD TC (D2). If set to USE SAVED PAR, the armature regulator gains are set using SAVE MEAS ARM L (A6), SAVE IR DROP (A6), SAVE MEAS ARM R (A6), SAVE FIELD RES (A6), and SAVE FIELD TC (A6). If the D2 submenu contains null values and USE SELF TUNE is selected, GAIN SELECTION (A4) will revert back to MANUAL. If the SAVE MEAS parameters in the A6 submenu contain null values and USE SAVED PAR is selected, GAIN SELECTION (A4) will revert back to MANUAL.	**none**	**MANUAL**	– **Manual** – **Use saved par** **Use self tune**	N	N

Parameter	Description	Units	Default	Range	Hidden Item	Run lock out
GAIN BANDWIDTH A	(Gain Bandwidth Armature) If GAIN SELECTION (A4) is set to MANUAL, this parameter is used to convert ARM RESISTANCE (A4) and ARM INDUCTANCE (A4) into the integral and proportional gains used by the current regulator. If GAIN SELECTION is set to USE SELF TUNE, this parameter is used to convert AUTO MEAS ARM R (D2) and AUTO MEAS ARM L (D2) into the integral and proportional gains used by the current regulator. The higher the setting, the more faithfully the regulator will duplicate its input command, however, too high of a bandwidth can cause problems such as a rough ride as the drive is more responsive.	**rad/ sec**	**500**	– **100 – 2000**	N	N
GAIN BANDWIDTH F	(Gain Bandwidth Field) If GAIN SELECTION is set to AUTO-TUNE, this parameter is used to calculate AUTO FIELD RES (D2) and AUTO FIELD TC (D2) into the integral and proportional gains used by the field regulator. The higher the setting, the more faithfully the regulator will duplicate its input command, however, too high of a bandwidth can cause problems such as a rough ride as the drive is more responsive. This parameter is not used when GAIN SELECTION (A4) = MANUAL.	**rad/sec**	**5**	**1 – 40**	N	N
SPD MODEFILT BW	(Speed Mode Filter Bandwidth) This parameter sets the frequency of an encoder filter that affects PWM control at very low motor torque. Care must be taken when using this parameter as an inappropriate value may cause speed instability.	**rad/sec**	**100**	**5 – 110**	N	N
PWM FREQUENCY	(PWM Frequency) This parameter sets the PWM or 'carrier' frequency of the motor armature portion of the drive.	**kHz**	**6.0**	**2.5 – 16.0**	N	N
UV-ALARM LEVEL	(Undervoltage Alarm Level) This parameter sets the level at which an under voltage alarm will be declared. Units in percent of L-L voltage.	**%**	**90**	**80 – 99**	Y	N
UV FAULT LEVEL	(Undervoltage Fault Level) This parameter sets the level at which an under voltage fault will occur. Units in percent of L-L voltage.	**%**	**80**	**50 – 99**	Y	N
FLD CARRIER FRQ	(Field Carrier Frequency) Allows modification of PWM frequency to help eliminate acoustic noise. If the Low Voltage Field Module is used, this parameter has no effect. With the Low Voltage Field Module, the Field Carrier Frequency is fixed at 40 kHz.	**kHz**	**HiVolt Fld Mod 3** **LoVolt Fld Mod 40**	**HiVolt Fld Mod 3 – 10** **LoVolt Fld Mod 40**	Y	N

Table 6: Motor Side Power Convert A4 Submenu

Line Side Power Converter A5 submenu

NOTE: The only parameter that should ever need to be adjusted is INPUT L-L VOLTS. Other parameters are for Magnetek Engineering use only.

Parameter	Description	Units	Default	Range	Hidden Item	Run lock out
Id REG PROP GAIN	Proportional gain for out-of-phase current regulator	**none**	**0.30**	**0.00 – 9.99**	N	N
Id REG INTEGRAL GAIN	Integral gain for out-of-phase current regulator	**none**	**10**	**0 – 999**	N	N
Iq REG PROP GAIN	Proportional gain for in-phase current regulator	**none**	**0.30**	**0.00 – 9.99**	N	N
Iq REG INTEGRAL GAIN	Integral gain for in-phase current regulator	**none**	**40**	**0 – 999**	N	N
DC BUS REG P GAIN	Proportional gain for bus voltage regulator	**none**	**3.00**	**0 – 9.99**	N	N
DC BUS REG I GAIN	Integral gain for bus voltage regulator	**none**	**40**	**0 – 999**	N	N
INPUT L-L VOLTS	(Input Line to Line Voltage - Input Voltage) This parameter sets the nominal input voltage to the drive. Must be set correctly to calibrate DC bus voltage regulation and precharge.	**volts**	**200**	**150 – 480**	N	Y
INITIAL L FREQ	(Initial Line Frequency) This parameter sets the initial frequency of the input line voltage. The defaulted value of 55Hz will work for most applications, however, when line power is switched from utility power to emergency power, this value should be set for the actual line power input frequency.	**Hz**	**55**	**50 – 60**	N	Y
DC BUS V BOOST	(DC bus voltage reference) Adjusts the DC bus voltage boost above the peak of line voltage. Note: The bus must be higher than the Motor Armature Voltage and higher than the line voltage for proper line side regulation of harmonics and power factor.	**Vdc**	**30**	**15 – 75**	N	N
SW BUS OV LEVEL	(Software Bus Overvoltage Level) DC bus software Overvoltage trip point.	**Vdc**	**850**	**100 – 850**	N	N
BUS VREF SOURCE	(Bus Voltage Reference Source) Selects the bus voltage boost reference. • Track Line V uses the actual line voltage for the bus reference. Recommended for systems with a stiff line. • Trk Vin Param uses INPUT L-L VOLTS (A5) for the bus reference. Recommended to systems with a soft line.	**none**	**TRACK LINE V**	– **Track Line V** – **Trk Vin Param**	N	N

Parameter	Description	Units	Default	Range	Hidden Item	Run lock out
PLL FILTER FC	(Phase Locked Loop Filter Frequency) Utility line Phase Locked Loop filter corner Frequency	**Hz**	**40.0**	**20.0 – 150.0**	N	N
POLE FILTER	(Pole Filter Setting) This parameter adds a low pass filter to the line side to help alleviate nuisance noise issues. This can be very useful in situations where multiple drives are located on the same line. For one Quattro DC on the line, 2.2kHz setting is recommended. Setting this parameter between 0.1 and 0.9 kHz, an 800 Hz 2nd order lowpass filter, plus a 2nd order notch filter is added to the line side. Setting this parameter to 1.0 kHz, an 800 Hz 2nd order lowpass filter is added. Setting this parameter between 1.1 and 3.0, a cascaded 2nd order notch filter is added with the center frequency the setting of POLE FILTER.	**kHz**	**2.2**	**0.1 – 3.0**	Y	N
PRE CHGE THRESH	(Pre-Charge Threshold) This parameter determines the allowable variance between actual and calculated Bus Voltage during power up. Failure to meet this threshold will result in a LS CHARGE Fault and can be an indication of a loaded down Bus. Most applications should use the default value. Lowering this value tightens the tolerance and lead to nuisance faults. Raising this value can cause loose tolerance and risk damage to Pre-Charge Resistors.	**none**	**28**	**1 – 60**	N	N
LS PWM FREQUENCY	(Line Side PWM Frequency) This parameter sets the PWM or 'carrier' frequency of the converter portion of the drive.	**kHz**	**10.0**	**8.0 – 12.0**	N	N

Table 7: Line Side Power Convert A5

Motor Parameters A6 submenu

Parameter	Description	Units	Default	Range	Hidden Item	Run lock out
MOTOR ID	(Motor Identification) This parameter allows for the selection of specific sets of motor parameters. This is yet to be determined for DC machines.	**-**	**-**	**-**	N	Y
RATED MOTOR CURR	(Rated Armature Amps) Motor armature amps. Note: value should be obtained from the motor nameplate.	**amps**	**0.0**	**1.0 – 400.0**	N	Y
ARMATURE VOLTAGE	(Rated Armature Voltage) Rated motor armature circuit voltage. Note: value should be obtained from the motor nameplate.	**volts**	**0**	**55 – 600**	N	N
FULL FLD CURRENT	(Full Field Current) This parameter sets motor field amps at low speed. Note: value should be obtained from the motor nameplate.	**amps**	**0.0**	**1.0 – 40.0**	N	N
WEAK FLD CURRENT	(Weak Field Current) This parameter sets the motor field amps at contract. Adjust as necessary to obtain rated armature volts at contract speed at full load up. May be the same as or lower than Full field Amps for motor field weakening. Motor field current will automatically begin to weaken when motor speed is Contract Speed x Weak Field/Full Field and follow a profile for constant CEMF.	**amps**	**0.0**	**1.0 – 40.0**	N	N
STANDBY FIELD	(Standby field Amps) Motor field current during drive standby conditions. Motor current will automatically drop to this level when idle after STNDBY FIELD TIME has expired.	**amps**	**0.0**	**0.0 – 40.0**	N	N
FLUX CNFRM LEVEL	(Flux Confirm Level) Determines the minimum motor field current necessary before drive is allowed to start. Arranged as a percent of Full Field ampere setting. This ensures that pre-torque current to motor will produce adequate torque when the elevator Brake is released. A lower setting will allow the drive to come alive earlier in the start cycle to help prevent unnecessary starting delays. Units in percent of full field.	**%**	**85.0**	**25.0 – 99.0**	N	N
ARMATURE IR DROP	(Armature IR Drop) Adjusts motor armature current regulator for expected current x resistance voltage drop of motor armature circuit at rated current. Includes motor armature, inter-poles and wiring resistance. Enter as a percent of rated armature volts. This parameter also affects the sensitivity of the fault, Encoder Fault. Note: This equation is only valid after an Auto Tune has been done. For information on auto tuning the motor, see page 122. $\frac{(\text{AUTO MEAS ARM R (D2)}) \times (\text{RATED MOTOR CURR(A6)})}{(\text{ARMATURE VOLTS (A6)})} \times 100 = (\text{ARM IR DROP (A6)})$	**%**	**0.0**	**0.0 – 25.0**	N	N

Parameter	Description	Units	Default	Range	Hidden Item	Run lock out
TACH VOLT SENSE	(Tachometer Voltage Sense) Sets the minimum armature voltage where the Encoder Loss and Reverse Tach functions will become operative. This parameter prevents nuisance encoder faults during low speeds and high torque conditions by adjusting the encoder loss sensitivity to motor IR drop. Works in conjunction with TACH SPEED SENSE. An ENCODER FLT will be declared if the following two equalities are satisfied: $\left(\begin{matrix}TACH\ VOLT\\SENSE\ (A6)\end{matrix}\right)\times\left(\begin{matrix}ARMATURE\\VOLTAGE\ (A6)\end{matrix}\right)<\left(\begin{matrix}ARMATURE\\VOLTAGE\ (D2)\end{matrix}\right)$ and $\left(\begin{matrix}TACH SPEED\\SENSE(A6)\end{matrix}\right)\times\left(\begin{matrix}CONTRACT\\CAR\\SPEED(A1)\end{matrix}\right)>\left(\begin{matrix}SPEED\\FEEDBACK\\(D1)\end{matrix}\right)$	**%**	**25.0**	**0.1 – 60.0**	N	N
TACH SPEED SENSE	(Tachometer Speed Sense) Sets the level of measured speed feedback below which an Encoder Loss Fault is declared – once motor armature voltage conditions are satisfied. Works in conjunction with TACH VOLT SENSE. An ENCODER FLT will be declared if the following two equalities are satisfied: $\left(\begin{matrix}TACH\ VOLT\\SENSE\ (A6)\end{matrix}\right)\times\left(\begin{matrix}ARMATURE\\VOLTAGE\ (A6)\end{matrix}\right)<\left(\begin{matrix}ARMATURE\\VOLTAGE\ (D2)\end{matrix}\right)$ and $\left(\begin{matrix}TACH SPEED\\SENSE(A6)\end{matrix}\right)\times\left(\begin{matrix}CONTRACT\\CAR\\SPEED(A1)\end{matrix}\right)>\left(\begin{matrix}SPEED\\FEEDBACK\\(D1)\end{matrix}\right)$	**%**	**5.0**	**0.1 – 40.0**	N	N
OVLD START LEVEL	(Motor Overload Start Level) This parameter defines maximum current at which motor can run continuously without triggering the motor overload. One of the two parameters that define the motor overload curve. Set as a percent of Rated Motor Current. *For more information on the motor overload curve, see* OVLD TIME OUT and OVLD START LEVEL *on page 62.*	**%**	**110**	**100 – 150**	N	Y
OVLD TIME OUT	(Motor Overload Time Out) This parameter defines the amount of time before a motor overload alarm occurs when the motor is running at the current level defined below: $\left(\begin{matrix}OVLD\\START\\LEVEL\ :\end{matrix}\right)+\left(\begin{matrix}40\ \%\\rated\\motor\\current\end{matrix}\right)$ This is the other parameter used to define the overload curve. *For more information on the motor overload curve, see* OVLD TIME OUT and OVLD START LEVEL *on page 62.*	**sec**	**60.0**	**5.0 – 120.0**	N	Y

Parameter	Description	Units	Default	Range	Hidden Item	Run lock out
SAVE MEAS ARM L	(Saved Measured Armature Circuit Inductance) Affects tuning of the armature current regulator. This parameter will automatically fill with measured value AUTO MEAS ARM R (D2) after Auto-Tune. This parameter is used only if GAIN SELECTION (A4) is set to USE SAVED PAR. Note: This parameter cannot be adjusted via the handheld operator.	**mH**	**0.00**	**0.00 – 327.67**	N	Y
SAVE IR DROP	(Saved Armature IR Drop) Adjusts motor armature current regulator for expected current multiplied by resistance voltage drop of motor armature circuit at rated current. Includes motor armature, inter-poles and wiring resistance. This parameter will automatically fill with the measured value AUTO MEAS IR DROP (D2) after Auto-Tune. This parameter also affects the sensitivity of the fault, Encoder Fault. This parameter is used only if GAIN SELECTION (A4) is set to USE SAVED PAR. Note: This parameter cannot be adjusted via the handheld operator.	**%**	**0.0**	**0.0 – 3276.7**	N	Y
SAVE MEAS ARM R	(Saved Measured Armature Circuit Resistance) Affects tuning of the armature current regulator. This parameter will automatically fill with measured value AUTO MEAS ARM L (D2) after Auto-Tune. This parameter is used only if GAIN SELECTION (A4) is set to USE SAVED PAR. Note: This parameter cannot be adjusted via the handheld operator.	**ohm**	**0.0000**	**0.0000 – 3.2767**	N	Y
SAVE FIELD RES	(Saved Measured Field Resistance) Affects tuning of the field current regulator. This parameter automatically fills in with AUTO MEAS FIELD RES (D2) after auto-tune. This parameter is used only if GAIN SELECTION (A4) is set to USE SAVED PAR. Note: This parameter cannot be adjusted via the handheld operator.	**ohm**	**0.0**	**0.0 – 3276.7**	Y	Y
SAVE FIELD TC	(Saved Measured Field Time Constant) Affects tuning of the field current regulator. This parameter automatically fills in with AUTO MEAS FIELD TC (D2) after auto-tune. This parameter is used only if GAIN SELECTION (A4) is set to USE SAVED PAR. Note: This parameter cannot be adjusted via the handheld operator.	**sec**	**0.000**	**0.000 – 32.767**	N	Y

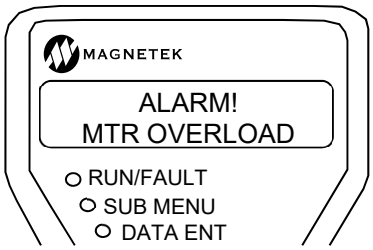
OVLD TIME OUT and OVLD START LEVEL

These two parameters are used to define the overload curve.
The user can adjust the motor overload parameters. Three overload curves are shown in the examples below. Curve #1 is the default motor overload curve.

	OVLD START LEVEL	OVLD TIME OUT
curve #1	110%	60 sec
curve #2	110%	40 sec
curve #3	120%	70 sec

Motor Overload Parameters

When the motor usage exceeds the user defined motor overload curve, the drive will declare a motor overload alarm.



The drive will only declare a motor overload alarm and the user is responsible for taking appropriate action to protect equipment.
The motor overload alarm can also be assigned to a logic output. See configuration sub-menu items, C3.

The drive can also be configured so that a motor overload event declares a Fault, which will automatically cause the drive to stop. If this is desirable, the following needs to be completed:

- solid state relay or relay coil is configured to MTR OVERLOAD
- logic input configured to EXT FAULT
- wire the EXT FAULT logic input terminal to the to MTR OVERLOAD relay output terminal
- wire one side of the normally open relay to +24V (TB1-11 or TB1-46)

With the above set-up, the drive will then declare an External Fault on a motor overload.

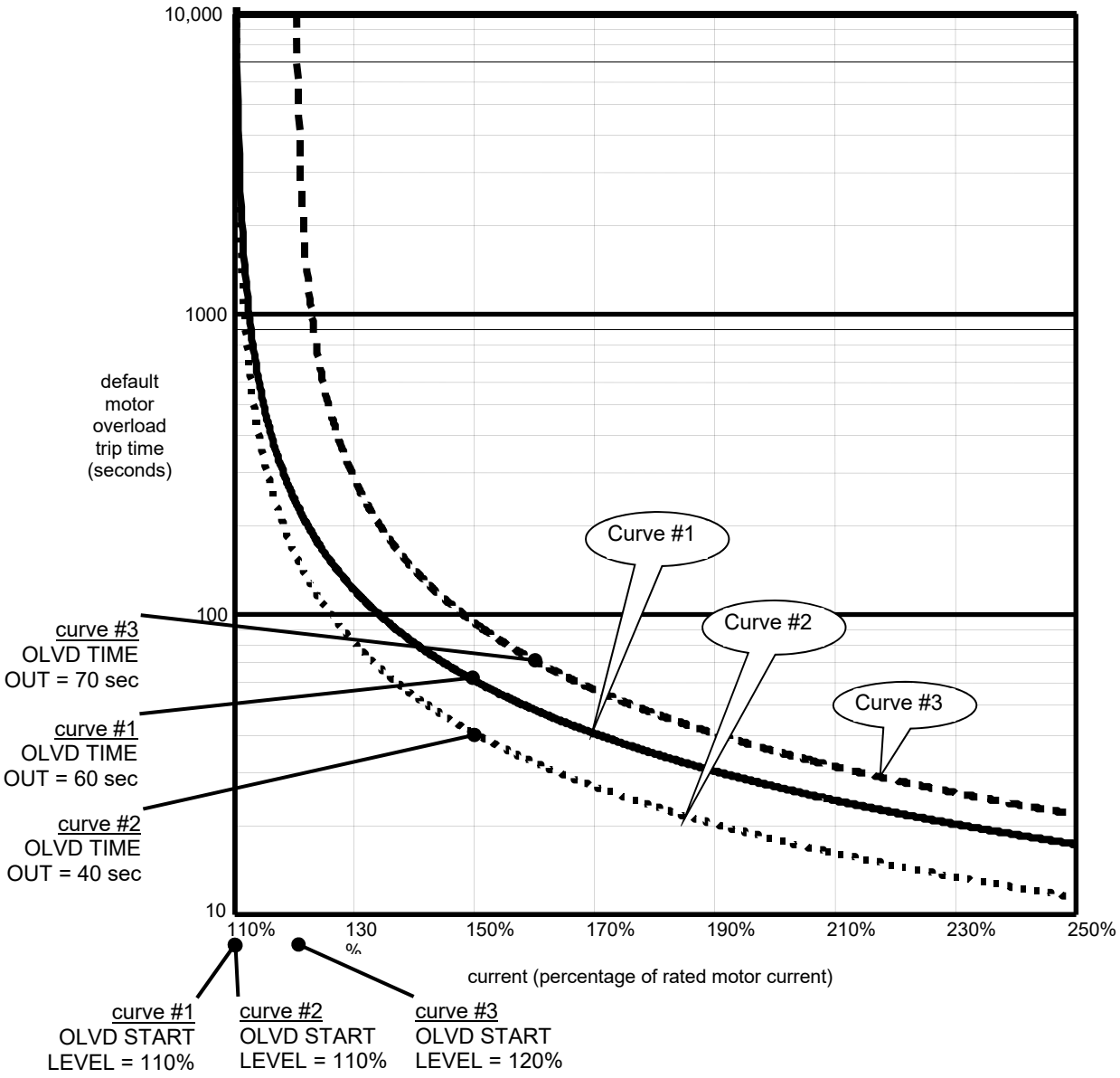


Figure 16: Motor Overload Curve

Configure C0 menu

User Switches C1 submenu

<table>
<tr><th>Parameter</th><th>Description</th><th>Default</th><th>Choices</th><th>Hidden Item</th><th>Run lock out</th></tr>
<tr><td>SPD COMMAND SRC</td><td>(Speed Command Source)
This parameter designates the source of the drive's speed command. The four possible sources for the speed command are following:
• Serial Channel - a RS-422 serial port located on the customer interface PCB.
• Analog Channel – a bipolar (±10V) signal. Available with the analog channel is a Speed Command Multiplier (SPD COMMAND MULT(A1)) and Speed Command Bias (SPD COMMAND BIAS(A1)). These parameters are used to scale the user's analog speed command to the proper range for use by the drive software.
• Multi-Step Command - user defined fifteen discrete speed commands (CMD1 - CMD15 in A3 submenu). Four logic inputs are used as speed command selections. CMD0 is reserved for zero speed, but the user can specify CMD1 - CMD15 to be any speed command either positive or negative. See Multistep Ref A3 on page 53.
• Ser Mult Step Command - user defined fifteen discrete speed commands (CMD1 - CMD15 in A3 submenu). Four bits in the serial protocol are toggled to run multi-step serially. See Multistep Ref A3 on page 53.</td><td>MULTI-STEP</td><td>– serial
– multi-step
– ser mult step
– analog input</td><td>Y</td><td>N</td></tr>
<tr><td>RUN COMMAND SRC</td><td>(Run Command Source)
This parameter allows the user to choose the source of the run command from one of the following sources: an external run signal from a logic input (external tb), a run signal transferred across a serial channel (serial), or a signal from both the serial channel and a logic input (serial+extrn). If a signal is required from a logic input (either externaltb or serial+extrn), the Run signal on TB1 must be selected.</td><td>EXTERNAL TB</td><td>– external tb
– serial
– serial+extrn</td><td>Y</td><td>N</td></tr>
<tr><td>FIELD ENA SOURCE</td><td>(Field Enable Source)
Enabling the Field Source initially turns on the Line Side Boost, than establishes a field. This may be done through a logic input (set FIELD ENA SOURCE to EXTERNAL TB), serially, (set FIELD ENA SOURCE to SERIAL), by the run command (set FIELD ENA SOURCE to ENABLE ON RUN), or by 2-bit serial. 2-bit serial uses two bits given to the drive serially to control the field. See the table below for the bit options. Bit 1 refers to Full Field bit while Bit 0 refers to Standby Field Bit. While the motor is running, both Boost and Field are on.
<table>
<tr><td>Bit 1</td><td>Bit 0</td><td>Boost</td><td>Field</td></tr>
<tr><td>0</td><td>0</td><td>Off</td><td>Off</td></tr>
<tr><td>1</td><td>~</td><td>On</td><td>Full Field or Weak Fld depending on speed</td></tr>
<tr><td>0</td><td>1</td><td>On</td><td>Standby</td></tr>
</table></td><td>ENABLE ON RUN</td><td>– external tb
– serial
– enable on run
– 2-bit serial</td><td>Y</td><td>N</td></tr>
</table>

Parameter	Description	Default	Choices	Hidden Item	Run lock out
HI/LO GAIN SRC	(High / low gain change switch source) This parameter determines the source of the high / low gain switch. The speed regulator high / low gain function was developed in response to high performance elevator requirements where the resonant nature of the elevator system interferes with the speed response of the drive. For more information, see HI/LO GAIN SRC on page 73.	**INTERNAL**	– **internal** – **external tb** – **serial**	Y	N
SPEED REG TYPE	(Speed Regulator Type) This switch toggles between the Elevator Speed Regulator (Ereg), the PI Speed Regulator, external reg, and cemf reg. Magnetek recommends the use of the Elevator Speed Regulator for better elevator performance with multi-step speed applications or when an active torque Feed Forward signal is not available. If set to CEMF REG, the drive will not use the encoder as feedback, but rather the armature voltage. Note: this is only meant for maintenance. For more information, see Armature Voltage Feedback on page 34. If set to External Regulator, the drive will be configured as a torque controller. The source of the external torque command is determined by the EXT TORQ CMD SRC (C1) parameter. **WARNING** If using an external speed regulator, which produces an analog torque command to Quattro (SPEED REG TYPE (C1) = external reg and EXT TORQ CMD SRC (C1) = analog input), it is imperative that the encoder polarity matches the armature voltage. To verify polarity, insert a torque command into the analog input. Check ENCODER SPD (D2) against ARMATURE VOLTAGE (D2). Verify they are the same polarity. If not, swap A and /A or change the ENCODER CONNECT (C1) parameter. IMPORTANT: This assumes the car controller is doing its own closed-loop speed regulation. (i.e. a completely closed outer speed loop with the car controller having its own encoder feedback). The drive has the following three closed loop speed regulation options and an option for turning off the internal speed regulator: • Elevator Speed Regulator (Ereg) (*see page 74*) • PI Speed Regulator (*see page 74*) • External Speed Regulator	**ELEV SPD REG**	– **elev spd reg** – **pi speed reg** – **external reg** – **cemf reg**	Y	N

Quattro DC User Switches C1 Submenu

Parameter	Description	Default	Choices	Hidden Item	Run lock out
MOTOR ROTATION	(Motor Rotation) This parameter allows the user to change the direction of the motor rotation. As an example, if the car controller is commanding the up direction and the car is actually going in a down direction, this parameter can be changed to allow the motor rotation to match the car controller command.	**FORWARD**	– **forward** – **reverse**	Y	N
ENCODER CONNECT	(Encoder Connection) This parameter allows the user to electronically switch A and /A signals from the encoder without moving any wiring.	**FORWARD**	– **forward** – **reverse**	Y	N
SPD REF RELEASE	(Speed Reference Release) The user can select when the Speed Reference Release signal is asserted: • If the user does not want the drive to wait for the mechanical brake to be picked then SPD REF RELEASE can be made equal to REG RELEASE; • If the user does want the drive to wait for the brake to be picked then SPD REF RELEASE is not asserted until an internal BRAKE PICKED signal becomes true. The user must have one logic input set to Mech Brk Pick – *see page 78*.	**REG RELEASE**	– **reg release** – **brake picked**	Y	N
CONT CONFIRM SRC	(Contactor Confirm Source) This switch selects if hardware confirmation of motor contactor closure is necessary before drive attempts to pass current through motor. If hardware confirmation is available set to EXTERNAL TB and select the Contact Cfirm signal on a logic input terminal – *see page 78*.	**NONE**	– **external tb** – **none**	Y	N
TACH FILTER	(Tach Filter) Determines if encoder feedback is filtered per TACH FILTER BW (A1).	**OFF**	– **off** – **on**	Y	N
PreTorque SOURCE	(Pre-Torque Source) This switch determines the source of a pre torque command and how it is used. Pre-torque is the value of torque that the drive should produce as soon as the speed regulator is released to prevent rollback due to unbalanced elevator loads. This 'priming' of the speed regulator is done with the pre-torque command, which is used when the speed regulator release is asserted. The two possible sources for the pre-torque command are following: • serial channel • analog channel The serial channel is the RS-422 serial port on the Customer Interface PCB. The analog pre-torque signal is bipolar (±10V). Available with the analog channel is a Pre-Torque Command Multiplier (PRE TORQUE MULT (A1)) and Pre-Torque Bias (PRE TORQUE BIAS(A1)). These parameters are used to scale the user's analog pre-torque command to the proper range for use by the drive software.	**NONE**	– **none** – **analog input** – **serial**	Y	N

Parameter	Description	Default	Choices	Hidden Item	Run lock out
PreTorque LATCH	(PreTorque Latch) If Pre-Torque latching is NOT selected, the Pre-Torque signal must be valid when the speed regulator is commanded to run. For verification on timing, see NORMAL operating sequence on page 31. Some car controllers send both analog pre-torque and speed commands. To facilitate this, the Drive has the option of latching the pre-torque command. If pre-torque latching is selected using the Pre-Torque Latch parameter, a FALSE to TRUE transition on the pre-torque latch clock latches the value on the pre-torque channel into the drive. This channel is allowed to change any time except during this transition without affecting the value of the latched pre-torque command. The Pre-Torque Latch Clock controls when the pre-torque command is latched. The Pre-Torque Latch clock parameter (Ptorq LATCH CLCK) determines the source of this latch control. The two choices for latch control are the serial channel or a logic input (EXTERNAL TB). The speed regulator uses the latched pre-torque command when the internal Speed Regulator Release signal is asserted. Once the pre-torque command is used, the latch and the pre-torque command are cleared.	**NOT LATCHED**	– **latched** – **not latched**	Y	N
Ptorq LATCH CLCK	(Pre-Torque Latch Clock) If the PRE-TORQUE LATCH has been set to LATCHED, then this parameter chooses the source for latch control. If set to EXTERNAL TB1, the Pre-Torq Latch signal on TB1 must be selected.	**EXTERNAL TB**	– **external tb** – **serial**	Y	N
FAULT RESET SRC	(Fault Reset Source) This parameter determines the source of the drive's external fault reset from one of the following sources: an external fault reset signal from a logic input (external tb), a fault reset signal transferred across a serial channel (serial), or the drive automatically resets the faults (automatic). The user also has the option to reset faults directly through the operator. <u>Automatic Fault Reset:</u> If the fault reset source is set to automatic, the faults will be reset according to the setting of the FLT RESET DELAY (A1) and FLT RESETS/HOUR (A1) parameters. When a logic input is defined as "fault reset" and this logic input signal is transitioned from false to true: an active fault will be reset and automatic fault reset counter (defined by FLT RESETS/HOUR(A1)) will be reset to zero. **CAUTION:** If the run signal is asserted at the time of a fault reset, the drive will immediately go into a run state. Unless using the auto-fault reset function (FAULT RESET SRC (C1) = automatic), then the run command needs to be cycled to be reset automatically, but will reset if initiated by a logic input without cycling the run command.	**EXTERNAL TB**	– **external tb** – **serial** – **automatic**	Y	N

Quattro DC User Switches C1 Submenu

Parameter	Description	Default	Choices	Hidden Item	Run lock out
OVERSPD TEST SRC	(Overspeed Test Source) This switch determines the source of the overspeed test. Operation of the overspeed test function is specified by the OVRSPEED MULT (A1) parameter. Regardless of the setting of this parameter, the user can call for the overspeed test via the Digital Operator.	**EXTERNAL TB**	– **external tb** – **serial**	Y	N
BRAKE PICK SRC	(Brake Pick Source) If the BRAKE PICK SRC (C1) is set to INTERNAL, the Drive will attempt to pick (lift) the brake when magnetizing current has been developed in the motor.	**INTERNAL**	– **internal** – **serial**	Y	N
BRAKE PICK CNFM	(Brake Pick Confirm) If this switch is set to EXTERNAL TB, the Drive will wait for brake pick confirmation before releasing the speed reference. When set to EXTERNAL TB, the MECH BRK PICK signal on TB1 must also be selected. If ON SPEED CMD is selected, the drive will wait for a non-zero speed command before releasing the speed reference.	**NONE**	– **none** – **external tb** – **internal time** – **on speed cmd**	Y	N
BRAKE HOLD SRC	(Brake Hold Source) If set to internal, the drive will command the mechanical brake to hold mode after confirmation of brake picked exists.	**INTERNAL**	– **internal** – **serial**	Y	N
RAMPED STOP SEL	(Ramp Stop Select) This parameter allows the selection of the Torque Ramp Down Stop function. This function is used to gradually remove the torque command after the elevator has stopped and the mechanical brake has been set. This prevents a shock and possible 'bump' felt in the elevator from the torque signal going to zero too quickly. For more information, see Ramp Stop Select on page 75.	**NONE**	– **none** – **ramp on stop**	Y	N
RAMP DOWN EN SRC	(Ramp Down Enable Source) If RUN LOGIC is selected, the user can remove the run command and the drive will delay in dropping the run command until torque ramp down stop function is complete. If EXTERNAL TB or SERIAL is selected, the user must keep the run command while allowing the Torque Ramp Down Stop function to be completed.	**EXTERNAL TB**	– **external tb** – **run logic** – **serial**	Y	N
BRK PICK FLT ENA	(Brake Pick Fault Enable) When this parameter is set to ENABLE, the brake pick command and confirmation must match within the specified time determined by the BRK PICK TIME (A1) parameter or a brake pick fault is declared.	**DISABLE**	– **disable** – **enable**	Y	N
BRK HOLD FLT ENA	(Brake Hold Fault Enable) When this parameter is set to ENABLE, the brake hold command and confirmation must match within the specified time determined by the BRK HOLD TIME (A1) parameter or a brake hold fault is declared.	**DISABLE**	– **disable** – **enable**	Y	N

Parameter	Description	Default	Choices	Hidden Item	Run lock out
EXT TORQ CMD SRC	(Torque Command Source) Sets the source of an external torque command, if any. Selections are: – NONE: no external torque command used – SERIAL: supplied via the serial link – ANALOG: supplied via an analog input channel **WARNING** If using an external torque command (SPEED REG TYPE (C1) = external reg and EXT TORQ CMD SRC (C1) = analog input), it is imperative that the encoder polarity matches incoming torque command polarity. To verify polarity, insert a positive torque command into the analog input. Check ENCODER FEEDBACK (D1) to verify it is also a positive value. If not, swap A and /A or change the ENCODER CONNECT (C1) parameter. NOTE: • if SPEED REG TYPE (C1) is set to external reg and EXT TORQ CMD SRC (C1) is set to serial or analog, the drive is a torque controller • if SPEED REG TYPE (C1) is set for a speed regulator (either pi speed reg or elev spd reg) and EXT TORQ CMD SRC (C1) is set to either analog or serial, the torque command will be used as an auxiliary torque command (torque feedforward command)	**NONE**	– **none** – **serial** – **analog input**	Y	N
DIR CONFIRM	(Direction Confirm) When enabled, the function allows confirmation of the polarity of the initial analog speed command via the Run Up or Run Down logic input commands. • If the Run Up logic input is selected and true with the polarity of the analog signal positive, then the analog speed command is accepted unchanged. • If the logic input Run Down logic input is selected and true with the polarity of the analog speed command negative, the analog speed command is accepted unchanged. • If however, the logic input Run Up is true and the polarity is negative or the logic input Run Down is true and the polarity is positive, then the speed command is held at zero.	**DISABLED**	– **disabled** – **enabled**	Y	N

Parameter	Description	Default	Choices	Hidden Item	Run lock out
S-CURVE ABORT	(S-Curve Abort) This parameter, S-CURVE ABORT (C1), addresses how the S-Curve Speed Reference Generator handles a reduction in the speed command before the S-Curve Generator has reached its target speed. Disabled: With a normal S-curve function, a change in the speed command is never allowed to violate the defined acceleration or jerk rates. If a reduction in the speed command is issued before the S-Curve generator has reached its target speed, then the jerk rate dictates what speed is reached before the speed may be reduced. Enabled: The optional S-Curve abort has been selected. In this case when the speed command is reduced, the speed reference immediately starts to reduce violating the jerk limit (thus no jerk out phase), which could be felt in the elevator. For optional S-Curve abort to be active: • The speed command source must be selected as Multi-step (SPD COMMAND SRC=multi-step). • The S-curve Abort function must be ENABLED (S-CURVE ABORT = enabled).	**DISABLED**	– **disabled** – **enabled**	Y	N
PRIORITY MESSAGE	(Priority Message Enabling) With Priority Message disabled the user will not see priority messages meaning faults and alarms will not be displayed on the operator, but the faults will be placed into the fault history and active fault lists with the Fault LED on. Leave Priority Message enabled when drive is not being worked on.	**ENABLE**	– **disable** – **enable**	Y	N
STOPPING MODE	(Multi-step Stopping Mode Selection) When the speed command source is set to multi-step (SPD COMMAND SRC (C1)=multi-step), the parameter, STOPPING MODE (C1), determines the stopping mode of the Drive. The two selectable methods for the Stopping Mode parameter are “Immediate” and “Ramp to stop”. Note: If the SPD COMMAND SRC (C1) parameter is set to any other definition other than “multi-step”, the drive will behave to the “immediate” stopping mode (independent of the setting of the STOPPING MODE (C1) parameter). The “Immediate” stopping mode requires the drive to be at zero speed prior to removing the “Run” command. The “Immediate“ selection is how the drive has traditionally behaved prior to the addition of this parameter. The “Ramp to stop” stopping mode is intended for use when removing the “Run” command prior to the drive reaching zero speed (as defined by the AB ZERO SPD LEV (A1) parameter). When the “Run” command is removed and the speed reference is above zero speed, the speed reference will ramp to zero speed following the selected s-curve.	**IMMEDIATE**	– **immediate** – **ramp to stop**	Y	N

Parameter	Description	Default	Choices	Hidden Item	Run lock out
AUTO STOP	(Auto Stop Function Enable) When the speed command source is set to multi-step or serial (SPD COMMAND SRC (C1)=multi-step or serial), the parameter determines the stopping mode of the drive. The two selectable methods for the STOPPING MODE (C1)* parameter are “Immediate” and “Ramp to stop”. The Auto Stop function determines how the drive logic will respond to a zero or non-zero speed command. The function will only work when the speed command source is either mult-step or serial (SPD COMMAND SRC (C1)=multi-step or serial). Disabled: When the Auto Stop function is disabled, the magnitude of the speed command plays no part in the logical starting or stopping of the drive. Enabled: When the Auto Stop function is enabled and the speed command source is either multi-step or serial, the following changes occurs to the start and stop sequence: • Both a Run command and a non-zero speed command are required to start the drive • Either the removal of the Run command or the setting the speed command to zero will initiate a stop. Remember, when the auto stop function is enabled (AUTO STOP (C1)=enabled) both a non-zero multi-step/serial speed command AND the run command are required to start the drive. It makes no difference which signal is enabled first, the drive does not start until both are present. When initiating a stop, if STOPPING MODE (C1) = RAMP TO STOP the drive will behave the same if either the run or the speed command is removed. If STOPPING MODE (C1) = IMMEDIATE, the drive will immediate drop SPD REF RLS and turn off SPD REG RLS after BRAKE PICK TIME (A1). With this same setup, if the speed command is removed before the run command, the drive will behave the same as if STOPPING MODE (C1) = Ramp to Stop.	**DISABLE**	– **enable** – **disable**	Y	N

Parameter	Description	Default	Choices	Hidden Item	Run lock out
DSPR ENABLE	(DSPR Enable) Turns Drive Standby Power Reduction (DSPR) feature ON or OFF. The choices are: ENABLE – Drive will turn motor field current off, shut down the input rectifier and open AC line input contactor after being in a Standby condition for longer than [DSPR Time] minutes. DISABLE – DPSR function not active. Drive will remain in Standby condition with utility input contactor closed until commanded to re-start. If DSPR is active, the drive will close the utility input contactor and re-start when a valid run or field enable command is received. A delay of several seconds may elapse while power control sections of the drive are re-started.	**DISABLE**	– **disable** – **enable**	Y	N
ARB SELECT	(Anti-Rollback Select) With ARB Select set to enabled, the drive will use its independent function for Anti-Rollback. This cannot be used in conjunction with PreTorque. For information on how to setup ARB, see Anti-Rollback on page 125.	**DISABLE**	– **disable** – **enable**	N	Y
Serial Mode	Selects the serial protocol	**None**	– **None** – **Mode 1** – **Mode 2** – **Mode 2 test**	N	Y
SER2 FLT Mode	Selects the fault response to be used when running serial mode 2.	**Immediate**	– **Immediate** – **Run Remove** – **Rescue**	N	Y

Table 8: User Switches C1 Submenu

Detailed descriptions

HI/LO GAIN SRC

(High / Low Gain Source)

This parameter determines the source of the high / low gain switch.

The speed regulator high / low gain function was developed in response to high performance elevator requirements where the resonant nature of the elevator system interferes with the speed response of the drive.

When the speed response (gain) is set to high levels, the resonant characteristics created by the spring action of the elevator ropes can cause car vibration. To solve this problem, the speed regulator is set to a low enough response (gain) so that the resonant characteristics of the ropes are not excited.

This is accomplished by controlling the sensitivity or response of the speed regulator via the high / low gain switch and gain reduce multiplier.

By using the gain reduce multiplier, the user can specify a lower response (gain) for the speed regulator when the drive is at higher speeds. The gain reduce multiplier (GAIN REDUCE MULT(A1)) tells the software how much lower, as a percentage, the speed regulator response (gain) should be.

The high / low gain switch determines when the drive is in 'low gain' mode. In the 'low gain' mode, the gain reduce multiplier has an effect on the speed regulator's response (gain).

The drive allows for the high / low gain switch to be controlled either externally or internally. The high / low gain source parameter (HI/LO GAIN SRC) allows for this external or internal selection.

The high / low gain switch can be controlled externally by either:

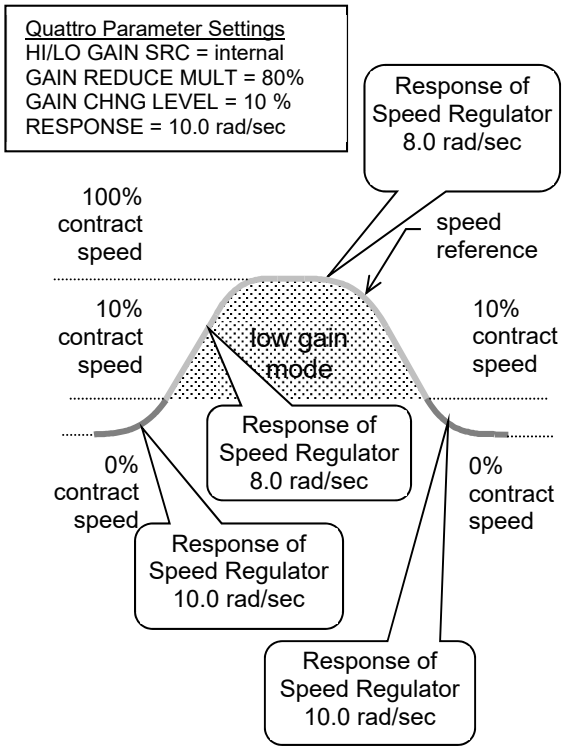
- a logic input
- the serial channel

The high / low gain switch can also be controlled internal by:

- the gain change level parameter (GAIN CHNG LEVEL), which defines a percentage of contract speed

With the drive set to internal control, the speed regulator will go into 'low gain' mode when the drive senses the motor is above a defined speed level. The defined speed level is determined by the gain change level parameter.

An example of internal high / low gain control is shown below.



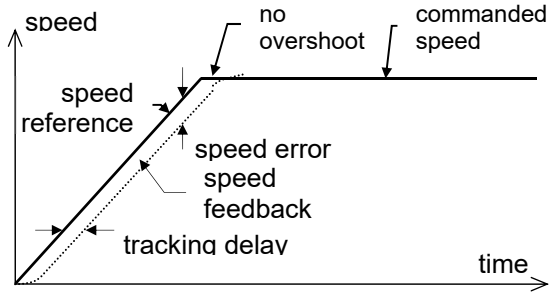
High / Low Gain Example

Elevator Speed Regulator (Ereg)

The use of the Elevator Speed Regulator allows the overall closed loop response between speed reference and speed to be ideal for elevator applications. The desirable features of the Elevator Speed Regulator are:

- no overshoot at the end of accel period
- no overshoot at the end of decel period

One characteristic of the Elevator Speed Regulator is that during the accel / decel period the speed feedback does not match the speed reference creating a speed error or tracking delay. As an example, the Elevator Speed Regulator's speed response is shown for a ramped speed reference below.



Ereg Example

The Elevator Speed Regulator is tuned by:

- System Inertia parameter (INERTIA(A1)), which is easy to obtain by using the drive software to estimate the system inertia.
- Response parameter (RESPONSE(A1)), which is the overall regulator bandwidth in radians per sec. This parameter defines the responsiveness of the speed regulator.

The tracking delay shown is defined as (1/RESPONSE) seconds. The tracking delay is not effected by the gain reduce multiplier.

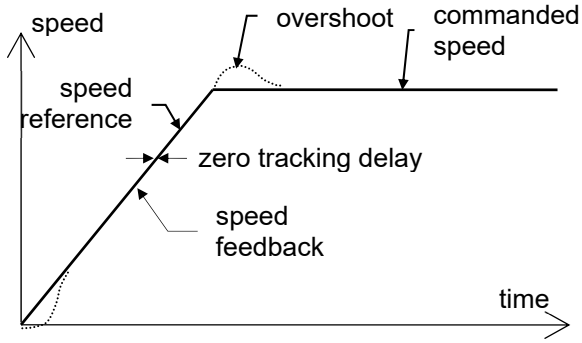
The inner loop crossover parameter (INNER LOOP XOVER(A1)) should not need to be changed. But if the number is changed, it must satisfy the following formula:

$$\begin{matrix} \textit{inner} \\ \textit{loop} \\ \textit{crossover} \end{matrix} \quad \langle \quad \textit{response} \quad \times \quad \begin{matrix} \textit{gain} \\ \textit{reduce} \\ \textit{multiplier} \end{matrix}$$

PI Speed Regulator

When the Proportional plus Integral (PI) speed regulator is used, the response to a speed reference is different. As an example, the PI Speed Regulator's speed response is shown below for a ramped speed reference. With the PI speed regulator, the end of each accel and decel period, there will be an overshoot. The amount of overshoot will be a function of the defined phase margin and response parameters.

Because of this overshoot, the PI regulator is not recommended for elevator control by itself. However, the PI regulator is the proper choice when a live torque demand signal is available from the car controller as an always-active Feed-Forward compensating signal. See EXTERNAL TORQ SRC (C1).



PI Speed Regulator Example

The PI Speed Regulator is tuned by:

- System Inertia parameter (INERTIA(A1)), which is easy to obtain by using the drive software to estimate the system inertia.
- Response parameter (RESPONSE(A1)), which is the overall regulator bandwidth in radians per sec. This parameter defines the responsiveness of the speed regulator.
- Speed Phase Margin parameter (SPD PHASE MARGIN(A1)) is used only by the PI Speed Regulator to define the phase margin of the speed regulator.

Ramp Stop Select

This parameter allows the selection of the Torque Ramp Down Stop function. This function is used to gradually remove the torque command after the elevator has stopped and the mechanical brake has been set. This prevents a shock and possible 'bump' felt in the elevator from the torque signal going to zero too quickly.

A function unique to elevators involves the interaction between the motor torque and the mechanical brake that holds the elevator. Under full load conditions at the end of a run, if the brake is set and the motor torque is removed quickly, some brake slippage may occur. Therefore, the option of gradually reducing the motor torque is provided by the Torque Ramp Down Stop function.

Upon being enabled by the Ramped Stop Select Parameter (RAMPED STOP SEL(C1)), the torque command is linearly ramped to zero from the value that was present when the 'Ramp Down Enable' was selected.

The Ramp Down Enable has the following three possible sources:

- An input logic bit (EXTERNAL TB)
- The run logic – initiated by the removal of the run command
    - The serial channel

The Ramp Down Enable Source parameter (RAMP DOWN EN SRC(C1)) is used to select one of the above options.

A method of providing the Ramp Down Enable would be with a logic signal (EXTERNAL TB) that is dedicated to that function. The Ramp Down Enable would be asserted while the Run command is still present and remain there until the ramp is completed, after which the Run command would be removed.
The RUN LOGIC option to trigger the Ramp Down Enable from the Run command is provided. In this case, removal of the Run command enables the Ramp Down Stop Function.
The time it takes for the Drive to perform its ramped stop is determined by the Ramped Stop Time Parameter. The Ramped Stop Time parameter (RAMPED STOP TIME(A1)) selects the amount of time it would take for the drive to ramp from the rated torque to zero torque.

NTSD MODE

(Normal Terminal Stopping Device Mode)
This parameter allows the drive to perform preprogrammed NTS slowdown. The drive will ignore most speed command (drive will follow any speed command slower than the NTSD Target Speed to ensure proper floor leveling) it is being told to run at, slow down using the SCurve 4 parameters, and clamp the drive speed command at NTSD Target Spd (A1) if it measures an elevator speed faster than what is set in NTSD Threshold 1 (A1), NTSD Threshold 2 (A1), and/or NTSD Threshold 3 (A1) to when the logic input NTSD Input 1 (C2) and/or NTSD Input 2 (C2) isn't being triggered. There are 4 methods that can be selected:

External: This should be selected if the drive NTSD function will not be used or if it is desired for the drive to go into NTSD mode as soon as NTSD Input 1 (C2) is triggered logic low. The drive will immediately slow down using SCurve 4 to the NTSD Target Spd (A1) and clamp the speed there. The drive will get out of NTSD mode and back into normal operation when: the NTSD input is re-asserted as logic high again.

NTSD Input 1	NTSD Input 2	Result
Not Used	Not Used	Internal NTSD function of drive is not used
1		Normal Operation
0		Use S-Curve 4 to decel and run at NTSD Target Speed, OR run at a slower supplied drive speed command

Table 9: External NTSD Mode function table

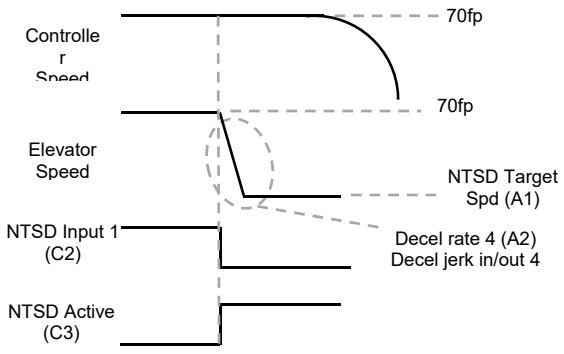


Figure 17: External NTSD Mode

1 Threshold:
The drive uses only 1 speed check point to determine whether or not it should go into NTSD mode. When Logic Input 1 (C2) is logic low, the drive will compare the speed feedback to NTSD Threshold 1. If the absolute value of speed feedback is greater than NTSD Threshold 1 (A1), the drive will slow down using S-Curve 4. Then it will clamp the drive speed command so that the absolute value of speed command is less than or equal to NTSD Target Speed (A1). The drive will get out of NTSD mode and back into normal operation when: the NTSD input is re-asserted as logic high again and the absolute value of speed feedback is less than or equal to the NTSD Target Spd (A1).

NTSD Input 1	NTSD Input 2	Result
1	Not Used	Normal Operation
0		if | speed feedback | > NTSD Threshold 1 decel using S-Curve 4, and clamp the drive speed command to | speed command | ≤ NTSD Target Speed

Table 9: 1 Threshold NTSD Mode funtion table

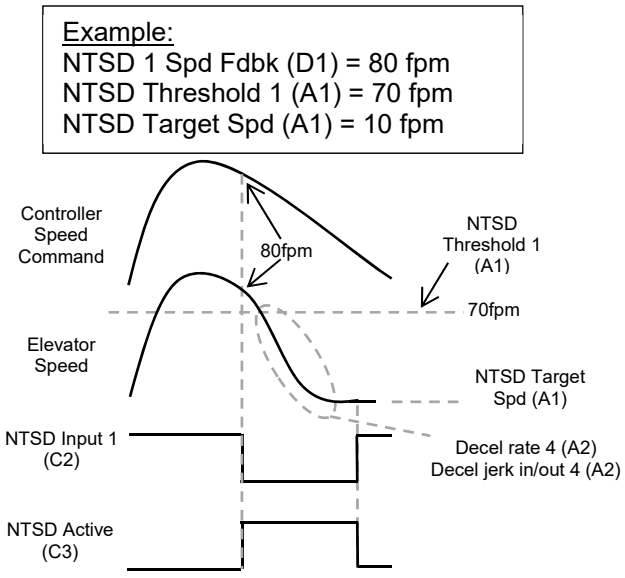


Figure 18: 1 Threshold NTSD Mode

2 Thresholds:
The drive uses 2 speed check points to determine whether or not it should go into NTSD mode. When either NTSD Input 1 (C2) or NTSD Input 2 (C2) is logic low, the drive will compare the speed feedback to NTSD Threshold 1 (A1) or NTSD Threshold 2 (A1). If the absolute value of speed feedback is greater than the selected threshold, the drive will slow down using S-Curve 4. Then it will clamp the drive speed command so that the absolute value of speed command is less than or equal to NTSD Target Speed (A1). The drive will get out of NTSD mode and back into normal operation when: both NTSD inputs are re-asserted as logic high again and the absolute value of speed feedback is less than or equal to the NTSD Target Spd (A1).

NTSD Input 1	NTSD Input 2	Result
1	1	Normal Operation
1	0	if | speed feedback | > NTSD Threshold 2 decel using S-Curve 4, and clamp the drive speed command to | speed command | ≤ NTSD Target Speed
0	1	if | speed feedback | > NTSD Threshold 1 decel using S-Curve 4, and clamp the drive speed command to | speed command | ≤ NTSD Target Speed
0	0	if | speed feedback | > NTSD Threshold 1 decel using S-Curve 4, and clamp the drive speed command to | speed command | ≤ NTSD Target Speed

Table 10: 2 Thresholds NTSD Mode function table

Example:
NTSD 2 Spd Fdbk (D1) = 80 fpm
NTSD 1 Spd Fdbk (D1) = 23 fpm
NTSD Threshold 2 (A1) = 70 fpm
NTSD Threshold 1 (A1) = 60 fpm
NTSD Target Spd (A1) = 10 fpm

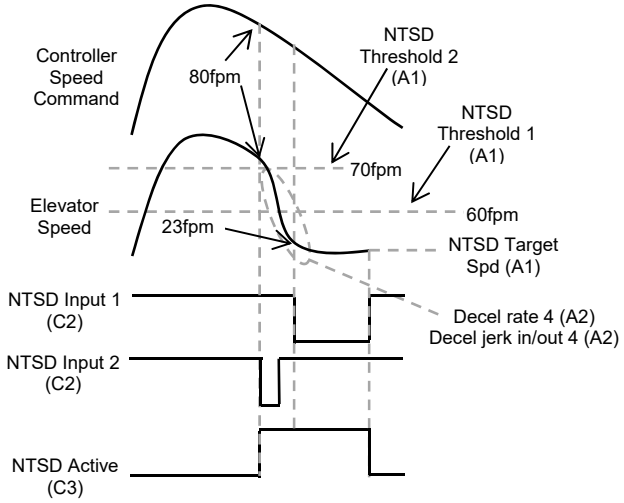


Figure 19: 2 Thresholds NTSD Mode

3 Thresholds:
The drive uses 3 speed check points to determine whether or not it should go into NTSD mode. When any combination of NTSD Input 1 (C2) or NTSD Input 2 (C2) is logic low, the drive will compare the speed feedback to NTSD Threshold 1 (A1), NTSD Threshold 2 (A1), or NTSD Threshold 3 (A1). If the absolute value of speed feedback is greater than the selected threshold, the drive will slow down using S-Curve 4. Then it will clamp the drive speed command so that the absolute value of speed command is less than or equal to NTSD Target Speed (A1). The drive will get out of NTSD mode and back into normal operation when: both NTSD inputs are re-asserted as logic high again and the absolute value of speed feedback is less than or equal to the NTSD Target Spd (A1).

NTSD Input 1	NTSD Input 2	Result
1	1	Normal Operation
0	1	if | speed feedback | > NTSD Threshold 3 decel using S-Curve 4, and clamp the drive speed command to | speed command | ≤ NTSD Target Speed
1	0	if | speed feedback | > NTSD Threshold 2 decel using S-Curve 4, and clamp the drive speed command to | speed command | ≤ NTSD Target Speed
0	0	if | speed feedback | > NTSD Threshold 1 decel using S-Curve 4, and clamp the drive speed command to | speed command | ≤ NTSD Target Speed

Table 11: 3 Thresholds NTSD Mode function table

Example:
NTSD 3 Spd Fdbk (D1) = 80 fpm
NTSD 2 Spd Fdbk (D1) = 60 fpm
NTSD 1 Spd Fdbk (D1) = 23 fpm
NTSD Threshold 3 (A1) = 80 fpm
NTSD Threshold 2 (A1) = 60 fpm
NTSD Threshold 1 (A1) = 20 fpm
NTSD Target Spd (A1) = 10 fpm

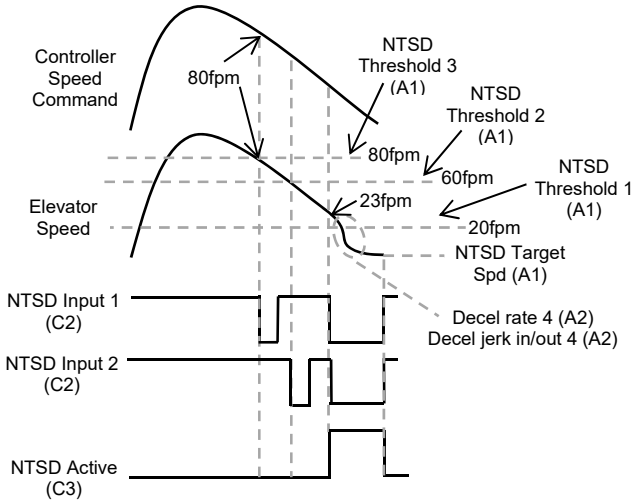
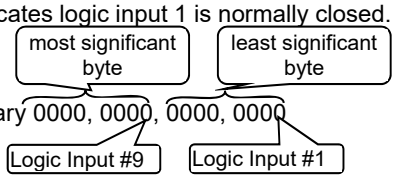


Figure 20: 3 Thresholds NTSD Mode

Logic Inputs C2 submenu

(Logic Inputs 1-9)
This parameter defines the function of the logic inputs.
NOTE: The user can assign particular functions to each input terminal. Only one function per terminal is allowed and multiple terminals cannot have the same function (except "No Function"). When a function is assigned to an input terminal, it is removed from the list of possible selections for subsequent terminals. **To re-assign a function to a different terminal one must first assign "No Function" to the original terminal so that the desired function is returned to the list of selections and can be assigned to a different new terminal.**
NOTE: The *current* setting of each parameter is displayed in all caps; all other choices in the list are displayed in lower case.

<table>
<tr><th>Parameter</th><th>Description</th><th>Default</th><th>Hidden Item</th><th>Run lock out</th></tr>
<tr><td>N.C. INPUTS</td><td>(Normally Closed Inputs) All Logic Inputs may be configured for use with Normally Open or Normally Closed external contacts. The numeric entry is a hexadecimal representation of a binary control bit for each channel. A binary 0 means Normally Open. A binary 1 indicates a Normally Closed external switch. Logic Input #1 is the least significant bit. The defaulted value of 0001 indicates logic input 1 is normally closed.
 

See table below for converting binary to hex:
<table>
<tr><th>Bit 3</th><th>Bit 2</th><th>Bit 1</th><th>Bit 0</th><th>Hex</th></tr>
<tr><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td>0</td><td>0</td><td>0</td><td>1</td><td>1</td></tr>
<tr><td>0</td><td>0</td><td>1</td><td>0</td><td>2</td></tr>
<tr><td>0</td><td>0</td><td>1</td><td>1</td><td>3</td></tr>
<tr><td>0</td><td>1</td><td>0</td><td>0</td><td>4</td></tr>
<tr><td>0</td><td>1</td><td>0</td><td>1</td><td>5</td></tr>
<tr><td>0</td><td>1</td><td>1</td><td>0</td><td>6</td></tr>
<tr><td>0</td><td>1</td><td>1</td><td>1</td><td>7</td></tr>
<tr><td>1</td><td>0</td><td>0</td><td>0</td><td>8</td></tr>
<tr><td>1</td><td>0</td><td>0</td><td>1</td><td>9</td></tr>
<tr><td>1</td><td>0</td><td>1</td><td>0</td><td>A</td></tr>
<tr><td>1</td><td>0</td><td>1</td><td>1</td><td>B</td></tr>
<tr><td>1</td><td>1</td><td>0</td><td>0</td><td>C</td></tr>
<tr><td>1</td><td>1</td><td>0</td><td>1</td><td>D</td></tr>
<tr><td>1</td><td>1</td><td>1</td><td>0</td><td>E</td></tr>
<tr><td>1</td><td>1</td><td>1</td><td>1</td><td>F</td></tr>
</table></td><td>0001
Note: the LSB is fixed at 01</td><td>Y</td><td>Y</td></tr>
<tr><td>LOGIC INPUT 1 TB1(1)</td><td>logic input #1 note: drive comes pre-wired for logic input #1 to be CONTACT CFIRM</td><td>CONTACT CFIRM</td><td>Y</td><td>N</td></tr>
<tr><td>LOGIC INPUT 2 TB1(2)</td><td>logic input #2 note: drive comes pre-wired for logic input #2 to be CTR PWR SENSE</td><td>CTR PWR SENSE</td><td>Y</td><td>N</td></tr>
<tr><td>LOGIC INPUT 3 TB1(3)</td><td>logic input #3</td><td>NO FUNCTION</td><td>Y</td><td>N</td></tr>
<tr><td>LOGIC INPUT 4 TB1(4)</td><td>logic input #4</td><td>DRIVE ENABLE</td><td>Y</td><td>N</td></tr>
<tr><td>LOGIC INPUT 5 TB1(5)</td><td>logic input #5</td><td>RUN</td><td>Y</td><td>N</td></tr>
<tr><td>LOGIC INPUT 6 TB1(6)</td><td>logic input #6</td><td>UP/DWN</td><td>Y</td><td>N</td></tr>
<tr><td>LOGIC INPUT 7 TB1(7)</td><td>logic input #7</td><td>STEP REF B0</td><td>Y</td><td>N</td></tr>
<tr><td>LOGIC INPUT 8 TB1(8)</td><td>logic input #8</td><td>STEP REF B1</td><td>Y</td><td>N</td></tr>
<tr><td>LOGIC INPUT 9 TB1(9)</td><td>logic input #9</td><td>FAULT RESET</td><td>Y</td><td>N</td></tr>
</table>

choices		
contact cfirm	(Contactor closed) Feedback from an auxiliary contact on the motor contactor. Default is that the drive expects a normally closed contact to energize the input when the contactor is not pulled in.	
ctr pwr sense	(Contactor Power Sensing) Energized when AC power is available to energize the motor contactor. Power to this circuit is control by elevator relay logic. This circuit must be energized before the drive will be allowed to start. If power is not available when told to start, or while running, a Fault will occur for diagnostic purposes.	
drive enable	(Drive Enable) Enables drive to run. This signal must be asserted to permit drive to run. This does not initiate run, just permits initiation.	
extrn fault 1	(External Fault 1) User input fault #1.	Closure of this contact will cause the drive to declare a fault and perform a fault shutdown.
extrn fault 2	(External Fault 2) User input fault #2.	
extrn fault 3	(External Fault 3) User input fault #3.	
extrn /flt 4	(External Fault 4) User input fault #4. Opening of this contact will cause the drive to declare a fault and perform a fault shutdown.	
fault reset	(Fault Reset) Asserting this input attempts to reset faults. If the FAULT RESET SRC (C1) switch is set to EXTERNAL TB, the drive's fault circuit will be reset when this signal is true. If the FAULT RESET SRC (C1) switch is set to AUTOMATIC, the drive's fault circuit will be reset when this signal is true and the automatic fault reset counter (defined by FLT RESETS/HOUR) will be reset to zero. *This input is edge sensitive and the fault is reset on the transition from false to true.	
field enable	(Field Enable) If FIELD ENA SOURCE (C1) switch is set to EXTERNAL TB, the field is enabled when this signal is true.	
low gain sel	(Low Gain Select) If the HI/LO GAIN SRC (C1) switch is set to EXTERNAL TB, the low gain mode is chosen for the speed regulator when this signal is true.	
mech brk hold	(Mechanical Brake Hold) Auxiliary contact closures confirming when the mechanical brake is in the hold mode (engaged).	
mech brk pick	(Mechanical Brake Pick) Closure of auxiliary contacts confirming the mechanical brake has been picked (lifted).	
no function	(No Function) When this setting is selected for one of the TB1 input terminals, any logic input connected to that terminal will have no effect on drive operation.	
ntsd input 1	(Normal Terminal Stopping Device input # 1) Removing the signal will force the drive to compare preprogram speeds to speed feedback to decide whether or not it has to clamp its running speed.	
ntsd input 2	(Normal Terminal Stopping Device input # 2) Removing the signal will force the drive to compare preprogram speeds to speed feedback to decide whether or not it has to clamp its running speed.	
ospd test src	(Overspeed Test Source) This function works only if the OVRSPEED TEST SRC (C1) switch is set to EXTERNAL TB. A true signal on this input applies the OVERSPEED MULT to the speed command for the next run. After the run command has dropped, the drive returns to 'normal' mode and must be re-configured to perform the overspeed function again. The OVERSPEED FLT level is also increased by the OVERSPEED MULT, allowing the elevator to overspeed without tripping out on an overspeed fault. NOTE: This input must be taken false then true each time that an overspeed test is run. If the input is left in the true, it is ignored after the first overspeed test.	
pre-trq latch	(Pre-Torque Latch) Closing a contact between this input and ground latches the pre torque command present on the analog channel #2.	
run	(Run) If drive is enabled through the DRIVE ENABLE logic input, this function will start drive operation.	
run 2	(Run 2) This functions as a 2nd RUN input that will start drive operation when DRIVE ENABLE, RUN 2, and serial run bit are activated. This input will not change the polarity of the speed command. NOTE: This ONLY works when Run Command Src (C1) is set to (serial + Extern). This input is NOT required to operate (serial + Extern). If both RUN and RUN 2 are activated at the same time, the drive will start drive operation.	
run down	(Run Down) If drive is enabled through the DRIVE ENABLE logic input, this function will start drive operation with negative speed commands. Note: if both RUN UP and RUN DOWN are true then the run is not recognized. Note: if DIR CONFIRM (C1) is enabled, this input will not change the polarity of the speed command and will be used to confirm the polarity of the analog speed command as well as starting the operation of the drive.	
run up	(Run Up) If drive is enabled through the DRIVE ENABLE logic input, this function will start drive operation with positive speed commands. Note: if both RUN UP and RUN DOWN are true then the run is not recognized. Note: if DIR CONFIRM (C1) is enabled, this input is also used to confirm the polarity of the analog speed command as well as starting the operation of the drive.	
s-curve sel 0	Bit 0 of S-curve selection	These two bits are used to select one of four s-curve selections. For more information, see S-Curves A2 submenu on page 51.
s-curve sel 1	Bit 1 of S-curve selection	
ser2 insp ena	(Serial Mode 2 Inspection Enable) Used only with custom serial protocol (mode 2) Defines the logic input to be used as one of the two sources of inspection run command when using serial mode 2. This input must be true as well as a comparable inspection run command sent serially for the drive to run in inspection mode.	
step ref b0	Bit 0 of multi-step speed command selection	

step ref b1	Bit 1 of multi-step speed command selection	Four inputs, which must be used together as a 4-bit command for multi-step speed selection. For more information, see Multistep Ref A3 submenu on page 53.
step ref b2	Bit 2 of multi-step speed command selection	
step ref b3	Bit 3 of multi-step speed command selection	
trq ramp down	(Torque Ramp Down Signal) This function works only if the RAMP STOP SEL (C1) switch is set to RAMP TO STOP and RAMP DOWN EN SRC (C1) is set to EXTERNAL TB.	
up/dwn	(Up/Down Signal) This signal is used to change the sign of the speed command. Default is FALSE; therefore, positive commands are for the up direction and negative speed command are for the down direction. Making this input true reverses the car's direction.	

Table 12: Logic Inputs C2 Submenu

Logic Outputs C3 submenu

LOGIC OUTPUT x
(Logic Outputs 1-4)
This parameter defines the function of the logic outputs.
NOTE: The *current* setting of each parameter is displayed in all caps; all other choices in the list are displayed in lower case.

RELAY COIL x
(Relay Logic Outputs 1-2)
This parameter defines the function of the relay logic outputs.
NOTE: The *current* setting of each parameter is displayed in all caps; all other choices in the list are displayed in lower case.

Parameter	Description	Defaults	Hidden Item	Run lock out
LOGIC OUTPUT 1 (TB1-25)	logic output #1 note: drive comes pre-wired for logic output #1 to be CLOSE CONTACT	CLOSE CONTACT	Y	N
LOGIC OUTPUT 2 (TB1-26)	logic output #2	RUN COMMANDED	Y	N
LOGIC OUTPUT 3 (TB1-27)	logic output #3	MTR OVERLOAD	Y	N
LOGIC OUTPUT 4 (TB1-28)	logic output #4	ENCODER FLT	Y	N
LOGIC OUTPUT 5 (TB1-29)	logic output #5	FAULT	Y	N
LOGIC OUTPUT 6 (TB1-30)	logic output #6	SPEED REG RLS	Y	N
LOGIC OUTPUT 7 (TB1-31)	logic output #7	SPEED REG RLS	Y	N
SSR1(TB1-21/22)	solid state relay #1	NO FUNCTION	Y	N
SSR2 (TB1-23/24)	solid state relay #2	NO FUNCTION	Y	N
RELAY COIL 1 (TB1-1/3/5)	relay coil #1	NO FUNCTION	Y	N
RELAY COIL 2 (TB1-8/10/12)	relay coil #2	NO FUNCTION	Y	N

choices	
alarm	(Alarm) The output is true when an alarm is declared by the drive.
alarm+flt	(Alarm and/or Fault) The output is true when a fault and/or an alarm is declared by the drive.
auto brake	(Auto Brake) The output is controlled by the Auto Brake function and is used to open the mechanical brake. (only multi-step speed commands)
b. ena status	(Base Enable Status) The output will be true when the contact for Base Block Input on TB2-7 and TB2-14 is closed. The output is false when the contact is open.
brake hold	(Brake Hold) The output is true when the brake pick confirmation is received. It is used to show the mechanical brake is remaining open. This function is used with brakes that need to have less than 100% voltage to hold the brake open.
brake pick	(Brake Pick) The output is true when the speed regulator is released and is used to open the mechanical brake.
brk hold flt	(Brake Hold Fault) The output is true when the brake hold command and the brake feedback do not match for the user specified time.
brk pick flt	**(**Brake Pick Fault) The output is true when the brake pick command and the brake feedback do not match for the user specified time.
car going dwn	(Car Going Down) The output is true when the motor moves in negative direction faster than the user specified speed.
car going up	(Car Going Up) The output is true when motor moves in positive direction faster than user specified speed.
charge fault	(Charging Fault) The output is true when the DC bus voltage has not stabilized above the voltage fault level or the charge contactor has not closed after charging.
close contact	(Close Motor Contactor) The output is true when the run command is given, the drive is enabled, the software has initialized, and no faults are present.
contactor flt	(Contactor Fault) The output is true when the command to close the contactor and the contactor feedback do not match before the user specified time.
curr reg flt	(Current Regulator Fault) The output is true when the actual current measurement does not match commanded current.
drv overload	(Drive Overload) The output is true when the drive has exceeded the drive overload curve.
encoder flt	(Encoder Fault) The output is true when the encoder is disconnected or not functioning, while attempting to run
fault	(Fault) The output is true when a fault is declared by the drive.

choices continued	
flux confirm	(Motor Flux Confirmation) The output is true when the drive has confirmed there is enough motor field current (flux) to issue a speed regulator release. Threshold is set by measured motor field current being greater than that set at Motor parameter A6, Flux Confirm Level.
ground fault	(Ground Fault) The output is true when the sum of all phase current exceeds 50% of rated current of the drive.
in low gain	(In Low Gain) The output is true when the speed regulator is in "low gain" or response mode.
motor trq lim	(Motor Torque Limit) The output is true when the torque limit has been reached while the drive is in the motoring mode. The motoring mode is defined as the drive delivering energy to the motor.
mtr overload	(Motor Overload) The output is true when the motor has exceeded the user defined motor overload curve.
no faults	(No Faults) No faults are currently present on the drive.
no function	(No Function) This setting indicates that the terminal or relay will not change state for any operating condition; i.e. the output signal will be constantly false.
not alarm	(Not Alarm) The output is true when an alarm is NOT present.
ntsd active	(Normal Terminal Stopping Device Active) The output is true when the drive is in NTSD mode.
over curr flt	(Motor overload current fault) The output is true when the phase current has exceeded 300% of rated current.
overspeed flt	(Overspeed Fault) The output is true when the motor has gone beyond the user defined percentage contract speed for a specified amount of time.
overtemp flt	(Heatsink Over Temperature Fault) The output is true when the drive's heatsink has exceeded 95°C (203°F).
overvolt flt	(Over Voltage Fault) The output is true when the DC bus voltage exceeds 825VDC.
ovrtemp alarm	(Over Temperature Alarm) The output is true when the drive's heatsink temperature has exceeded 85°C (185°F).
phase fault	(Phase Loss) The output is true when the drive senses an open motor phase.
ramp down ena	(Ramp Down Enable) The output is true after a torque ramp down stop has been initiated by either a logic input, the serial channel, or internally by the drive. When this output is true the torque is being ramped to zero.
ready 2 start	(Ready to Start) The output is true when the drive's software has been initialized, no faults are present and the drive is *not* boosting.
ready to run	(Ready to Run) The output is true when the drive's software has been initialized, no faults are present and the drive is boosting.
regen trq lim	(Regeneration Torque Limit) The output is true when the torque limit has been reached while the drive is in the regenerative mode. The regenerative mode is defined as when the motor is returning energy to the drive. When the drive is in regenerative mode, the energy is dissipated via the dynamic brake circuitry (internal brake IGBT and external brake resistor).
Safe-off	Provides feedback to the car controller of the status of the Safe Off Input, and therefore the status of the IGBTs (Enabled or Disabled). Used to determine if the drive has been correctly set for the "Safe Off" function, and provide similar feedback to that of a contactor auxiliary. Can be configured to any free output. This Output will be HIGH when the drive's IGBTs are disabled by the Safe Off circuitry, and LOW when the drive's IGBT are enabled by the Safe Off circuitry. The status of this output can be monitored in the D1 menu under Logic Outputs as a 1 or 0 as with any other output.
run commanded	(Run Commanded) The output is true when the drive is being commanded to run.
run confirm	(Run Command Confirm) The output is true after the software has initialized, no faults are present, the drive has been commanded to run, the contactor has closed and the IGBTs are firing.
speed dev	(Speed Deviation) The output is true when the speed feedback is failing to properly track the speed reference. The speed deviation needs to be above a user defined level. (Speed Dev. = reference - feedback)
speed dev low	(Speed Deviation Low Level) The output is true when the speed feedback is properly tracking the speed reference. The speed deviation needs to be within a user-defined range for a user-defined period of time. (Speed Dev. = reference - feedback)
speed ref rls	(Speed Reference Release) The output is true when the flux is confirmed and drive is NOT in DC injection.
speed reg rls	(Speed Regulator Release) The output is true when the flux is confirmed at 75% and brake is commanded to be picked (if used)
undervolt flt	(Low Voltage Fault) The output is true when the DC bus voltage drops below the user specified percent of the input line-to-line voltage.
up to speed	(Up to Speed) The output is true when the motor speed is above the user specified speed
uv alarm	(Under Voltage Alarm) The output is true when the DC bus voltage drops below the user specified percent of the input line-to-line voltage.
zero speed	(Zero Speed) The output is true when the motor speed is below the user specified speed for the user specified time.

Table 13: Logic Outputs C3 Submenu

Analog Outputs C4 submenu

With a gain of 1.0 and an offset of 0.0, 10V will indicate 100% or full value based on programmed values. For example, with the above scenario of a gain of 1.0 and an offset of 0.0, a 10V signal an Analog Output set to arm current would indicate 100% of rated current.

Whereas a 0V signal on the same Analog Output would indicate 0% of rated current.

Any value over 100% will cause the analog channel to saturate.

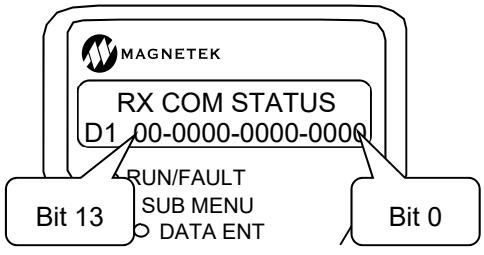
Parameter	Description	Default	Hidden Item	Run lock out
ANALOG OUTPUT 1	analog output #1	SPEED REF	Y	N
ANALOG OUTPUT 2	analog output #2	SPEED FEEDBK	Y	N

choices	***description***	***D/A units***
analog addr2	(Analog Address 2) Ability to view hex monitor functions via the analog outputs. Choosing this function will display the hex monitor value of ADDR2& (U8).	none
analog addr3	(Analog Address 3) Ability to view hex monitor functions via the analog outputs. Choosing this function will display the hex monitor value of ADDR3& (U8).	none
arb state	(ARB State) Ability to view which section ARB Mode is in while setting up ARB. For further information, see Anti-Rollback on page 125.	-
arm current	(Motor Armature Current) Measured motor armature current	% rated current
arm voltage	(Motor Armature Voltage) Measured motor armature voltage	% of rated volts
aux torq cmd	(Auxiliary Torque Command) Additional torque command from auxiliary source	% rated torque
bus voltage	(DC Bus Voltage Output) Measured DC bus voltage	% of peak in
est motor spd	(Estimated Motor Speed) Estimated speed of the motor	RPM
field current	(Motor Field Current) Measured motor field current	% of rated (Full Field)
iarm error	(Armature Current Error) Measures the difference between the reference current and the measured current	Amps
ls pwr input	(Line Side Power Input) Estimated power transfer to and from the AC Line. Value is positive when drive is pulling power from the line and negative when drive is delivering power back to the line.	kW
pretorque ref	(PreTorque Reference) Pre-torque reference	% base torque
Motor overload	0 – 10V, when the number reaches 10V the drive will shut down and declare the fault.	0 – 100%
motor mode	(Motor Mode) Voltage level switches to indicate the mode the current regulator is operating in. 1) Forward motoring (~ 9.7V) 2) Forward regeneration (high CEMF) (~ 4.4V) 3) Forward plugging (regeneration at low CEMF) (~ 1.3V) 4) Reverse plugging (regeneration at low CEMF) (~ -1.3V) 5) Reverse regeneration (high CEMF) (~ -9.7V) 6) Reverse motoring (~ -4.4V)	-
spd rg tq cmd	(Speed Regulator Torque Command) Torque command from speed regulator	% base torque
speed command	(Speed Command) Speed command before S-Curve	% rated speed
speed error	(Speed Error) Speed reference minus speed feedback	% rated speed
speed feedbk	(Speed Feedback) Speed feedback used by speed regulator	% rated speed
speed ref	(Speed Reference) Speed reference after S-Curve	% rated speed
tach rate cmd	(Tachometer Rate Command) Torque command from tach rate gain function	% base torque
tach speed	(Tachometer / Encoder Speed) Bi-directional signal representing velocity measured by the encoder.	ft/min or m/sec
torque ref	(Torque Reference) Torque reference used by vector control	% base torque

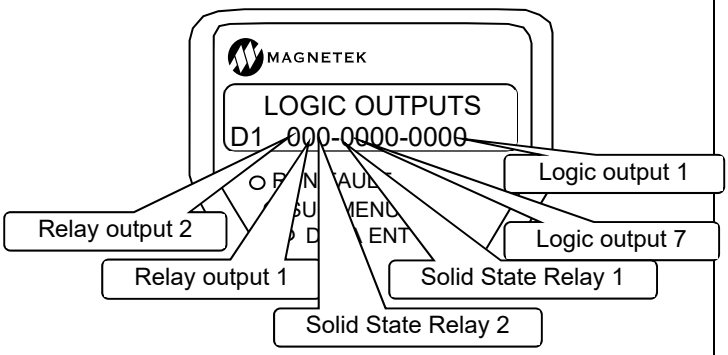
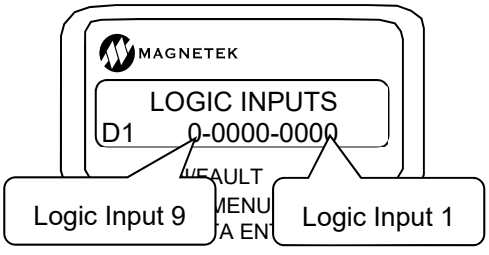
Table 14: Analog Outputs C4 Submenu

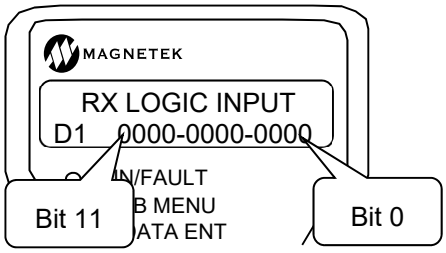
Display D0 menu

Elevator Data D1 submenu

<table>
<tr><th>Parameter</th><th>Description</th><th>Units</th><th>Hidden Item</th></tr>
<tr><td>SPEED COMMAND</td><td>(Speed Command) Monitors the speed command before the speed reference generator (input to the S-Curve). This command comes from either multi-step references, speed command from analog channel, or the serial channel.</td><td>ft/min or m/s</td><td>N</td></tr>
<tr><td>SPEED REFERENCE</td><td>(Speed Reference) Monitors the speed reference being used by the drive. This is the speed command after passing through the speed reference generator (which uses a S-Curve).</td><td>ft/min or m/s</td><td>N</td></tr>
<tr><td>SPEED FEEDBACK</td><td>(Speed Feedback) Monitors the speed feedback coming from the encoder. It is based on contract speed, motor rpm and encoder pulses per revolution. The drive converts from motor RPM to linear speed using the relationship between the CONTRACT CAR SPD (A1) and CONTRACT MTR SPD (A1) parameters.</td><td>ft/min or m/s</td><td>N</td></tr>
<tr><td>MOTOR SPEED</td><td>(Motor Speed) Monitors the measured speed feedback coming from the encoder. ENCODER PULSES (A1) calibrates this parameter.</td><td>RPM</td><td>N</td></tr>
<tr><td>SPEED ERROR</td><td>(Speed Error) Monitors the speed error between the speed reference and the speed feedback. It is equal to the following equation:
$\left\lvert \begin{pmatrix} speed \\ reference \end{pmatrix} - \begin{pmatrix} speed \\ feedback \end{pmatrix} \right\rvert = \begin{matrix} speed \\ error \end{matrix}$</td><td>ft/min or m/s</td><td>N</td></tr>
<tr><td>PRE-TORQUE REF</td><td>(Pre-Torque Reference) Monitors the pre torque reference, coming from either analog channel #2 or the serial channel.</td><td>% rated torque</td><td>N</td></tr>
<tr><td>PRE-TORQ LAST</td><td>(Pre-Torque Last Value) Displays the pre-torque used for the previous run.</td><td>% rated torque</td><td>N</td></tr>
<tr><td>EXT-TORQUE CMD</td><td>(External Torque Command) Monitors the Torque Feed Forward Command when used.</td><td>% of rated current</td><td>N</td></tr>
<tr><td>SPD REG TORQ CMD</td><td>(Speed Regulator Torque Command) Monitors the speed regulator’s torque command. This is the torque command before it passes through the tach rate gain function or the auxiliary torque command. It is the torque required for the motor to follow the speed reference.</td><td>% rated torque</td><td>Y</td></tr>
<tr><td>TACH RATE CMD</td><td>(Tachometer Rate Command) Monitors the torque command from the tach rate gain function, (if used).</td><td>% rated torque</td><td>Y</td></tr>
<tr><td>AUX TORQUE CMD</td><td>(Auxiliary Torque Command) Monitors the feedforward torque command from auxiliary source, when used.</td><td>% rated torque</td><td>Y</td></tr>
<tr><td>EST INERTIA</td><td>(Estimated Inertia) Estimated elevator system inertia.</td><td>seconds</td><td>N</td></tr>
<tr><td>RX COM STATUS (continued on next page)</td><td>(Serial Communications Status)
 

<table>
<tr><th>Bit</th><th>Severity</th><th>Name Description/Reason</th></tr>
<tr><td>0</td><td>Info</td><td>RX_INVALID_SETUP_ID Invalid setup id on setup message</td></tr>
<tr><td>1</td><td>Info</td><td>RX_SETUP_IN_RUN A setup message to write was received while the serial run bit was set.</td></tr>
<tr><td>2</td><td>Fatal</td><td>RX_TIMEOUT A COMM Fault was declared because of a communication time-out.</td></tr>
<tr><td>3</td><td>Info / Fatal</td><td>RX_INVALID_CHECKSUM If COMM FAULT was declared because of bad message checksums.</td></tr>
</table></td><td>1=true
0=false</td><td>N</td></tr>
</table>

<table>
<tr><th>Parameter</th><th>Description</th><th>Units</th><th>Hidden Item</th></tr>
<tr><td>RX COM STATUS (continued)</td><td>
<table>
<tr><th>Bit</th><th>Severity</th><th>Name Description/Reason</th></tr>
<tr><td>4</td><td>Info</td><td>RX_INVALID_MESSAGE Invalid header character in message.</td></tr>
<tr><td>5</td><td>Info</td><td>RX_FIFO_OVERRUN Overflow has occurred.</td></tr>
<tr><td>6</td><td>Info</td><td>RX_INVALID_RUN_ID Set if the Cmd_Id sent in the RUN MESSAGE is not in range.</td></tr>
<tr><td>7</td><td>Info</td><td>RX_INVALID_MONITOR_ID
(Not available in Mode 2) Set if the Monitor_Id received in the run message is not in range.</td></tr>
<tr><td>8</td><td>Info</td><td>RX_INVALID_FAULT_ID Set if the Fault_Id sent in the setup message is not in range.</td></tr>
<tr><td>9</td><td>Info</td><td>RX_FAULT_DETECTED COMM FAULT has been detected</td></tr>
<tr><td>10</td><td>Info</td><td>Fault_Mode_1
(Not available in Mode 1) Immediate Shutdown Mode</td></tr>
<tr><td>11</td><td>Info</td><td>Fault_Mode_2
(Not available in Mode 1)
Run Removal Shutdown Mode</td></tr>
<tr><td>12</td><td>Info</td><td>Fault_Mode_3
(Not available in Mode 1)
Rescue Shutdown Mode</td></tr>
<tr><td>13</td><td></td><td>N/a</td></tr>
<tr><td>14</td><td></td><td>N/a</td></tr>
<tr><td>15</td><td>Fatal</td><td>RX_COMM_FAULT COMM FAULT has been declared by the drive</td></tr>
</table>
</td><td>1=true
0=false</td><td>N</td></tr>
<tr><td>RX Error Count</td><td>(Serial communication error counter) This function will monitor invalid serial messages and increase the count per invalid messages. This is used as a diagnostic tool.</td><td>Count</td><td>N</td></tr>
<tr><td>LOGIC OUTPUTS</td><td>(Logic Outputs Status) This display shows the condition of the logic outputs. (1=true 0=false)
 
</td><td>1=true
0=false</td><td>N</td></tr>
<tr><td>LOGIC INPUTS</td><td>(Logic Inputs Status) This display shows the condition of the logic inputs. (1=true 0=false)
 
</td><td>1=true
0=false</td><td>N</td></tr>
</table>

<table>
<tr><th>Parameter</th><th>Description</th><th>Units</th><th>Hidden Item</th></tr>
<tr><td>RX LOGIC INPUT</td><td>(Serial Communications Logic Inputs)
 

<table>
<tr><th>Bit</th><th>Name Description/Reason</th></tr>
<tr><td>0</td><td>AUX_RUN_BIT Serial Run Command bit from car controller</td></tr>
<tr><td>1</td><td>AUX_FLT_RST_REQ_BIT Serial Fault Reset Request from car controller</td></tr>
<tr><td>2</td><td>AUX_PT_CLK_BIT Serial Pre-Torque Latch Clock Bit from car controller</td></tr>
<tr><td>3</td><td>AUX_LOW_GAIN_BIT Serial Low PI Gain Control Bit from car controller</td></tr>
<tr><td>4</td><td>AUX_RAMP_DWN_EN_BIT Serial Ramp Down Enable Bit from car controller</td></tr>
<tr><td>5</td><td>AUX_BRAKE_PICK_BIT Serial Brake Pick Command Bit from car controller</td></tr>
<tr><td>6</td><td>AUX_BRAKE_HOLD_BIT Serial Brake Hold Command Bit from car controller</td></tr>
<tr><td>7</td><td>AUX_OSPD_TST_BIT Serial Overspeed Test Request Bit from car controller</td></tr>
<tr><td>8</td><td>AUX_LBEF_BIT Serial Field Enable Bit from car controller</td></tr>
<tr><td>9</td><td>AUX_FLD_STANDBY_ENABLE_BIT Serial Field Standby enabled (field goes from full field to standby field using STNDBY FLD TIME (A1)) from car controller</td></tr>
<tr><td>10</td><td>AUX_FULL_FIELD_BIT Serial Full Field Bit with auto field weakening when appropriate</td></tr>
<tr><td>11</td><td>N/A</td></tr>
</table></td><td>1=true
0=false</td><td>N</td></tr>
</table>

Table 15: Elevator Display Data D1 Submenu

MS Power Data D2 submenu

Parameter	Description	Units	Hidden Item
ARM CURRENT	(Armature Current) Measured motor armature current	**amps**	N
FIELD CURRENT	(Field Current) Measured motor field current	**volts**	N
ARM VOLTAGE	(Armature Voltage) Measured motor armature voltage	**volts**	N
MS BUS VOLTAGE	(Motor Side Bus Voltage) Measured Motor Side DC bus voltage	**volts**	N
MOTOR MODE	(Motor Mode) Tells the user if the motor is motoring, regening, CEMF braking, or idle.	**none**	Y
TORQUE REF	(Torque Reference) This is the output of the speed regulator plus any torque feed forwards from the car controller	**%**	N
EST SPD FDBK	(Estimated Speed Feedback) Estimated speed based on voltage readings. When running the CEMF regulator, the EST SPD FDBK will equal the speed reference. When running in tach feedback mode, EST SPD FDBK will estimate the speed based on voltages.	**m/sec**	N
ENCODER SPEED	(Encoder Speed) Give the speed of the encoder in meters / second.	**m/sec**	N
ANALOG ADDESS2	(Analog Address 2) Gives the Hex Monitor Address of the hex monitor in ADDR2& (U8).	**none**	N
ANALOG ADDESS3	(Analog Address 3) Gives the Hex Monitor Address of the hex monitor in ADDR3& (U8).	**none**	N
DS MODULE TEMP	(Drive Side Module Temperature) Indicates the hottest of the drive side IGBT module.	**°C**	N
LS MODULE TEMP	(Line Side Module Temperature) Indicates the hottest of the line side converter IGBT module temperature.	**°C**	N
HIGHEST TEMP	(Highest Measured Temperature) Indicates the hottest of the drive side IGBT module and the line side IGBT module and the Field IGBT.	**°C**	N
FIELD IGBT TEMP	(Field IGBT Temperature) Monitors temperature of IGBT module that controls motor field current as indicated by an internal thermistor. Reported in degrees C.	**°C**	N
ARMATURE CUR ERR	(Armature Current Error) Measured Motor Armature Current in amperes.	**amps**	N
AUTO MEAS ARM L	(Auto-tune Measured Armature Inductance) Measured Motor Armature Inductance as calculated by the auto-tune (in GAIN SELECTION (A4)) after an auto-tune has been done.	**mH**	N
AUTO MEAS IRDROP	(Auto-tune measured Armature IR Drop) Adjusts motor armature current regulator for expected current x resistance voltage drop of motor armature circuit at rated current. Includes motor armature, inter-poles and wiring resistance.	%	N
AUTO MEAS ARM R	(Auto-tune Measured Armature Resistance) Measured Motor Armature Resistance as calculated by the auto-tune (in GAIN SELECTION (A4)) after an auto-tune has been done.	**ohm**	N
AUTO FIELD RES	(Auto-tune Measured Field Resistance) Measured Field Resistance as calculated by the auto-tune (in GAIN SELECTION (A4)) after an auto-tune has been done.	**ohm**	N
AUTO FIELD TC	(Auto-tune Measured Field Time Constant) Measured Field Time Constant as calculated by the auto-tune (in GAIN SELECTION (A4)) after an auto-tune has been done.	**sec**	N

Table 16: MS Power Data D2 Submenu

LS Power Data D3 submenu

Parameter	Description	Units	Hidden Item
LS PWR INPUT	(Line Side Power Input) Estimated power transfer to and from the AC Line. Value is positive when drive is pulling power from the line, and negative when drive is delivering power back to the line.	**kW**	N
DC BUS VOLTS	(DC Bus Voltage) Measured DC Bus voltage as seen by the line side controller.	**Volts**	N
DC BUS VOLTS REF	(DC Bus Voltage Reference) Calculated applied DC Bus Voltage reference as the peak of the AC line voltage plus the amount to boost. For more information, see Line Side Power Convert A5 Submenu on page 57.	**Volts**	N
LS OVERLOAD	(Line Side Overload) Reports active condition of Line Side overload accumulator during operation. If this parameter reaches 100%, the Line Side Overload faults will occur. This overload is provided for Quattro equipment protection.	**%**	N
LS INPUT CURRENT	(Line Side Input Current) Measured input line current as the average of the three phases.	**Amps**	N
LS D AXIS I	(Line Side D Axis Current) Percent of rated current in the D axis. Note: This is reactive power producing current.	**%**	N
LS Q AXIS I	(Line Side Q Axis Current) Percent of rated current in the Q axis. Note: This is power producing current.	**%**	N
LS D AXIS V	(Line Side D Axis Voltage) Percent of rated voltage in the Q axis. Note: This is reactive power producing voltage.	**%**	N
LS Q AXIS V	(Line Side Q Axis Voltage) Percent of rated voltage in the Q axis. Note: This is power-producing voltage.	**%**	N
INPUT HZ	(Input Frequency) Measured input line frequency. Note, this value will read 55Hz until the drive is able to measure true input frequency.	**Hz**	N
INPUT Vab	(Input Voltage A-B Phase) Measured input line-to-line voltage phase A-B.	**Volts**	N
INPUT Vca	(Input Voltage C-A Phase) Measured input line-to-line voltage phase C-A.	**Volts**	N
LS MODULE TEMP	(Line Side Module Temp) Indicates the hottest of the line side converters IGBT modules.	**°C**	N

Table 17: LS Power Data D3 Submenu

Utility U0 menu

U0	Parameter	Description	Default	Choices	Hidden Item	Run lock out
U1	**PASSWORD**	**For more information, see PASSWORD on page 90.**				
	ENTER PASSWORD	Allows the user to enter in a password	012345		N	N
	NEW PASSWORD	Used to change the established password			N	N
	PASSWORD LOCKOUT	Used to enable and disable password lockout	DISABLED	disabled enabled	N	N
U2	**HIDDEN ITEMS**	**For more information, see HIDDEN ITEMS on page 90.**				
	HIDDEN ITEMS	Selects if the “hidden” parameters will be displayed on the Digital Operator.	ENABLED	enabled disabled	N	N
U3	**UNITS**	**For more information, see UNITS on page 90.**				
	UNITS SELECTION	Choose either Metric units or standard English measurements units	ENGLISH	english metric	N	Y
U4	**OVRSPEED TEST**	**For more information, see OVERSPEED TEST on page 90.**				
	OVERSPEED TEST?	Allows for Overspeed Test to be enabled via the digital operator	NO	no yes	N	Y
U5	**RESTORE DFLTS**	**For more information, see RESTORE DFLTS on page 91.**				
	RESTORE DRIVE DEFAULTS?	Resets all parameters in the A1, A2, A3, A4, C1, C2, C3, and C4 Submenus. Also resets the following parameters in the A6 submenu: FLUX CONFIRM LEV, TACH VOLT SENSE, TACH SPEED SENSE, OVLD START LEVEL, and OVLD TIME OUT.			N	Y
	RESTORE MOTOR DEFAULTS?	Resets the parameter GAIN SELECTION (A4) to its default value.			N	Y
	RESTORE UTILITY DEFAULTS	Resets the parameters in A5 submenu to default values. Also reset GAIN SELECTION (A4).			N	Y
U6	**MS DRIVE INFO**	**For more information, see MS DRIVE INFO on page 92.**				
	MS TYPE			Read Only Data	N	N
	MS PLATFORM			Read Only Data	N	N
	FIELD MODULE			Read Only Data	N	N
	MS CODE VERSION			Read Only Data	N	N
	MS S/W DATE			Read Only Data	N	N
	MS S/W TIME			Read Only Data	N	N
	MS PIB MODULE			Read Only Data	N	N
	MS FPGA REV			Read Only Data	N	N
	MS CUBE ID			Read Only Data	N	N
U7	**LS DRIVE INFO**	**For more information, see LS DRIVE INFO on page 94.**				
	LS TYPE			Read Only Data	N	N
	LS CODE VERSION			Read Only Data	N	N
	LS S/W DATE			Read Only Data	N	N
	LS S/W TIME			Read Only Data	N	N
	LS FPGA REV			Read Only Data	N	N
	LS CUBE ID			Read Only Data	N	N
U8	**HEX MONITOR**	**For more information see HEX MONITOR on page 94.**				
	Addr1				N	N
	Addr2&				N	N
	Addr3&				N	N

Detailed Description

PASSWORD

(Password Function)

The following three different screens are used by the password function:

- ENTER PASSWORD
- NEW PASSWORD
- PASSWORD LOCKOUT

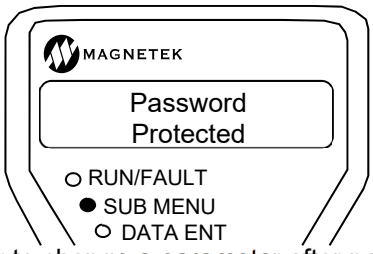
Password Function

The password function allows the user to select a six-digit number for a password. The password function allows the user to lockout changes to the parameters until a valid password is entered.

And with the password lockout enabled, all parameters and display values will be able to be viewed but no changes to the parameters will be allowed until a correct password is entered.

Parameter Protection

If the password lockout is enabled, the following message will appear on the display when attempting to change a parameter.



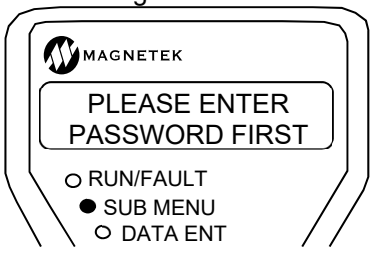
In order to change a parameter after password lockout has been enabled, the following two steps must be followed in the PASSWORD sub-menu:

1) A valid password must be entered in the ENTER PASSWORD screen.
2) The password lockout must be DISABLED in the PASSWORD LOCKOUT screen.

PASSWORD Sub-menu Protection

The following message will appear when in the PASSWORD sub-menu, if you are trying to:

- Enable or disable the password lockout without a valid password being entered.
- Enter a new password without a valid password being entered.



ENTER PASSWORD Screen

This screen allows the user to enter in a password. A valid password must be entered before enabling or disabling the password lockout or changing to a new password.

NEW PASSWORD Screen

This screen is used to change the established password.

NOTE: Remember that a valid password must be entered at the ENTER PASSWORD screen before the established password can be changed.

PASSWORD LOCKOUT Screen

This screen is used to enable and disable password lockout. The factory default for password lockout is DISABLED.

NOTE: Remember that a valid password must be entered at the ENTER PASSWORD screen before the password lockout condition can be changed.

HIDDEN ITEMS

(Hidden Items Function)

The HIDDEN ITEMS sub-menu allows the user to select whether or not “hidden” parameters will be displayed on the Digital Operator. There are two types of parameters, standard and hidden. Standard parameters are available at all times. Hidden parameters are available only if activated. The default for this function is ENABLED (meaning the hidden parameters are visible).

UNITS

(Units Selection Function)

When the UNITS SELECTION sub-menu is displayed, the user can choose either Metric units or Standard English measurements units for use by the drive’s parameters.

IMPORTANT

The unit’s selection must be made before entering any setting values into the parameters. The user cannot toggle between units after drive has been programmed.

OVERSPEED TEST

(Overspeed Test Function)

The speed command is normally limited by Overspeed Level parameter (OVERSPEED LEVEL(A1)), which is set as a percentage of the contract speed (100% to 150%). But in order to allow overspeed tests during elevator inspections, a means is provided to multiply the speed command by the Overspeed Multiplier parameter (OVERSPEED MULT(A1)).

An overspeed test can be initiated by:

- an external logic input
- the serial channel
- directly from the digital operator

Overspeed Test via Logic Input

The external logic input can be used by:

- setting the Overspeed Test Source parameter to external tb1.
- defining a logic input terminal to ospd test src

NOTE: This logic input requires a transition from false to true to be recognized - this prevents the overspeed function from being permanently enabled if left in the true state.

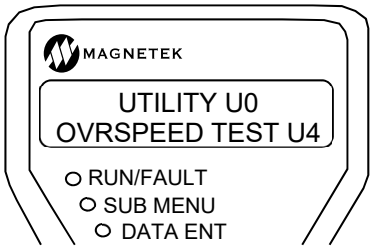
Overspeed Test via Serial Channel

The serial channel can be used by setting Overspeed Test Source (C1) parameter to serial.

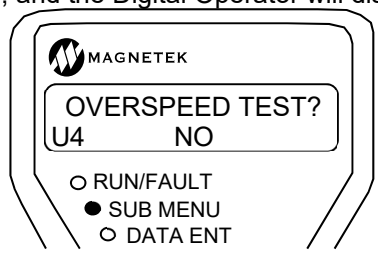
Overspeed Test via Operator

The Digital Operator can also initiate the overspeed test by performing the following:

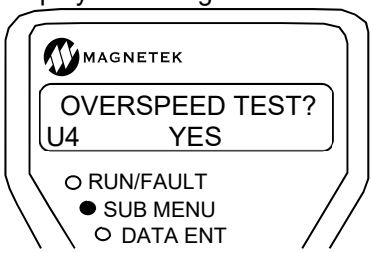
- While the Digital Operator display shows



Press the ENTER key. The sub-menu LED will turn on, and the Digital Operator will display:



- Press the ENTER key again. The sub menu LED will go out and data ent LED will turn on.
- Press the up arrow or down arrow key and the display will change to:



- Press the ENTER key to begin the overspeed test.

The value in the Overspeed Mult (A1) parameter is applied to the speed reference and the overspeed level, so that the elevator can be operated at greater than contract speed and not trip on an Overspeed Fault.
When the Run command is remove after the overspeed test, overspeed test reverts back to its default of NO. In order to run another overspeed test via the Digital Operator, the above steps must be repeated again.

RESTORE DFLTS

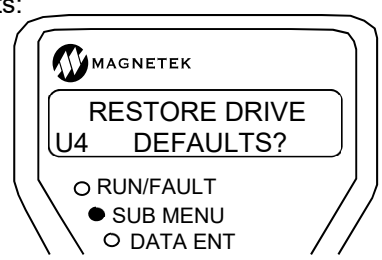
(Restore Parameter Defaults)

Three different functions are included in this sub-menu.

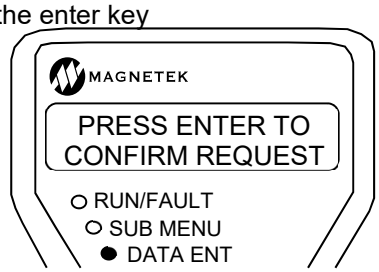
Restore Drive Defaults

This function resets parameters in DRIVE A1 submenu, S-CURVES A2 submenu, MULTISTEP REF A3 submenu, MS PWR CONVERT A4 submenu and CONFIGURE C0 menu to their default values. Also resets the following parameters in the A6 submenu: FLUX CONFIRM LEV, TACH VOLT SENSE, TACH SPEED SENSE, OVLD START LEVEL, and OVLD TIME OUT.

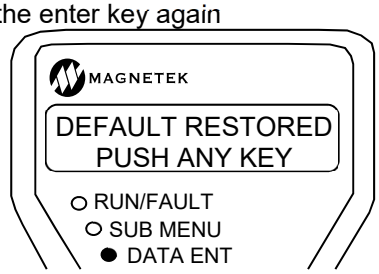
The following shows how to restore the drive defaults:



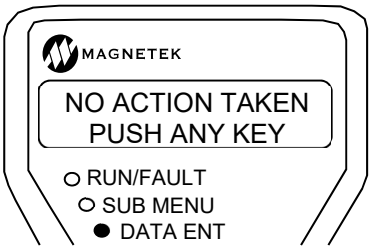
Press the enter key



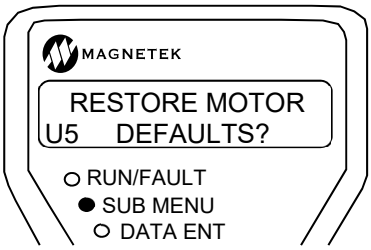
Press the enter key again



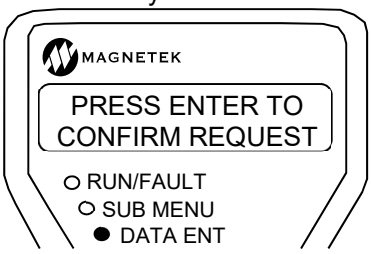
If the esc key is pressed, instead the reset action will be aborted



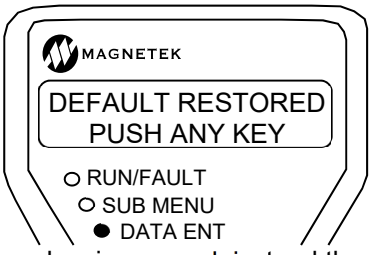
Restore Motor Defaults
The following shows how to restore the motor defaults:



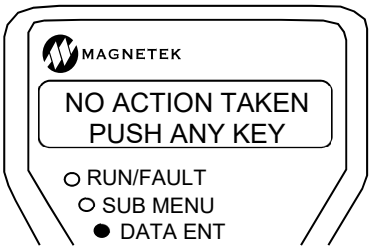
Press the enter key



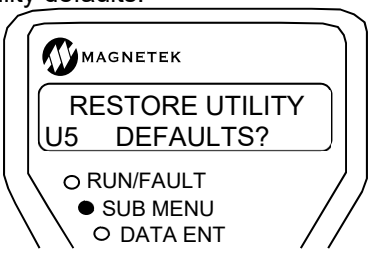
Press the enter key *again*



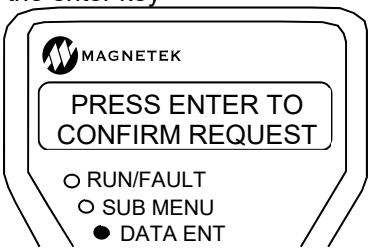
If the esc key is pressed, *in*stead the reset action will be aborted



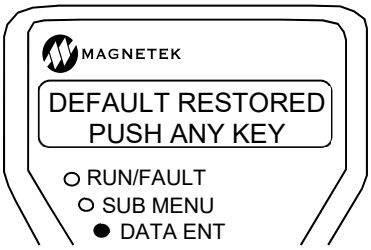
Restore Utility Defaults
This function resets the parameters in the LS PWR CONVERT (A5) submenu to the defaults. The following shows how to restore the utility defaults:



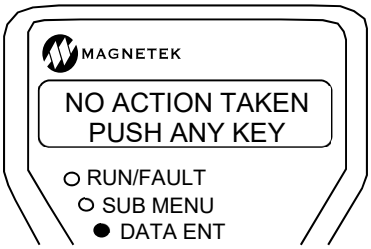
Press the enter key



Press the enter key again



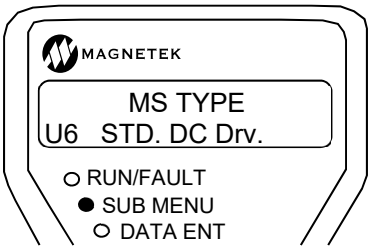
If the esc key is pressed, *in*stead the reset action will be aborted



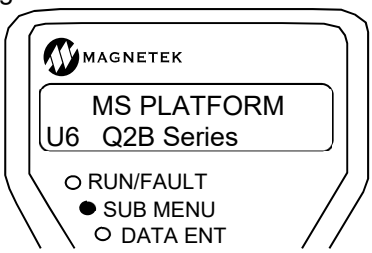
MS DRIVE INFO

(Motor Side Drive Information)
Six different screens are included in this sub-menu, each display an identification number.

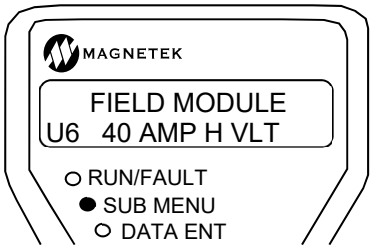
MS TYPE Screen
Shows the type of drive the software is installed in:



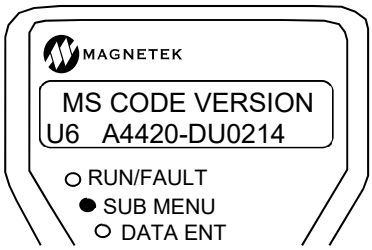
MS PLATFORM
Shows the platform of the drive. This display should correspond with the selection of J1 jumper on the Product Interface Board. See Testpoints (Product Interface Board – Other) on page 131.



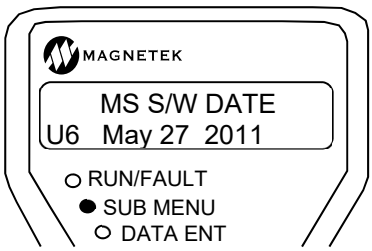
Field Module
Gives the version of field module detected by the code.



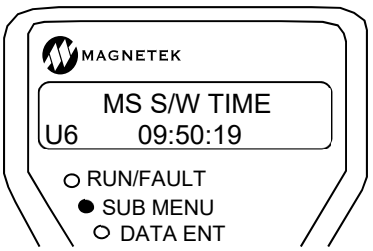
MS CODE VERSION
Shows the version of code located in the Motor Side portion of the drive.



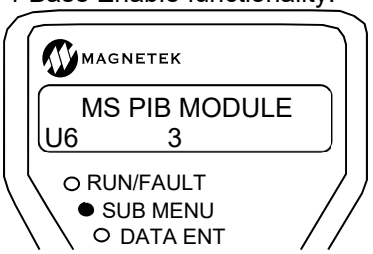
MS S/W DATE Screen
Gives the date of the released motor side code version.



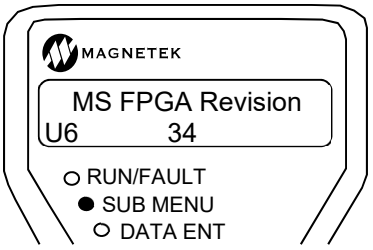
MS S/W TIME Screen
Displays the time of the released motor side code version.



MS PIB MODULE Screen
Gives the revision number for the motor side product interface board. When 2 is displayed, the product interface board is a -0010 or -0020 version. When 3 is displayed, the product interface board is a -0030 and is capable of EN81-1 Base Enable functionality.



MS FPGA REVISION Screen
Gives the revision number for the motor side FPGA.



MS CUBE ID Screen

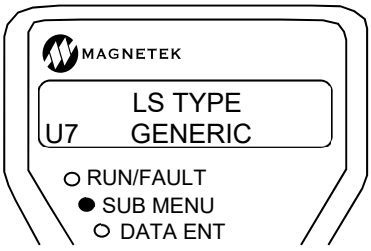
Displays the cube identification number of the drive. This number identifies specific drive ratings related to detected equipment hardware.

Ampere Rating of drive	Model Number	Cube ID #
125A	QDC125-	156
150A	QDC150-	158
200A	QDC200-	168
250A	QDC250-	170
300A	QDC300-	172

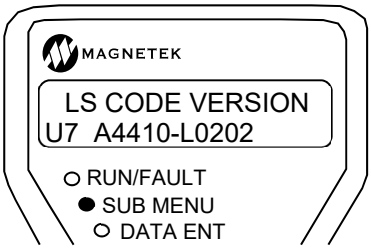
LS DRIVE INFO

(Drive Information)
Six different screens are included in this sub-menu, each display an identification number.

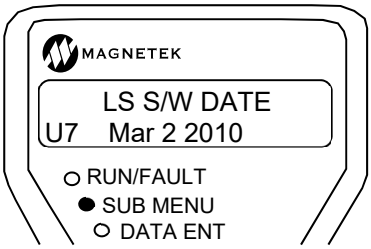
LS TYPE Screen
Shows the type of drive the software is installed in:



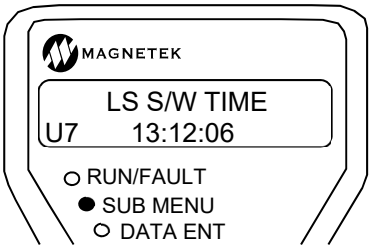
LS CODE VERSION
Shows the version of code located in the Line Side portion of the drive.



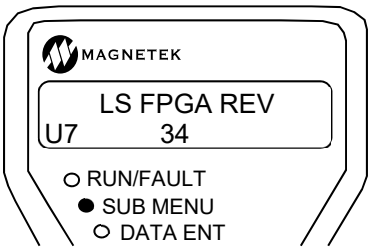
LS S/W DATE Screen
Gives the date of the released Line side code version.



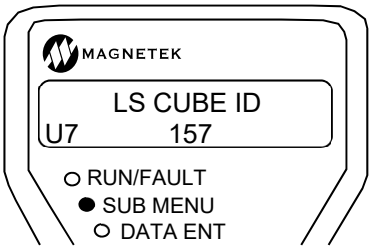
LS S/W TIME Screen
Displays the time of the released Line side code version.



LS FPGA REV Screen
Gives the revision number for the Line side FPGA.



LS CUBE ID Screen
Displays the cube identification number of the drive. This number identifies specific drive ratings related to detected equipment hardware.



Ampere Rating of drive	Model Number	Cube ID #
125A	QDC125-	155
150A	QDC150-	157
200A	QDC200-	167
250A	QDC250-	169
300A	QDC300-	171

HEX MONITOR

(Hex Monitor)
The hex monitor was designed for fault and parameter diagnostics. It is intended for use by Magnetek personnel only. The Hex Monitor contains 3 addresses for viewing. Address 1 may only be displayed in U8, whereas Address 2 and Address 3 may be viewed in either U8, or D1, or may be programmed to an analog output.

Fault F0 menu

The FAULTS F0 menu does not access settable parameters; instead, it provides a means of examining the drive's active faults and the fault history.

This menu also allows for clearing of active faults in order to get the drive ready to return to operation after a fault shutdown.

F0	Parameter	Description	Hidden Item	Run lock out
F1	ACTIVE FAULTS			
	DISPLAY ACTIVE FAULTS?	Contains a list of the active faults	N	N
	RESET ACTIVE FAULTS?	Allows for reset of active faults	N	N
F2	FAULT HISTORY			
	DISPLAY FAULT HISTORY?	Contains a list of up to the last sixteen faults	N	N
	CLEAR FAULT HISTORY?	Allows for the clearing of the fault history and fault counters	N	N
	DISPLAY FAULT COUNTERS?	Contains list of faults and the number of times they occurred	N	N

Detailed Descriptions

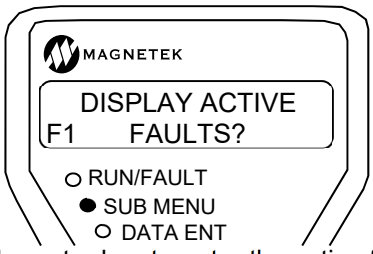
ACTIVE FAULTS

(Active Faults)

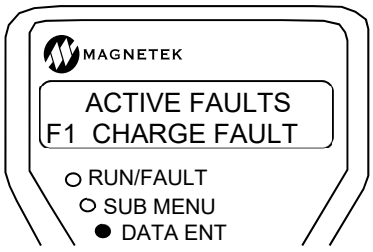
This sub-menu contains a list of the active faults. This sub-menu also allows the user to reset the active faults.

Active Faults List

The active fault list displays and records the active faults. The faults will remain on the fault list until a fault reset is initiated.



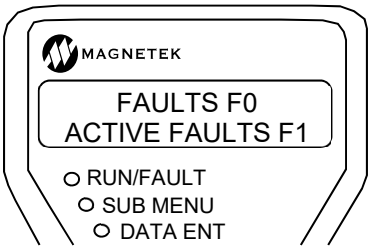
Press the enter key to enter the active fault list. Use the up and down arrow keys to scroll through the active faults.



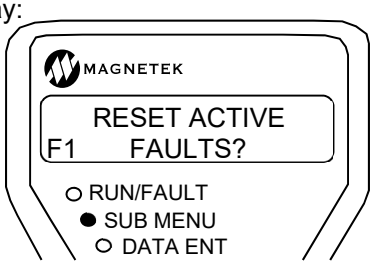
Resetting Active Faults

The Reset Active Faults function allows the user to initiate a fault reset via the digital operator, regardless of the setting of the Fault Reset Source parameter (*see User Switches C1 submenu on page 64*)

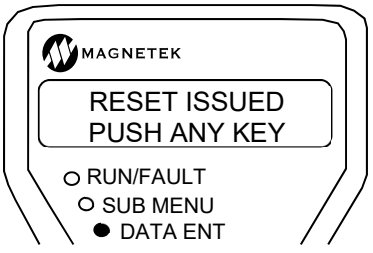
While the Digital Operator display shows:



Press the ENTER key. The sub-menu LED will turn ON, and the Digital Operator will display:



Press the ENTER key again to begin the fault reset procedure. The sub-menu LED will go out and the data ent LED will turn on.



FAULT HISTORY

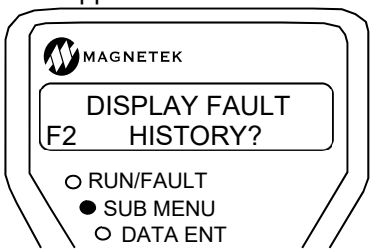
(Fault History)

This sub-menu contains a list of up to the last sixteen faults.

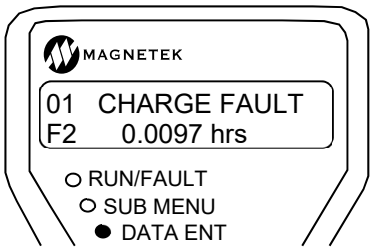
NOTE: The fault history is not affected by the fault reset or a power loss. The fault history can only be cleared by a function in this sub-menu.

Fault History

All faults are placed in the fault history. The fault history displays the last 16 faults that have occurred and a time stamp indicating when each happened.



Press the enter key to enter the fault history. Use the up and down arrow keys to scroll through the faults.



FAULT COUNTERS

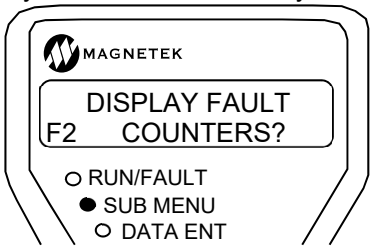
(Fault Counters)

This sub-menu contains a list of all the faults and the numbers of times they occurred.

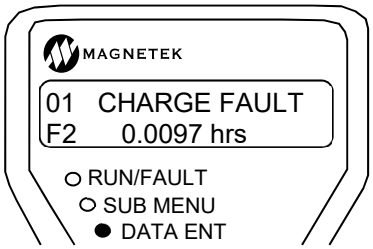
NOTE: The fault counters list is not affected by the fault reset or a power loss. The fault counters can only be cleared by a clear fault history

Fault Counter

All faults possible are located in the Fault Counter. The fault counter shows each fault and the number of times it occurred until cleared by the Clear Fault History function.

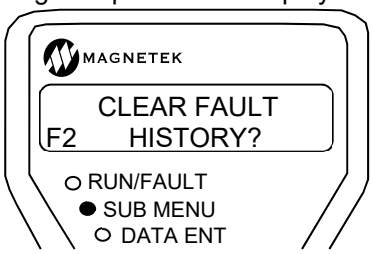


Press the enter key to enter the fault history. Use the up and down arrow keys to scroll through the faults.



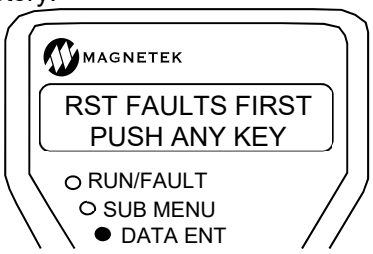
Clearing Fault History

The fault history is not affected by the fault reset or a power loss. The fault history can only be cleared via the user function described below. Clearing the Fault History will also clear the Fault Counters.
Enter the submenu in F2 by pressing the ENTER key. The sub-menu LED will turn ON, and the Digital Operator will display:

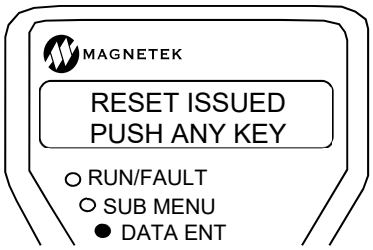


- Press the ENTER key again to begin the fault reset procedure.

The active faults must be cleared in order to clear the fault history. If not the following message will appear when trying to clear the fault history.



The sub-menu LED will go out and the data ent LED will turn on.



Maintenance

Maintenance Overview

Preventive maintenance is primarily a matter of routine inspection and cleaning. The most important maintenance factors are the following:

Is there sufficient airflow to cool the drive?

Has vibration loosened any connections?

The Drive needs to have sufficient air flow for long, reliable operation. Accumulated dust and dirt accumulation can reduce airflow and cause the heat sinks to overheat. The heat sinks can be kept clean by brushing, while using a vacuum cleaner.

Periodically, check air filters on enclosure doors, clean if dirty and replace as necessary.

Periodically, clean the cooling fans to prevent dirt buildup. At the same time, check that the impellers are free and not binding in the housing.

Periodically, check all mounting and electrical connections. Any loose hardware should be tightened.

WARNING
Hazardous voltages may exist in the drive circuits even with drive circuit breaker in off position. NEVER attempt preventive maintenance unless incoming power and control power is disconnected and locked out. Also, ensure the DC Bus charge light is out. There are two separate areas for the DC Bus Charge light. One charge light is located on the control panel in the lower right hand corner. Two additional charge lights are located on the DC Bus Board. The turn off voltage for the DC Bus Board Charge lights (DS1 and DS2) is 2V.

Drive Servicing

Remember when servicing the Drive:
Hazardous voltages may exist in the drive circuits even with drive circuit breaker in off position.

IMPORTANT
Use extreme caution: Do not touch any circuit board, the drive, or motor electrical connections without making sure that the unit is properly grounded and that no high voltage is present.
NEVER attempt maintenance unless the incoming three phase power and control power is disconnected and locked out.
Also, ensure the DC Bus charge light is out, verify with a voltmeter that no voltage exists between the (+) and (-) terminals.

Troubleshooting

Faults and Alarms

Two classes of warnings are reported by the Drive; these are identified as Faults and Alarms.

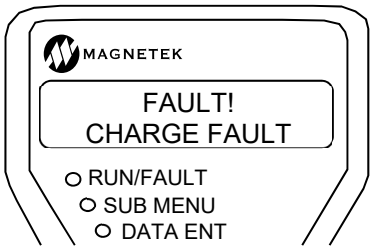
An **Alarm** is a drive condition worth noting that may or may not require immediate attention, but the condition is not severe enough to stop operating the drive. In many cases, Alarms will automatically clear when the condition returns to normal or when the drive is stopped and restarted.

Faults and Fault Annunciation

A **Fault** is a severe failure condition that will stop a drive if it has been running and prevent the drive from starting as long as it is present. All faults require some type of action by the user to clear.

There are four means of fault annunciation:

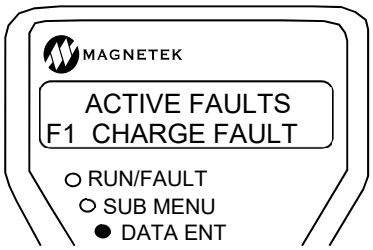
1. A priority message will be seen on the Digital Operator:



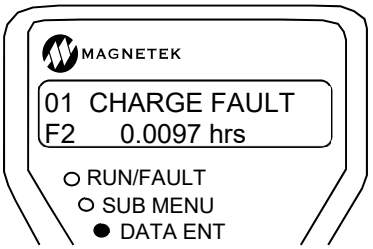
A priority message will overwrite what ever is currently displayed. The user can clear this message by pressing any key on the Digital Operator keypad. If another fault is present, the next fault will appear as a priority message.

NOTE: Clearing the fault priority message from the display DOES NOT clear the fault from the active fault list. The faults must be cleared by a fault reset before the drive will run. Setting PRIORITY MESSAGE (C1) to DISABLE can disable priority Messages.

2. The fault will be placed on the active fault list which will record and display currently active faults. The faults will remain on the fault list until an active fault reset is initiated. The drive will not be able to run until all active faults are cleared.



3. The fault will be placed on the fault history. The fault history displays the last 16 faults and a time stamp indicating when each happened. The fault history IS NOT affected by an active fault reset or a power loss. The fault history can be cleared via a user-initiated function.



4. The user can assign a fault to an external logic output. Refer to configuration submenu item C3.

Fault Clearing

Performing a fault reset can clear most faults. The fault reset can be initiated by:

- an external logic input
- the serial channel
- automatically by the drive
- manually by the digital operator

CAUTION

If the run signal is asserted at the time of a fault reset, the drive could immediately go into a run state. However, if the auto-fault reset function is enabled (FAULT RESET SRC(C1)=automatic) then the run command needs to be cycled.

Drive Faults, Alarms, and operator messages along with possible causes and corrective actions are listed below.

Note:

- **fault** - a severe failure that will stop a drive if it has been running and prevent the drive from starting as long as it is present. All faults require some type of action by the user to clear.
- **alarm** - only meant for annunciation. It will NOT stop the operation of the drive or prevent the drive from operating.
- **operator message** - operator communications message. It will NOT stop the operation of the drive or prevent the drive from operating.

Name	Description	Possible Causes & Corrective Action
Bad Srl Chksm ***(alarm)***	The drive is being operated by serial the following has occurred: Bad message checksum	**Bad Serial Connection** ⇩ Remove and re-seat the RS-422 serial cable ⇩ Check car controller serial driver board ⇩ Check the serial cable connected to the drive's RS-422 port ⇩ The Customer I/O PCB on the drive may need to be replaced ⇩ Possible problem with car controller serial communication **Grounding Issue** ⇩ Check grounding between car controller and drive ⇩ Noise on serial channel due to the cable
Base Enable Opnd	The contact between TB2-7 and TB2-14 on the customer interface board has opened	**Check Connections** ⇩ Verify external contact between TB2-7 and TB2-14 is closed ⇩ Verify +24VDC is present on pin TB2-7 ⇩ Reconnect cable from A6JC3 to A4JP9
BBlock Not Avail ***(alarm)***	Base Block is not available with version of Product Interface Board	**Check Connections** ⇩ Verify external contact between TB2-7 and TB2-14 is closed ⇩ If it is desired to use Base Block, upgrade Product Interface board to version -0030 ⇩ **Reconnect cable from A6JC3 to A4JP9**
Bridge Ground	A ground fault has been detected by the hardware on the motor side. The current going to A1 armature motor lead does not match the current returning from the motor armature lead A2.	**Check Motor Wiring** ⇩ Check motor wiring and motor for insulation breakdown or unintentional contact to other objects ⇩ Ensure proper connection of shield drain wires to chassis **Check Connections** ⇩ Possibly missing connector on one of the current sensors of the motor side bridge ⇩ **Bad Current Sensor**

Name	Description	Possible Causes & Corrective Action
Brk Hold Flt	The brake hold command and the brake feedback did not match for the time specified with Brake Hold Time (A1) parameter.	**Check Parameter Settings** ⇩ Check the correct logic input is configured for the correct TB1 terminal and set to MECH BRK HOLD (C2) ⇩ Check BRAKE HOLD SRC (C1) parameter for the correct source of brake pick feedback ⇩ Check BRAKE HOLD TIME (A1) parameter for the correct brake hold time ⇩ Wrong assignment of Normally Closed contact mask (C2) ⇩ Check BRK HOLD FLT ENA (C1) **Verify Brake Settings** ⇩ If drive is controlling brake, verify a logic output is set to BRAKE HOLD (C3) ⇩ Check for an open circuit between the brake pick pilot relay and the logic output assigned to brake pick control **Mechanical Brake Hold Signal Wiring** ⇩ Defective Brake Hold Coil ⇩ Defective Brake Hold Auxiliary contactor used for sensing the brake state **If nuisance fault, the fault can be disabled by BRK HOLD FLT ENA (C1) parameter.**
Brk Pick Flt	The brake pick command and the brake feedback did not match for the time specified with Brake Pick Time parameter.	**Check Parameter Settings** ⇩ Check the correct logic input is configured for the correct TB1 terminal and set to MECH BRK PICK (C2) ⇩ Check BRAKE PICK SRC (C1) parameter for the correct source of brake pick feedback ⇩ Check BRAKE PICK TIME (A1) parameter for the correct brake hold time ⇩ Wrong assignment of Normally Closed contact mask (C2) ⇩ Increase BRAKE PICK TIME (A1) **Verify Brake Settings** ⇩ If drive is controlling brake, verify a logic output is set to BRAKE PICK (C3) ⇩ Check for an open circuit between the brake pick pilot relay and the logic output assigned to brake pick control **Mechanical Brake Pick Signal Wiring** ⇩ Defective Brake Pick Coil ⇩ Defective Brake Pick Auxiliary contactor used for sensing the brake state If nuisance fault, the fault can be disabled by BRK PICK FLT ENA (C1) parameter.
Check Setup	This fault is logged when a new program is loaded to the motor side processor, and the default data is loaded for the parameter values.	**Invalid Parameter Setup** This is an advisory fault indicating that the user should verify the drive's parameters or Upload a valid parameter set using Magnetek Explorer

Name	Description	Possible Causes & Corrective Action
Comm Fault	The drive is being operated by serial communications and one of the following has occurred: Communication time-out – The drive did not receive a valid run-time message within 40ms while running Bad message checksum – Drive has detected 3 consecutive bad message checksums	**Bad Serial Connection** ⇩ Remove and re-seat the RS-422 serial cable ⇩ Check car controller serial driver board ⇩ Check the serial cable connected to the drive's RS-422 port ⇩ The Customer I/O PCB on the drive may need to be replaced ⇩ Possible problem with car controller serial communication **Grounding Issue** ⇩ Check grounding between car controller and drive ⇩ Noise on serial channel due to the cable
Comm Fault Invalid Checksum *(operator)*	The operator received four consecutive invalid messages	**Noise or Bad Connector Connection** ⇩ Remove and re-seat the operator in its cradle ⇩ If re-seating the operator did not work, the operator or the drive's control board may need to be replaced
Comm Fault No Drv Handshake *(operator)*	The operator lost communications with the drive's control board.	**Bad Connector Connection** ⇩ Remove and re-seat the operator in its cradle ⇩ If re-seating the operator did not work, the operator or the drive's control board may need to be replaced
Contactor Flt	Contactor confirm on TB1-1 is opened when the regulator release is active and the speed reference is greater than 20% of contract speed.	**Check parameter settings and contactor** ⇩ Check CONTACT FLT TIME (A1) parameter for the correct contactor fault time. ⇩ Verify wiring to logic input 1 (CONTACT CFIRM (C2)) is correct and Logic Input 1 (C2) is set to CONTACT CFIRM ⇩ Verify Logic Output 1 is set to CLOSE CONTACT (C3) ⇩ Verify N.C. Inputs are correct ⇩ Safety chain issue **Contactor hardware problem** ⇩ Problem with poles or auxiliary
Cube data Flt	The cube data for the motor side processor is invalid.	**Parameters Corrupted** ⇩ Re-enter parameters and power-cycle ⇩ If re-occurs, replace Drive Control board ⇩ Note: This fault cannot be reset, unit must be powered down before fault will clear.
Cube ID Fault	The cube identification number for the motor side is invalid.	**Hardware Problem** ⇩ Power cycle the drive. ⇩ Verify the Cube ID board is properly connected and fully seated ⇩ Check MS Drive Info in submenu U6 to verify processor is reading the correct cube id ⇩ If re-occurs, replace Drive Control board Note: This fault cannot be reset, unit must be powered down before fault will clear.

Name	Description	Possible Causes & Corrective Action
Curr Reg Flt	Declared if the current regulator loses the ability to generate the current required by the speed regulator.	**Problem with Motor Contactor** ⇩ Verify that motor contactor is closing ⇩ Verify motor contactor is not opening unexpectedly **Faulty current feedback signals** ⇩ Verify that reported drive current is zero when drive is not operating ⇩ Verify connections to current transducers **Loss of gate power supply** ⇩ Verify base block jumper is between TB2-7 and TB2-14 **Incorrect DC Bus Voltage reading** ⇩ Measure the dc bus with a meter ⇩ Compare that with the value on the digital operator, MS BUS VOLT (D2) or DC BUS VOLTS (D3) ⇩ Increase the boost voltage **Inaccurate Motor Parameters** ⇩ Verify motor nameplate values (A6) are entered correctly **Motor Problems** Verify Motor Armature does not have an open armature wire
DCU Data Flt	The DCU parameters checksum is invalid on the motor side.	**Parameters Corrupted** ⇩ Check & re-enter parameters and power cycle the drive ⇩ If re-occurs, replace Drive Control board
Dir Conflict ***(alarm)***	Declared when the speed command is held at zero due conflict with the analog speed command polarity and the run up / run down logic DIR CONFIRM (C1) must be enabled.	**Check Parameter Settings** ⇩ Sensitivity determined by the ZERO SPEED LEVEL (A1) **Confirm Speed Command Polarity** ⇩ Check polarity of the analog speed command on analog channel #1 ⇩ Compare that with the RUN UP (positive) and RUN DOWN (negative) logic input status ⇩ If nuisance, the function can be disabled by DIR CONFIRM (C1) parameter.
Drive Temp. ***(fault)***	One or more of the IGBT modules on the motor side power bridge has exceeded 95°C (203°F).	**Overtemperature Problems** ⇩ Verify that the two fans located under the power module are both working properly ⇩ Inspect and clean air intake filters ⇩ Verify ambient temperature is less than 45°C ⇩ Verify drive is sized correctly ⇩ Possible defective temperature sensor **Hardware problem** ⇩ Replace the motor side product interface board (A4)

Name	Description	Possible Causes & Corrective Action
Drive Temp. ***(alarm)***	One or more of the IGBT modules on the motor side power bridge has exceeded 85°C (185°F).	**Overtemperature Problems** ⇩ Verify that the two fans located under the power module are both working properly ⇩ Inspect and clean air intake filters ⇩ Verify ambient temperature is less than 45°C ⇩ Verify drive is sized correctly ⇩ Possible defective temperature sensor **Hardware problem** ⇩ Replace the motor side product interface board (A4) ⇩
DRIVE OVERLOAD	Drive has detected an overload condition. At 1.0 PU current the drive can run continuously. At 1.5 PU current, the drive can run for 60 seconds. At 2.5 PU current, the drive can run for 5 seconds. In the event these limits are exceeded, the drive will declare a DRIVE OVRLOAD fault and shutdown. These settings are not adjustable and cannot be defeated.	**Check Connections** ⇩ Monitor D2 Motor overload to help identify when the fault occurred. ⇩ An unusual condition causing unusual drag on the motor. ⇩ Defective motor fields.

Name	Description	Possible Causes & Corrective Action
Encoder Flt	The drive is in a run condition and the encoder is: not functioning or not connected or phasing direction is not proper with motor rotation.	**Encoder Phasing Should Match Motor Rotation** ⇩ If Reversed Tach Fault is indicated the encoder rotation is backwards ⇩ Swap two encoder wires (A and /A) ⇩ Verify that speed is reported back to the drive by manually rotating the encoder and observing the speed feedback on the display. **Encoder Power Supply Loss** ⇩ Check 12 or 5 volt supply on terminal strip **Accurate Parameters** ⇩ Verify motor nameplate values are entered correctly ⇩ Verify encoder PPR value is correct ⇩ Verify that the Tach Volt Sense (A6) is at least set to default. ⇩ Verify that the Tach Speed Sense (A6) is at least set to default. ⇩ If problem is due to a high IR drop on the armature, increase the value of Tach Volt Sense (A6) **Response of Speed Regulator** ⇩ Enter accurate INERTIA (A1) parameter ⇩ Increase RESPONSE (A1) parameter **Encoder Coupling Sloppy or Broken** ⇩ Check encoder to motor coupling ⇩ Possible bad encoder **Excessive Noise on Encoder Lines** ⇩ Check encoder connections. Separate encoder leads from power wiring (cross power lead at 90°) ⇩ Ensure that encoder shaft and frame are electrically isolated from the motor **Motor Problem** ⇩ Check for open motor armature (may occur with Open Armature Flt) ⇩ Check for dirty commutator **Hardware Problem** ⇩ Possible bad IGBT ⇩ Possible bad Customer Interface PCB
Extrn Fault 1	User defined external logic fault input *...Closure of this contact will cause the drive to declare the fault*	**Check Parameter Settings and External Fault Signal Wiring** ⇩ Check the correct logic input is configured for the correct TB1 terminal and set to EXTRN FAULT 1 (C2) ⇩ Verify the source of the external fault signal.
Extrn Fault 2	User defined external logic fault input *...Closure of this contact will cause the drive to declare the fault*	**Check Parameter Settings and External Fault Signal Wiring** ⇩ Check the correct logic input is configured for the correct TB1 terminal and set to EXTRN FAULT 2 (C2) ⇩ Verify the source of the external fault signal.

Name	Description	Possible Causes & Corrective Action
Extrn Fault 3	User defined external logic fault input *...Closure of this contact will cause the drive to declare the fault*	**Check Parameter Settings and External Fault Signal Wiring** ⇩ Check the correct logic input is configured for the correct TB1 terminal and set to EXTRN FAULT 3 (C2) ⇩ Verify the source of the external fault signal.
Extrn Fault 4	User defined external logic fault input *...Opening of this contact will cause the drive to declare the fault*	**Check Parameter Settings and External Fault Signal Wiring** ⇩ Check the correct logic input is configured for the correct TB1 terminal and set to EXTRN /FLT 4 (C2) ⇩ Verify the source of the external fault signal.
Field Ground	The hardware has detected a ground fault in the field circuit.	**Check Motor Field wiring** ⇩ Check motor field wiring and motor field for insulation breakdown or unintentional contact to other objects ⇩ Verify the wires on TB1 on field module are connected in the correct terminals. ⇩ Measure the low voltage power supplies on the LV Power distribution board (A10), replace power supply if out of tolerance. ⇩ On the motor side product interface board measure TPP14 (2.5V) to TPP36 (AC) if reading incorrect replace the board. ⇩ On the motor side product interface board measure TPP4 (IFLD_O) to TPP36 (AC) and TPP5 (IFLD_I) to TPP36 (AC), these are inputs from the current feedback on the field module if they don't match replace the field module.
Field I REG	The field regulator cannot regulate properly. If using the Low voltage field module verify that there is enough bus voltage to operate at the full field level. Temporarily increase the DC bus boost (A5) to 75, then order a high voltage field module.	**Check motor field and wiring** ⇩ Verify motor field and motor wirings are not open ⇩ Verify A24J1 (Field Module) and A4JP1 (Motor-Side Product Interface PCB) connections **Check Parameter Settings** ⇩ Verify proper setting for FULL FLD CURR (A6), WEAK FLD CURR (A6), and STANDBY FIELD (A6) ⇩ Hardware Failure
Field IGBT	A de-saturation condition has been detected on a field power bridge IGBT.	**Check motor field and wiring** ⇩ Verify motor field and motor wirings are not shorted **If re-occurs and the motor field and wirings are okay, suspect a defective field module IGBT**

Name	Description	Possible Causes & Corrective Action
Field LOSS	The field voltage has been above 35% of rated and the field current below 2% of rated for 1.5 seconds	**Check motor field and wiring** ⇩ Verify motor field and motor wirings are not open ⇩ Verify A24J1 (Field Module) and A4JP1 (Motor-Side Product Interface PCB) connections ⇩ Verify the following LEDs on the Electrical Control Board (46S04174-0010) are lit: DS1 Line 1, DS2 Line 2, and DS3 Line 3 ⇩ Verify Bus Voltage is present on A24Tb1(1)-(4) ⇩ Verify Bus voltage is present on the topside of F3 and F4 on the Field Module Supply. ⇩ Note: This fault cannot be reset, unit must be powered down before fault will clear.
Field Temp. ***(fault)***	One or more of the IGBT modules on the field module has exceeded 95°C (203°F).	**Overtemperature Problems** ⇩ Verify the fan on field control module is circulating air freely. ⇩ Inspect and clean air intake filters ⇩ Verify ambient temperature is less than 45°C **Hardware Problem** ⇩ View Field IGBT Temp (D2) to see what temperature the drive is reading for the field module ⇩ Replace the field module
Field Temp. ***(alarm)***	One or more of the IGBT modules on the field module has exceeded 85°C (185°F).	**Over temperature Problems** ⇩ Verify the fan on field control module is circulating air freely. ⇩ Inspect and clean air intake filters ⇩ Verify ambient temperature is less than 45°C **Hardware Problem** ⇩ View Field IGBT Temp (D2) to see what temperature the drive is reading for the field module ⇩ Replace the field module
FId Cur Set Hi	The field current is set above the 20A jumper level when the drive contains the Low Voltage Field Module	**Check Parameter Settings** ⇩ Verify FULL FLD CURRENT (A6), WEAK FLD CURRENT (A6), and STANDBY FIELD (A6) are set below 20A when JP1 on the field module PCB is A. **Check Jumpers** ⇩ Verify Jumper JP1 on the Field module is placed in the correct field ampere range ⇩ Note: Drive automatically detects the type of field module, either Low Voltage Field Module or Standard Field Module. If the Low Voltage Field Module is being used, drive automatically detects max current level for the field.

Name	Description	Possible Causes & Corrective Action
Fld PWM Set Hi	The FLD CARRIER FRQ (A4) is set too high for the type of Field Module detected.	**Check Parameter Settings** ⇩ Verify FLD CARRIER FRQ (A4) is set at or below 10kHz when a standard field module is being use. Note: Drive automatically detects the type of field module, either Low Voltage Field Module or Standard Field Module.
Fld Over Curr	If field current exceeds 250% the fault is declared immediately. If field current exceeds 150% for 0.5 seconds, the fault will be declared. If field current is less than 110% no fault will be declared.	**Check Parameter Settings** ⇩ Verify parameter settings for motor field control **Check motor field and wiring** ⇩ Check motor field and wiring for short circuits Note: This fault cannot be reset, unit must be powered down before fault will clear.
Full Fld Time	Drive was commanded to provide Full Field current but not told to Start for longer than the time set in FULL FIELD TIME (A1)	**Incorrect Start Timing** ⇩ Check for proper drive Start sequencing signals Verify FULL FIELD TIME (A1)
Hit Torque Limit ***(alarm)***	The drive is or was being limited by the motor current limit setting. This can limit acceleration rates and cause subsequent velocity tracking errors.	**Incorrect Wiring** ⇩ Verify motor armature circuit wiring ⇩ Verify motor field current is correct **Drive and/or Motor is Undersized** ⇩ Verify drive and/or motor sizing. May need a larger capacity Drive and / or motor. **Check Parameter Settings** ⇩ Check the torque limit parameter MTR TORQUE LIMIT (A1) ⇩ Alarm sensitivity - TRQ LIM MSG DELAY (A1) parameter determines the amount of time the drive is in torque limit before the alarm message is displayed. **Problem in the motor fields** ⇩ Verify that the motor field coils are operating correctly, check DC resistance and perform an AC drop test to verify.
HW/SW Mismatch	Line side software is installed in the motor side control board and cube id is for motor side	**Mismatching cube ids vs. software** ⇩ Replace A2 board with correct software for board location or program correct software into Motor Side Board
Invalid Checksum ***(operator serial link error)***	The operator received four consecutive invalid messages.	**Noise or Bad Connector Connection** ⇩ Remove and re-seat the operator in its cradle. ⇩ If re-occurs, the operator or the drive's control board may need to be replaced.
IP Comm	A fault has occurred in the communications channel between the Line side and Motor side processors. This was detected on the motor side.	**Communication problem** ⇩ Reset drive ⇩ Verify Line Side software and Motor Side software is compatible ⇩ If re-occurs, replace Main Processor PCBs ⇩ Replace the low voltage power supply

Name	Description	Possible Causes & Corrective Action
Line HI Volts	Line voltage is greater than max drive rating. Monitored via the DC Bus.	**Line Voltage is too High** ⇩ Verify DC Bus is reading voltage correctly ⇩ Verify Line voltage is set correctly
LS A to D	The Analog to Digital conversion on the line side control board is not working properly.	**Line Side Analog to Digital Conversion incorrect** ⇩ Replace Line Side Main and Power Interface PCBs
LS AC CNTCR	The main AC power contactor is not following the commanded state within 1 second.	**AC Power Contactor Problem** ⇩ Check for faulty UTM contactor coil or interlocking aux contact blocks on PCM or UTM ⇩ Check A8 TB3-9 has 24Vdc, it then goes through the aux on the UTM to A8 TB3-18, with the line power off close UTM, the 24V on A8 TB3-18 should go to zero. If this checks it may be a bad product interface PCB on the line side ⇩ CAUTION: Do not manually engage the UTM contactor with power applied.
LS BRDG GND	The hardware has detected a ground fault on the line side power bridge.	**IGBT Breakdown** ⇩ Inspect and measure for physical voltage breakdown damage on IGBTs and DC bus
LS Charge	The DC bus voltage has not stabilized above the voltage fault level within 2 seconds or the charge contactor has not closed after charging OR The DC bus voltage is below the UV Fault level as defined by the INPUT L-L VOLTS (A5) and UV FAULT LEVEL (A4) parameters Please note, if LS Charge occurs 3 consecutive times, the drive will require a power cycle to reset the fault	**Low Input Voltage** ⇩ Check INPUT L-L VOLTS (A5) and UV FAULT LEVEL (A4) parameters ⇩ Verify proper input voltage and increase, if necessary, the input AC voltage within the proper range ⇩ Check for a missing input phase ⇩ Check power line disturbances due to starting of other equipment **Incorrect Setting** ⇩ Verify the PCM pulls in ⇩ Observe DC BUS VOLTS (D3) and verify it increases until the fault occurs ⇩ Observe DC BUS VOLTS (D3) decreased after the fault as occurred **DC Bus Problems** ⇩ Observe DC BUS VOLTS (D3) ⇩ Manually push in PCM, do not hold for longer than 1s!! Does the bus voltage rise, if so does it decay slowly or rapidly drop to zero. ⇩ If it stays at zero or drops quickly, it indicates the bus is shorted. **Hardware Failure** ⇩ Possible Damaged Product Interface Board ⇩ Possible Damaged Pre-Charge Resistor and / or Pre-Charge Contactor ⇩ Possible field module failure / shorted motor field

Name	Description	Possible Causes & Corrective Action
LS CHK Setup	This fault is logged when a new program is loaded to the line side processor, and the default data is loaded for the parameter values.	**Inconsistent Parameter Settings** ⇩ Verify Parameters settings in menu A1, A2, A3, A4, and A6 are correct
LS Cube Data	The cube data for the line side processor is invalid.	**Invalid Cube ID** Verify LS Cube ID is seated correctly and not damaged
LS Cube ID	The drive is reading the cube ID and it doesn't match the size of the power module	**Invalid Cube ID** ⇩ Verify LS Cube ID is seated correctly and not damaged ⇩ Verify LS Cube ID in U7 is correct version ⇩ Replace product interface board
LS Curr Reg	Inability to regulate AC side to match incoming line 3-phase voltage.	**Faulty current feedback signals** ⇩ Verify connections to current transducers **Incorrect DC Bus Voltage reading** ⇩ Measure the dc bus with a meter ⇩ Compare that with the value on the digital operator, DC BUS VOLTS (D3) or MS BUS VOLTS (D2) **Parameter Settings** ⇩ Increase DC BUS V BOOST (A5) ⇩ Set BUS VREF SOURCE (A5) to TRK VIN PARAM ⇩ Decrease values in Id REG INTGRL GAIN (A5) and Iq REG INTGRL GAIN (A5) ⇩ Decrease values in Id REG PROP GAIN (A5) and Iq REG PROP GAIN (A5) **External Relay Timing** ⇩ Check for improper external relay timing ⇩ Verify UTM is closed and verify the correct operation of the power poles **Check Wiring** ⇩ Missing jumper wire at Customer Interface Board PCB, TB2 ⇩ Missing jumper at JP9 on Product Interface Board, A3 **Hardware / software not at the latest revision** ⇩ Check with tech support to verify that the drive has the correct version product interface boards and software. It should have 46S03954-0030 RV07 or later. ⇩ Verify UTM is properly closing, check the power poles for damage
LS DCU Data	The DCU parameters checksum is invalid on the line side.	**Parameters Corrupted** Check & re-enter Line Side parameters and power cycle the drive

Name	Description	Possible Causes & Corrective Action
LS HIT TRQ LMT *(alarm)*	The line side is or was being limited by the motoring current limit or regenerative current limit setting. This can limit current into the dc bus leading to an under-voltage condition, or limit current into the line leading to a bus over-voltage condition.	**Improper Line Side Menu Parameters (A5)** ⇩ Verify and correct all Line side (A5) parameter data **Low Line Voltage** ⇩ Input line voltage is too low causing current to be too high for the operating power level Verify INPUT L-L VOLTAGE (A5)
LS HW/SW	Motor side software is installed in the line side control board and cube id is for line side	**Mismatching cube ids vs. software** ⇩ Replace A1 board with correct software for board location or program correct software into Line Side Board
LS I Conn Off	The line side power interface board has detected a missing or loose connector on the motor side.	**Missing Connector** ⇩ Verify JP7 connector is connected and seated properly ⇩ Verify the current tranducers, CT1, CT2 and CT3 connections are connected and seated properly
LS IGBT 1,2,3	A de-saturation condition has been detected on the line side IGBT power module. Note: Module 2 or 3 IGBT fault should not occur. If that is reported change the line side product interface board.	**Bridge failure** ⇩ Turn the power off on the drive; wait for the bus to drop to zero. Measure at F3, 4 for DC voltage. Once at zero volts go to the next step. ⇩ With an ohm meter check on the upper gate board from phase A, B, C to + then – (on the cap board) then reverse the leads and check again from + then -. Next do the same check on the lower MS gating board, check from the (+) output to the + then – connections on the cap board, then (-) output to the + then – on the cap board, reverse the leads do it again. If anything reads shorted, then that would indicate an IGBT failure. Call Magnetek to confirm results and get advice on what to do next. **Motor Problem** ⇩ Check motor armature and wiring for short circuits **Field Control Problem** Open F3, 4 fuses, check if problem goes away. **Product Interface Problem (A3 / A4)** Try replacing the board ⇩
LS IP Comm	A fault has occurred in the communications channel between the Line side and Motor side processors. This was detected on the line side.	**Miscommunication problem** ⇩ Verify proper software installed in Line Side and Motor Side processors If re-occurs, replace PCB A2 - Replace power supply

Name	Description	Possible Causes & Corrective Action
LS Overcurr	The line side power converted has detected that 280% rated amps has been detected by the current transducers through the product interface PCB (A3).	**Overcurrent Problem** ⇩ Check for a possible short circuit in motor or external power wiring. ⇩ This could also be a result of other faults occurring first. Verify by reviewing the fault history prior to this event. ⇩ Encoder issue **Poor Regulator Tuning** ⇩ Check LS parameters, these are in the A5 menu. These are factory set and shouldn't need to be adjusted. Verify that they are at default.
LS Overload	An overload condition has been detected on the line side power bridge.	**Excessive Current Draw** ⇩ Decrease accel/decel rate ⇩ Mechanical brake not releasing properly **Drive Sizing** ⇩ Verify drive sizing with motor ampere requirements. May need a larger capacity drive
LS Overtemp ***(fault)***	One or more of the IGBT modules on the line side power bridge has exceeded 95°C (203°F).	**Overtemperature Problems** ⇩ Verify that the two fans located under the power module are both working properly and rotating in the same direction ⇩ Inspect and clean air intake filters ⇩ Verify ambient temperature is less than 45°C ⇩ Verify drive is sized correctly ⇩ Possible defective temperature sensor **Hardware problem** ⇩ Replace the line side product interface board (A3)
LS Over Temp ***(alarm)***	One or more of the IGBT modules on the line side power bridge has exceeded 85°C (185°F).	**Overtemperature Problems** ⇩ Verify that the two fans located under the power module are both working properly ⇩ Inspect and clean air intake filters ⇩ Verify ambient temperature is less than 45°C ⇩ Verify drive is sized correctly ⇩ Possible defective temperature sensor **Hardware problem** ⇩ Replace the line side product interface board (A3)

Name	Description	Possible Causes & Corrective Action
LS Overvolt	The line side power converter has detected an over-voltage condition.	**Line Converter Problem** ⇩ Verify the line converter did not shutdown while the motor controller was in process of regeneration **Check Parameter Settings** ⇩ Bad tuning of the line side regulators **Contactor Problem** ⇩ Verify motor contactor did not open while motoring **Result of a fault on the motor side of the drive** ⇩ Look in the fault history for other events that occurred at the same approximate time.
LS PCU Data	PCU parameters checksum is invalid on the line side.	**Parameters Corrupted** ⇩ Check & re-enter Line Side parameters and power cycle the drive
LS Phase	The line side converter has detected the loss of one or more phases of the AC line.	**Input Line to Line Phase Loss** ⇩ Verify all 3 AC line phases are present ⇩ Check line fuses ⇩ Verify INPUT L-L VOLTS (A5) is set correctly ⇩ Verify wiring to / from contactor UTM ⇩ Verify 3 phase signal wiring to PCB A8 ⇩ If re-occurs, replace A8
LS Size	The line side power converter has detected that the power bridge size and cube I.D. size does not match.	**Hardware Mismatch** ⇩ Size of the power bridge does not match the rating as defined on the cube ID board. Call tech support to verify the proper locations for the jumpers on the gating boards. ⇩ Check for correct Cube ID board located on A3 product interface board, verify by looking up motor side cube I.D. in the U6 menu, and then ensure it matches the table in this manual.
LS SW BUS OV	The line side power converter has detected an over-voltage condition above setting SW BUS OV LEVEL (A5)	**Line Converter Problem** ⇩ Verify the line converter did not shutdown while the motor controller was in process of regeneration **Check Parameter Settings** ⇩ Verify setting of SW BUS OV LEVEL (A5) ⇩ Bad tuning of the line side regulators **Contactor Problem** ⇩ Verify motor contactor did not open while motoring

Name	Description	Possible Causes & Corrective Action
LS Undr Voltg ***(alarm)***	The L-L AC voltage has fallen below the under voltage alarm level. The alarm level is set by UV Alarm Level parameter.	**Low Input Voltage** ⇩ Check INPUT L-L VOLTS (A5) and UV ALARM LEVEL (A4) ⇩ Verify proper input voltage and increase, if necessary, the input AC voltage within the proper range ⇩ Check for missing input phase ⇩ Check power line disturbances due to starting of other equipment **Drive Accurately Reading the AC line volts** ⇩ Measure the AC line volts with a meter Compare that with the value on the digital operator, Vab (D3) or Vca (D3)
LS Undrvolt ***(fault)***	The L-L AC voltage has fallen below the under voltage fault level. The fault level is set by UV FAULT Level parameter.	**Low Input Voltage** ⇩ Check INPUT L-L VOLTS (A5) and UV ALARM LEVEL (A4) ⇩ Verify proper input voltage and increase, if necessary, the input AC voltage within the proper range ⇩ Check for missing input phase ⇩ Check power line disturbances due to starting of other equipment **Drive Accurately Reading the AC line volts** ⇩ Measure the AC line volts with a meter ⇩ Compare that with the value on the digital operator, Vab (D3) or Vca (D3)
Module A IGBT	A de-saturation condition has been detected on the specified motor side IGBT power module. Note: Module B or C IGBT fault should not occur. If that is reported change the motor side product interface board.	**Bridge failure** ⇩ Turn the power off on the drive; wait for the bus to drop to zero. Measure at F3, 4 for DC voltage. Once at zero volts go to the next step. ⇩ With an ohm meter check on the upper gate board from phase A, B, C to + then – (on the cap board) then reverse the leads and check again from + then -. Next do the same check on the lower MS gating board, check from the (+) output to the + then – connections on the cap board, then (-) output to the + then – on the cap board, reverse the leads do it again. If anything reads shorted, then that would indicate an IGBT failure. Call Magnetek to confirm results and get advice on what to do next. **Motor Problem** ⇩ Check motor armature and wiring for short circuits **Product Interface Problem** ⇩ Try replacing the board
Monitor Rev	The revision level of the monitor data structure shared between the line and motor side processors does not match.	**Software Problem** ⇩ Re-load proper software into both processors

Name	Description	Possible Causes & Corrective Action
Motor ID Flt	The motor submenu (A6) does not have properly defined motor parameters	**Incorrect Parameter Settings** ⇩ Verify the Motor Submenu (A6) contains valid values Note: The following parameters in the A6 submenu are defaulted at zero. These must be changed to values within their respective ranges before the fault can be cleared. Those parameters are: RATED MOTOR CURR, ARMATURE VOLTAGE, FULL FLD CURRENT, WEAK FLD CURRENT, and ARMATURE IR DROP.
MS I Conn Off	The motor side power interface board has detected a missing or loose connector on the motor side.	**Missing Connector** ⇩ Verify JP7 connector on the motor side PI board and the current transducers, CT5 and CT6 connections are connected and seated properly
MS-LS Mismatch	The revision level for parameter data shared between the line side and motor side processors does not match.	**Misplaced Jumper** ⇩ Verify the Line Side and Motor Side Programming jumper on JM13 is in NORMAL mode, not in PROGRAM mode **Software Incompatibility** ⇩ Contact Factory Note: This fault cannot be reset, unit must be powered down before fault will clear.
MS Size	The motor side power converter has detected that the power bridge size and cube I.D. size does not match.	**Hardware Mismatch** ⇩ Size of the power bridge does not match the rating as defined on the cube ID board. Call tech support to verify the proper locations for the jumpers on the gating boards. ⇩ Check for correct Cube ID board located on A4 product interface board, verify by looking up motor side cube I.D. in the U6 menu, and then ensure it matches the table in this manual.
MTR Data Flt	Motor parameters checksum is invalid.	**Parameters Corrupted** ⇩ Check & re-enter Motor Side (A4) parameters and power cycle the drive If re-occurs, replace Drive Control board A2

Name	Description	Possible Causes & Corrective Action
Mtr Overload ***(alarm)***	The motor had exceeded the user defined motor overload curve.	**Verify Overload Curve Parameters** ⇩ Check both OVLD START LEVEL (A6) and OVLD TIME OUT (A6) parameters. **Excessive Field Weakening** ⇩ Verify that FULL FLD AMPS (A6) and WEAK FLD AMPS (A6) are set correctly so that motor can produce rated torque ⇩ Verify that motor armature voltage is correct for applied speed and load **Accurate Motor Parameters** ⇩ Verify motor nameplate values are entered correctly **Excessive Current Draw** ⇩ Decrease accel/decel rate ⇩ Verify elevator counterweights ⇩ Verify mechanical release of elevator brake **Motor Problem** ⇩ Check for motor failure Check for faulty motor wiring
Mtr Settings	The fault looks for proper motor values.	**Improper Parameter Setting** ⇩ Verify RATED MOTOR CURR (A6) setting ⇩ Verify ARMATURE VOLTS (A6) ⇩ Verify FULL FLD CURRENT (A6)
No Drv Handshake *(operator serial link error)*	The operator lost communications with the drive's control board.	**Bad Connector Connection** ⇩ Remove and re-seat the operator in its cradle. ⇩ If re-occurs, the operator or the drive's control board may need to be replaced.
No Field Cable	A disconnected field cable has been detected.	**Missing Cable** ⇩ Verify Field Supply (A24J1 or A3JP1) connector and Current Sense (A4JP4) cable are connected and properly seated ⇩ Note: This fault cannot be reset, unit must be powered down before fault will clear.
NTSD Logic In	This fault will be active if: • The NTSD Mode (C1) doesn't match the input set in the C2 sub-menu	**Check Parameters Settings:** ⇩ Verify the correct NTSD Mode (C1) is selected ⇩ Verify Logic Input 1 - 9 in C2 is set for the correct NTSD Input

Name	Description	Possible Causes & Corrective Action
Open Armature	Armature current reference has remained above 10% of rated, but the armature current has remained below 2% of rated for more than 1 seconds	**Contactor Problem** ⇩ Verify correct operation of power poles on motor armature contactor **Motor Problem** ⇩ Verify motor is wired correctly ⇩ This fault could indicate an open armature in motor ⇩ This fault could also indicate a brush problem in the motor ⇩ Note: This fault cannot be reset, unit must be powered down before fault will clear.
Overcurr Flt	The motor side power converted has detected that 280% rated amps has been detected by the current transducers through the product interface PCB (A4).	**Overcurrent Problem** ⇩ Check for a possible short circuit in motor or external power wiring. **Poor Regulator Tuning** ⇩ Check parameters ⇩ Complete the motor auto-tune **Wiring issue** ⇩ Make sure that the armature wires from the left side of the motor side power module go up through the CT5, and the one on the right goes up through CT6. ⇩ Check that the CT cable is plugged in correctly, CT5 should plug into CT5 and then CT6 plugs into CT6 **Encoder** ⇩ A defective encoder may sort of work but can glitch the speed regulator.
Overspeed Flt	Generated when the motor has gone beyond the user defined percentage contract speed for a specified amount of time.	**Check Parameter Settings** ⇩ Check OVERSPEED LEVEL (A1) parameter for the correct level. ⇩ Check OVERSPEED TIME (A1) parameter for the correct time. **Poor Regulator Tuning** ⇩ Check INERTIA (A1) and RESPONSE (A1) for speed regulator tuning **Speed Request** ⇩ Excessive speed dictation signal from car controller ⇩ Improper feed forward signal Note: This fault is defined by Overspeed Level parameter and Overspeed Time parameter.
Overvolt Flt	The DC bus voltage has exceeded the maximum allowed value.	**Line Converter Problem** ⇩ Verify the line converter did not shutdown while the motor controller was in process of regeneration ⇩ Verify AC line didn't lose a phase while drive was in the process of regen **Check Parameter Settings** ⇩ Bad tuning of either the motor side regulators **Contactor Problem** Verify motor contactor did not open while motoring

Name	Description	Possible Causes & Corrective Action
PCU data Flt	PCU parameters checksum is invalid on the motor side.	**Parameters Corrupted** ⇩ Check parameters and power cycle ⇩ Change one parameter, then set back and cycle power. ⇩ Change control boards
Power On	Annunciation that the drive has successfully powered up	**No Corrective Action needed**
Ready, Waiting For Drive *(operator)*	The operator is waiting to establish communications with the drive's control board.	**Normal, if displayed momentarily** ⇩ No action is required, if the message disappears shortly after power-up of the operator **Bad Connector Connection** ⇩ Remove and re-seat the operator in its cradle ⇩ If re-seating of the operator does not work, the operator may need to be replaced
Reverse Tach	See ENCODER FLT	See ENCODER FLT ⇩ Note: This fault cannot be reset, unit must be powered down before fault will clear.
S-Chain Event ***(alarm)***	Elevator Safety Chain opened while the drive was running.	**Safety Chain Problem** ⇩ Safety Chain was opened during a run ⇩ **Verify correct Safety-Chain operation and timing**
Safe off Opn	Safe off input is located on the customer interface board, TB2-7 to TB2-14. • If the "Safe-Off" input is open and the drive is in the ready state, but has a run command active, then "Safe-Off Open" will be declared after 1 second (But the IGBTs will be disabled immediately) If the "Safe-Off" input becomes open while the drive is in a run condition, "Safe-Off Open" will be declared after 50ms (But the IGBTs will be disabled immediately).	**Check Connections** ⇩ Verify external contact between TB2-7 and TB2-14 is closed ⇩ Verify +24VDC is present on pin TB2-7 ⇩ Check the cable from A6JC3 to A4JP9 ⇩ Verify external contact between TB2-7 and TB2-14 is closed during auto-tune.
Setup Fault 4	This fault is declared if the contract motor speed (in rpm), encoder pulses/revolution, and encoder/motor ratio do not satisfy the following equations: $3.6\times10^{5} < \left(\begin{matrix}\text{contract}\\ \text{mtr spd}\end{matrix}\right)\left(\begin{matrix}\text{encoder}\\ \text{pulses}\end{matrix}\right)\left(\begin{matrix}\text{enc}\\ \text{ratio}\\ \text{mult}\end{matrix}\right) < 18\times10^{6}$ • $\left(\begin{matrix}encoder\\ pulses\end{matrix}\right)\times\left(\begin{matrix}enc\\ ratio\\ mult\end{matrix}\right) < 32{,}700$	**Check Parameters Settings:** ⇩ Check ENCODER PULSES (A1) parameter for correct setting ⇩ Check CONTRACT MTR SPD (A1) parameter for correct setting **Check ENC RATIO MULT (A1) parameter for correct setting**

Name	Description	Possible Causes & Corrective Action
Setup Fault 6	This fault is declared if the multi-step speed references have exceeded a defined limit, which is defined in terms of a percentage of contract speed (CONTRACT CAR SPD parameter).	**Check Parameters Settings** ⇩ Check SPEED COMMAND1-16 (A3) parameters, if greater than 150% of CONTRACT CAR SPD (A1) parameter ⇩ Note: This fault is only declared with SPD CMD SRC (C1) equals MULTISTEP or SER MULTISTEP
Setup Fault 7	This fault is declared if the run logic inputs are defined incorrectly. You can either choose group #1 (RUN and UP/DWN) or group #2 (RUN UP and RUN DOWN). But you cannot mix and match or this fault will be declared.	**Check Parameters Settings** Check configurations of logic inputs (C2) – either RUN & UP/DWN or RUN UP & RUN DOWN
Setup Fault 8	This fault is declared if the DIR CONFIRM (C1) parameter is enabled and any of the following conditions are not met: A logic input (C2) must be assigned to RUN UP. A logic input (C2) must be assigned to RUN DOWN. The SPD COMMAND SRC (C1) parameter must be set to ANALOG INPUT *... Confirms proper set-up of Analog Speed Command direction confirm function*	**Check Parameters Settings:** ⇩ Check configurations of logic inputs (C2) for two logic input defined as RUN UP & RUN DOWN ⇩ Verify SPD COMMAND SRC (C1) is set to ANALOG INPUT ⇩ If nuisance fault and not using Up-Down Confirm, function disabled by setting the DIR CONFIRM (C1) parameter to DISABLED
Sft Cn Opened	Safety Chain is open and motor contactor power was not available when the drive was commanded to start. Contactor power sense on TB1-2 is opened for 20mS when the regulator release is active and the speed reference is greater than 20% of contract speed.	**Contactor Problem** ⇩ Check motor contactor power ⇩ Verify safety chain was closed **Parameter Settings** ⇩ Verify C2 Logic Inputs contains setting CTR PWR SENSE **Hardware problem** ⇩ Verify wiring to A6TB1-2, this input is on if the contactor power is on. If the above point is not on, check at A8TB4-1 & A8TB4-4, this is the input for the 120 or 240Vac control power. ⇩ Verify that the correct A8 PCB is installed, 46S04174-0010 works with the 240V Safety chain power and the -0020 works with the 120V Safety chain power. ⇩

Name	Description	Possible Causes & Corrective Action
Sft Cn Not Closed	Safety Chain was closed and motor contactor power was removed after the contactor has been confirmed as picked.	**Improper drive On-Run-Stop sequencing** ⇩ Verify Safety Chain operation ⇩ Verify Safety Chain timing ⇩ Verify that the correct A8 PCB is installed, 46S04174-0010 works with the 240V Safety chain power and the -0020 works with the 120V Safety chain power. **Hardware problem** ⇩ Verify wiring to A6TB1-2, this input is on, if the contactor power is on. ⇩ If the above point is not on, check at A8TB4-1 & A8TB4-4, this is the input for the 120 or 240Vac control power. ⇩ Verify that the correct A8 PCB is installed, 46S04174-0010 works with the 240V Safety chain power and the -0020 works with the 120V Safety chain power.
Speed Dev ***(alarm)***	The speed feedback is failing to properly track the speed reference. Sensitivity determined by SPD DEV HI LEVEL (A1) parameter.	**Any active faults?** ⇩ Check if any active faults in F1 sub-menu **Check Parameters Settings:** ⇩ Verify SPD DEV HI LEVEL (A1) is set to the proper level. **Does "Hit CURRENT Limit" message appear?** ⇩ If message appears during running, verify a fault has not occurred. Then, increase the torque limit parameters MTR TORQUE LIMIT and REGEN TORQ LIMIT (A1) – maximum 250%
Srl Timeout	The drive is being operated by serial communications and one of the following has occurred: Communication time-out – The drive did not receive a valid run-time message within 40ms while running Bad message checksum – Drive has detected 3 consecutive bad message checksums	**Bad Serial Connection** ⇩ Remove and re-seat the RS-422 serial cable ⇩ Check car controller serial driver board ⇩ Check the serial cable connected to the drive's RS-422 port ⇩ The Customer I/O PCB on the drive may need to be replaced ⇩ Possible problem with car controller serial communication **Grounding Issue** ⇩ Check grounding between car controller and drive ⇩ Noise on serial channel due to the cable
TQ LIM 2Hi 4CUBE	The torque limits (based on the defined motor) exceed the cube's capacity. Example: A6(Rated Motor I) x A1(Ilim) / 100 cannot exceed the rating of the Quattro.	**Check Parameter Settings** ⇩ Verify motor nameplate values are entered correctly in the A6 submenu ⇩ Decrease CURRENT LIMIT (A1), until the formula is satisfied. If more accel amps are required then a larger drive will be needed. **Drive Sizing** ⇩ Verify drive sizing.

Name	Description	Possible Causes & Corrective Action
Undervolt Flt	The L-L AC voltage has fallen below the under voltage alarm level. The alarm level is set by UV Alarm Level parameter.	**Low Input Voltage** ⇩ Check INPUT L-L VOLTS (A5) and UV ALARM LEVEL (A4) ⇩ Verify proper input voltage and increase, if necessary, the input AC voltage within the proper range ⇩ Check for missing input phase ⇩ Check power line disturbances due to starting of other equipment **Drive Accurately Reading the L-L AC Voltage** ⇩ Measure the AC line volts with a meter ⇩ Compare that with the value on the digital operator, Vab (D3) or Vca (D3)
Util Data Sum	The line side calculated checksum is not the same as the stored checksum	**Hardware Failure** ⇩ Cycle power to the Drive ⇩ If re-occurs, replace line side main control board (A1)
Utility Temp ***(fault)***	One or more of the IGBT modules on the line side power bridge has exceeded 95°C (203°F).	**Overtemperature Problems** ⇩ Verify that the two fans located under the power module are both working properly ⇩ Inspect and clean air intake filters ⇩ Verify ambient temperature is less than 45°C ⇩ Verify drive is sized correctly ⇩ Possible defective temperature sensor **Hardware problem** ⇩ Replace the motor side product interface board (A4) ⇩
Utility Temp ***(alarm)***	One or more of the IGBT modules on the line side power bridge has exceeded 85°C (185°F).	**Overtemperature Problems** ⇩ Verify that the two fans located under the power module are both working properly ⇩ Inspect and clean air intake filters ⇩ Verify ambient temperature is less than 45°C ⇩ Verify drive is sized correctly ⇩ Possible defective temperature sensor **Hardware problem** ⇩ Replace the motor side product interface board (A4)
UV Alarm ***(alarm)***	The L-L AC voltage has fallen below the under voltage alarm level. The alarm level is set by UV Alarm Level parameter.	**Low Input Voltage** ⇩ Check INPUT L-L VOLTS (A5) and UV ALARM LEVEL (A4) ⇩ Verify proper input voltage and increase, if necessary, the input AC voltage within the proper range ⇩ Check for missing input phase ⇩ Check power line disturbances due to starting of other equipment **Drive Accurately Reading the AC line volts** ⇩ Measure the AC line volts with a meter ⇩ Compare that with the value on the digital operator, Vab (D3) or Vca (D3)

Name	Description	Possible Causes & Corrective Action
SER2 SPD FLT	SER2 RS CRP SPD or SER2 INSP SPD is set greater than Contract Car Speed. Only applies when Serial Mode 2 is selected.	⇩ SER2 RS CRP SPD and SER2 INSP SPD must be less than Contract Car Speed.
		⇩

Table 18: Troubleshooting Guide

Appendix

Auto Tune Procedure

The following details the procedure on how to run auto tune on a Quattro DC drive. The purpose of auto tune allows the drive to calculate the following motor parameters:

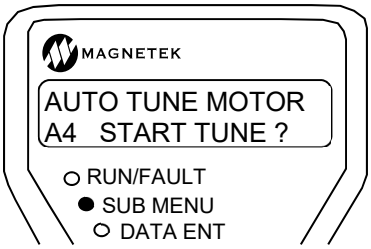
- Armature Inductance
- Armature Resistance
- Field Resistance
- Field Time Constant
- Armature Resistance Voltage Drop at Motor Rated Current

IMPORTANT: Brake must be set while auto tune is running for valid data.

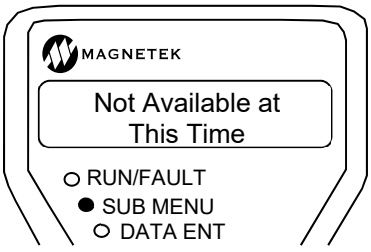
NOTE: No faults may be present on the drive and contactor power (safety chain must be closed) must be available for Auto Tune to begin. 15 seconds must elapse before reattempting the procedure.

NOTE: Auto Tune may take up to 1 minute to complete. Please wait until the message AUTOTUNE DONE displays to continue working with the drive.

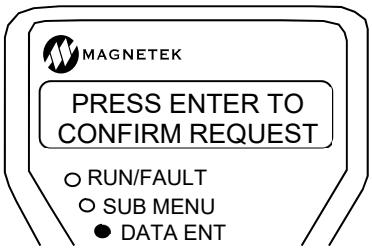
To run Auto tune by use of the operator, use the AUTO TUNE MOTOR parameter in the A4 menu. The Operator will display:



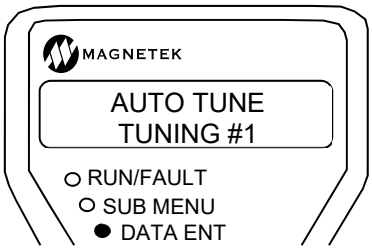
Press the “enter” key. If there are any active faults on the drive, “Not Available at This Time” will display and Auto Tune will not run:



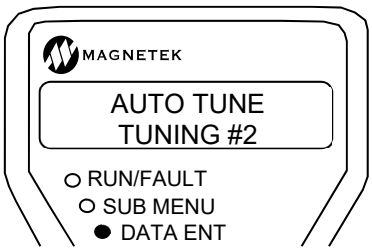
If there are no faults present, the drive will display:



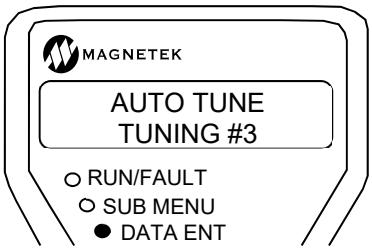
Press “enter” to start. There are 5 sections within the Auto Tune Test. The first section will boost the drive if the drive is not currently boosting. During this section, the drive will display:



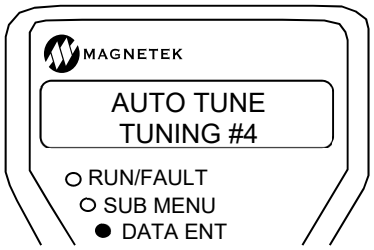
The second section will test the Armature Resistance. During this section, the drive will display:



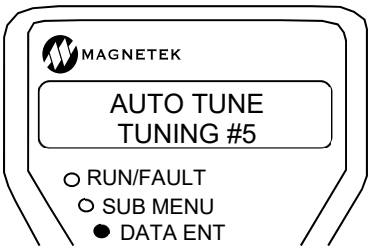
The third section will test the Field Resistance. During this section, the drive will display:



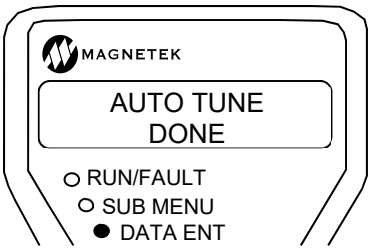
The fourth section will measure the Armature Inductance. While testing the Armature Inductance, the field will be increased to full field. During this section, the drive will display:



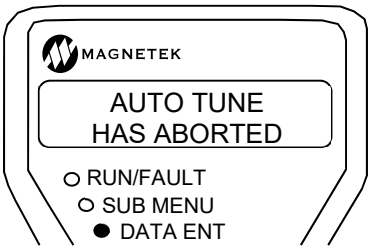
The final section will measure the Field Time Constant. During this section, the drive will display:



After Auto tune is finished, the drive will display:



If a fault occurs while the drive is performing the Auto Tune test, the drive will display:



Pressing Enter again will display the name of the fault that occurred during Auto Tune.

There are two parameters located in A4 that set the bandwidth for the Armature Regulation gain and the Field Regulation gain. GAIN BANDWIDTH A (A4) determines the bandwidth used in the calculation of the Armature Regulation Gains. Similarly, GAIN BANDWIDTH F (A4) determines the bandwidth used in the calculation of the Field Regulation Gains.

Quattro DC will not use the values measured or calculated by auto tune unless GAIN SELECTION (A4) is set to USE SAVED PAR or USE SELF TUNE.

If GAIN SELECTION (A4) is set to USE SELF TUNE, the armature current regulator gains are set using AUTO MEAS ARM L(D2), AUTO MEAS IR DROP (D2), AUTO MEAS ARM R (D2), AUTO FIELD RES (D2), and AUTO FIELD TC (D2).

If GAIN SELECTION (A4) is set to USE SAVED PAR, the armature regulator gains are set using SAVE MEAS ARM L (A6), SAVE IR DROP (A6), SAVE MEAS ARM R (A6), SAVE FIELD RES (A6), and SAVE FIELD TC (A6).

If the D2 submenu contains null values and USE SELF TUNE is selected, GAIN SELECTION (A4) will revert back to MANUAL. Similarly, if the SAVE MEAS parameters in the A6 submenu contain null values and USE SAVED PAR is selected, GAIN SELECTION (A4) will revert back to MANUAL.
When GAIN SELECTION (A4) is set to MANUAL, the armature current regulator uses the values in ARM RESISTANCE (A4), ARM INDUCTANCE (A4), MOTOR FIELD RES (A4), and MOTOR FIELD TC (A4).

Appendix

Inertia Calculations

The Quattro DC software can be used to calculate the inertia of the entire elevator, which is used for accurate tuning of the speed regulator.

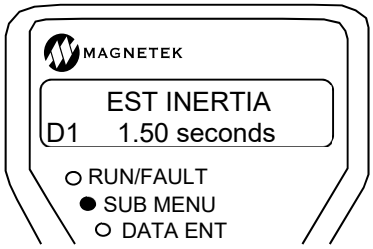
The following is a step-by-step procedure for using the Quattro DC to estimate the elevator system inertia.

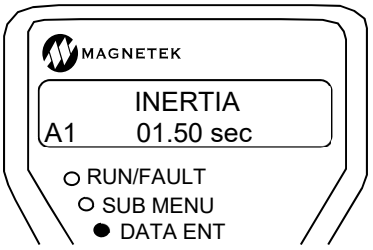
Using the Software to Estimate the System's Inertia

With a balanced car, run the car at 100% contract speed from top floor to the bottom floor then back to the top floor.

Note: To obtain the proper reading the drive cannot be in field weakening. To disable the field weakening mode go to the A6 submenu and set the weak field amps to the same value as the full field amps. After running the test set the parameter back. Failure to disable the field weakening may cause the results to be higher than required and cause performance issues.

Observe the EST INERTIA under DISPLAY MENU - ELEVATOR DATA D1 for both the down and up direction.





Average the two values and enter the DRIVE A1 parameter. Once this value is calculated and set, it should not require further adjusting.

Appendix

Anti-Rollback

Using Anti-Rollback (ARB)

Elevator rollback occurs when an elevator motor drive is started and the brake is released but the hoist motor has not yet developed enough torque to prevent gravity from moving the car. The car may move up or down depending on the overall balance of equipment and payload. Velocity regulators normally used for speed regulation will eventually detect unwanted movement and react to halt the car. But there will be a position error accumulated during that process that can represent many inches of unwanted car movement relative to the landing. This effect is most noticeable with low friction gear-less elevators. It may be totally masked by the friction of an elevator driven through worm gears. Rollback by itself does not pose any hazards, but it does give an uneasy, out of control feeling to passengers. In many installations brake release timing is adjusted so that the brake is released just as the car begins to accelerate toward the next landing to mask the rollback effect. This often results in jerky starts as the brake linings release. The correct countermeasure is to weigh the car just as the doors close to determine the degree of gravity unbalance, then pre-torque the motor so that when the brake is released all forces are balanced. This method is very effective, but does require expensive calibrated load weighing equipment.

The purpose of the Magnetek Anti-rollback feature is to help prevent rollback on elevators that do not use load weighing or do not use the motor pre-torque capability provided by the Magnetek drive. It uses a double integrator (type 2) regulator when operating at zero speed to hold the elevator car at an average speed of zero and to regulate a constant position as the brake is released. When the velocity reference leaves zero speed to accelerate the car toward the next landing, the active velocity regulator is switched to be E-Reg to precisely track (follow) the velocity reference profile. Be aware that this anti-rollback feature works from encoder/tachometer signals. So there must and will be some movement in order for the feature to function, but the position error generated by elevator movement will recover. The bandwidth gain of the system will determine how much movement will occur. Several new operating options and adjustments are provided.

Set-Up And Tuning Of Anti-Rollback (ARB)

1. The ARB function uses adjustment settings, Inertia(A1), response(A1). These settings and others are critical for good performance of the E-Reg velocity regulator. The first step for good ARB performance is to disable ARB by setting ARB MODE to 0 (zero) and to tune all other E-Reg adjustments for a smooth ride and good floor-to-floor elevator performance. Be sure that the car weight and counterweights have been adjusted to be at the final values. Follow the suggested procedures for tuning E-Reg as listed in this Tech Manual. Ignore elevator rollback while adjusting primary elevator performance features. If rope resonance exists, also adjust the notch filter for minimum interference. Then tune up ARB last as necessary to prevent elevator rollback with an unbalanced payload.
2. After all other adjustments are satisfactory, ARB MODE to a 1 to enable ARB when starting an elevator run. Set up the following initial ARB adjustment values. Be sure to read ADJUSTMENT HINTS and CAUTIONS listed below.
   a) Set ARB Bandwidth, to 2 times the response setting (A1).
   b) Set the initial value of ARB damping, to 0.5.
3. If the drive will be using an internally generated velocity reference or serial link commands set ARB Speed Threshold to 0.0%, otherwise if an analog reference is used set to 0.5.
4. With the car empty at a convenient landing, prepare to start the elevator drive, call for zero velocity from the car controller via the normal way, release the elevator brake, and observe any car motion. When the car comes to a stop, the observation is complete, set the brake and stop the drive, again through normal control channels. Do so and observe that...
   a) The contactor picks, and the drive starts.
   b) There may be some initial upward motion, but the car should return to its original position within a second or so.
   c) When motion is halted, there will be motor armature current producing torque holding the car. This can be observed at armature current (D2) on the local display or a separate DC clamp-on ammeter, if available.

   d) Set the brake and turn the drive OFF via normal commands. (In that order, to prevent the car from drifting away!)
5. Repeat #3 several times and.....
   a) Increase the setting of ARB Bandwidth to reduce the amount of initial movement as desired. But there may be more jerkiness. Reducing the setting will allow more movement, but with less jerk. Adjust for a good compromise.
   b) Reduce the setting of ARB Damping to speed up the position recovery, or increase the setting for a softer recovery, as desired.
   c) If oscillations occur, release the brake and shut down the drive or reduce the setting of ARB Bandwidth to stop them. This may be a practical limit for position tightness in this particular hoistway. See the hints below for using the notch filter.
6. Change the reference velocity to run the car at normal speeds. Make several empty single or multiple floor runs up and down to observe the complete starting action. The adjustments made so far should not alter landing position accuracy. Ride the car to observe the quality of adjustment.
7. If weights are available, load the car to payload capacity. Repeat the observations and adjustments of step 4 with a full load. In this case the initial movement should be downward. Then repeat floor runs as in step 5 with a full load. Ride the car to verify smoothness.

Adjustment procedure is complete.

ARB Adjustment Hints And Cautions

1. Caution, the ARB function can increase regulator bandwidth far beyond that required for controlling the speed of the elevator. It does so at only near zero speed, but when the ARB gain bandwidth is boosted it is possible that one or more mechanical resonant frequencies may become excited to produce unacceptable vibration. If an annoying vibration does occur, try to determine the resonant frequency. Then use the notch filter to tune it out if possible. Be aware that the notch filter does cause additional phase shift lag. This can and will interfere with the operation of E-Reg and ARB. Tune the notch filter to the resonant frequency and adjust notch depth to the smallest value that suppresses the vibration. Then turn ARB off and verify or re-tune E-Reg to yield acceptable performance. Then re-tune ARB settings to control rollback. Some hoist ways may not be compatible with high gain ARB settings.
2. The adjustment settings for Speed Bandwidth and Per-Unit Inertia are used by both the velocity regulator (E-Reg) and the velocity control portion of ARB, therefore adjustment of them will alter the performance of anti-rollback controls. Be sure to tune the velocity controls of the elevator BEFORE adjusting controls for ARB Bandwidth and Damping. Changing any ARB settings will not interfere with other velocity control tuning.
3. Elevator rollback is a function of gravity load unbalance of the car. This is what causes the car to move when the brake is released, even though the reference velocity may still be at zero. However, there is a finite time required for ARB to measure unwanted car motion via the encoder, produce a counteracting motor torque, and then return the car to the original position. The reaction time is controlled by ARB Bandwidth. The smoothness and time to settle is controlled by ARB Damping. The need for ARB starts only when the elevator brake is actually released, not when it is told to release. (A subtle difference in electromechanical timing.) But the allotted time for ARB to function will cease as soon as the velocity reference (internal or external) moves away from zero speed and crosses the threshold identified by ARB threshold.
   a) Ideally, there would be adequate dwell time after release of the brake for ARB settling to occur. But elevator floor-to-floor time specifications do not necessarily allow for any time delay. If the resulting ARB time is cut short by release of the velocity reference before position settling is complete, the car will begin to accelerate toward the next landing from wherever it may be in the ARB cycle. The position regulator to speed regulator change-over will be smooth, but the repeatability of velocity profile tracking during acceleration may be altered by the amount of load unbalance and the value of the threshold set in ARB threshold. Keep this setting as low as possible for best results.
   b) If the threshold is set too low ARB may be terminated too early, particularly when using an external analog reference. This will result in elevator rollback that could have been prevented.
   c) If acceleration of the velocity profile is started and crosses the threshold before the elevator brake actually releases, ARB will not function and may result in elevator roll-back as acceleration begins. This, and the jerk or vibration sometimes felt by passengers as the motor

pulls through the brake to start the car, is a result of poor velocity reference release vs brake release timing. With ARB the velocity reference should not be released to move away from zero until after the brake is mechanically released. Otherwise the ARB feature cannot work.

4. Anti-Rollback can be used with external load weighing and pre-torque, as these features are independent of each other. If motor pre-torque values are not precisely correct at the time of starting the elevator drive, as may occur during elevator re-leveling, the features of ARB will intervene to help reduce rollback. If pre-torque is accomplished correctly, Anti-rollback will not need to do anything. However, it can still cause vibration or oscillation if ARB gains are set too high.
5. It is not always convenient to use payload weights during adjustment. Most elevators are counterweighted such that an empty car represents an unbalanced load of 43-57%, with the counterweight being heavier. If Anti-rollback works effectively with an empty car at all landing stops, it should also perform adequately with full payload weight in the car. Step 7 in the adjustment procedure indicates how to verify and adjust ARB operation with a full car payload, but it is not always necessary.

Anti-rollback may also be used to hold the car at a constant position at the end of an elevator run. Normally this is not required because the velocity regulator, E-Reg, will stabilize and hold an armature current value as necessary to hold the car at a standstill at the end of an elevator run. However, turning ARB back on may be useful to aid car re-level positioning without first setting the brake for a total drive re-start. Set ARB mode to “2” to re-enable ARB when the car returns to zero speed at the end of an elevator run. Zero speed in this case is measured by the encoder, not the reference, and defined by the up/down threshold. ARB will remain enabled until the drive is either shut down by removal run logic, or the internal velocity reference is increased to again be larger than the ARB threshold. If u/d threshold is set too high, there may be a jerk felt as the car comes to rest and the control switches to the ARB zero speed / position hold mode. If u/d threshold is set too low, minor disturbances and movement may delay and possibly prevent control transfer to the ARB hold mode because the measured encoder speed over a relatively short measuring time appears to not fall below the threshold value. Set up/down threshold to the lowest value that yields repeatable results.

Appendix

EMC Compliance

The Quattro DC drive requires EMC Compliance (EN12015 and EN12016) to function at the highest performance level possible. The following pages will provide the user with an installation guideline for field personnel regarding proper metallic bonding for EMC compliance. All necessary metallic bonding within the Quattro cabinet will be performed at the factory.
In order to be compliant with conducted and radiated emissions standards, it is critical that the motor leads are coupled correctly to the chassis of the Quattro product. Ensuring proper connections through the conduit plate does this. The conduit plate is located on the upper right hand corner of the cabinet.

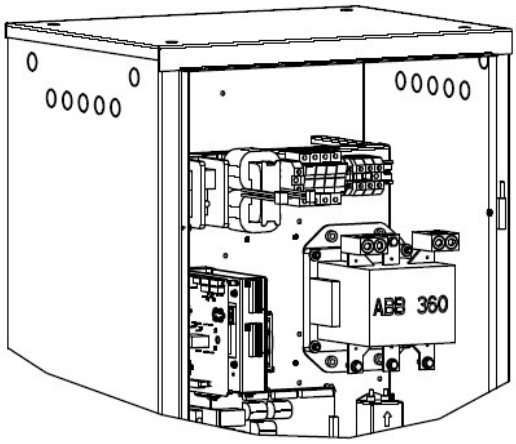


Figure 21: Conduit Access

Proper bonding of motor wiring can be achieved by using one of the following two methods:

- Method 1:

1. Use rigid conduit combined with appropriate conduit couplings for an acceptable metallic bond to the conduit plate. Note: The conduit can only contain the armature and field lines. No communication or encoder feedback wires can be run through this conduit.
2. Verify proper conduit connections to the galvanized side panels located on the Quattro drive.

Method 2:

1. Use braided, shielded leads for the DC armature and for the motor field connections. Note: When shielded multi-conductor wire is used, it is very important to use termination couplings that are designed for this type of installation. These couplings are designed to make a bond to the braid, which will complete the metallic connection to the chassis.
2. Verify proper connection of the braided shield to the galvanized side panels located on the Quattro drive.

Proper bonding of encoder cables and communication wiring may be seen in. All shielded multi-conductor cables used for communications or for the encoder feedback must be the braided type.

There are several places along the edge of the lower part on the card cage near the customer I/O board to mount a braided clamp.

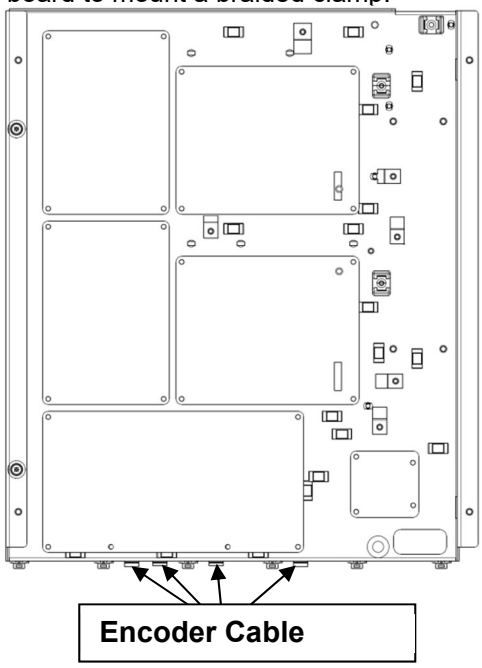
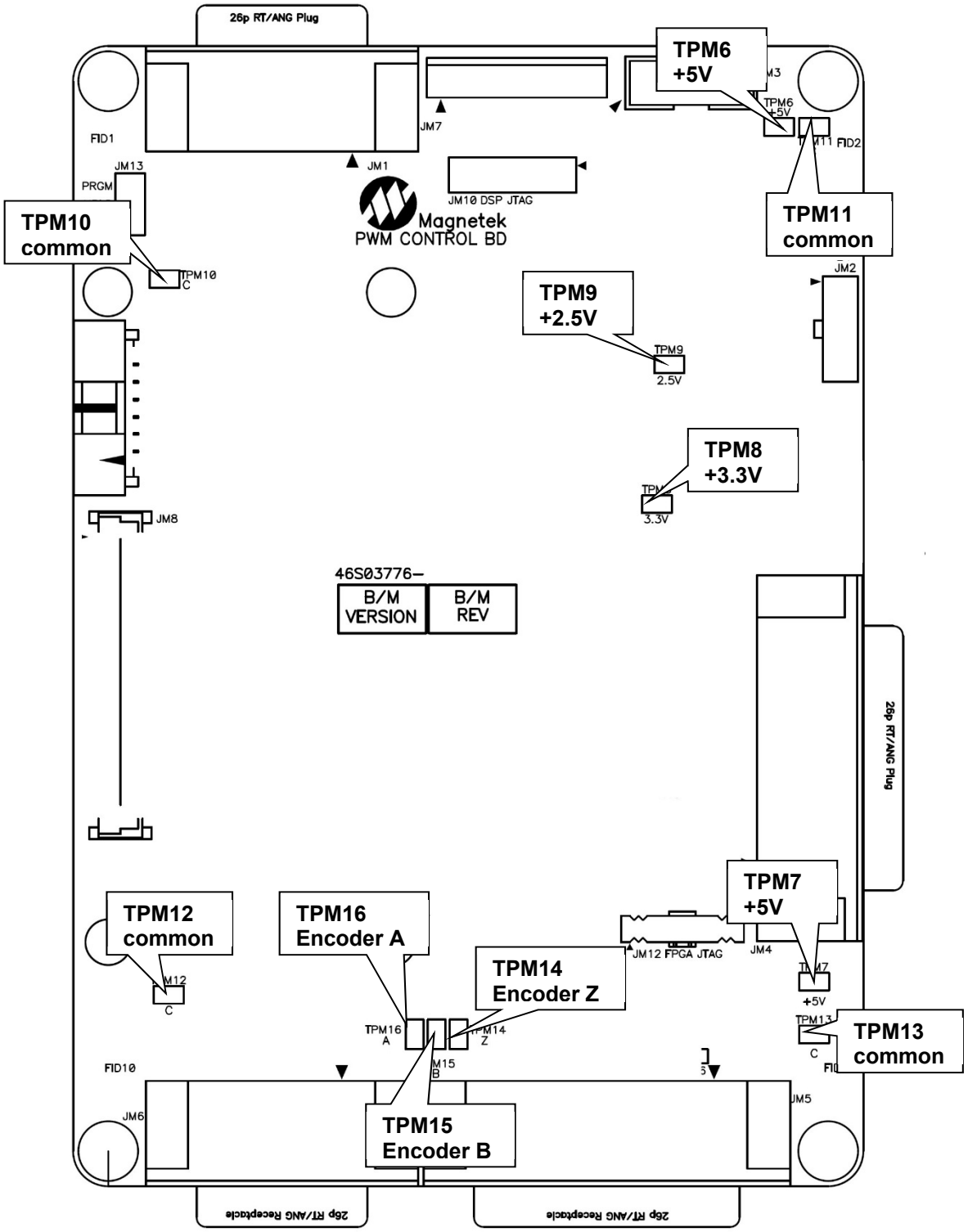


Figure 22: Encoder Cable Clamp

Appendix

Testpoints (Main Control Board – Power Supplies)

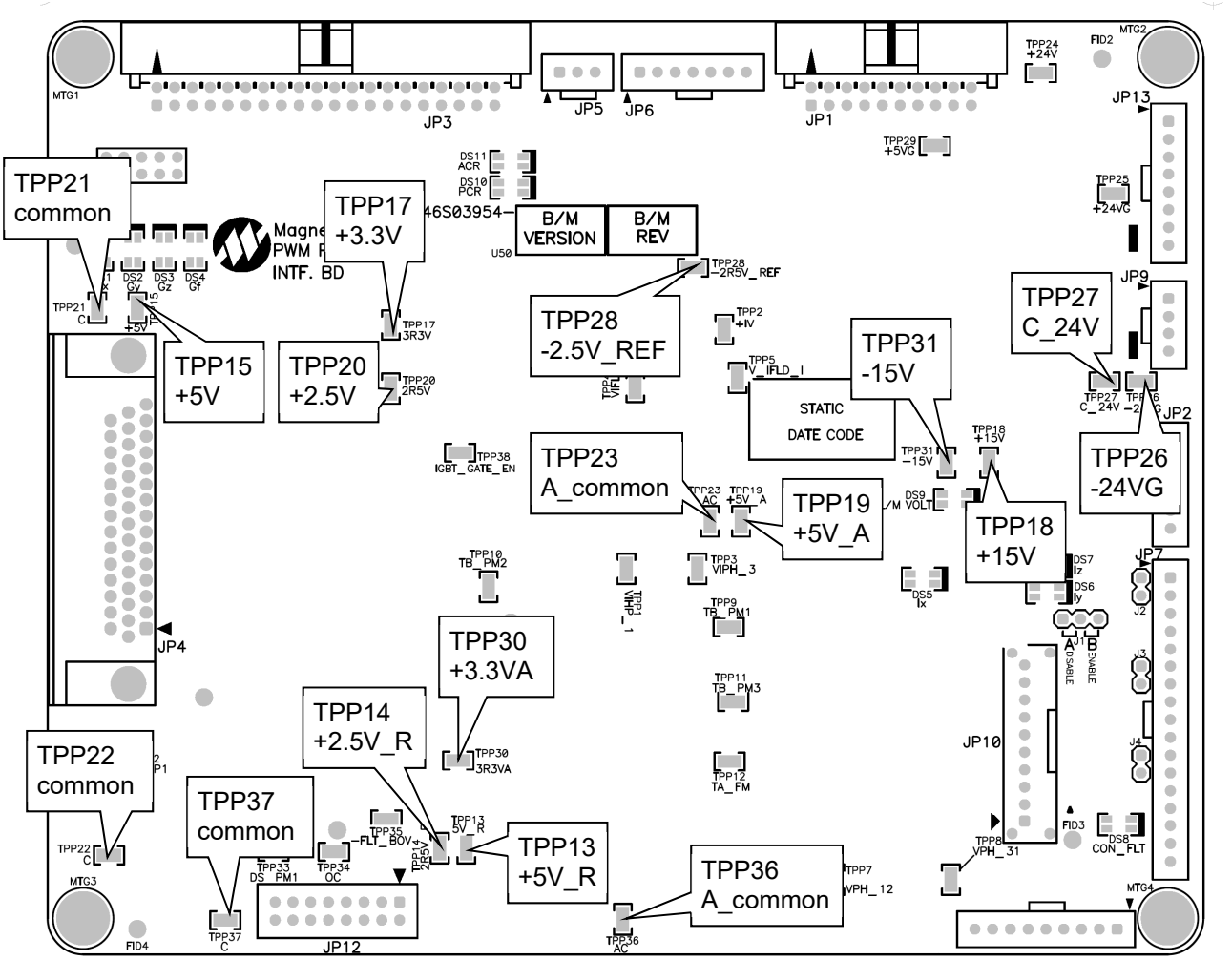
Part Number 46S03776-0020; Reference Designators A1 and A2



Appendix

Testpoints (Product Interface Board – Power Supplies)

Part Number 46S03954-0030; Reference Designators A3 and A4



Use TPP21 or TPP22 or TPP37 (common) as common for the following testpoints:
- **TPP15 (+5V)TPP17 (+3.3V)**
- **TPP20 (+2.5V)**

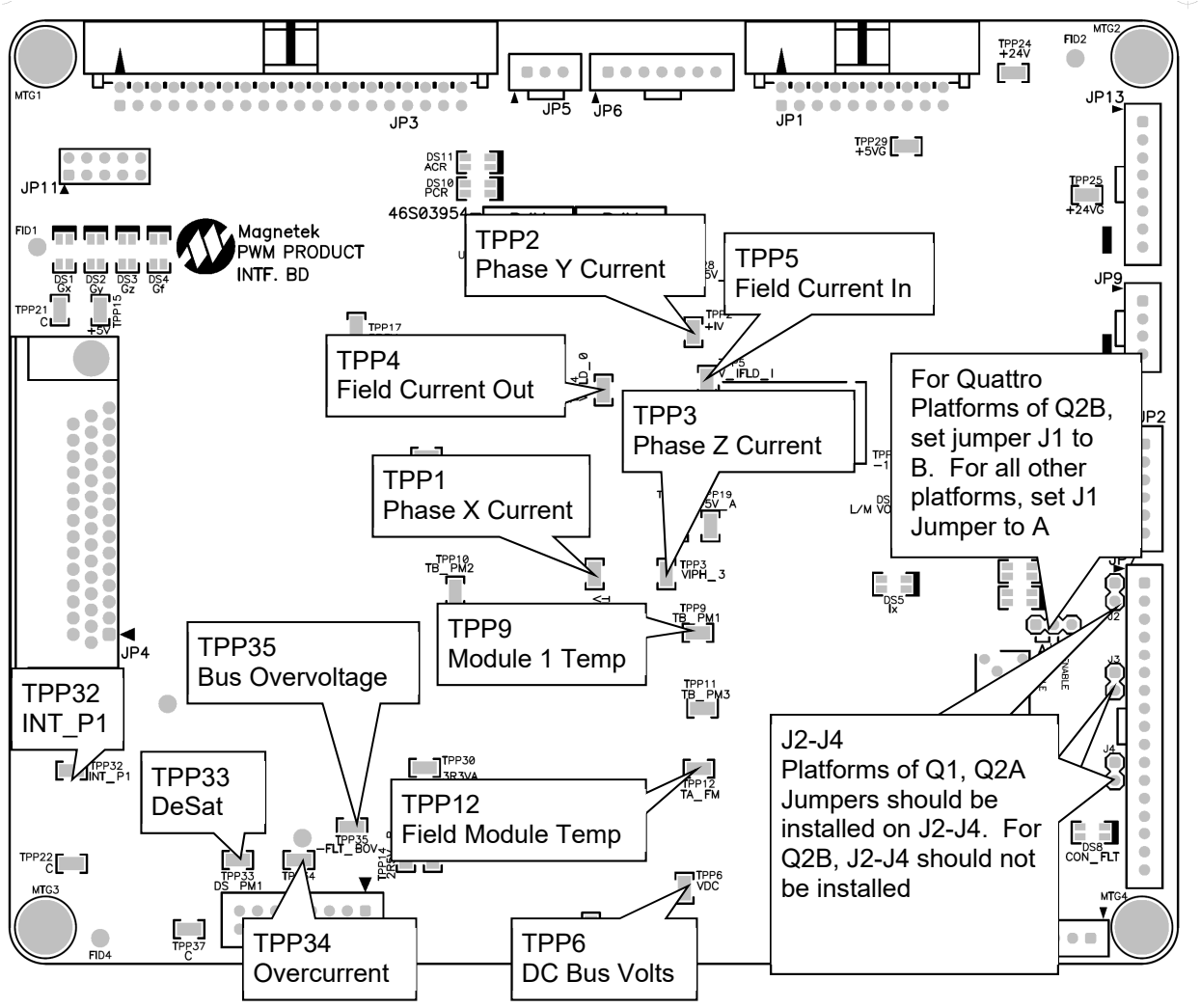
Use TPP23 or TPP36 (A_Common) as common for the following testpoints:
- **TPP13 (+5V_REF)**
- **TPP14 (+2.5V_REF)**
- **TPP18 (+15V)**
- **TPP19 (+5V_A)**
- **TPP28 (-2.5V_REF)**
- **TPP31 (-15V)**
- **TPP30 (+3.3VA)**

Use TPP27 (C_24V) as common for the following testpoints:
- **TPP24 (+24V)**

Appendix

Testpoints (Product Interface Board – Other)

Part Number 46S03954-0030; Reference Designators A3 and A4

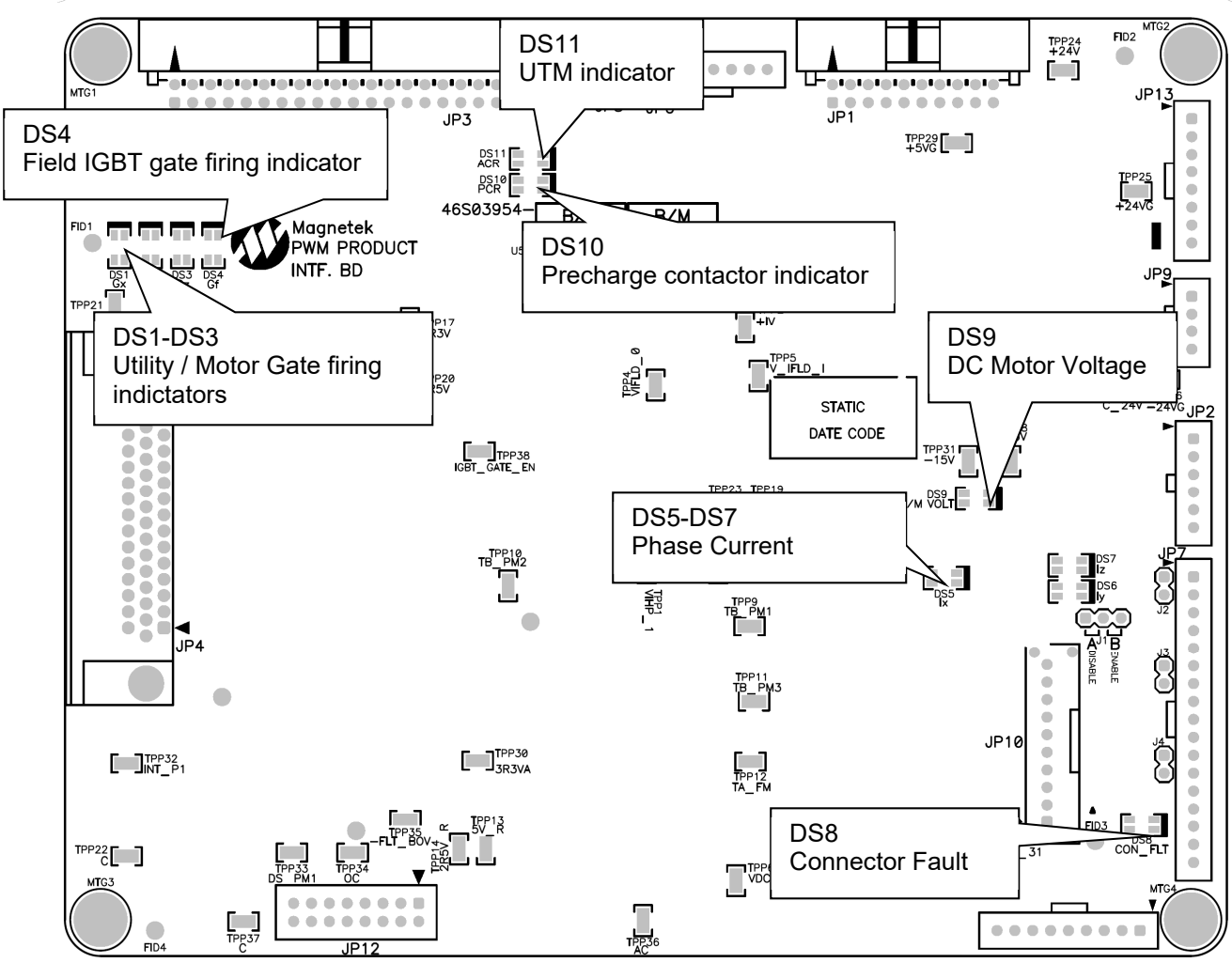


Appendix

Testpoints (Product Interface Board - LED definitions)

Part Number 46S03954-0030; Reference Designators A3 and A4

The PWM product interface board has added LEDs for easier troubleshooting. Although the LEDs have the same basic functionality on both the A3 and the A4, the referenced parts differ.

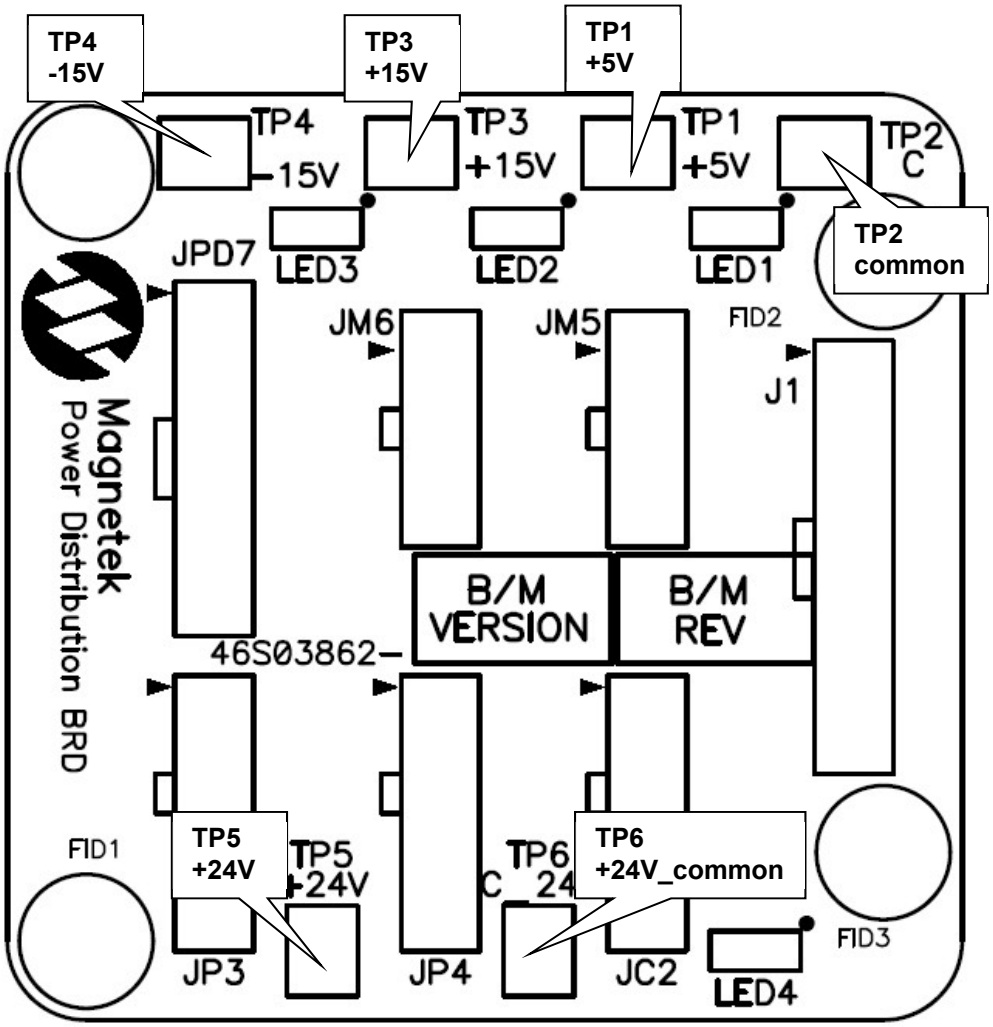


- DS1-DS3 will be Amber when the appropriate gates are firing. On the line side Product Interface Board, they refer to the line side IGBTs. On the motor side Product Interface Board, DS1-DS3 refer to the motor IGBTs. Note: only DS1 and DS3 will be lit for motor side applications.
- DS4 will be green when the drive is outputting low field current and orange when the drive is outputting high current. DS4 is not used on the line side PI Board.
- DS5-DS7 will be Amber in the line side PI Board when AC Current is flowing. Brightness is proportional to load power. On the motor side PI Board, DS7 indicates current flowing through CT6 and DS6 indicates current flowing through CT5. Red shows negative current and green shows positive current. DS5 is not used on the motor side PI Board.
- DS8 will be red if any of the current sensor cables are disconnected. On the line side these include the following current transducers: CT1, CT2, and CT3. On the motor side these include the following current transducers: CT5 or CT5. This may also indicate JP7 is not properly connected.
- DS9 on the line side PI board will be Amber when the 3-phase voltage is applied and sensed by the drive. DS9 on the motor side PI Board will be green when the motor voltage is in reverse mode and red in forward. Brightness is proportional to speed.
- DS10-DS11 are only used on the line side PI Board.

Appendix

Testpoints (Power Distribution Board – Power Supplies)

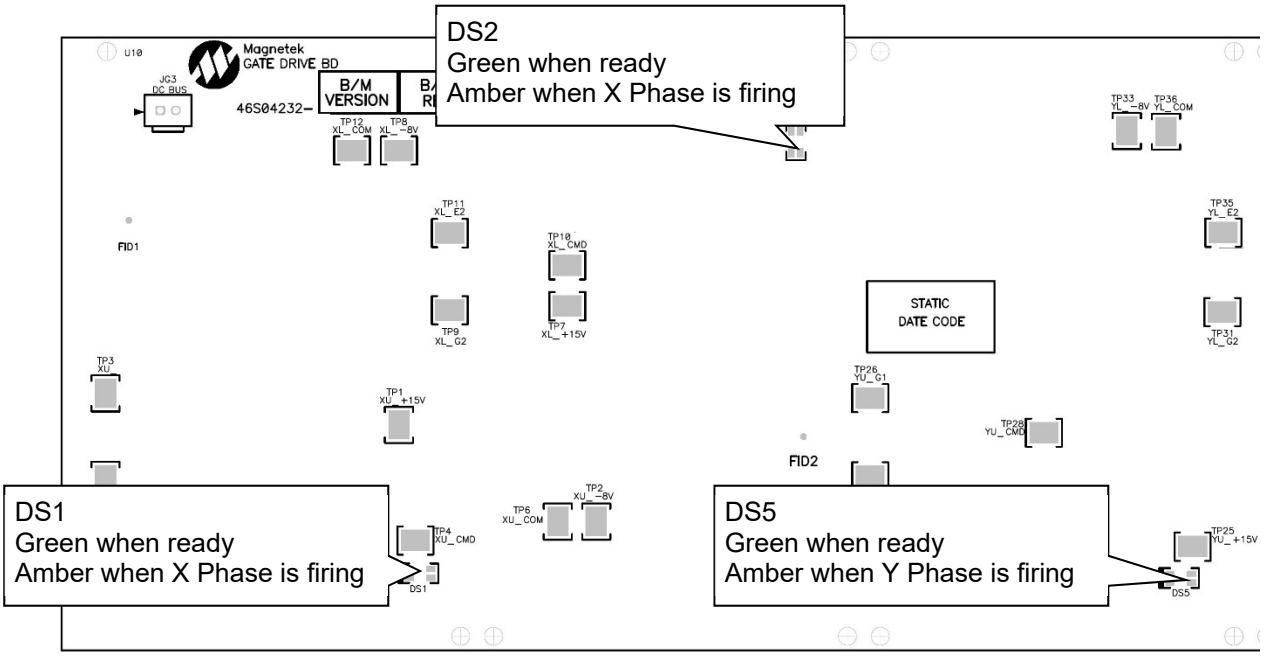
Part Number 46S03862-0010; Reference Designator A10

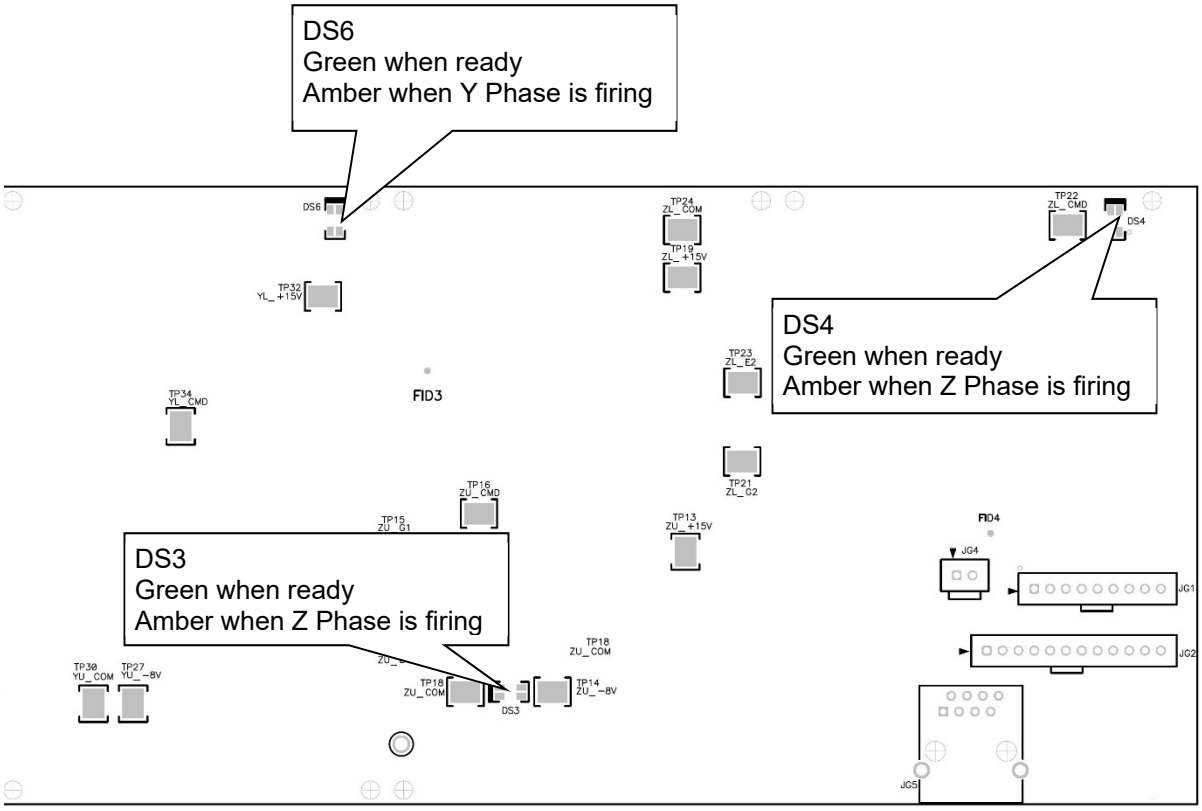


Appendix

Testpoints (Gate Drive Board – LED definitions)

Part Number 46S04232-0010
The LEDs contained on the Gate Drive Board are for visual inspection only. This is for a secondary reference to the gate firing LEDs on the Product Interface Board (see page 132). Note: the Amber color will vary depending on the frequency of the PWM signal.

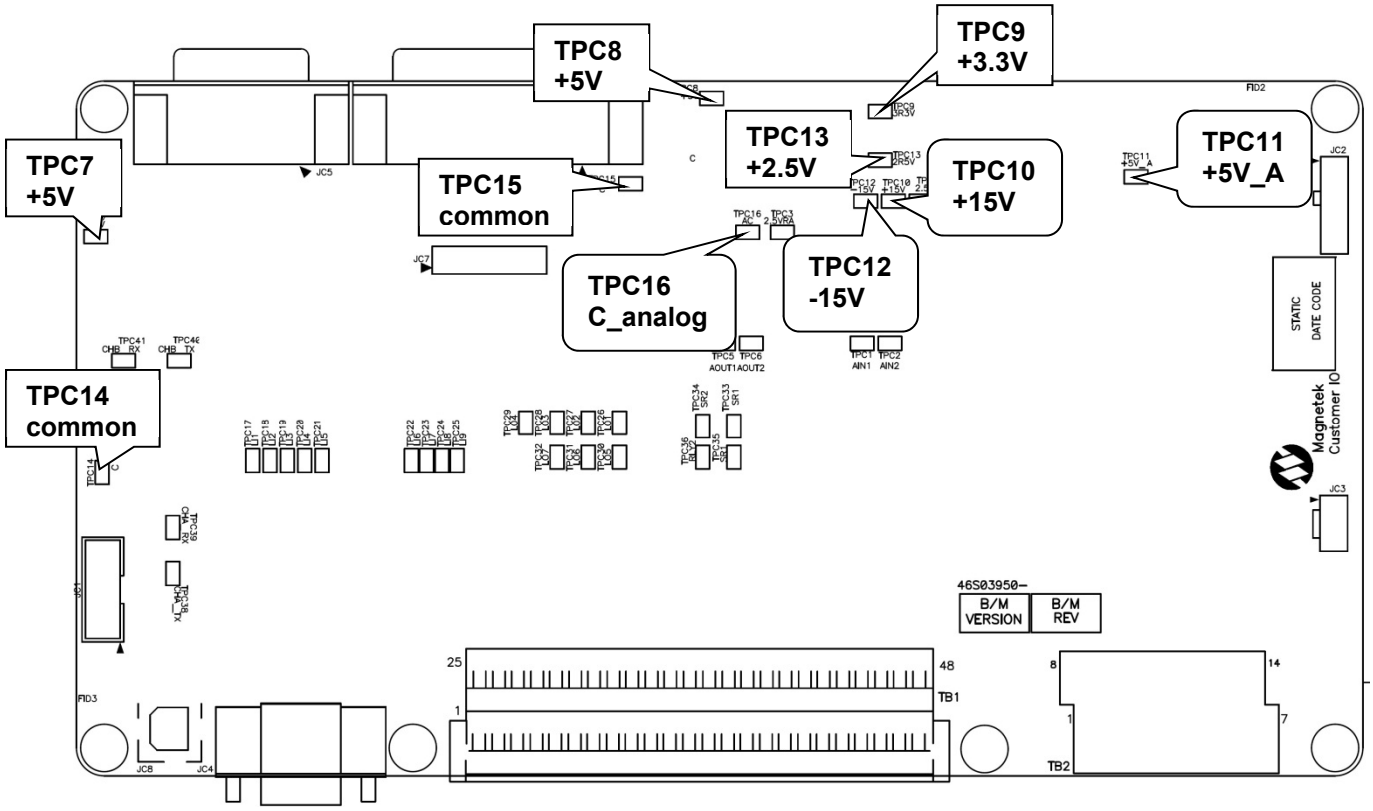



DS6
Green when ready
Amber when Y Phase is firing
DS4
Green when ready
Amber when Z Phase is firing
DS3
Green when ready
Amber when Z Phase is firing
DS6
DS4
DS3
FID3
FID4
TP34 YL_CMD
TP32 YL_+15V
TP24 ZL_COM
TP19 ZL_+15V
TP22 ZL_CMD
TP23 ZL_E2
TP21 ZL_G2
TP16 ZU_CMD
TP15 ZU_G1
TP13 ZU_+15V
TP30 YU_COM
TP27 YU_-8V
TP18 ZU_COM
TP14 ZU_-8V
JG4
JG1
JG2
JG5

Appendix

Testpoints (Customer Interface Board – Power Supplies)

Part Number 46S03950-0010; Reference Designator A6



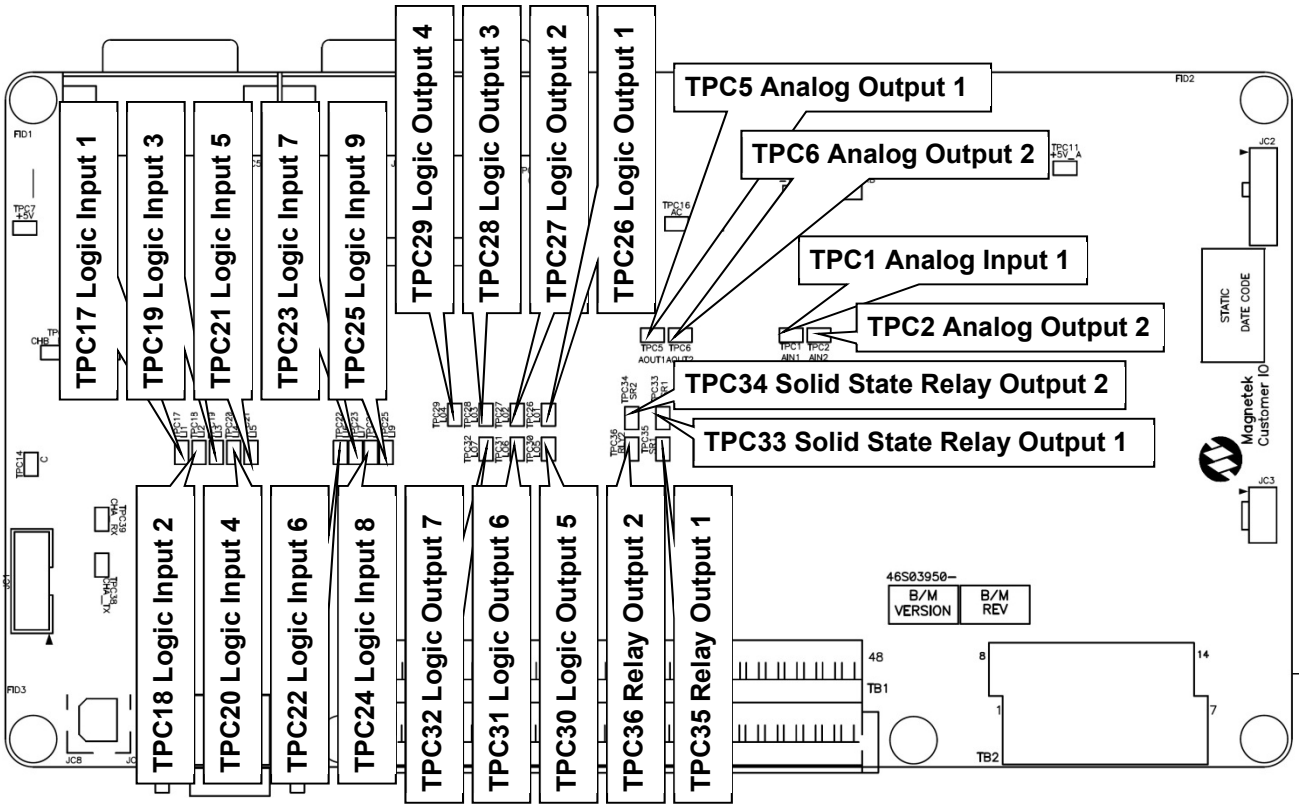
Use TPC14 or TPC15 (common) as common for the following testpoints:
- TPC7 (+5V)
- TPC8 (+5V)
- TPC9 (+3.3V)
- TPC13 (+2.5V)

Use TPC16 (C_analog) as common for the following testpoints:
- TPC10 (+15V)
- TPC11 (+5V_A)
- TPC12 (-15V)

Appendix

Testpoints (Customer Interface Board – Other)

Part Number 46S03950-0010; Reference Designator A6



Appendix

Control Power Consumption

Drive Model Number	Control Power (230VAC) consumption (max)*		
	kVA	Watts	Current (Amps)
QDC125-xxxx-xx	0.525	525	2.25
QDC150-xxxx-xx	0.525	525	2.25
QDC200-xxxx-xx	0.525	525	2.25
QDC250-xxxx-xx	0.600	600	2.6
QDC300-xxxx-xx	0.600	600	2.6

*Note: Does not include the Elevator Brake

Watts Loss

Drive Model Number	Total System Power Loss (max)** no Auto Transformer		Total System Power Loss (max)** with 480VAC:380VAC Auto Transformer	
	Watts	BTU	Watts	BTU
QDC125-xxxx-xx	2,500	8,600	3,000	10,000
QDC150-xxxx-xx	2,900	9,900	3,400	11,700
QDC200-xxxx-xx	3,700	12,500	4,400	14,900
QDC250-xxxx-xx	4,500	15,500	5,400	18,700
QDC300-xxxx-xx	5,350	18,300	6,400	21,700

**Note: Includes both Control Power and 3-Phase Input Power Consumption

Input / Output Ratings

Drive Model Number	Input		Output (rated max)		
	Voltage (V)	Current (A)	Voltage (V)	Current (A)	Power (kW)
QDC125-xxxx-xx	150 – 480	88	50 – 550	125	62.5
QDC150-xxxx-xx	150 – 480	106	50 – 550	150	75
QDC200-xxxx-xx	150 – 480	141	50 – 550	200	100
QDC250-xxxx-xx	150 – 480	176	50 – 550	250	125
QDC300-xxxx-xx	150 – 480	212	50 – 550	300	150

Appendix

Wire Terminal Specs

Power Terminals

English / Imperial Units

Drive Ampere Rating	Input Power Terminals *TB1-1,2,3*		Ground Terminals				Control Power Terminals (F1 & F2) *230VAC*		Motor Armature Connections *ME1, ME3*		Motor Field Terminals *TB3*		Dynamic Braking Resistor Connections *3-4*	
			PE		Lugs									
	Wire Size range (awg)	Torque Spec (in-lb)	Wire Size range (awg)	Torque Spec (in-lb)	Wire Size range (awg)	Torque Spec (in-lb)	Wire Size range (awg)	Torque Spec (in-lb)	Wire Size range (awg)	Torque Spec (in-lb)	Wire Size range (awg)	Torque Spec (in-lb)	Wire Size range (awg)	Torque Spec (in-lb)
125A	#6-350 MCM	275	#6-1/0	40	#6-350 MCM	275	#18-10	18	#6-350 MCM	275	#16-6	18	#12-2	30
150A	#6-350 MCM	275	#6-1/0	40	#6-350 MCM	275	#18-10	18	#6-350 MCM	275	#16-6	18	#12-2	30
200A	#6-350 MCM	275	#6-1/0	40	#6-350 MCM	275	#18-10	18	#6-350 MCM	275	#16-6	18	#12-2	30
250A	#6-350 MCM	275	#6-1/0	40	#6-350 MCM	275	#18-10	18	#6-350 MCM	275	#16-6	18	#12-2	30
300A	#6-350 MCM	275	#6-1/0	40	#6-350 MCM	275	#18-10	18	#6-350 MCM	275	#16-6	18	#12-2	30

Metric Units

Drive Ampere Rating	Input Power Terminals *TB1-1,2,3*		Ground Terminals				Control Power Terminals (F1 & F2) *230VAC*		Motor Armature Connections *ME1, ME3*		Motor Field Terminals *TB3*		Dynamic Braking Resistor Connections *3-4*	
			PE		Lugs									
	Wire Size range (mm^2)	Torque Spec (N-m)	Wire Size range (mm^2)	Torque Spec (N-m)	Wire Size range (mm^2)	Torque Spec (N-m)	Wire Size range (mm^2)	Torque Spec (N-m)	Wire Size range (mm^2)	Torque Spec (N-m)	Wire Size range (mm^2)	Torque Spec (N-m)	Wire Size range (mm^2)	Torque Spec (N-m)
125A	10-175	31	10-50	4.5	10-175	31	0.6-4	2	10-120	13.6	0.9-10	2	2.5-25	3.4
150A	10-175	31	10-50	4.5	10-175	31	0.6-4	2	10-120	13.6	0.9-10	2	2.5-25	3.4
200A	10-175	31	10-50	4.5	10-175	31	0.6-4	2	10-120	13.6	0.9-10	2	2.5-25	3.4
250A	10-175	31	10-50	4.5	10-175	31	0.6-4	2	16-240	56.6	0.9-10	2	2.5-25	3.4
300A	10-175	31	10-50	4.5	10-175	31	0.6-4	2	16-240	56.6	0.9-10	2	2.5-25	3.4

Note: Additional ground terminal lugs are located at the top of the drive on right side of the chassis. These lugs will accommodate ground wires in the range of #6-350MCM (10-175mm^2)

Appendix

Wire Terminal Specs

Customer Interface Board Terminals

English / Imperial Units

Drive Model Number	Control Wiring Terminals *TB1*		Control Wiring Terminals *TB2*	
	Wire Size range (AWG)	Torque Spec (in-lb)	Wire Size range (AWG)	Torque Spec (in-lb)
QDC125-xxxx-xx	#16-#24	1.8-2.2	#14-#24	3.6-4.4
QDC150-xxxx-xx	#16-#24	1.8-2.2	#14-#24	3.6-4.4
QDC200-xxxx-xx	#16-#24	1.8-2.2	#14-#24	3.6-4.4
QDC250-xxxx-xx	#16-#24	1.8-2.2	#14-#24	3.6-4.4
QDC300-xxxx-xx	#16-#24	1.8-2.2	#14-#24	3.6-4.4

Metric Units

Drive Model Number	Control Wiring Terminals *TB1*		Control Wiring Terminals *TB2*	
	Wire Size range (mm^2)	Torque Spec (N-m)	Wire Size range (mm^2)	Torque Spec (N-m)
QDC125-xxxx-xx	0.2-1.5	0.2-0.25	0.2-2.5	0.4-0.5
QDC150-xxxx-xx	0.2-1.5	0.2-0.25	0.2-2.5	0.4-0.5
QDC200-xxxx-xx	0.2-1.5	0.2-0.25	0.2-2.5	0.4-0.5
QDC250-xxxx-xx	0.2-1.5	0.2-0.25	0.2-2.5	0.4-0.5
QDC300-xxxx-xx	0.2-1.5	0.2-0.25	0.2-2.5	0.4-0.5

Appendix

Dimensions / Weights Standard

Excluding customer I/O panel

Drive Model Number	Dimensions						Weight	
	Height		Width		Depth			
	inches	mm	inches	mm	inches	mm	lbs	kg
QDC125-xxxx-xxx	72	1829	24	613	19	483	380	173
QDC150-xxxx-xxx	72	1829	24	613	19	483	380	173
QDC200-xxxx-xxx	72	1829	24	613	19	483	390	177
QDC250-xxxx-xxx	72	1829	24	613	19	483	410	186
QDC300-xxxx-xxx	72	1829	24	613	19	483	410	186

With Optional Customer I/O panel

Drive Model Number	Dimensions						Weight	
	Height		Width		Depth			
	inches	mm	inches	mm	inches	mm	lbs	kg
QDC125-xxxx-xxx	72	1829	32	813	19	483	540	245
QDC150-xxxx-xxx	72	1829	32	813	19	483	540	245
QDC200-xxxx-xxx	72	1829	32	813	19	483	560	255
QDC250-xxxx-xxx	72	1829	32	813	19	483	580	264
QDC300-xxxx-xxx	72	1829	32	813	19	483	580	264

Dimensions / Weights with Top Hat

On drives that require both the Auto Transformer option and the Dynamic Braking Resistor Option, the Auto Transformer will be placed at the bottom of the cabinet and the Dynamic Braking Resistors will be placed in a sheet metal box at the top of the drive.

Excluding customer I/O panel

Drive Model Number	Dimensions						Weight*	
	Height		Width		Depth			
	inches	mm	inches	mm	inches	mm	lbs	kg
QDC125-xxxx-xxx	82.9	2140	24	613	19	483	560	255
QDC150-xxxx-xxx	82.9	2140	24	613	19	483	560	255
QDC200-xxxx-xxx	82.9	2140	24	613	19	483	570	260
QDC250-xxxx-xxx	82.9	2140	24	613	19	483	590	268
QDC300-xxxx-xxx	82.9	2140	24	613	19	483	590	268

With Optional Customer I/O panel

Drive Model Number	Dimensions						Weight*	
	Height		Width		Depth			
	inches	mm	inches	mm	inches	mm	lbs	kg
QDC125-xxxx-xxx	82.9	2140	32	813	19	483	720	327
QDC150-xxxx-xxx	82.9	2140	32	813	19	483	720	327
QDC200-xxxx-xxx	82.9	2140	32	813	19	483	740	336
QDC250-xxxx-xxx	82.9	2140	32	813	19	483	760	345
QDC300-xxxx-xxx	82.9	2140	32	813	19	483	760	345

*Includes Auto Transformer weight of ~130lbs

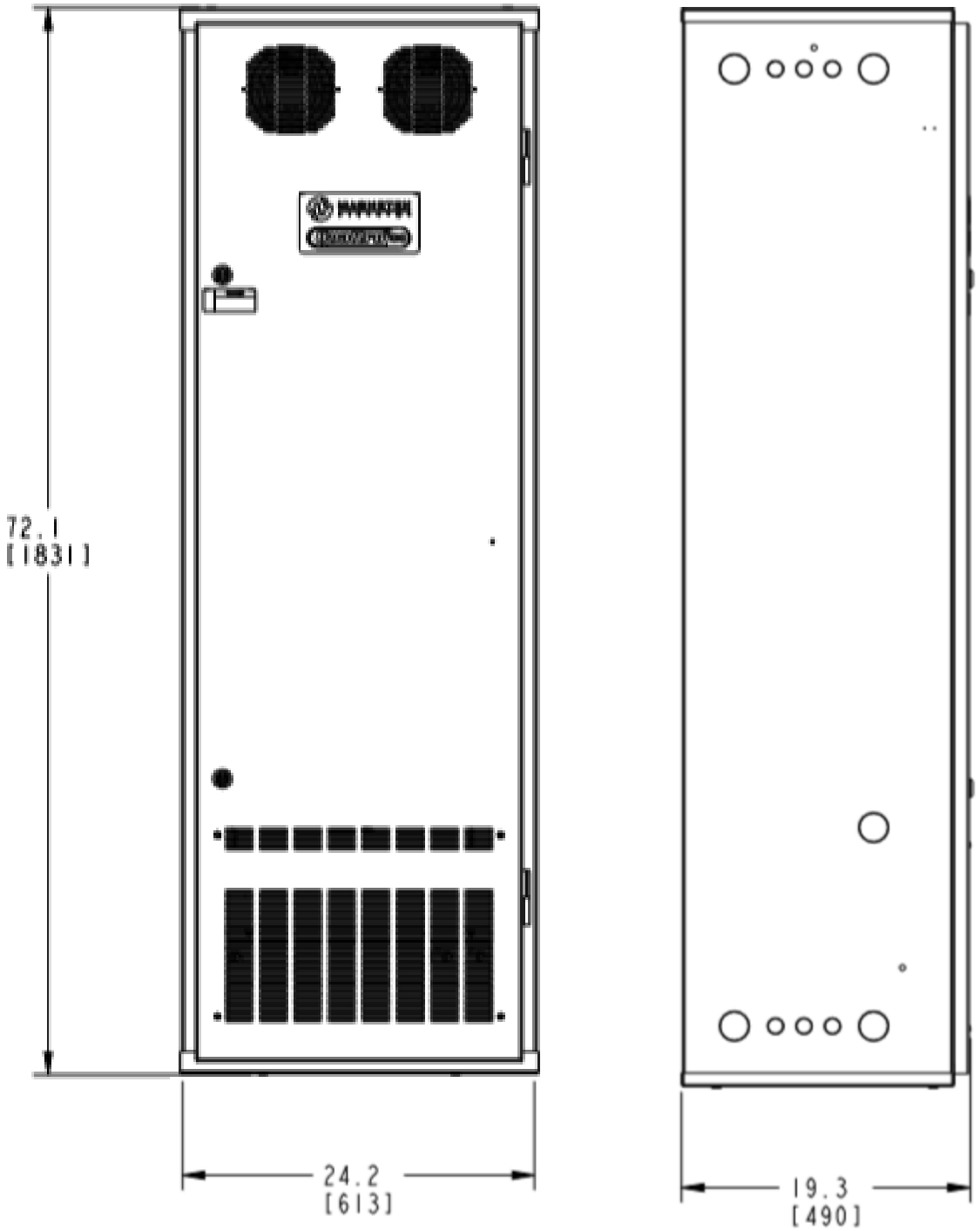


Figure 23: Dimensions without optional Customer I/O Panel no Top Hat

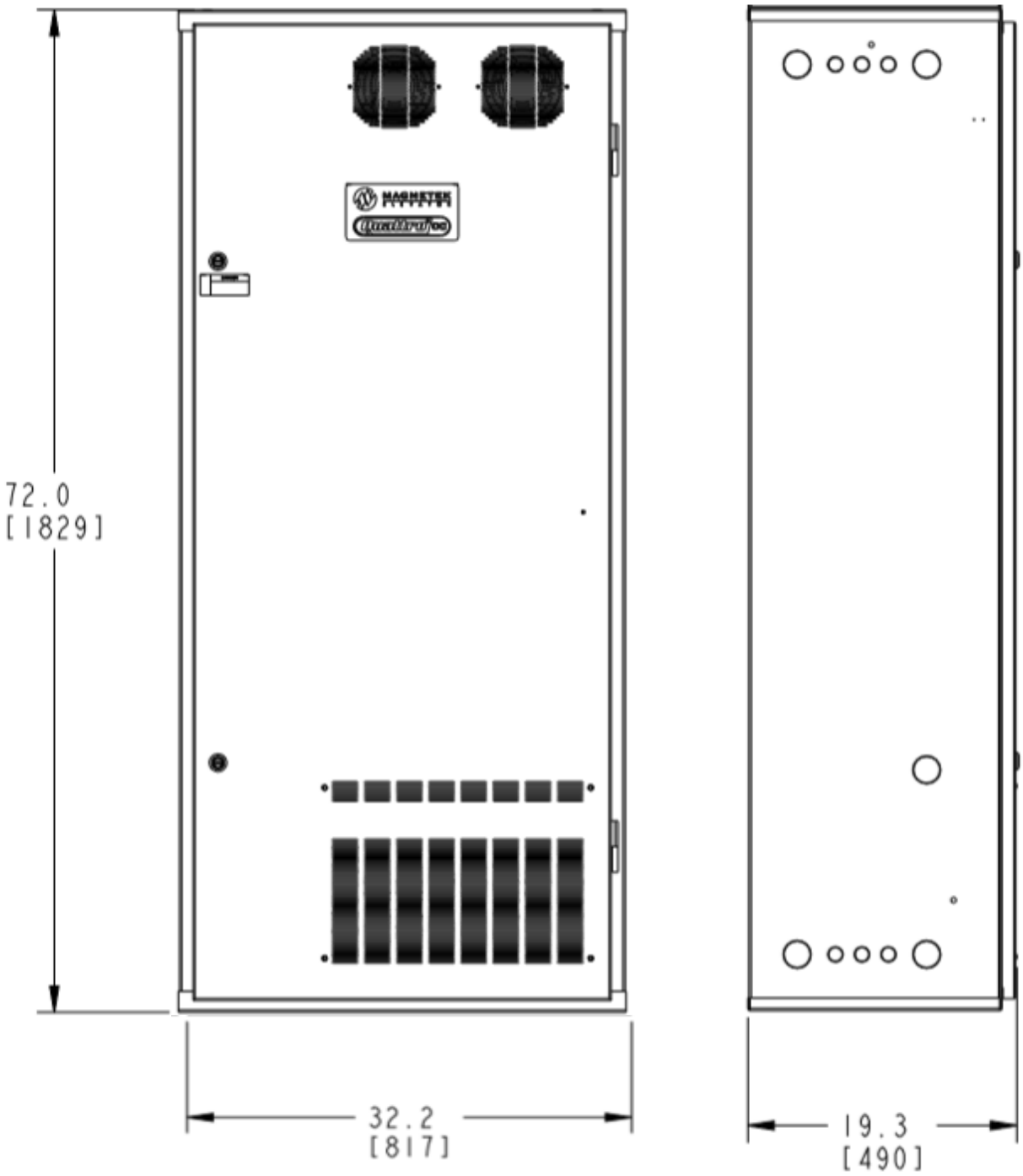


Figure 24: Dimensions with optional Customer I/O Panel no Top Hat

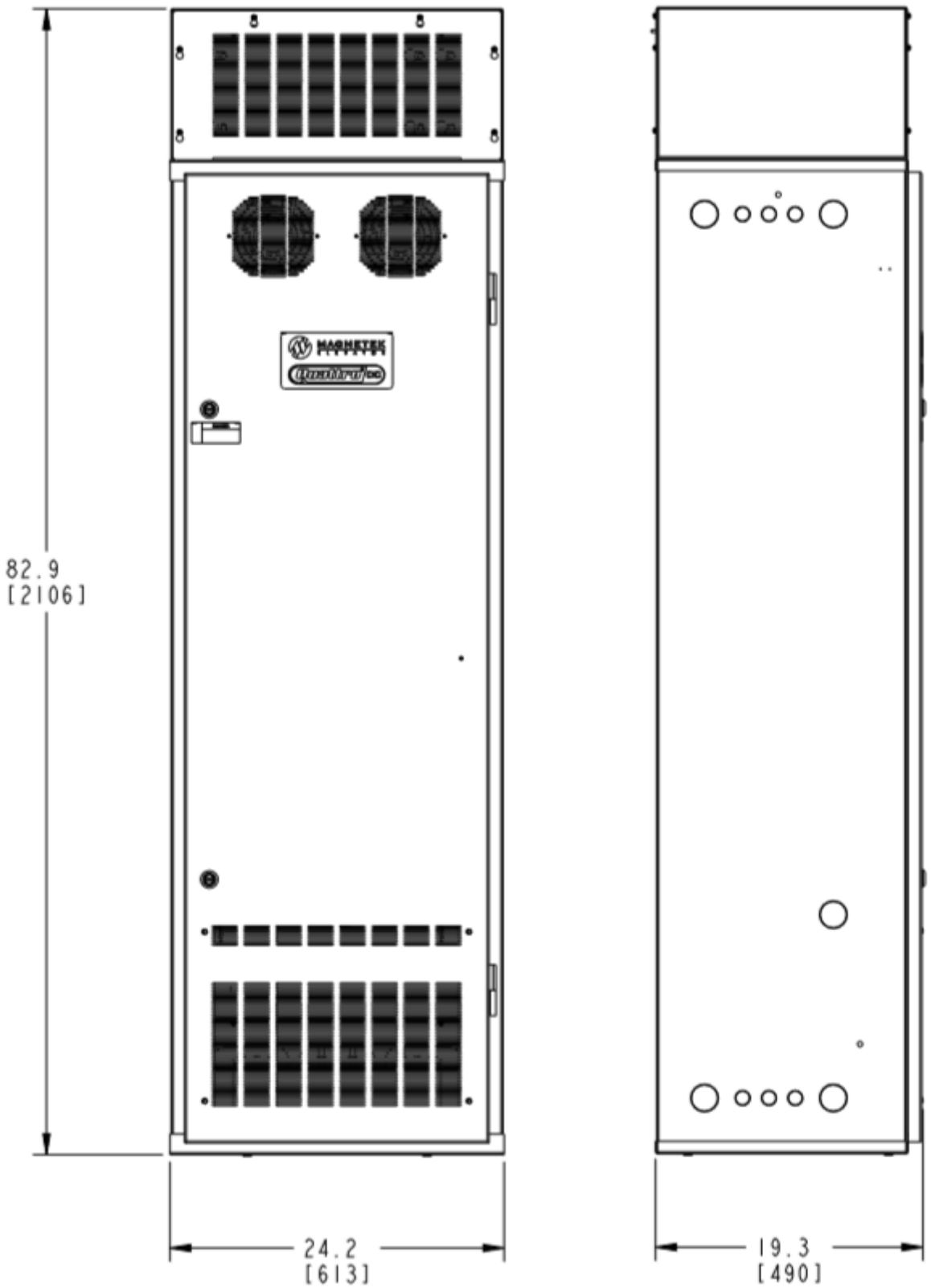


Figure 25: Dimensions without optional Customer I/O Panel includes Top Hat

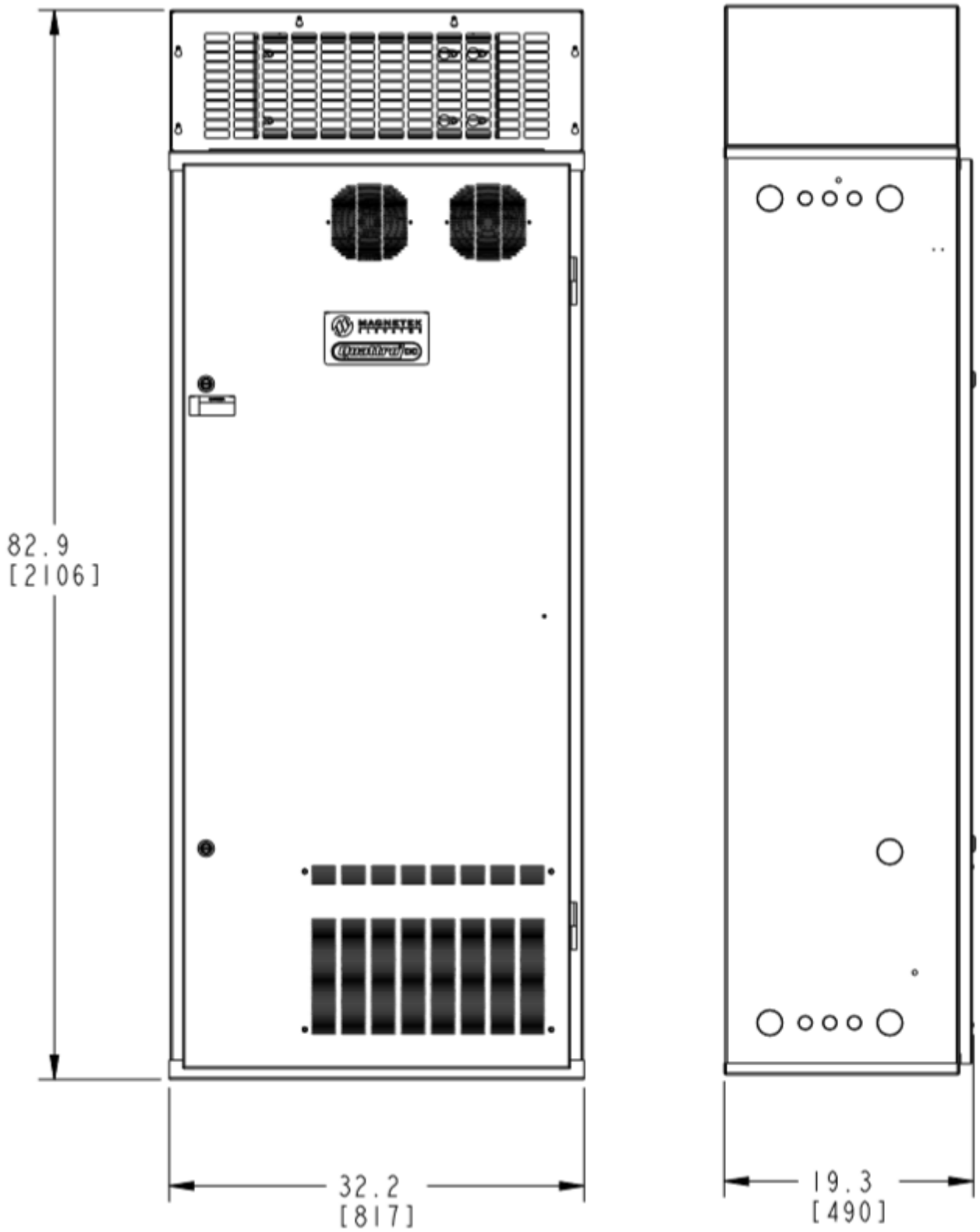


Figure 26: Dimensions with optional Customer I/O Panel includes Top Hat

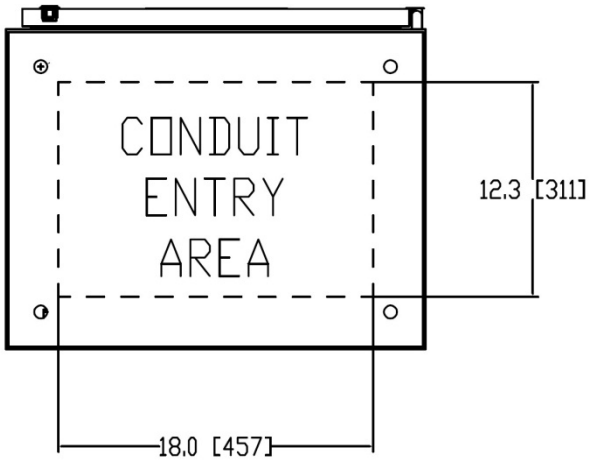


Figure 27: Top Dimensions, no Customer I/O Panel

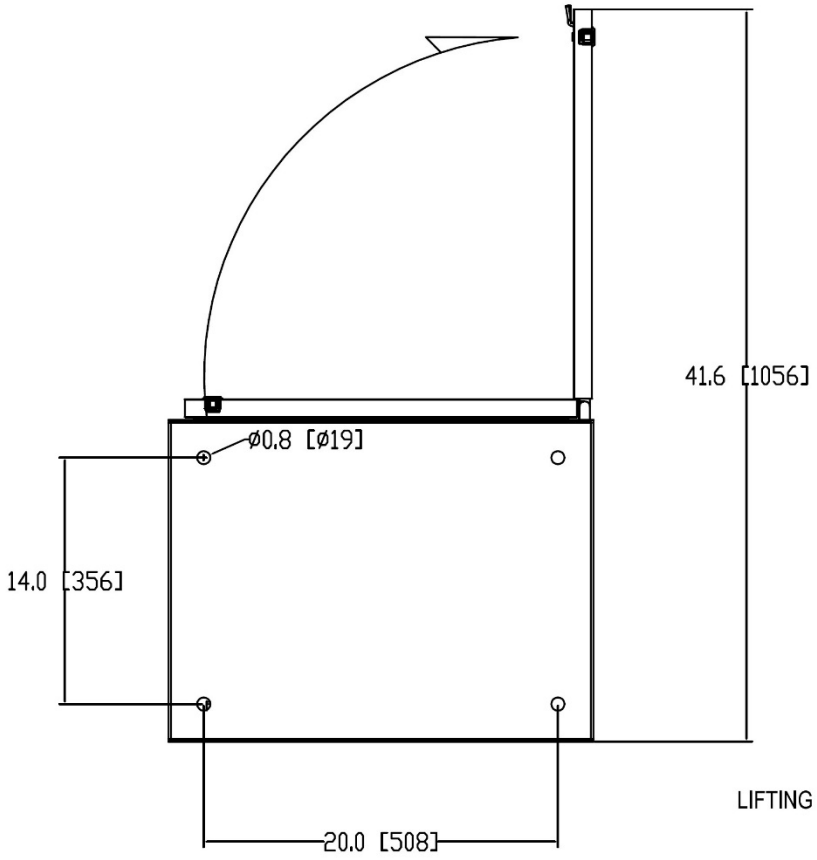


Figure 28: Bottom Dimensions, no Customer I/O Panel

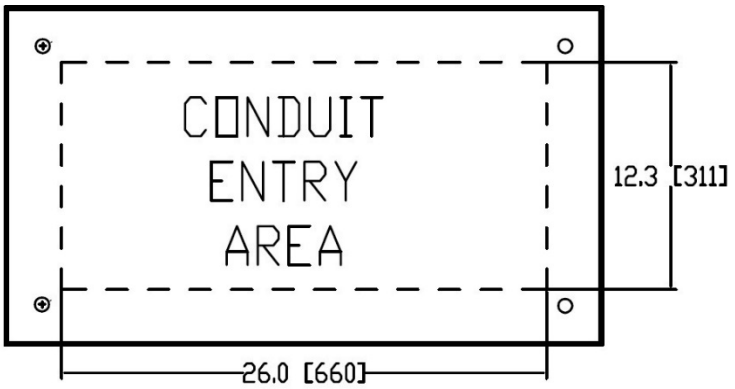


Figure 29: Top Dimensions, Customer I/O Panel

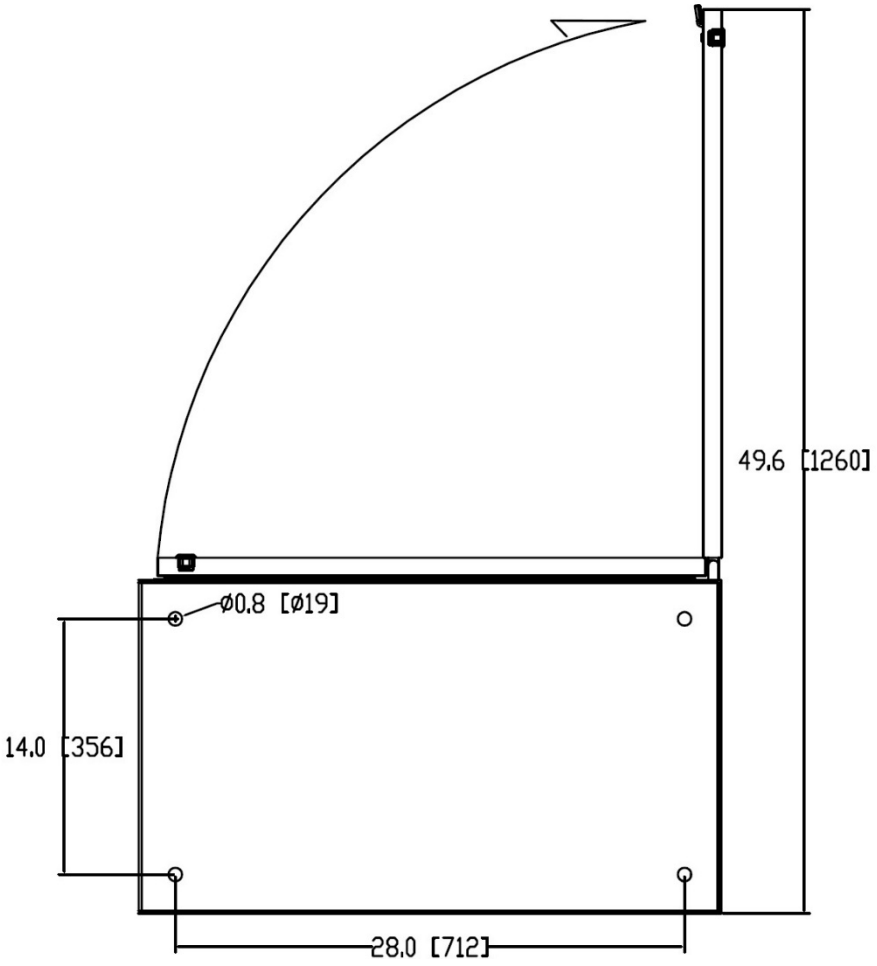


Figure 30: Bottom Dimensions, Customer I/O Panel

Appendix

Component Locations

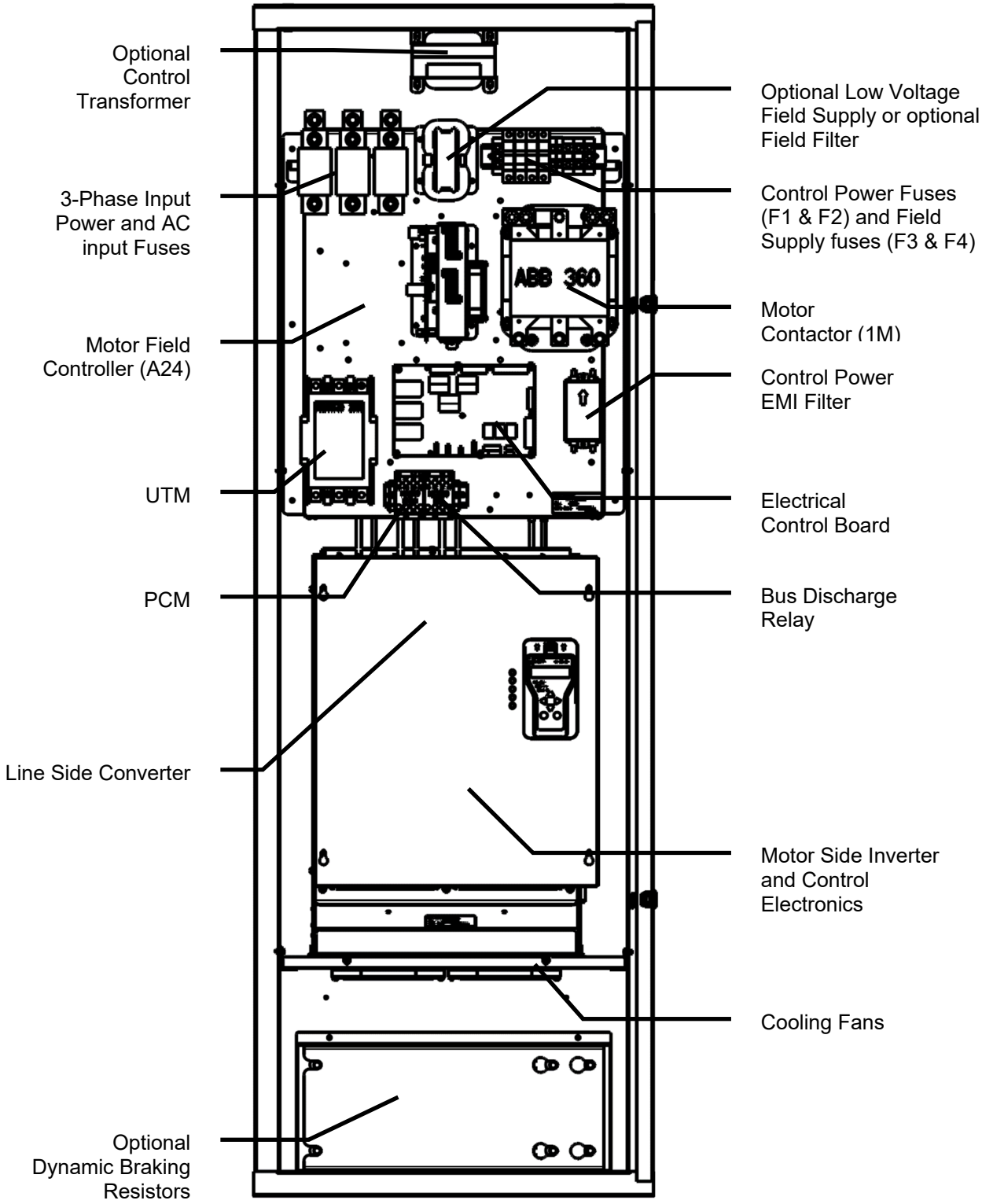


Figure 31: Component Locations in Front of Drive

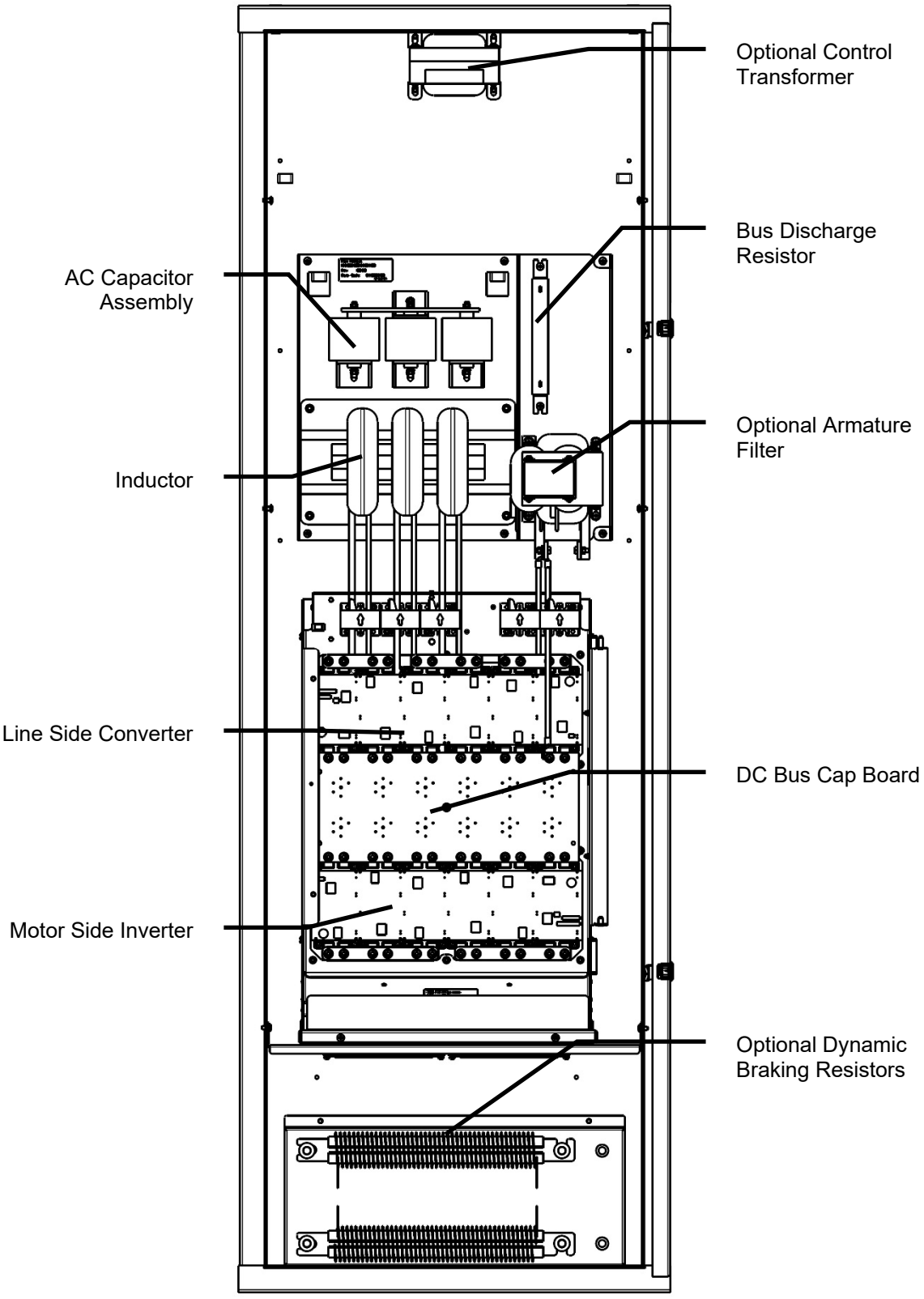


Figure 32: Component Locations with Front End Removed

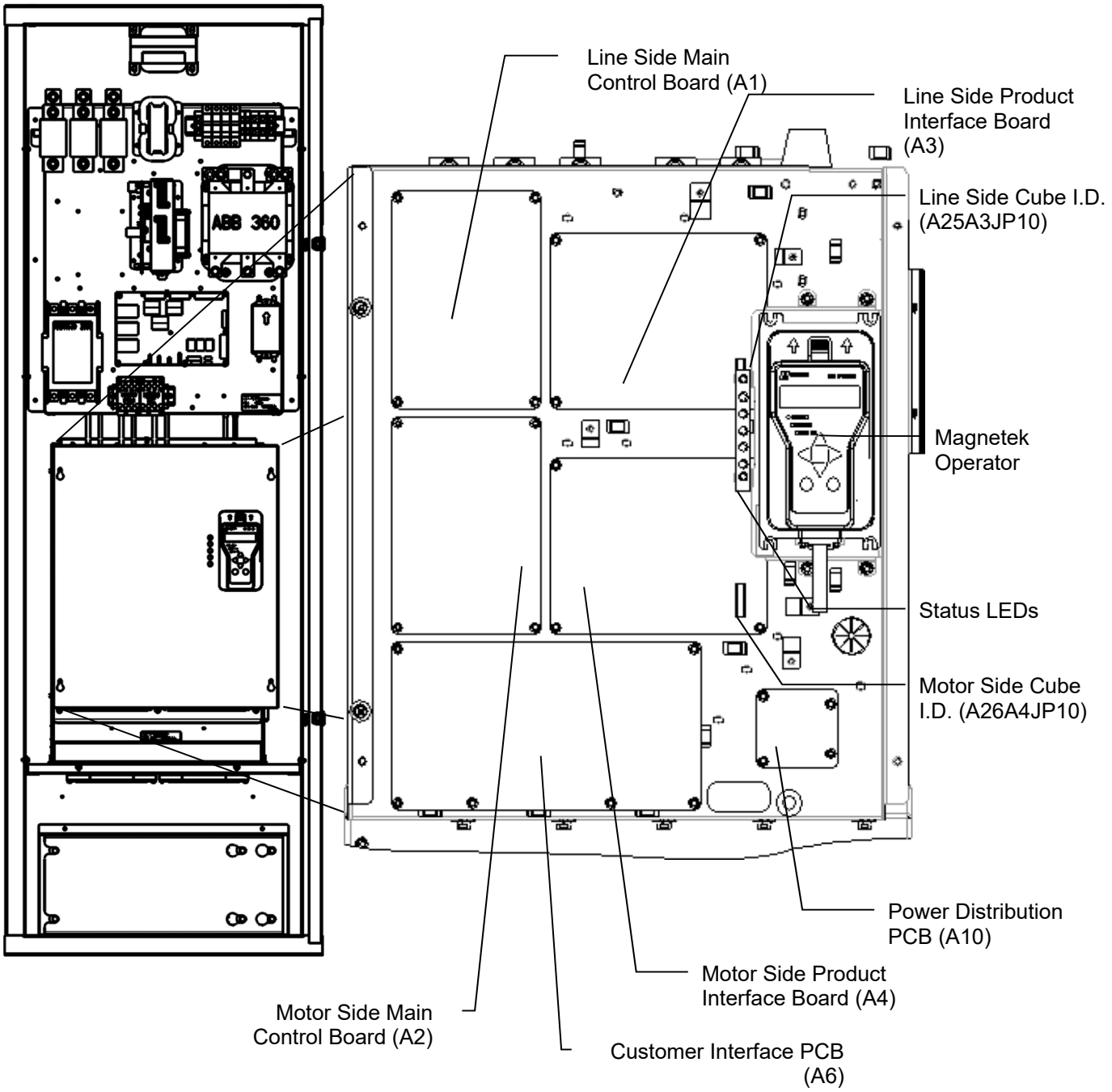


Figure 33: Circuit Board Locations

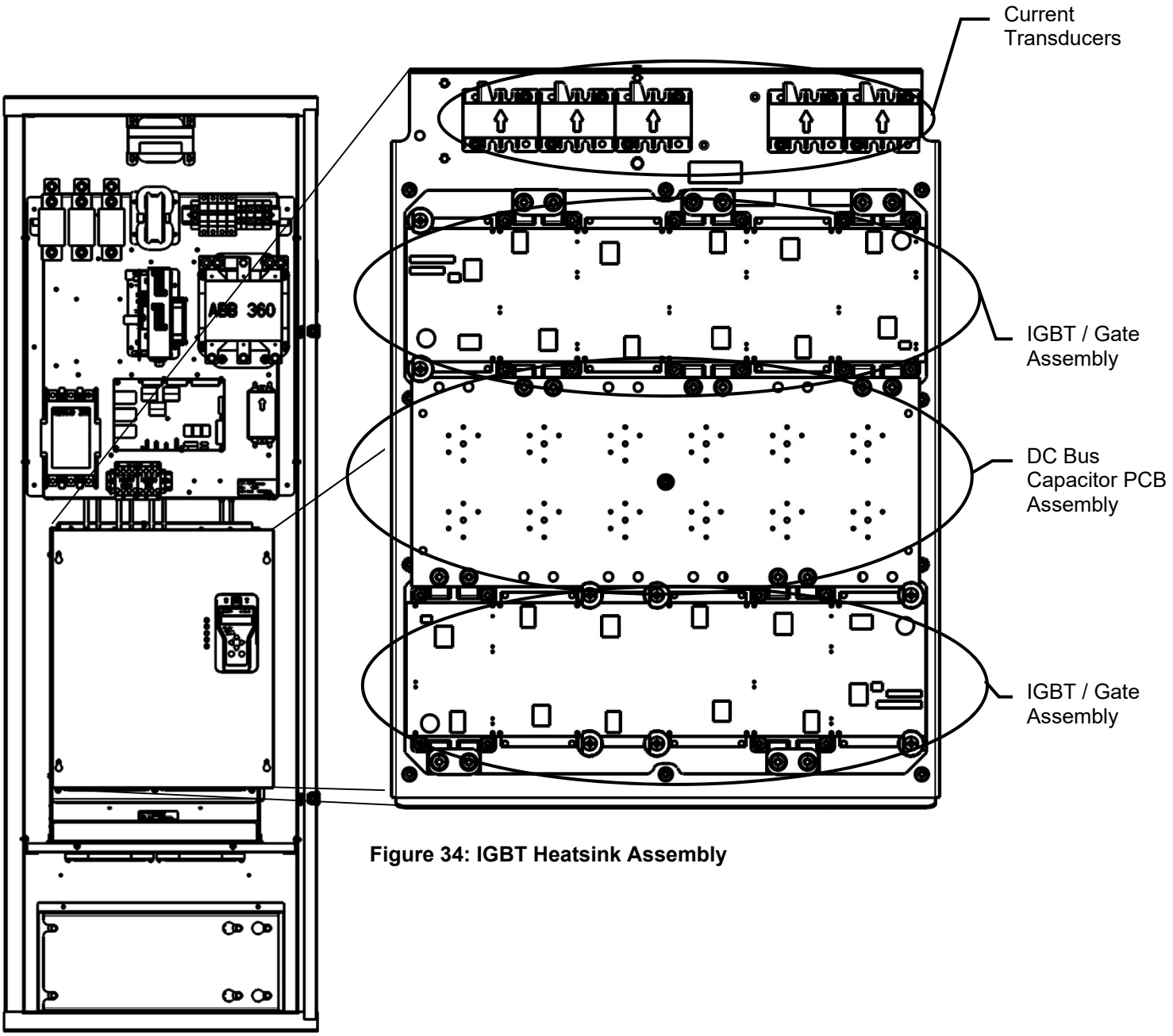


Figure 34: IGBT Heatsink Assembly

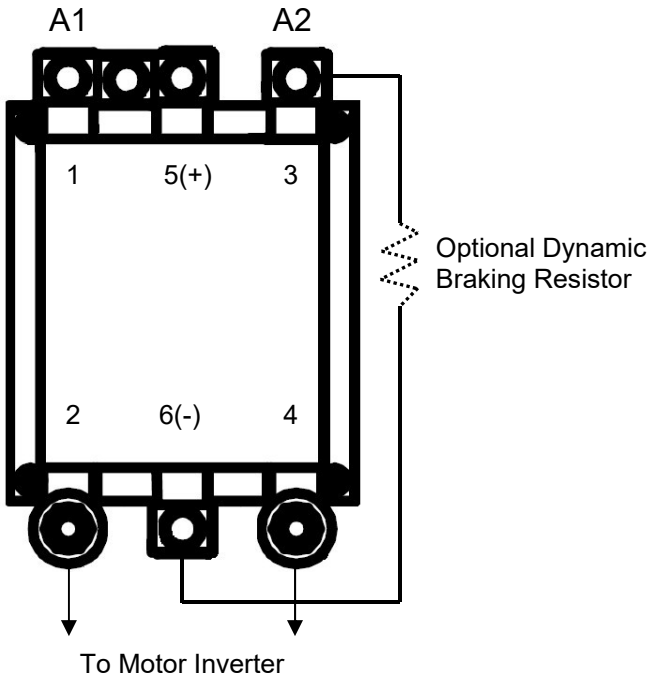


Figure 35: Motor Contactor Connections

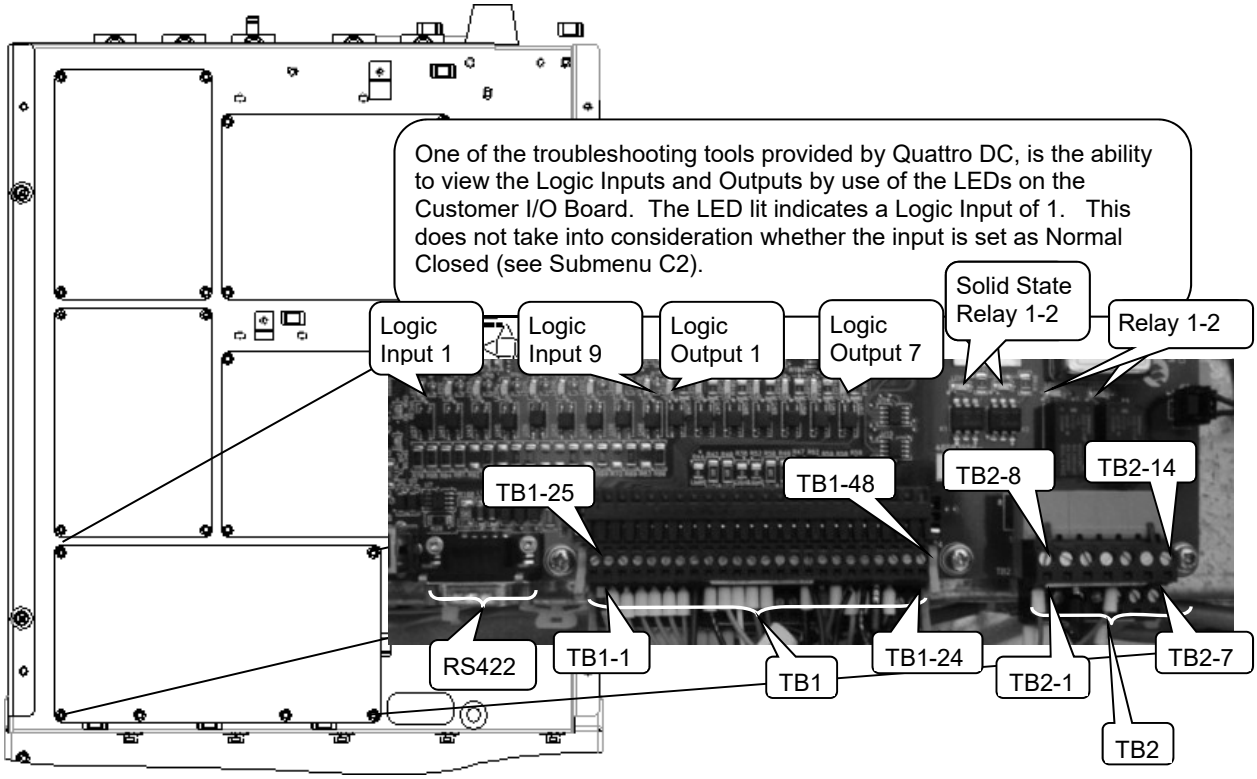


Figure 36: Customer Input / Output Connections

Appendix

Low Voltage Field Module

Magnetek offers two version of the Field Module for Quattro™ DC. This document details the appropriate use of each module.

- The Low Voltage Field Module is recommended for applications with:
  - 380-480 VAC 3-phase input to drive or 200-240 VAC 3-phase input to drive when Field Current is less than 20 Amps
  - Lower peak to peak and ground voltage on field when using higher input voltage
- The Standard Field Module is recommended for applications with:
  - 200-480 VAC 3-phase input to drive where insulation stress is not a factor
  - Applications that exceed output voltage/current rating of Low Voltage Field Module[1]

Low Voltage Field Module Specifications

Input Power

- Powered from the DC Bus

Output Power[1]

- 20 Amps at 250 Volts[2]
- 40 Amps at 125 Volts[2]

Standards

- CSA

Design Features

- 40kHz switching frequency
- Low Voltage to ground on field winding insulation
- Jumper on Field Module Board to determine ampere range (see page 155 for more information)

Standard Field Module Specifications

Input Power

- Powered from the DC Bus

Output Power

- Up to 40 Amps

Standards

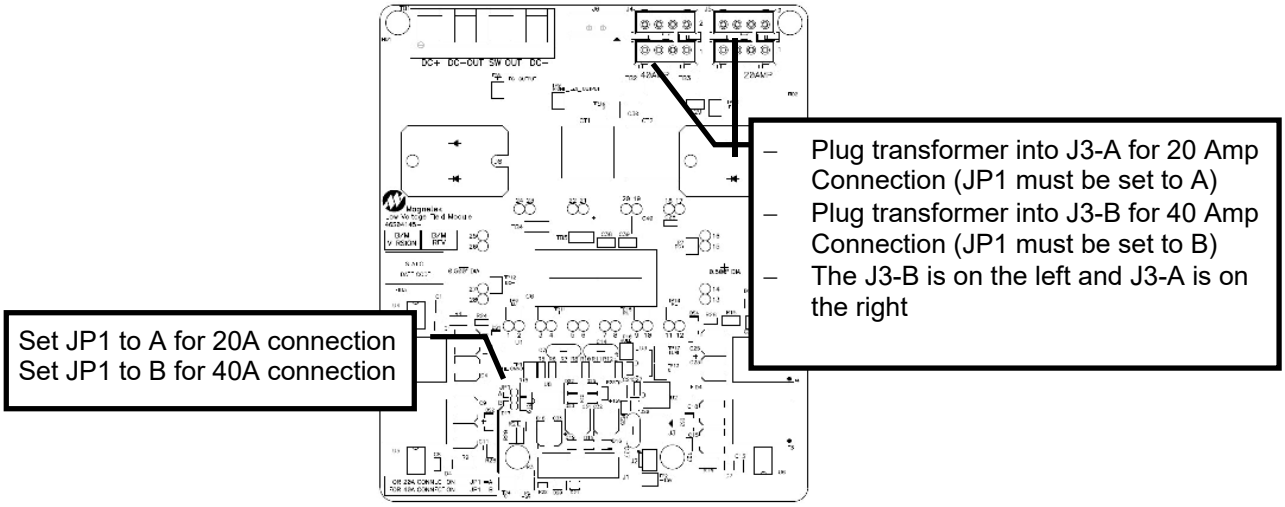
- CSA

Design Features

- Settable switching frequency, FLD CARRIER FRQ (A4)
- Optional Field Filter helps with high voltage peak to peak on field winding insulation

Low Voltage Field Module Option Board

Due to the expanded options on the Low Voltage Field Module, 20 amps and 40 amps, slight setup is required. If the application is below the 20 Amp limitations, verify the connector from the transformer is connected to J3-A, and the jumper on JP1 is connected to A. If the application requires the 40 Amps, verify the connector from the transformer is connected to J3-B and the JP1 connected to B.



Use these formula's to determine if the low voltage field module will operate in the application.

Calculate both Vbus and Vf,
Vin x 1.41 + (DC bus boost, default = 30) = **Vbus**
Field amps x Field Resistance = **Vf**
Where Vin is the AC voltage applied to the drive, this is either measured at the line fuses or in the case the drive utilizes an auto transformer it would be the voltage applied to the drive from the secondary.

Field amps are less than or equal to 20, then;
Vbus / 2 must be greater than or equal to (Vf x 1.5)

Field amps are greater than 20, then;
Vbus / 4 must greater than or equal to (Vf x 1.5)

If either the conditions are not true then the High voltage module must be used.

Appendix

Input Voltage Requirements

Quattro™ DC has an active front that can regulate DC motor voltage to be higher than the nominal Vac line-to-line input. This application note shows how to determine the minimum input line voltage required.

There are three limitations when determining nominal line-to-line voltage requirements of a Quattro™ DC drive. Motor current, line amps, and motor voltage are all factors in the voltage input requirement of the drive.

1. Select drive size to meet motor ampere requirements. Selections are 125A, 150A, 200A, 250A or 300A.
2. Perform Equation 1 and Equation 2 using Motor Voltage and Current the motor needs to run at contract car speed with contract load in up direction (Full Load Up Voltage and Current)

$$V_{L-L} = \frac{(Motor\,Voltage \times 1.3) - 75}{\sqrt{2}}$$

Equation 1: Nominal Line-to-line Voltage

$$(V_{L-L}) = \left(\frac{Rated\ Motor\ Current \times Motor\ Voltage \times 0.92}{Rated\ Drive\ Amps} \right)$$

Equation 2: Nominal Line-to-line Voltage

Where: V_{L-L} = Nominal Input Line-to-Line Voltage

Drive Amps = Current Rating of Quattro™ DC (125A, 150A, 200A, 250A, or 300A)

Rated Motor Current = Armature Motor Current required to go contract speed and load up

Rated Motor Voltage = Armature Motor Voltage required to go contract speed and load up

3. Use the *LARGER* of the values from Equation 1 and Equation 2. Note: This value must be lower than 480VAC due to input limitations of the drive.

Example:

Rated Motor Run Current	115A
Rated Full Load Motor Voltage	460VDC
Drive Current Rating	125A

$$V_{L-L} = \frac{(460 \times 1.3) - 75}{\sqrt{2}} \quad ; \quad (V_{L-L}) = 370\ VAC$$

$$(V_{L-L}) = \left(\frac{115 \times 460 \times 0.92}{125} \right) ; \quad (V_{L-L}) = 389\ VAC$$

Therefore, the drive requires a minimum nominal voltage of 389VAC on the input to run a motor with the Rated Full Load Motor Voltage of 460VDC and rated current of 115A.

Below are five graphical representations of what each drive size is capable of producing in relationship to Rated Motor Current and commonly supplied nominal line-to-line VAC input to drive.

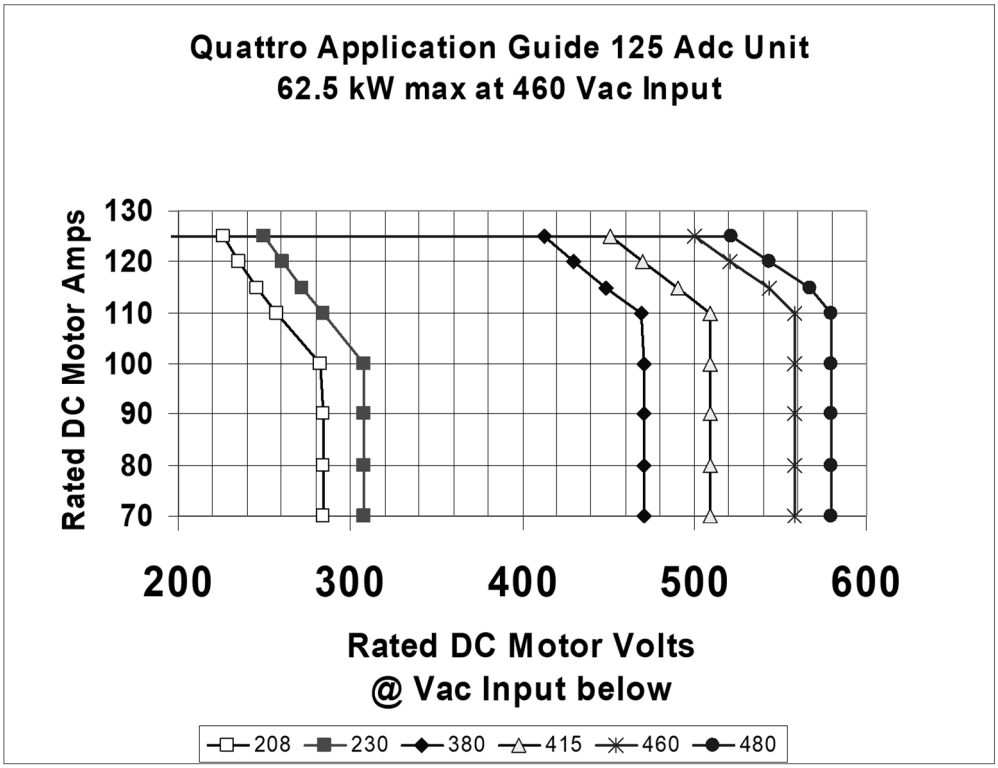


Figure 37: 125A Application Guide

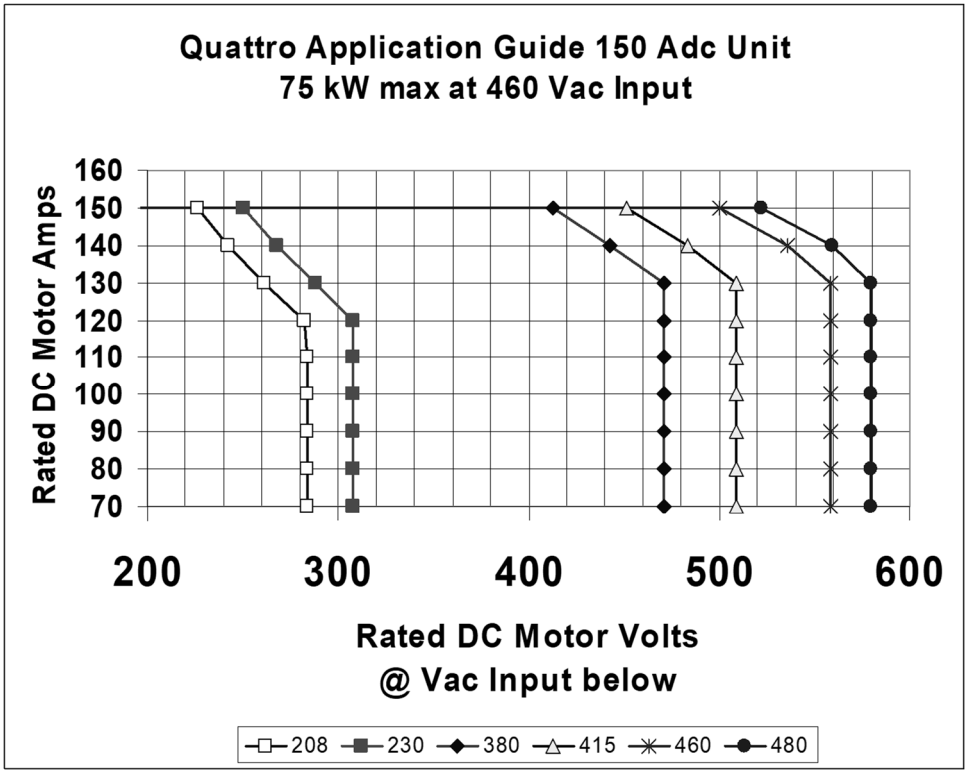


Figure 38: 150A Application Guide

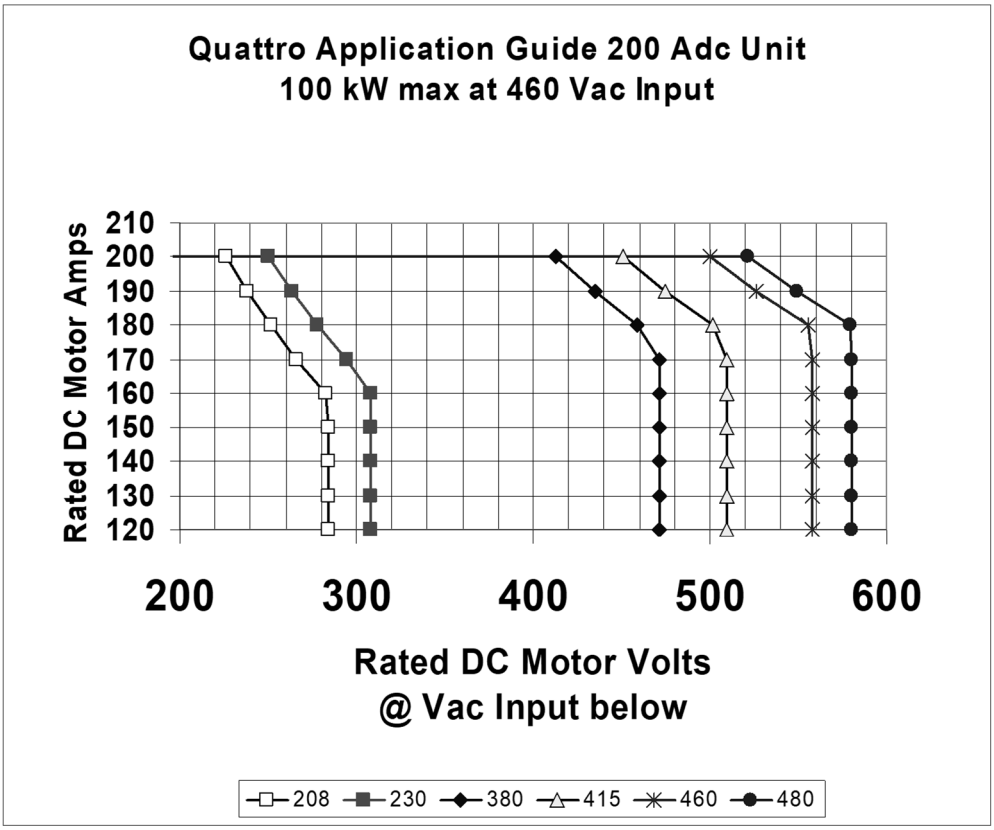


Figure 39: 200A Application Guide

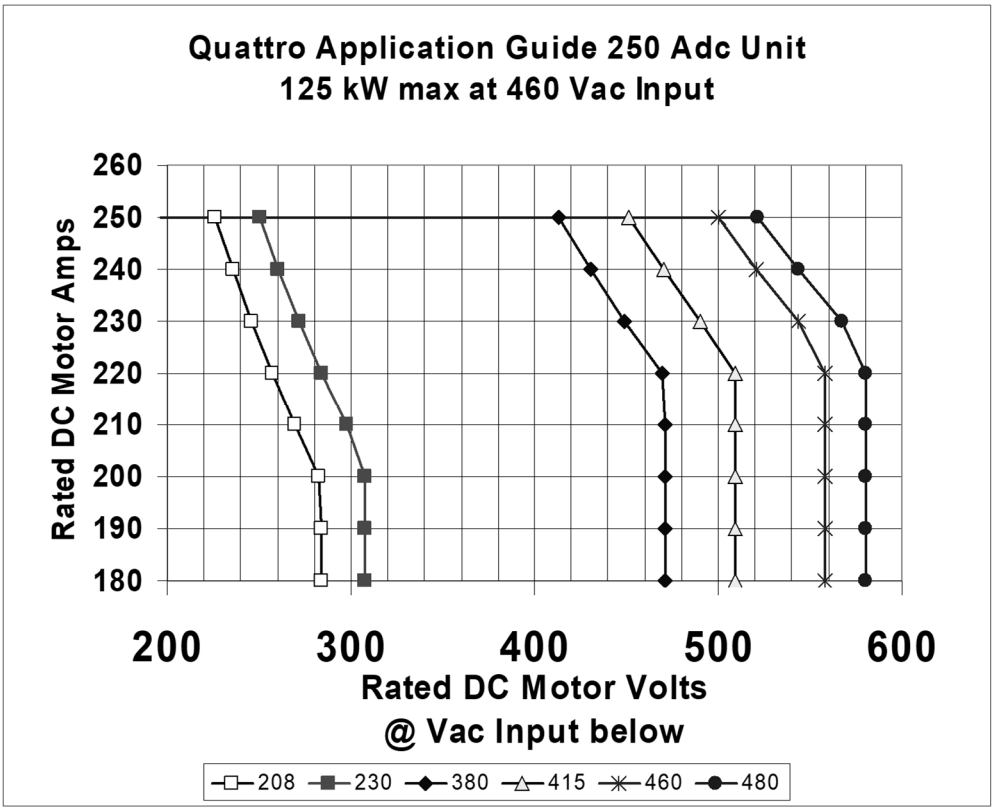


Figure 40: 250A Application Guide

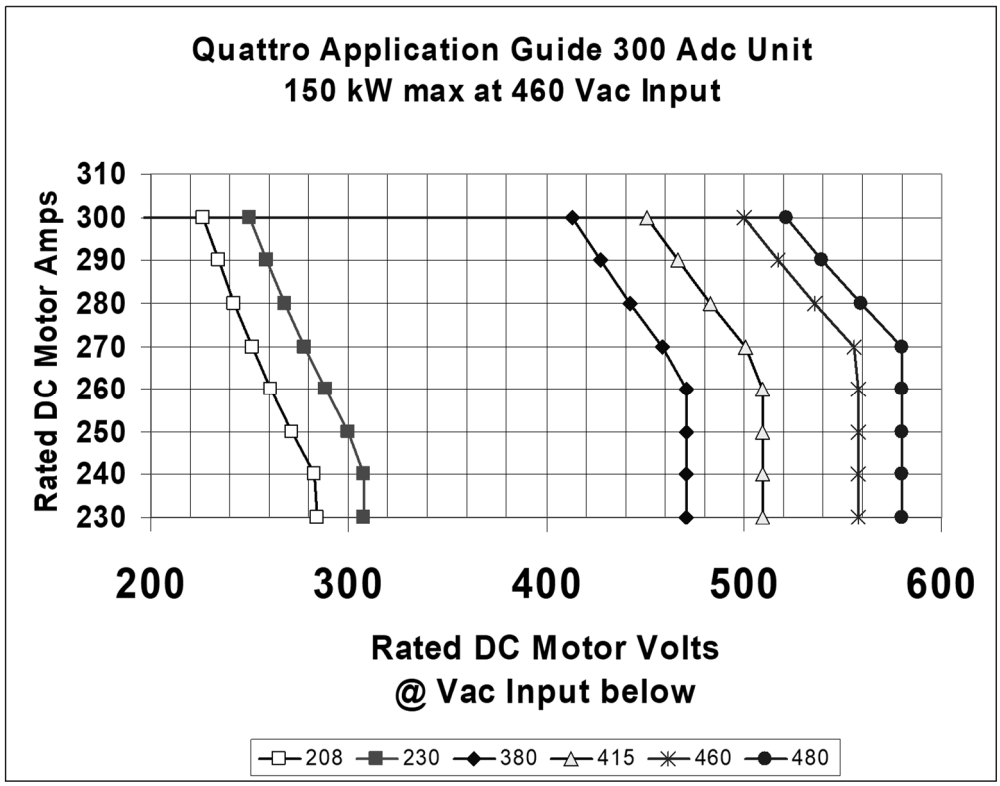
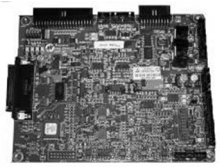
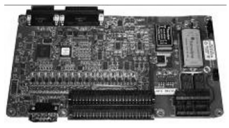
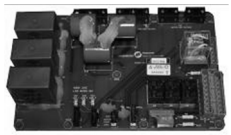
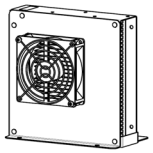
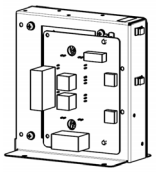
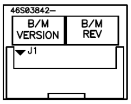
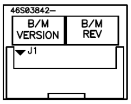
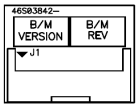
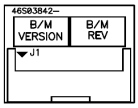


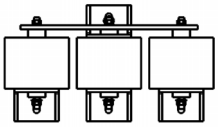
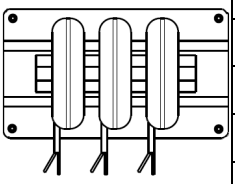
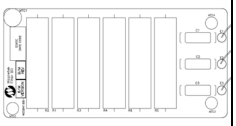
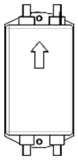
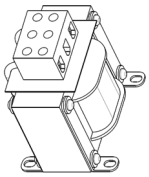
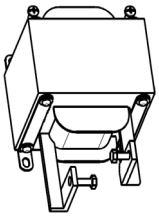
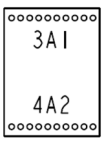
Figure 41: 300A Application Guide

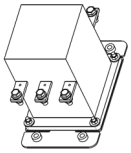
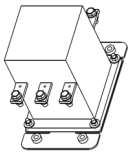
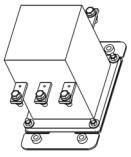
Appendix

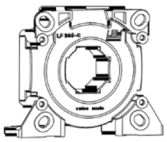
Spare Parts Quattro DC Drive

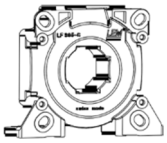
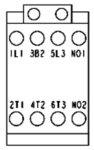
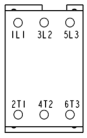
Description	Pictorial Reference	Drive Rating	Reference Designator	Magnetek kit Number	Quantity Per Drive
Main Control PCB (Line Side) Controls line side power conversion		ALL	A1	LA46S03776-2110	1
Main Control PCB (Motor Side) Controls Motor Side Conversion		ALL	A2	LA46S03776-0110	1
Product Interface PCB 1. Kit contains 1.0 PCB 2. These PCB's are interchangeable except for the cube I.D's Converts signals from the respective main control boards to drive hardware		ALL	A3, A4	LA46S03954-0020	2
Power Supply Provides low voltage control power		ALL	A5	LA05P00090-0668	1
Power Supply Relocation Kit Provides hardware to relocate the supply from behind the control tray to the right side of the power module.		ALL	A5	LA05P00090-ALTL	1
Customer Interface PCB Contains customer inputs and outputs		ALL	A6	LA46S03950-0010	1
120V Voltage Feedback PCB Contains line and motor sense and Pre-charge control relay logic, **must be used with the 120V ME contactor option.**		ALL	A8	LA46S04174-0020	1
230V Voltage Feedback PCB Contains line and motor sense and Pre-charge control relay logic, **must be used with the 230V ME contactor option.**		ALL	A8	LA46S04174-0010	1

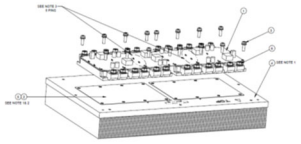
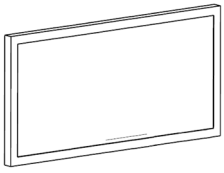
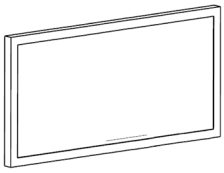
Description	Pictorial Reference	Drive Rating	Reference Designator	Magnetek kit Number	Quantity Per Drive
Power Distribution PCB Distributes voltage from the Power Supply (A5)		ALL	A10	LA46S03862-0010	1
DC Bus Cap Board Bus Filter Capacitors		ALL	A17	LA46S04259-0010	1
Field Control Module Motor Shunt Field Regulator Kit will include the F3, F4 fuses for both the standard field module and the low voltage field module		ALL Standard Field Module	A24	LA46S03829-0100	1
		ALL Low Voltage Field Module	A24	LA46S03829-0200	1
Cube ID PCB (Line Side) Defines size of drive and gives the Product Interface Board (A3) its identification		125A	A25	LA46S04187-1550	1
		150A	A25	LA46S04187-1570	1
		200A	A25	LA46S04187-1670	1
		250A	A25	LA46S04187-1690	1
		300A	A25	LA46S04187-1710	1
Cube ID PCB (Motor Side) Defines size of drive and gives the Product Interface Board (A4) its identification		125A	A26	LA46S04187-1560	1
		150A	A26	LA46S04187-1580	1
		200A	A26	LA46S04187-1680	1
		250A	A26	LA46S04187-1700	1
		300A	A26	LA46S04187-1720	1
Cube ID PCB (Line Side) Defines size of drive and gives the Product Interface Board (A3) its identification. Important note: These will only work with the LF Series transducers.		125A	A25	LA46S04187-2550	1
		150A	A25	LA46S04187-2570	1
		200A	A25	LA46S04187-2670	1
		250A	A25	LA46S04187-2690	1
		300A	A25	LA46S04187-2710	1
Cube ID PCB (Motor Side) Defines size of drive and gives the Product Interface Board (A4) its identification. Important note: These will only work with the LF Series transducers.		125A	A26	LA46S04187-2560	1
		150A	A26	LA46S04187-2580	1
		200A	A26	LA46S04187-2680	1
		250A	A26	LA46S04187-2700	1
		300A	A26	LA46S04187-2720	1

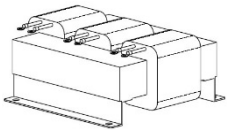
Description	Pictorial Reference	Drive Rating	Reference Designator	Magnetek kit Number	Quantity Per Drive
AC Capacitor Assembly Along with the L1 Inductor, creates a filter to minimize harmonics and better the power factor		125A	C1, C2, C3	LA46S03948-0010	3
		150A	C1, C2, C3	LA46S03948-0010	3
		200A	C1, C2, C3	LA46S03948-0020	3
		250A	C1, C2, C3	LA46S03948-0020	3
		300A	C1, C2, C3	LA46S03948-0020	3
Control Fuses (Kit will contain 2.0 fuses) 230VAC Control Power Fuses		ALL	F1, F2	LA05P00017-0565	2
Control Fuse Fuse Blocks (Kit will contain 2.0 blocks) 230VAC Control Fuse Fuse Blocks		ALL	F1, F2	LA05P00019-0163	2
Inductor Along with the AC Capacitor Assembly, creates a filter to minimize harmonics and better the power factor		125A	L1	LA05P00010-0651	1
		150A	L1	LA05P00010-0651	1
		200A	L1	LA05P00010-0652	1
		250A	L1	LA05P00010-0670	1
		300A	L1	LA05P00010-0670	1
Filter Board Filter for reduction of RFI/EMI to and from the drive and the line utility		ALL	A23	LA46S04431-0020	1
Control Power EMI Filter Filter for reduction of RFI/EMI to and from the drive and the 230VAC Control Power		ALL	L3	LA05P00010-0586	1
Field Filter Field dV/dT Filter including wiring		ALL	L4	LA46S04069-0020	1
Armature Filter Armature dV/dT Filter including wiring		125A	L5	LA46S04068-2125	1
		150A	L5	LA46S04068-2150	
		200A	L5	LA46S04068-2200	1
		250A	L5	LA46S04068-2250	1
		300A	L5	LA46S04068-2300	
DC bus discharge contactor Contactor used to discharge the bus when the drive is no longer boosting		ALL	DCHG	LA05P00037-0311	1

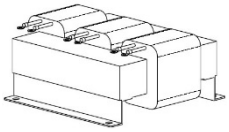
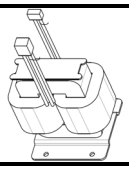
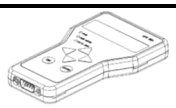
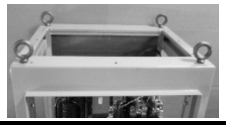
Description	Pictorial Reference	Drive Rating	Reference Designator	Magnetek kit Number	Quantity Per Drive
DC Output Contactor (110V coil) Motor Armature Contactor (ME), **120V coil option. If used must also use the 46S04174-0020 A8 PCB** **Use with single and dual contactor configurations**		125A	ME	LA05P00032-0177	1
		150A	ME	LA05P00032-0177	1
		200A	ME	LA05P00032-0177	1
		250A	ME	LA05P00031-0152	1
		300A	ME	LA05P00032-0220	1
DC Output Contactor (240V coil) Motor Armature Contactor (ME) **Use only with single contactor configurations**		125A	ME	LA05P00032-0154	1
		150A	ME	LA05P00032-0154	1
		200A	ME	LA05P00032-0154	1
		250A	ME	LA05P00032-0155	1
		300A	ME	LA05P00032-0156	1
DC Output Contactor (240V coil) Motor Armature Contactor (ME) **Use only with Dual contactor configurations**		125A	ME1A,ME1B	LA05P00032-0258	2
		150A	ME1A,ME1B	LA05P00032-0258	2
		200A	ME1A,ME1B	LA05P00032-0258	2
		250A	ME1A,ME1B	LA05P00032-0259	2
		300A	ME1A,ME1B	LA05P00032-0210	2
Contact kits – 2 Pole N.O.			ABB220	05P00066-0700	1
			ABB280	05P00066-0701	1
			ABB360	05P00066-0702	1
Contact kits – DB Pole N.C.			ABB220	05P00066-0703	1
			ABB280	05P00066-0704	1
			ABB360	05P00066-0705	1
DC Output Contactor Auxiliaries (1NO 13,14 / 1NC 21,22)		ALL	1M AUX	LA05P00054-0239	1
DC Output Contactor Auxiliaries (2NO 43,44 / 2NC 31,32)		ALL	1M AUX	LA05P00054-0240	1
DC Output Contactor Coils ABB220,280 120Vac		125A-250A	1M Coil, 120Vac	LA05P00032-0206	1
DC Output Contactor Coils ABB220,280 240Vac		125A-250A	1M Coil, 240Vac	LA05P00032-0207	1
DC Output Contactor Coil ABB360 120Vac		300A	1M Coil, 120Vac	LA05P00032-0221	1

Description	Pictorial Reference	Drive Rating	Reference Designator	Magnetek kit Number	Quantity Per Drive
DC Output Contactor Coil ABB360 240Vac		300A	1M Coil, 240Vac	LA05P00032-0219	1
LUG kit, contains 5.0		All	L1-3, MEout	LA05P00204-0278	1
OPTION: Dual auxiliary **Allows the motor contactor auxiliaries to be in parallel. This adds to the reliability of the contactor confirm.** **Contains;** **Wiring harness** **CAL16-11C** (1NO 53,54 / 1NC 61,62) **CAL16-11D** (1NO 83,84 / 1NC 71,72) **Installation instructions**		ALL	1M AUX. RH LH mount	LA46S04453-0200	1
Current transducer Contains one device, to order the replacement part your CT must look like this. If it doesn't refer to the upgrade kit. It is not possible to mix and match the LA and LF series transducers.	 LF series	125-200A	1, 2, 3, 5, 6CT	LA05P00217-0091	5
		250-300A		LA05P00217-0092	

Description	Pictorial Reference	Drive Rating	Reference Designator	Magnetek kit Number	Quantity Per Drive
Current feedback transducer upgrade kit; Contains; cube I.D. boards, five sensors, cables and adaptor plate. The new LF style transducer shown in the top view, was introduced in early 2012 and has the LEM P/N LF…, the LA style which has been used up to that point is in the lower view, this item will no longer be available as a spare part.  LA series	 LF series	125-200A	1, 2, 3, 5, 6CT	LA05P00217-1091	1
		250-300A		LA05P00217-1092	
Precharge Contactor Pre-charge Contactor		ALL	PCM	LA05P00037-0312	1
Touch Safe cover for the line terminals		All		LA46S04453-0020	1
Touch Safe cover for the 3-Phase Auto transformer		All		LA46S04453-0110	1
Line Contactor 230VAC Control Power Line Contactor		125A	UTM	LA05P00032-0201	1
		150A	UTM	LA05P00032-0201	1
		200A	UTM	LA05P00032-0201	1
		250A	UTM	LA05P00032-0202	1
		300A	UTM	LA05P00032-0202	1

Description	Pictorial Reference	Drive Rating	Reference Designator	Magnetek kit Number	Quantity Per Drive
IGBT Assembly only Includes: 1. IGBT and gate PCB and gate power harness. 2. The kit will contain instruction and tools to change just the IGBT and re-install back onto the heatsink. 3. This kit does not include the heatsink it is shown for illustration purposes only. 		125A	Line Side	LA46S04256-5125	1
		125A	Motor Side	LA46S04256-6125	1
		150A	Line Side	LA46S04256-5150	1
		150A	Motor Side	LA46S04256-6150	1
		200A	Line Side	LA46S04256-5200	1
		200A	Motor Side	LA46S04256-6200	1
		250A	Line Side	LA46S04256-5250	1
		250A	Motor Side	LA46S04256-6250	1
		300A	Line Side	LA46S04256-5300	1
		300A	Motor Side	LA46S04256-6300	1
		300A	Motor Side	LA46S03825-7300	1
AC Input Fuses Replacement fuses for the AC input to the drive. Kit contains 3 fuses.		125A	LF1-LF3	LA46S04305-0125	1
		150A	LF1-LF3	LA46S04305-0150	1
		200A	LF1-LF3	LA46S04305-0200	1
		250A	LF1-LF3	LA46S04305-0250	1
		300A	LF1-LF3	LA46S04305-0300	1
Door Filter, 18 x 9.5 Disposable air filter located in the door		ALL	FLTR1	LA05P00015-0049	1
Door Filter, 18 x 15 Disposable air filter located in the door, used in the door with blowers		ALL	FLTR1	LA05P00015-0075	1

Description	Pictorial Reference	Drive Rating	Reference Designator	Magnetek kit Number	Quantity Per Drive
Low Voltage Field Supply Fuses Kit contains 2.0 fuses. 30A, 700VAC Semiconductor fuses		ALL	F3, F4	LA05P00017-0597	2
All Auto Transformer kits contain power cables and fuse hardware modification kit.					
Auto Transformer (480:380) Optional Transformer input to drive. 480VAC primary, 380VAC secondary, 60Hz.		125A	-	LA46S04263-1100	1
		150A	-	LA46S04263-1110	1
		200A	-	LA46S04263-1120	1
		250A	-	LA46S04263-1130	1
		300A	-	LA46S04263-1140	1
Auto Transformer (575:380) Optional Transformer input to drive. 575VAC primary, 380VAC secondary, 60Hz.		125A	-	LA46S04263-1101	1
		150A	-	LA46S04263-1111	1
		200A	-	LA46S04263-1121	1
		250A	-	LA46S04263-1131	1
		300A	-	LA46S04263-1141	1
Auto Transformer (208/240:380) Optional Transformer input to drive. 208/240VAC primary, 380VAC secondary, 60Hz.		125A	-	LA46S04263-1103	1
		150A	-	LA46S04263-1113	1
		200A	-	LA46S04263-1123	1
		250A	-	LA46S04263-1133	1
		300A	-	LA46S04263-1143	1
Auto Transformer (208/240:480) Optional Transformer input to drive. 208/240VAC primary, 480VAC secondary, 60Hz.		125A	-	LA46S04263-1104	1
		150A	-	LA46S04263-1114	1
		200A	-	LA46S04263-1124	1
		250A	-	LA46S04263-1134	1
		300A	-	LA46S04263-1144	1
Auto Transformer (380/400/415:480) Optional Transformer input to drive. 380/400/415VAC primary, 480VAC secondary 50/60Hz.		125A	-	LA46S04263-1105	1
		150A	-	LA46S04263-1115	1
		200A	-	LA46S04263-1125	1
		250A	-	LA46S04263-1135	1
		300A	-	LA46S04263-1145	1
Auto Transformer (575:480) Optional Transformer input to drive. 575VAC primary, 480VAC secondary, 60Hz.		125A	-	LA46S04263-1106	1
		150A	-	LA46S04263-1116	1
		200A	-	LA46S04263-1126	1
		250A	-	LA46S04263-1136	1
		300A	-	LA46S04263-1146	1

Description	Pictorial Reference	Drive Rating	Reference Designator	Magnetek kit Number	Quantity Per Drive
Auto Transformer (600:380) Optional Transformer input to drive. 600VAC primary, 380VAC secondary, 60Hz.		125A	-	LA46S04263-1107	1
		150A	-	LA46S04263-1117	1
		200A	-	LA46S04263-1127	1
		250A	-	LA46S04263-1137	1
		300A	-	LA46S04263-1147	1
Auto Transformer (600:480) Optional Transformer input to drive. 600VAC primary, 480VAC secondary, 60Hz.		125A	-	LA46S04263-1108	1
		150A	-	LA46S04263-1118	1
		200A	-	LA46S04263-1128	1
		250A	-	LA46S04263-1138	1
		300A	-	LA46S04263-1148	1
Field Control Module Low Voltage Field Module Transformer		ALL Low Voltage Field Module		LA05P00058-1170	1
Blower Module 230 VAC Cooling Fan		ALL		LA05P00016-0107	2
Field module fan Cools heatsink of the Field Supply		ALL		LA46S04186-0010	1
Operator Keypad Drive Programming Tool		ALL		ELEV-ELOP	1
Operator Extension Cord 6 foot extension cable for operator		ALL	-	ELEV-CABLE	1
Software Flash Drive Contains Magnetek Explorer, LS and MS Quattro Code and the latest tech manual.		ALL	-	46S04413-DU02	1
Lifting Kit Optional Lifting Kit includes qty (4) M8 Eyebolts and instructional sheet		ALL		QDC2-LIFTKIT	1
Touchup Paint Aerosol spray can	Spray can	ALL	-	05P00100-0092	-

Description	Pictorial Reference	Drive Rating	Reference Designator	Magnetek kit Number	Quantity Per Drive
Shaft Ground brush This contains only the brush, it will require a mounting bracket to attach to the motor. The brush comes in two different sizes, select the quantity required and type based on the description provided.	Use 1.0 for shaft diameters up to 3IN(76mm), use 2.0 for 5-8IN(127-203mm), use 3.0 for 9-10IN(228-254mm)	ALL	-	05P00066-0681	
	Use 1.0 for 5-8IN(127-203mm), use 2.0 for 9-10IN(228-254mm)	ALL	-	05P00066-0682	
Door Fan Kit Includes adaptor plate, fans, cables to upgrade drive that weren't manufactured with fans in the door	24IN Enclosure	ALL	-	Q2B-24IN-DOORFAN	-
	32IN Enclosure	All	-	Q2B-32IN-DOORFAN	-
DC output filter Optional DC Output Filters are designed to offer an additional level of protection to existing DC machines in a modernization project. The DC filters are designed to provide a reduction in the change in voltage with respect to time (dv/dt) of 500V/micro second or less as recommended by the NEMA MG-1 Motor & Generator design guide.		DC Output filters are available in the following 5 configurations 1. Armature and field filter mounted on a sub-panel for mounting internal to the Quattro DC Cabinet ** 2. Armature and field filter mounted in a standalone NEMA 1 enclosure for locating external to the Quattro DC Cabinet ** 3. Armature only filter mounted on a sub-panel for mounting internal to the Quattro DC Cabinet ** 4. Armature only filter mounted in a standalone NEMA 1 enclosure for locating external to the Quattro DC Cabinet *5.* The drive can be built in the factory with this filter integrated into the product. *Refer to the drive model numbers section in the front of this manual.* ** Can be located in the location under the auto-transformer if it isn't installed. Otherwise, refer to the standalone NEMA 1 options, these options are for field retrofit.		
QDC-0125-01	-	125A	Panel only, field and armature		
QDC-1125-01	-	125A	NEMA Enclosed, field and armature		
QDC-2125-01	-	125A	Panel only, armature		
QDC-3125-01	-	125A	NEMA Enclosed, armature		
QDC-0150-01	-	150A	Panel only, field and armature		
QDC-1150-01	-	150A	NEMA Enclosed, field and armature		
QDC-2150-01	-	150A	Panel only, armature		

Description	Pictorial Reference	Drive Rating	Reference Designator	Magnetek kit Number	Quantity Per Drive
QDC-3150-01	-	150A	NEMA Enclosed, armature		
QDC-0200-01	-	200A	Panel only, field and armature		
QDC-1200-01	-	200A	NEMA Enclosed, field and armature		
QDC-2200-01	-	200A	Panel only, armature		
QDC-3200-01	-	200A	NEMA Enclosed, armature		
QDC-0250-01	-	250A	Panel only, field and armature		
QDC-1250-01	-	250A	NEMA Enclosed, field and armature		
QDC-2250-01	-	250A	Panel only, armature		
QDC-3250-01	-	250A	NEMA Enclosed, armature		
QDC-0300-01	-	300A	Panel only, field and armature		
QDC-1300-01	-	300A	NEMA Enclosed, field and armature		
QDC-2300-01	-	300A	Panel only, armature		
QDC-3300-01	-	300A	NEMA Enclosed, armature		

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QUATTRO DC

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