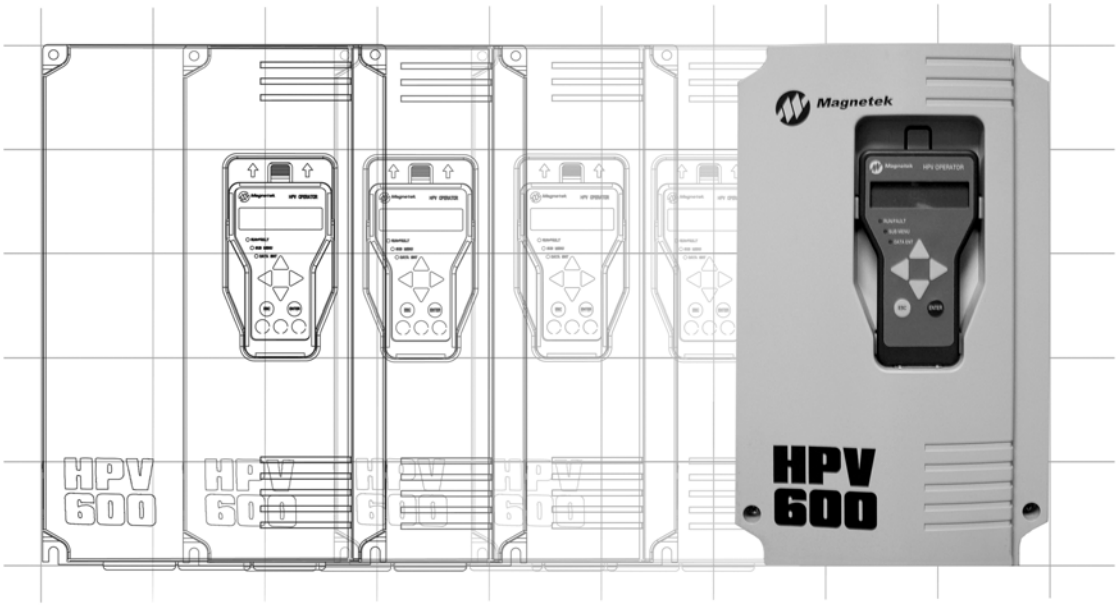
MAGNETEK
ELEVATOR

HPV 600 AC Elevator Drive

Technical Manual



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Current Ratings

North American

Voltage Class	*Rated HP*	*Rated kW*	*Continuous Output General Purpose Current Rating*	*Continuous Output Elevator Duty Cycle Current Rating*	*150% Output Current for 60 Sec*	*200% Maximum Output Current for 5 Sec*	*Cube Size**	*Model Number***
380V to 480V	10	7.5	18 A	20.8 A	27 A	36 A	B	HPV600-4018-xxxx-xx
	15	11	24 A	27.8 A	36 A	48 A	B	HPV600-4024-xxxx-xx
	20	15	34 A	39.4 A	51 A	68 A	C	HPV600-4034-xxxx-xx
	25	18	39 A	45.2 A	58.5 A	78 A	C	HPV600-4039-xxxx-xx
200V to 240V	7.5	5.5	28 A	32.4 A	42 A	56 A	A	HPV600-2028-xxxx-xx
	10	7.5	35 A	40.6 A	52.5 A	70 A	B	HPV600-2035-xxxx-xx
	15	11	47 A	54.5 A	70.5 A	94 A	B	HPV600-2047-xxxx-xx
	20	15	60 A	69.6 A	90 A	120 A	C	HPV600-2060-xxxx-xx

- All ratings at 60/50Hz, 10kHz carrier frequency and based on a geared elevator application
- Standard: CSA

European

Voltage Class	*Rated kW*	*Continuous Output General Purpose Current Rating*	*Continuous Output Elevator Duty Cycle Current Rating*	*150% Output Current for 60 Sec*	*200% Maximum Output Current for 5 Sec*	*Cube Size**	*Model Number***
380V to 440V	4	11 A	12.7 A	16.5 A	22 A	A	HPV600-4011-xxxx-xx
	5.5	15 A	17.4 A	22.5 A	30 A	A	HPV600-4015-xxxx-xx
	7.5	21 A	24.3 A	31.5 A	42 A	B	HPV600-4021-xxxx-xx
	11	28 A	32.4 A	42 A	56 A	B	HPV600-4028-xxxx-xx
	15	39 A	45.2 A	58.5 A	78 A	C	HPV600-4039-xxxx-xx
	18.5	47 A	54.5 A	70.5 A	94 A	C	HPV600-4047-xxxx-xx
	22	57 A	66.1 A	85.5 A	114 A	C	HPV600-4057-xxxx-xx

- All ratings at 60/50Hz, 10kHz carrier frequency and based on a geared elevator application
- Standard: CE

For more information on altitude, temperature, and carrier frequency derating, see page 12.
** Cube size dimensions, mounting holes, and weights are shown in page 154.*
*** From more information on model numbers, see page 12*

Submenu	Parameter	Units	Range	Default	Site Setting
A1	***Closed-Loop Drive A1 submenu – For more information, see page 35.*** *Note: For Open-Loop Drive A1 Site Setting Table, see page 76.*				
A1	CONTRACT CAR SPEED	fpm	0.0 – 1500.0	100.0	
		m/s	0.000 – 8.000	2.000	
A1	CONTRACT MTR SPD	rpm	50.0 – 3000.0	1130.0	
A1	RESPONSE	rad/sec	1.0 – 20.0	10.0	
A1	INERTIA	sec	0.25 – 50.00	2.00	
A1	INNER LOOP XOVER	rad/sec	0.1 – 20.0	2.0	
A1	GAIN REDUCE MULT	%	10 – 100	100	
A1	GAIN CHNG LEVEL	%	0.0 – 100.0	100.0	
A1	TACH RATE GAIN	none	0.0 – 30.0	0.0	
A1	SPD PHASE MARGIN	degs	45 – 90	80	
A1	RAMPED STOP TIME	sec	0.00 – 2.50	0.20	
A1	CONTACT FLT TIME	sec	0.10 – 5.00	0.10	
A1	BRAKE PICK TIME	sec	0.00 – 5.00	1.00	
A1	BRAKE HOLD TIME	sec	0.00 – 5.00	0.20	
A1	OVERSPEED LEVEL	%	100.0 – 150.0	115.0	
A1	OVERSPEED TIME	sec	0.00 – 9.99	1.00	
A1	OVERSPEED MULT	%	100.0 – 150.0	125.0	
A1	ENCODER PULSES	pls/rev	600 – 10000	1024	
A1	SPD DEV LO LEVEL	%	0.1 – 20.0	10.0	
A1	SPD DEV TIME	sec	0.00 – 9.99	0.50	
A1	SPD DEV HI LEVEL	%	0.0 – 99.9	10.0	
A1	SPD COMMAND BIAS	volts	0.00 – 6.00	0.00	
A1	SPD COMMAND MULT	none	0.90 – 5.00	1.00	
A1	PRE TORQUE BIAS	volts	0.00 – 6.00	0.00	
A1	PRE TORQUE MULT	none	-10.00 – +10.00	1.00	
A1	ZERO SPEED LEVEL	%	0.00 – 99.99	1.00	
A1	ZERO SPEED TIME	sec	0.00 – 9.99	0.10	
A1	UP/DWN THRESHOLD	%	0.00 – 9.99	1.00	
A1	MTR TORQUE LIMIT	%	0.0 – 275.0	200.0	
A1	REGEN TORQ LIMIT	%	0.0 – 275.0	200.0	
A1	FLUX WKN FACTOR	%	60 – 100	100	
A1	ANA OUT 1 OFFSET	%	-99.9 – +99.9	0.0	
A1	ANA OUT 2 OFFSET	%	-99.9 – +99.9	0.0	
A1	ANA OUT 1 GAIN	none	0.0 – 10.0	1.0	
A1	ANA OUT 2 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	%	0.00 – 110.00	80.00	
A1	MAINS DIP SPEED	%	5.00 – 99.99	25.00	
A1	RUN DELAY TIMER	sec	0.00 – 0.99	0.00	
A1	AB ZERO SPD LEV	%	0.00 – 2.00	0.00	
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	0.0 – 10.00	0.50	
A1	SER2 INSP SPD	fpm	0.0 – 100.0	30.0	
		m/s	0.000 – 0.500	0.150	
A1	SER2 RS CRP SPD	fpm	0.0 – 300.0	10.0	
		m/s	0.000 – 1.540	0.050	
A1	SER2 RS CPR TIME	sec	0.0 – 200.0	180.0	
A1	SER2 FLT TOL	sec	0.00 – 2.00	0.04	
A1	ROLLBACK GAIN	none	1 – 20	1	
A1	NOTCH FILTER FRQ	Hz	5 – 60	20	
A1	NOTCH FILT DEPTH	%	0 – 100	0	
A1	MSPD DELAY 1-4	sec	0.000 – 10.000	0.000	
A1	MID SPEED LEVEL	%	0.00 – 110.00	80.00	

Submenu	Parameter	Units	Range	Default	Site Setting
A2	***Closed-Loop S-Curves A2 submenu – For more information, see page 46.*** *Note: For Open-Loop S-Curves A2 Site Setting Table, see page 77.*				
A2	ACCEL RATE 0	ft/s^2	0.00 – 7.99	1.00	
		m/s^2	0.000 – 3.999	0.300	
A2	DECEL RATE 0	ft/s^2	0.00 – 7.99	1.00	
		m/s^2	0.000 – 3.999	0.300	
A2	ACCEL JERK IN 0	ft/s^3	0.0 – 29.9	0.5	
		m/s^3	0.00 – 9.99	0.15	
A2	ACCEL JERK OUT 0	ft/s^3	0.0 – 29.9	0.5	
		m/s^3	0.00 – 9.99	0.15	
A2	DECEL JERK IN 0	ft/s^3	0.0 – 29.9	0.5	
		m/s^3	0.00 – 9.99	0.15	
A2	DECEL JERK OUT 0	ft/s^3	0.0 – 29.9	0.5	
		m/s^3	0.00 – 9.99	0.15	
A2	ACCEL RATE 1	ft/s^2	0.00 – 7.99	1.00	
		m/s^2	0.000 – 3.999	0.300	
A2	DECEL RATE 1	ft/s^2	0.00 – 7.99	1.00	
		m/s^2	0.000 – 3.999	0.300	
A2	ACCEL JERK IN 1	ft/s^3	0.0 – 29.9	0.5	
		m/s^3	0.00 – 9.99	0.15	
A2	ACCEL JERK OUT 1	ft/s^3	0.0 – 29.9	0.5	
		m/s^3	0.00 – 9.99	0.15	
A2	DECEL JERK IN 1	ft/s^3	0.0 – 29.9	0.5	
		m/s^3	0.00 – 9.99	0.15	
A2	DECEL JERK OUT 1	ft/s^3	0.0 – 29.9	0.5	
		m/s^3	0.00 – 9.99	0.15	
A2	ACCEL RATE 2	ft/s^2	0.00 – 7.99	1.00	
		m/s^2	0.000 – 3.999	0.300	
A2	DECEL RATE 2	ft/s^2	0.00 – 7.99	1.00	
		m/s^2	0.000 – 3.999	0.300	
A2	ACCEL JERK IN 2	ft/s^3	0.0 – 29.9	0.5	
		m/s^3	0.00 – 9.99	0.15	
A2	ACCEL JERK OUT 2	ft/s^3	0.0 – 29.9	0.5	
		m/s^3	0.00 – 9.99	0.15	
A2	DECEL JERK IN 2	ft/s^3	0.0 – 29.9	0.5	
		m/s^3	0.00 – 9.99	0.15	
A2	DECEL JERK OUT 2	ft/s^3	0.0 – 29.9	0.5	
		m/s^3	0.00 – 9.99	0.15	
A2	ACCEL RATE 3	ft/s^2	0.00 – 7.99	1.00	
		m/s^2	0.000 – 3.999	0.300	
A2	DECEL RATE 3	ft/s^2	0.00 – 7.99	1.00	
		m/s^2	0.000 – 3.999	0.300	
A2	ACCEL JERK IN 3	ft/s^3	0.0 – 29.9	0.5	
		m/s^3	0.00 – 9.99	0.15	
A2	ACCEL JERK OUT 3	ft/s^3	0.0 – 29.9	0.5	
		m/s^3	0.00 – 9.99	0.15	
A2	DECEL JERK IN 3	ft/s^3	0.0 – 29.9	0.5	
		m/s^3	0.00 – 9.99	0.15	
A2	DECEL JERK OUT 3	ft/s^3	0.0 – 29.9	0.5	
		m/s^3	0.00 – 9.99	0.15	

Submenu	Parameter	Units	Range	Default	Site Setting
A3	***Closed-Loop Multistep Ref A3 submenu – For more information, see page 48.*** *Note: For Open-Loop Multistep Ref A3 Site Setting Table, see page 78.*				
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	SPEED COMMAND 14	ft/min	-3000.0 – +3000.0	0.0	
		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	
A4	***Closed-Loop Power Convert A4 submenu – For more information, see page 50.*** *Note: For Open-Loop Convert A4 Site Setting Table, see page 78.*				
A4	Id REG DIFF GAIN	none	0.80 – 1.20	1.00	
A4	Id REG PROP GAIN	none	0.20 – 0.40	0.30	
A4	Iq REG DIFF GAIN	none	0.80 – 1.20	1.00	
A4	Iq REG PROP GAIN	none	0.20 – 0.40	0.30	
A4	PWM FREQUENCY	kHz	2.5 – 16.0	10.0	
A4	UV ALARM LEVEL	%	80 – 99	90	
A4	UV FAULT LEVEL	%	50 – 99	80	
A4	EXTERN REACTANCE	%	0.0 – 10.0	0.0	
A4	INPUT L-L VOLTS	volts	110 – 480	460 or 230	

Submenu	Parameter	Units	Range	Default	Site Setting
A5	***Closed-Loop Motor A5 submenu – For more information, see page 51.*** *Note: For Open-Loop Motor A5 Site Setting Table, see page 79.*				
A5	MOTOR ID	none	-	-	
A5	RATED MTR POWER	HP	1.0 – 500.0	0.0	
		kW	0.75 – 400.00	0.00	
A5	RATED MTR VOLTS	volts	190.0 – 575.0	0.0	
A5	RATED EXCIT FREQ	Hz	5.0 – 400.0	0.0	
A5	RATED MOTOR CURR	amps	1.00 – 800.00	0.00	
A5	MOTOR POLES	none	2 – 32	Per ID	
A5	RATED MTR SPEED	rpm	50.0 – 3000.0	0.0	
A5	% NO LOAD CURR	%	10.0 – 80.0	Per ID	
A5	STATOR LEAKAGE X	%	0.0 – 20.0	Per ID	
A5	ROTOR LEAKAGE X	%	0.0 – 20.0	Per ID	
A5	STATOR RESIST	%	0.0 – 20.0	Per ID	
A5	MOTOR IRON LOSS	%	0.0 – 15.0	0.5	
A5	MOTOR MECH LOSS	%	0.0 – 15.0	1.0	
A5	OVLD START LEVEL	%	100 – 150	110	
A5	OVLD TIME OUT	sec	5.0 – 120.0	60.0	
A5	FLUX SAT BREAK	%	0 – 100	75	
A5	FLUX SAT SLOPE 1	PU Slope	0.0 – 200.0	0.0	
A5	FLUX SAT SLOPE 2	PU Slope	0.0 – 200.0	50.0	
C1	***Closed-Loop User Switches C1 submenu – For more information, see page 55.*** *Note: For Open-Loop User Switches C1 Site Setting Table, see page 79.*				
C1	SPD COMMAND SRC	none	– analog input – multi-step – serial – ser mult step	MULTI-STEP	
C1	RUN COMMAND SRC	none	– external tb – serial – serial+extrn	EXTERNAL TB	
C1	HI/LO GAIN SRC	none	– external tb – serial – internal	INTERNAL	
C1	SPEED REG TYPE	none	– elev spd reg – pi speed reg – external reg	ELEV SPD REG	
C1	MOTOR ROTATION	none	– forward – reverse	FORWARD	
C1	SPD REF RELEASE	none	– reg release – brake picked	REG RELEASE	
C1	CONT CONFIRM SRC	none	– none – external tb	NONE	
C1	PreTorque SOURCE	none	– none – analog input – serial	NONE	
C1	PreTorque LATCH	none	– latched – not latched	NOT LATCHED	
C1	Ptorq LATCH CLCK	none	– serial – external tb	EXTERNAL TB	
C1	FAULT RESET SRC	none	– external tb – serial – automatic	EXTERNAL TB	
C1	OVERSPD TEST SRC	none	– external tb – serial	EXTERNAL TB	
C1	BRAKE PICK SRC	none	– internal – serial	INTERNAL	

Submenu	Parameter	Units	Range	Default	Site Setting
C1	***Closed-Loop User Switches C1 submenu continued…***				
C1	BRAKE PICK CNFM	none	– none – external tb – internal time	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	FAST FLUX	none	– disabled – enabled	DISABLED	
C1	MAINS DIP ENA	none	– disable – enable	DISABLE	
C1	DB PROTECTION	none	– fault – alarm	FAULT	
C1	ENCODER FAULT	none	– disable – enable	ENABLE	
C1	STOPPING MODE	none	– immediate – ramp to stop	IMMEDIATE	
C1	MOTOR OVRLD SEL	none	– alarm – flt immediate – fault at stop	ALARM	
C1	AUTO STOP	none	– disable – enable	DISABLE	
C1	SERIAL MODE	none	– none – mode 1 – mode 2 – mode 2 test	MODE 1	
C1	SER2 FLT MODE	none	– immediate – run remove – rescue	IMMEDIATE	
C1	DRV FAST DISABLE	none	– disable – enable	DISABLE	
C1	MLT-STEP TO DLY 1-4	none	– none – mspd 1-15	NONE	
C1	PRIORITY MESSAGE	none	– enable – disable	ENABLE	
C1	PWR MODULE LATCH	none	– enable – disable	ENABLE	

Submenu	Parameter	Units	Range	Default	Site Setting
C2	***Closed-Loop Logic Inputs C2 submenu – For more information, see page 68.*** *Note: For Open-Loop Logic Inputs Site Setting Table, see page 80.*				
C2	LOGIC INPUT 1	– contact cfirm – drive enable – extrn fault 1 – extrn fault 2 – extrn fault 3 – extrn /flt 4 – fault reset – low gain sel – mech brk hold – mech brk pick – no function – ospd test src	– pre-trq latch – run – 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	DRIVE ENABLE	
C2	LOGIC INPUT 2			RUN	
C2	LOGIC INPUT 3			FAULT RESET	
C2	LOGIC INPUT 4			UP/DWN	
C2	LOGIC INPUT 5			S-CURVE SEL 0	
C2	LOGIC INPUT 6			STEP REF B0	
C2	LOGIC INPUT 7			STEP REF B1	
C2	LOGIC INPUT 8			STEP REF B2	
C2	LOGIC INPUT 9			EXTRN FAULT 1	
C3	***Closed-Loop Logic Outputs C3 submenu – For more information, see page 70.*** *Note: For Open-Loop Logic Outputs Site Setting Table, see page 81.*				
C3	LOGIC OUTPUT 1	– alarm – alarm+flt – at mid speed – auto brake – brake alarm – brake hold – brake pick – brk hold flt – brk icbt flt – brk pick flt – car going dwn – car going up – charge fault – close contact – contactor flt – curr reg flt – drv overload – encoder flt – fan alarm – fault – flux confirm – fuse fault – ground fault – in low gain	– motor trq lim – mtr overload – no function – not alarm – over curr flt – overspeed flt – overtemp flt – overvolt flt – ovrtemp alarm – phase fault – ramp down ena – ready to run – regen trq lim – run commanded – run confirm – speed dev – speed dev low – reed ref rls – speed reg rels – undervolt flt – up to speed – uv alarm – zero speed	READY TO RUN	
C3	LOGIC OUTPUT 2			RUN COMMANDED	
C3	LOGIC OUTPUT 3			MTR OVERLOAD	
C3	LOGIC OUTPUT 4			READY TO RUN	
C3	RELAY COIL 1			FAULT	
C3	RELAY COIL 2			SPEED REG RLS	
C4	***Closed-LoopAnalog Outputs C4 submenu – For more information, see page 72.*** *Note: For Open-Loop Analog Outputs Site Setting Table, see page 81.*				
C4	ANALOG OUTPUT 1	– aux torq cmd – bus voltage – current out – drv overload	– spd reg tq cmd – speed command	TORQUE REF	
C4	ANALOG OUTPUT 2	– flux current – flux output – flux ref – flux voltage – frequency out – mtr overload – power output – pretorque ref – slip freq	– speed error – speed feedbk – speed ref – tach rate cmd – torq current – torq voltage – torque output – torque ref – voltage out	SPEED FEEDBK	

Quick Reference Parameters

Sub menu	Parameter	Units
D1	***Elevator Data D1 Submenu***	
D1	Speed Command	ft/min or m/s
D1	Speed Reference	ft/min or m/s
D1	Speed Feedback	ft/min or m/s
D1	Speed Error	ft/min or m/s
D1	Pre-Torque Ref	% of rated torque
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	Logic Outputs	1 = true; 0 = false
D1	Logic Inputs	1 = true; 0 = false
D2	***Power Data D2 Submenu***	
D2	Torque Reference	% of rated torque
D2	Motor Current	Amps
D2	% Motor Current	% rated current
D2	Motor Voltage	Volts
D2	Motor Frequency	Hz
D2	Motor Torque	% rated torque
D2	Power Output	kW
D2	DC Bus Voltage	Volts
D2	Flux Reference	%
D2	Flux Output	%
D2	Slip Frequency	Hz
D2	Motor Overload	%
D2	Drive Overload	%
D2	Flux Current	%
D2	Torque Current	% rated current
D2	Flux Voltage	% rated volts
D2	Torque Voltage	% rated volts
D2	Base Impedance	Ohms
D2	Est No Load Curr %	%
D2	Est Rated RPM	Rpm

Sub menu	Parameter	Site Setting
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 Dflts	
U5	Restore Drive Dflts	
U6	***Drive Info U6 Submenu***	
U6	Drive Version	
U6	Boot Version	
U6	Cube ID	
U6	Drive Type	
U7	***Hex Monitor U7 Submenu***	
U7	Address	
U8	***Language Sel***	
U8	Language Select	
U9	***Basics***	
U9	Operation	
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	-

Drive Specifications

Power Ratings

- 208/230 Volt AC input:
  7.5, 10, 15, and 20 HP (North American)
- 460 Volt AC input:
  10, 15, 20, and 25 HP (North American)
- 400 Volt AC input:
  4, 5.5, 7.5, 11, 15, 18.5,
  and 22 kW (European)
- 150% of continuous current rating
  for 60 seconds
- 200% of continuous current rating
  for 5 seconds

Input Power

- Nominal Voltage Levels:
  - 200-240 VAC, 3-phase, ± 10%
    (North American)
  - 380-480 VAC, 3-phase, ± 10%
    (North American)
  - 380-440 VAC, 3-phase –15, +10%
    (European)
- Frequency: 48 - 63 Hz
- Line Impedance: 3% without choke / 1%
  with choke

Output Power

- Voltage: 0 - Input Voltage
- Frequency: 0 - 120 Hz
- Carrier Frequency: 2.5 kHz - 16 kHz

Digital Inputs

- Nine (9) programmable opto-isolated
  logic inputs.
- Internal 24VDC power supply:
  200-250mA*capacity (do not exceed
  250mA)
  * except for –4011 and –4015
  which have a 100mA capacity
- Voltage: 24VDC (internal or external)
- Sinking Current: 9 mA
- Scan Rate: 2 msec.
- Update Rate: 4 msec.

Digital Outputs

Two (2) programmable Form-C relays.

- 2A at 30VDC / 250VAC (inductive load)
- Update Rate: 2 msec.

Four (4) programmable opto-isolated open collectors.

- Voltage: 50 Volts DC (max.)
- Capacity: 150 mA
- Update Rate: 2 msec.

Analog Input

One differential input.

- Voltage: ± 10 Volts DC
- Resolution: 12 Bit
- Software gain and offset available
- Update Rate: 2 msec.

Analog Outputs

with optional analog output option card

Two (2) programmable differential outputs.

- Voltage: ± 10 Volts DC
- Capacity: 10 mA
- Resolution: 12 Bit
- Update Rate: 2 msec.

Encoder Feedback

with optional incremental encoder option card

- Supply Voltage: 12VDC or 5VDC
- Capacity: 150mA
- PPR: 600 - 10,000
- Maximum Frequency: 300 kHz
- Input: 2 channel quadrature
  5 or 12 volts dc differential
  (A, /A, B, /B)

Design Features

- DC Bus Choke: Connections for optional
  external DC Bus Choke*
  * except for –4034, –4039, –4047, –4057,
  and –2060
  which have an external DC Bus Choke
- Internal Dynamic Brake IGBT:
  Connections for external Dynamic Brake
  Resistor

Environmental

- Operating ambient air temperature range -
  10°C (14°F) to 50°C (120°F)
- Altitude 1000m (3300 ft) without derating
- Relative humidity 95% (non-condensing)
- Environment: protected from corrosive
  gases; conductive dust
- Vibration: 0.5g

Standards

- CSA (North American Models)
- CE (European Models)

Drive Derating

Altitude Derating

Control ratings apply to 1000 meters (3300 feet) altitude without derating. For installations at higher altitudes, derate both the continuous and peak current levels 5% for each 300 m (1000 ft) above 1000 m (3300 ft).

Derating for Carrier Frequency

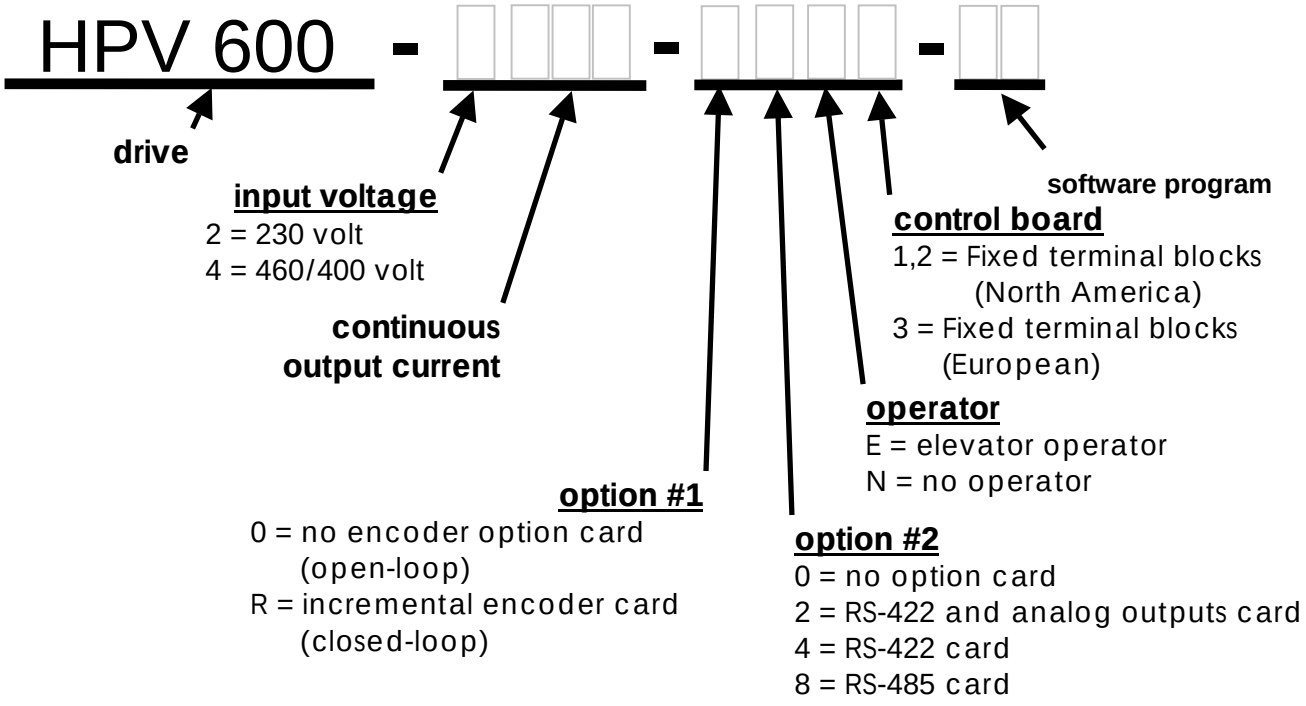
Control ratings apply for carrier frequencies up to and including 10 kHz. Above that linearly derate both the continuous and peak current levels by 5% for each 1kHz.

Derating for Single Phase Input Power

For single-phase input power, derate both the continuous and peak current levels by 50%.

Drive Model Number

The HPV 600 nameplate contains the model number, which provides complete identification of the drive.

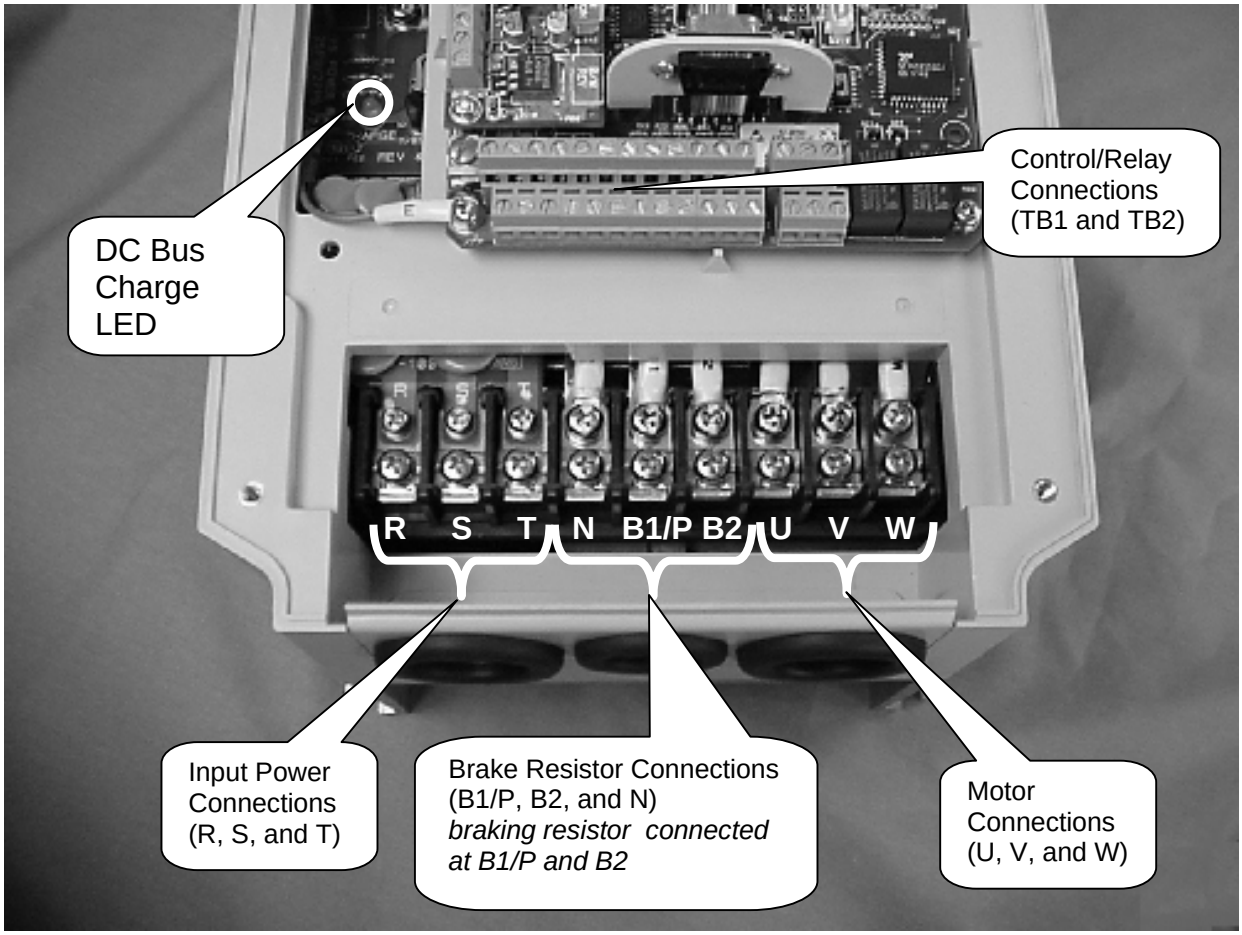


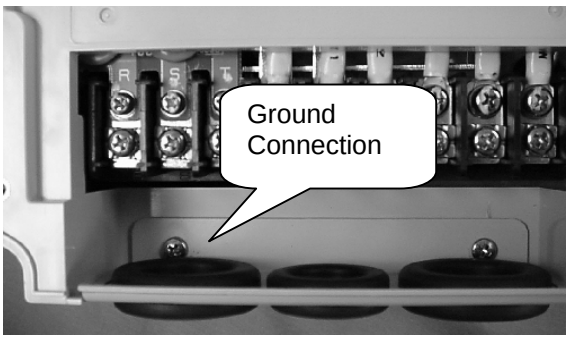
HPV 600 Model Numbers

-

Terminals

Terminal Layout A-cube





Remember when servicing the HPV 600: 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.

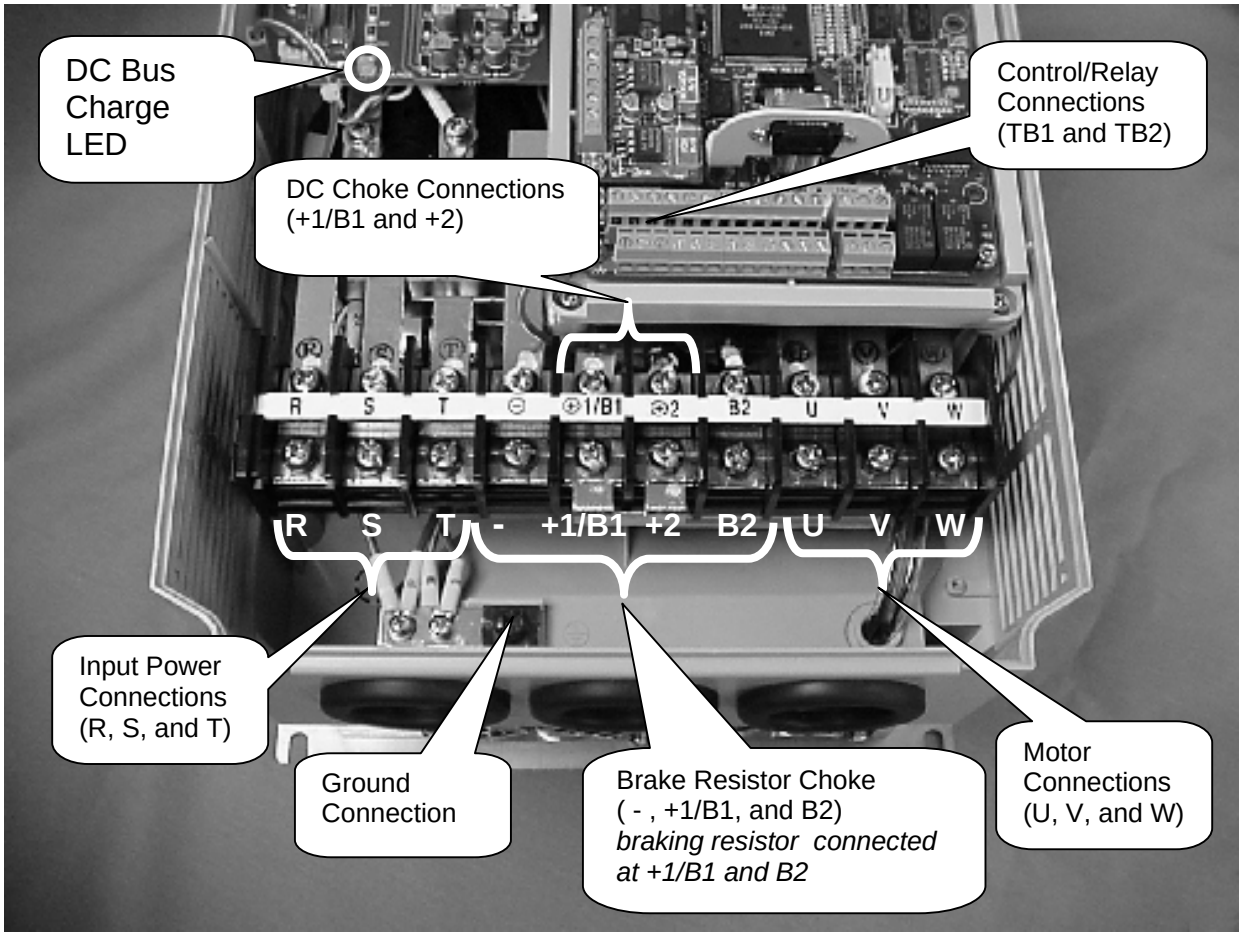
NEVER attempt maintenance unless:

- the incoming three phase power (460 or 230VAC) is disconnected and locked out.
- also, ensure the DC Bus charge light is out.
- even with the light out, we recommend that you use a voltmeter between (N) and (P) to verify no voltage is present.

CAUTION: Before continuing, ensure the DC Bus Charge LED is not illuminated.

IMPORTANT: Take ESD precautions, devices within the drive are sensitive to static damage.

Terminal Layout B-cube



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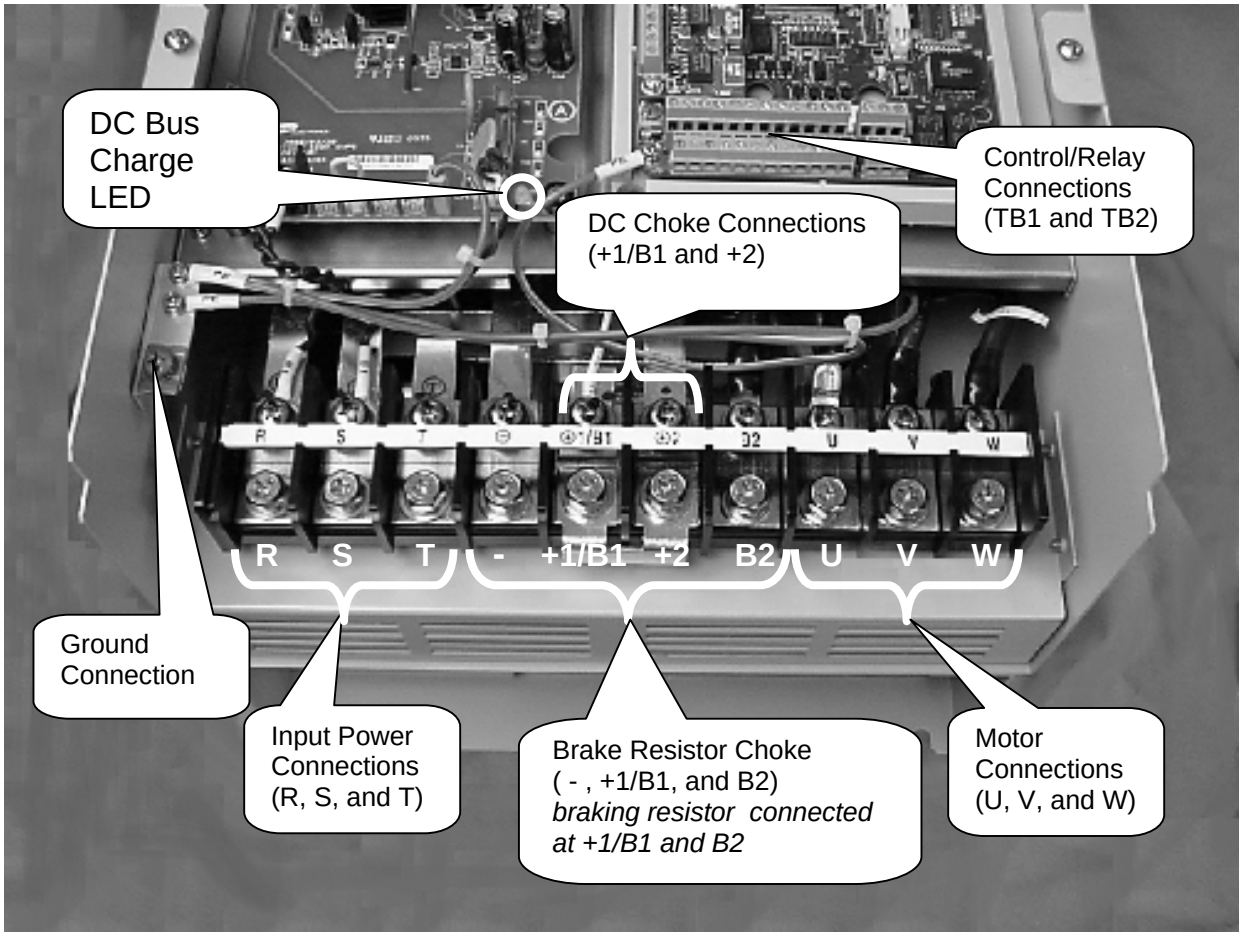
Terminal Layout C-cube



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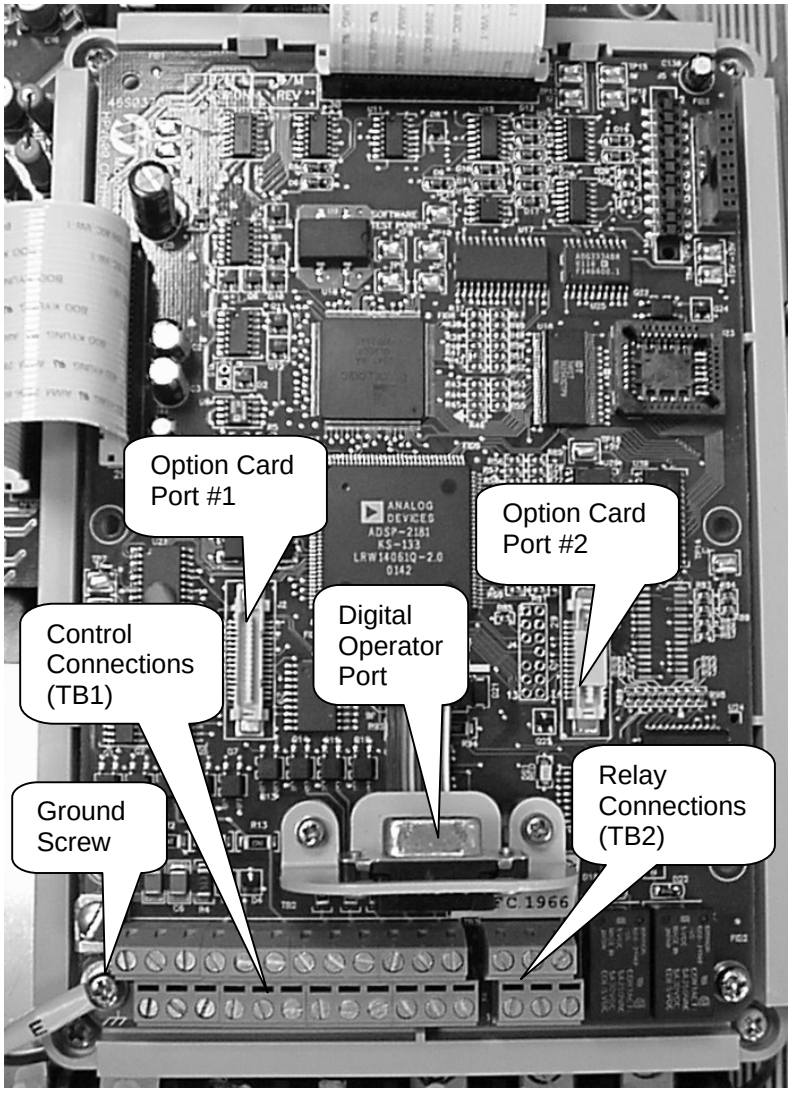
Control Board Layout



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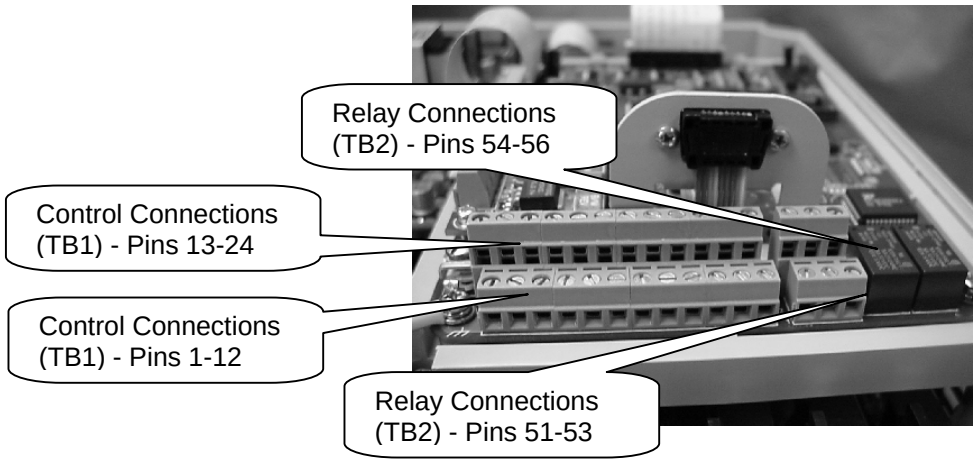
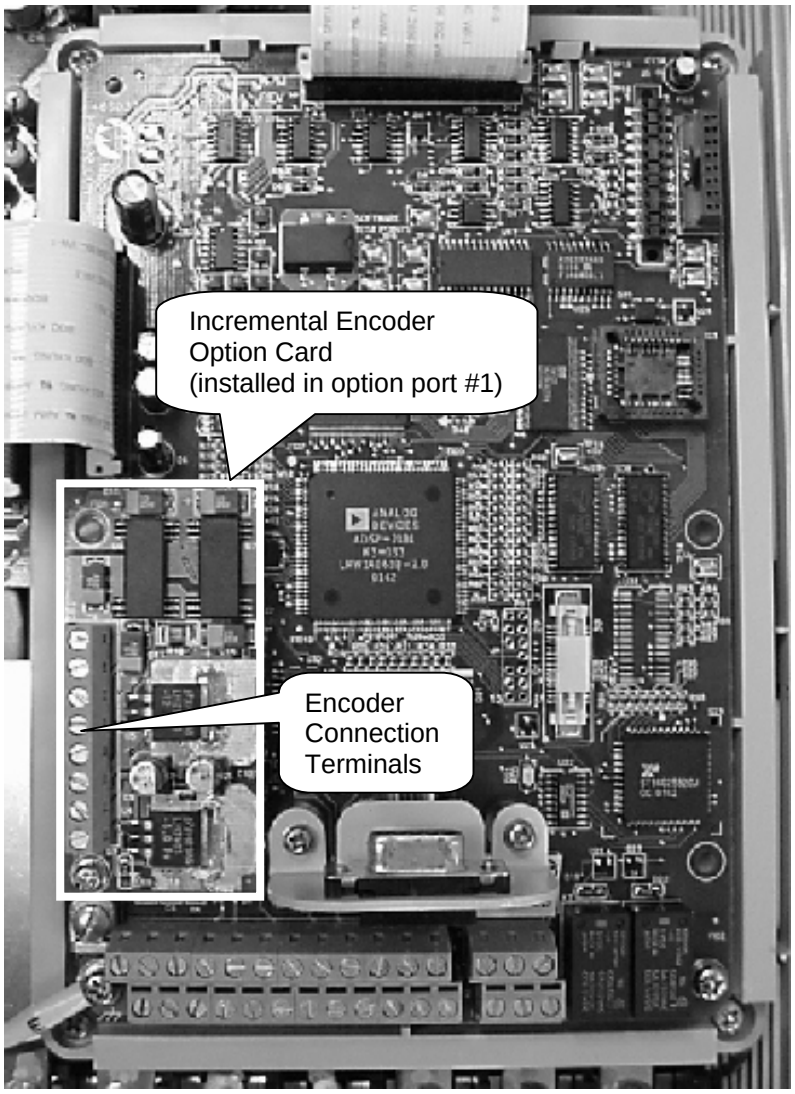


Incremental Encoder Option Card



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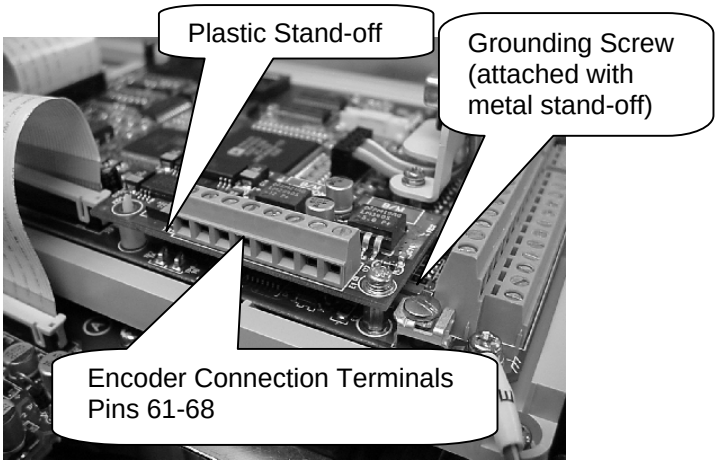
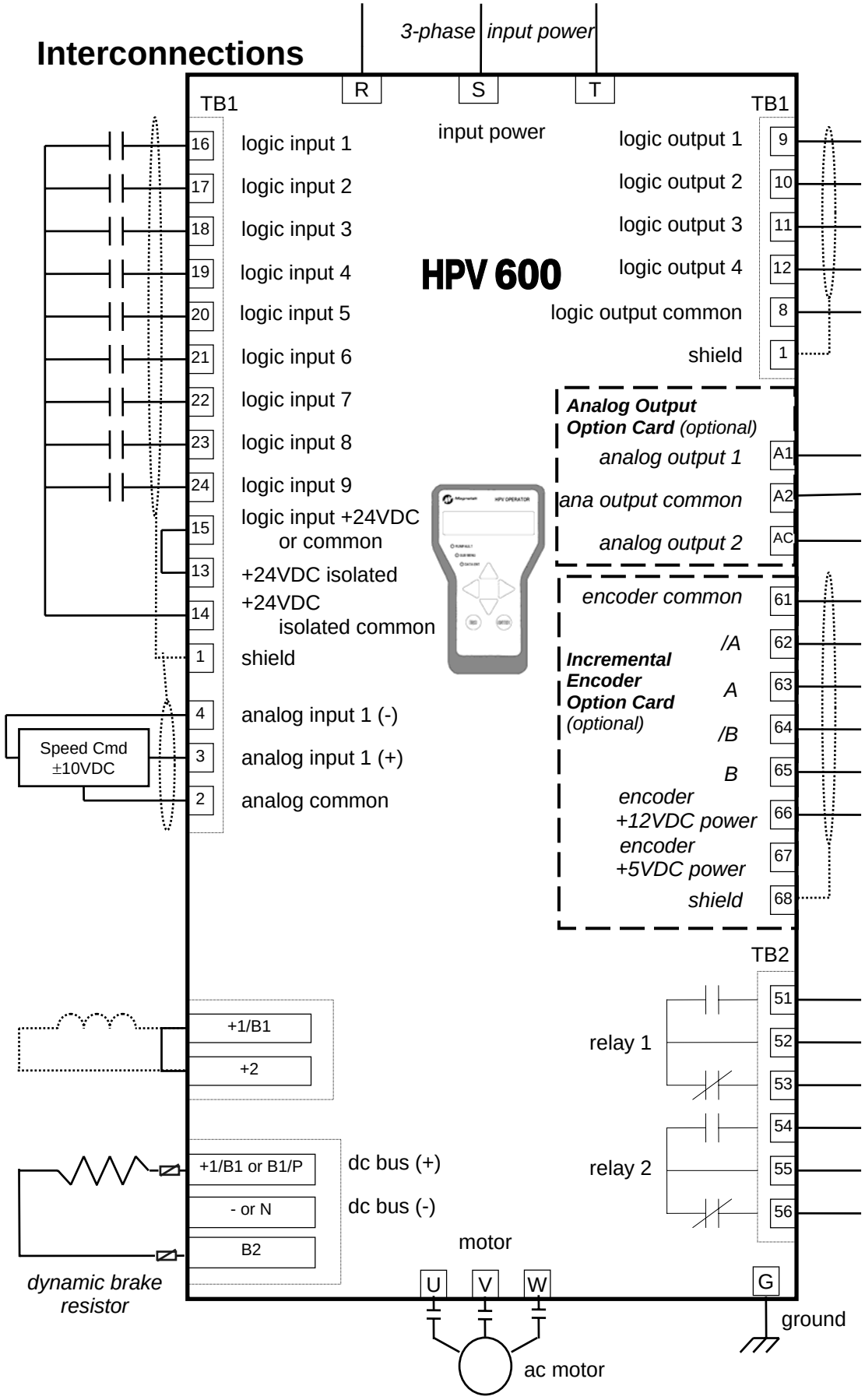


Interconnections



Details

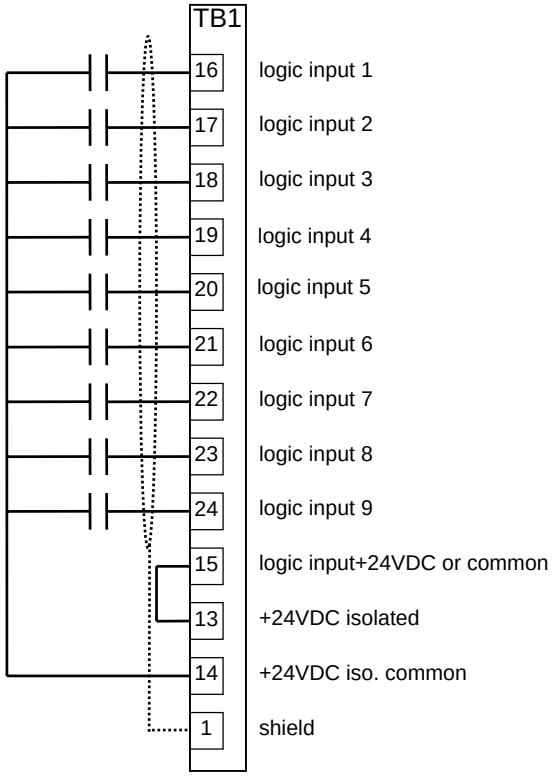
Logic Inputs

The HPV 600's nine programmable logic inputs are opto-isolated. The inputs become "true" by closing contacts or switches between the logic input terminal and voltage source common (or voltage source). The voltage supply for the logic inputs is 24VDC.

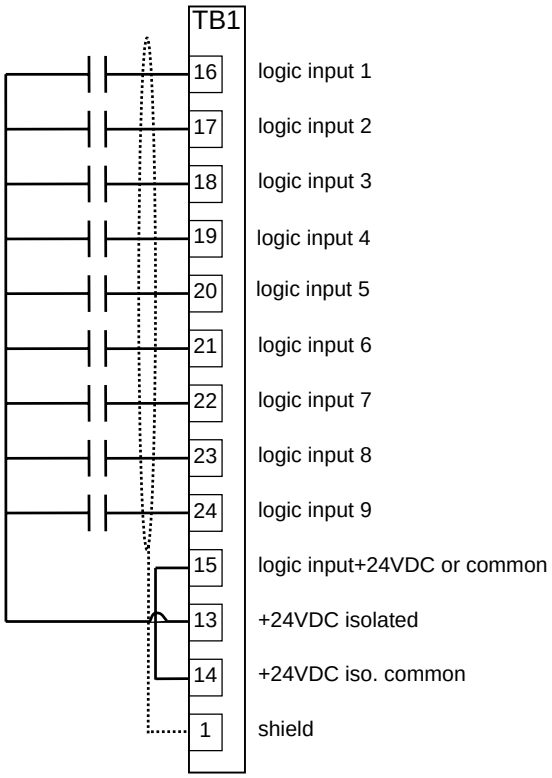
IMPORTANT

Internal 24VDC power supply has a capacity of 100 mA

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.

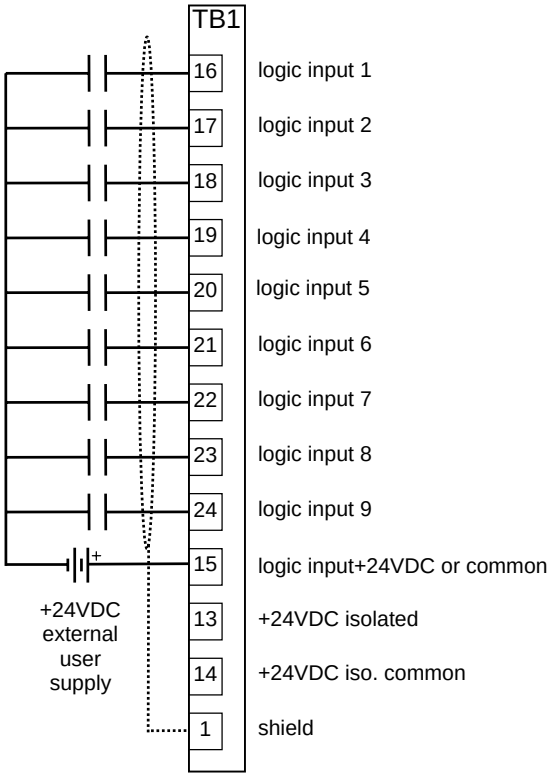


Sinking Logic Inputs (Internal Supply)

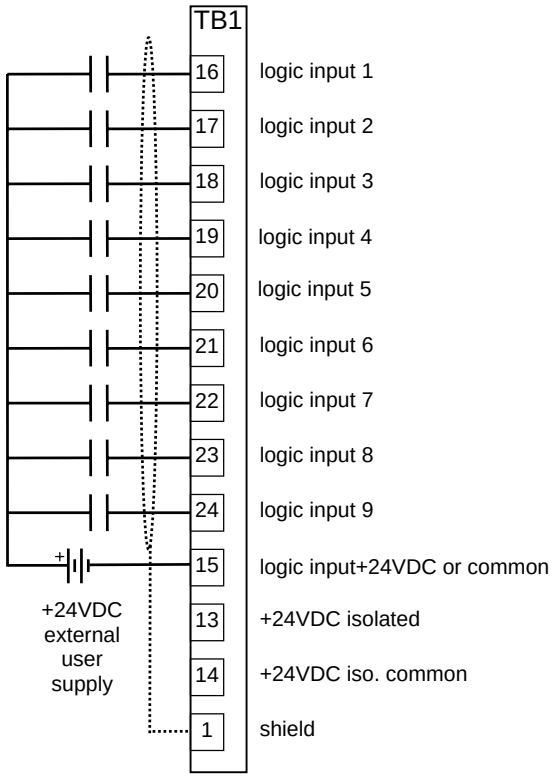


Sourcing Logic Inputs (Internal Supply)

Below shows the connection for using the external voltage supply.



Sinking Logic Inputs (External Supply)



Sourcing Logic Inputs (External Supply)

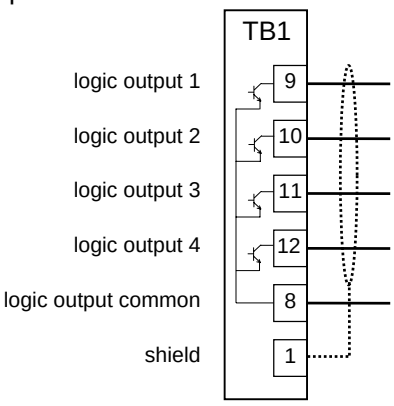
The logic inputs have a current rating of 9mA.

The switches or contacts used to operate the logic inputs may be replaced by logic outputs from a PLC or car controller. If the outputs are open collector, the PLC or car controller ground needs to be connected to the proper voltage source common.

Logic Outputs

The HPV 600's four programmable logic outputs are opto-isolated. The outputs are normally open and can withstand an applied maximum voltage of 50VDC. When the outputs become "true", the output closes and are capable of sinking up to 150mA between the logic output terminal and the logic output common

HPV 600 Control Boards with the part number (46S04010-xxxx) have four open collector logic outputs.



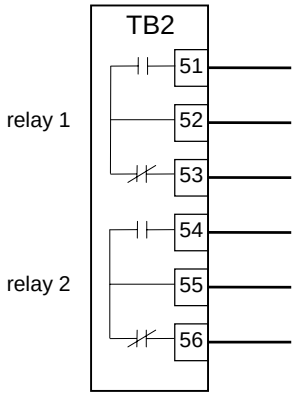
Logic Outputs (46S04010-xxxx)

Relay Outputs

The HPV 600's two programmable relay logic outputs are Form-C relays. They have both normally open and normally closed contacts.

The specifications for each relays are as follows: 2A at 30VDC / 250VAC (inductive load)

Below shows the logic output terminals.



Relay Outputs

Encoder

The HPV 600 has an incremental encoder option card that has connections for an incremental two-channel quadrature encoder. The drive's encoder circuitry incorporates resolution multiplication and complimentary outputs.

Encoder Wiring

Use twisted pair cable with shield tied to chassis ground at drive end, in order to minimize magnetic and electrostatic pick-up current and to minimize radiated and conducted noise.

Reasonable care must be taken when connecting and routing power and signal

wiring. Radiated noise from nearby relays (relay coils should have R/C suppressors), transformers, other electronic drives, etc. may be induced into the signal lines causing undesired signal pulses.

Power leads and signal lines must be routed separately. Signal lines should be shielded, twisted and routed in separate conduits or harnesses spaced at least 12 inches apart from power wiring. This protects the cable from physical damage while providing a degree of electrical isolation. Also, do not run cable in close proximity to other conductors, which carry current to heavy loads such as motors, motor starters, contactors, or solenoids. Doing so could result in electrical transients in the encoder cable, which can cause undesired signal pulses. Power leads are defined as the transformer primary and secondary leads, motor leads and any 120 VAC or above control wiring for relays, fans, thermal protectors, etc.

Continuity of wires and shields should be maintained from the encoder through to the controller avoiding the use of terminals in a junction box. The shield and shield drain wires must be insulated from other objects. This helps to minimize radiated & induced noise problems and magnetically induced ground loops.

Always use an encoder with complementary output signals. Connect with twisted-pair shielded wire so that wire-induced currents will self-cancel.

NOTE: DO NOT ground the encoder through both the machine and the cable wiring. Connect the shield at the receiver device only. If the shield is connected at both ends, noise currents will flow through the shield and degraded performance will result.

HPV 600 Encoder Specifications

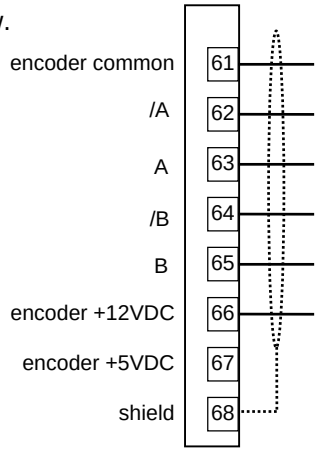
The HPV 600 requires the use of an encoder coupled to the motor shaft. The encoder power can be either a 5VDC or 12VDC supply. The capacity of each 5VDC or 12VDC power supply is 150mA.

The HPV 600 can accept encoder pulses of:

- 600 to 10,000 pulses per revolution (ppr)
- a maximum frequency of 300kHz

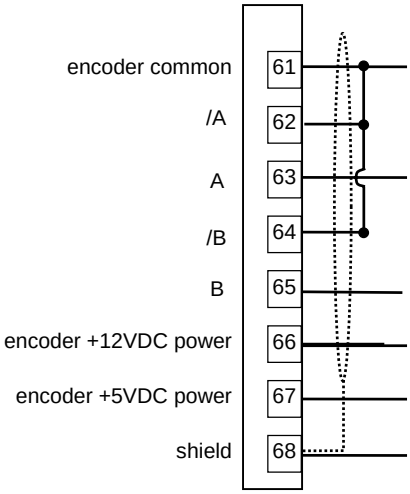
IMPORTANT

Motor phasing should match the encoder feedback phasing. If the phasing is not correct, the motor will not accelerate up to speed. It will typically oscillate back and forth at zero speed, and the current will be at the torque limit. Swapping A and /A or switching two motor phases should correct this situation. The encoder pulses per revolution must be entered in the ENCODER PULSES parameter. The encoder connection terminals are shown below.



Encoder Option Card 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 HPV 600 encoder noise immunity circuitry is not in effect.



Single-ended Encoder Option Card Connections (pn46S03710-0020)

Analog Input

The HPV 600 has one non-programmable differential analog input channel that is reserved for the speed command (if used).

The analog input channel is bipolar and has a voltage range of ±10VDC.

Available with the analog channel is multiplier gain parameter (SPD COMMAND MULT) and bias parameter (SPD COMMAND 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.

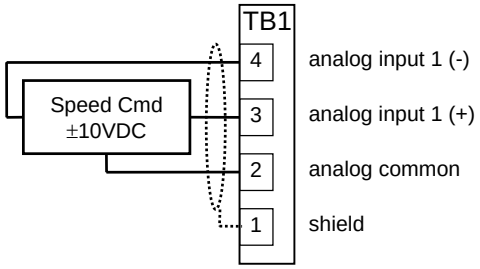
$$\left(\begin{array}{c}\textit{analog}\\ \textit{channel}\\ \textit{input}\\ \textit{voltage}\end{array} - \textit{BIAS}\right) \times \textit{MULT} = \begin{array}{c}\textit{signal}\\ \textit{drive}\\ \textit{software}\\ \textit{uses}\end{array}$$

The scaling of the analog input signal is as follows:

Speed Command
+10VDC = positive contract speed
-10VDC = negative contract speed

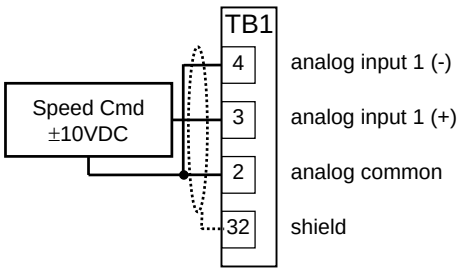
NOTE: The drive cannot recognize voltages outside of the ±10VDC on its analog input channels.

The HPV 600 provides common mode noise rejection with the differential analog inputs. The connection of these two inputs is shown.



Analog Inputs (Differential)

Below shows the connection for the analog inputs, if they are configured to be single ended. In this configuration, the HPV 600 noise immunity circuitry is not in effect.



Analog Inputs (Single Ended)

Analog Outputs

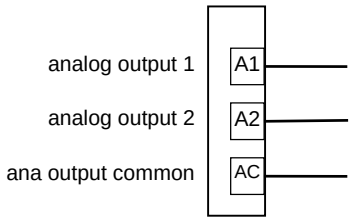
The HPV 600 has an analog output option card. The card contains two analog output channels designed for diagnostic help.

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

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.

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

The connection of these two inputs is shown below.



Analog Outputs
(via option card)

General Startup Procedure

The following is a recommended start-up procedure:

1. The HPV 600 is thoroughly tested at the factory. Verify the drive has been installed without shipping and installation damage.
2. Review the HPV 600 technical manual, shipped with the drive.
3. Verify the proper drive model numbers and voltage ratings as specified on the purchase order.
4. Verify the drive has been installed in accordance with the guidelines detailed below:

Location of the HPV 600 is important for proper operation of the drive and normal life expectancy. 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.
- Mount control vertically using mounting holes provided by Magnetek.
- Allow at least 7cm (2.5 in) clearance above and at least 7 to 13 cm (2.5 to 5 in) clearance below the unit.
- Allow at least 3 cm (1 in) clearance to either side of the drive.
- Separate grounded metal conduit is required for input, output and control wiring.

The unit should be installed in an open ventilated area where free air can be circulated around the control. The installation should comply with the following:

- When necessary, the cooling should be provided by using filtered air.
- If the cooling air coming inside the control cabinet contains airborne dust, filter the incoming air as required and clean the cooling surface of the HPV 600 regularly using compressed air and a brush. An unclean heatsink operates at an efficiency less than that of cooling design specifications. Therefore, drive may fault on thermal protection if heatsink is not cleaned periodically.

5. Inspect the security of the supply line power, ground connections, and all control circuit connections. Ensure that the main circuit input/output precautions are observed. Also, ensure that the control circuit precautions are observed.

Observe the following precautions:

- Use 600V vinyl sheathed wire or equivalent. Wire size should be determined considering voltage drop of leads.
- Never connect main AC power to the output terminals: U, V, and W.
- Never allow wire leads to contact metal surfaces. Short circuit may result.
- SIZE OF WIRE MUST BE SUITABLE FOR CLASS I CIRCUITS.
- Motor lead length should not exceed 45m (150 ft) and motor wiring should be run in a separate conduit from the power wiring. If lead length must exceed this distance, contact Magnetek for proper installation procedures.
- Use UL/CSA certified connectors sized for the selected wire gauge. Install connectors using the specified crimping tools specified by the connector manufacturer.
- Use twisted shielded or twisted-pair shielded wire for control and signal circuit leads. The shield sheath MUST be connected at the HPV 600 ONLY. The other end should be dressed neatly and left unconnected (floating).
- Control wire size should be determined considering the voltage drops of the leads.
- Control wire lead length should not exceed 45m (150 ft). Signal leads and feedback leads should be run in separate conduits from power and motor wiring.

6. Verify that the input voltage matches the drive's rating.
7. Verify that the motor is wired for the application voltage and amperage.
8. Tighten all of the three-phase power and ground connections. Check that all control and signal terminations are also tight. As they sometimes come loose during the shipment process.

Pre-Power Check

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

- 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 that all transformers are connected for proper voltage.

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

IMPORTANT: Insure the incoming line supply IS CONNECTED to the drive INPUT TERMINALS R, S, & T and NOT to the output motor terminals U, V, & W.

9. Insure the DC Choke link is in place, if a DC choke is NOT used.
10. Insure a Dynamic Braking Resistor is connected to the drive, see page 154.
11. Measure and verify transformer primary and secondary volts
12. Check for balanced Vac from phase to ground.
13. Verify the accuracy of the drive's input line-to-line voltage in parameter INPUT L-L VOLTS (A4)

NOTE: The INPUT L-L VOLTS (A4) parameter helps to determine the DC bus undervoltage alarm/fault level.

This completes the recommended general start-up procedure. Please refer to the specific open or closed-loop start-up procedure.

Parameters

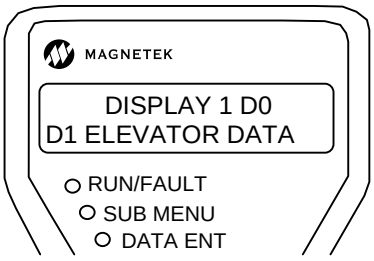
Parameter Introduction

This section describes the parameter menu structure; how to navigate this menu structure via the HPV 600 digital operator; 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

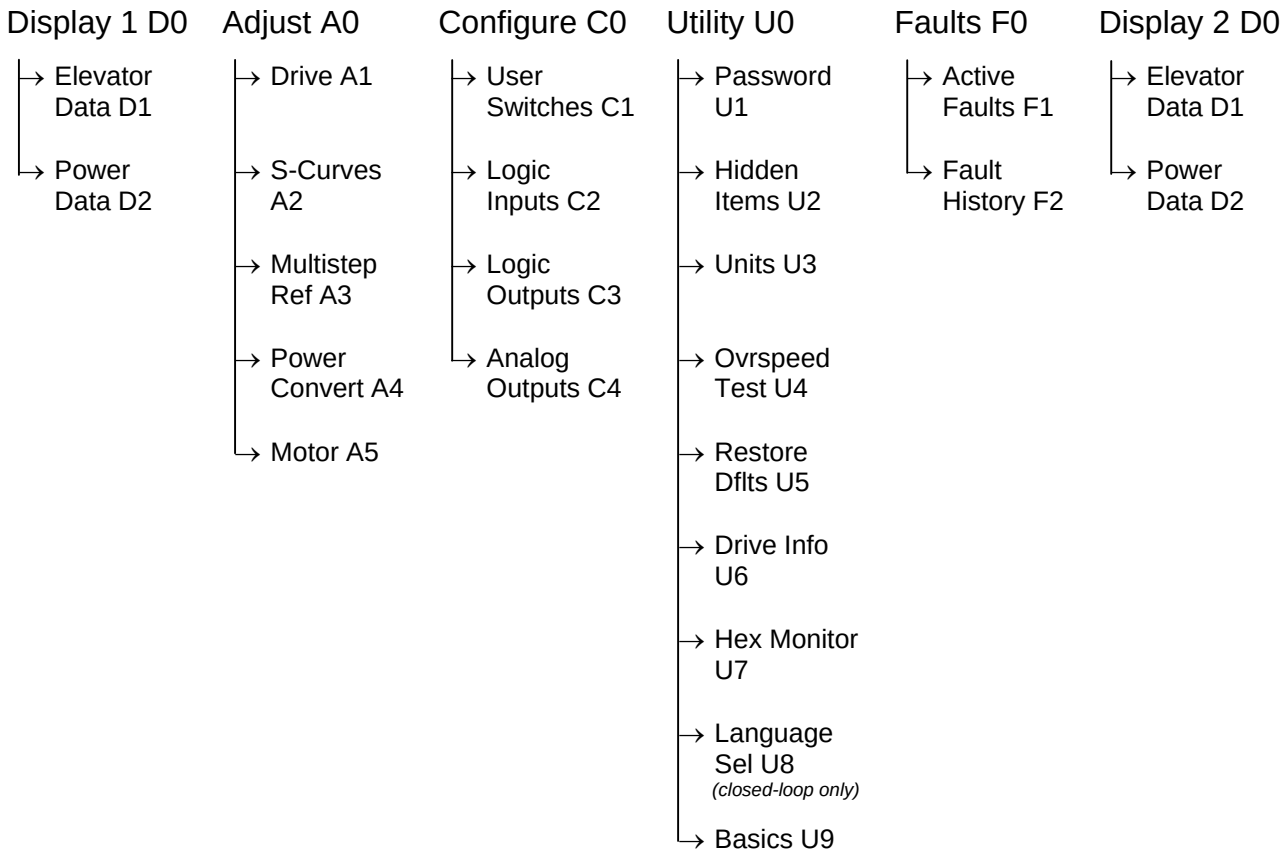
When the SUB-MENU LED is *not* lit , the currently selected menu is shown on the top line of the Digital Operator display and the currently selected sub-menu is shown on the bottom line of the Digital Operator display.



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

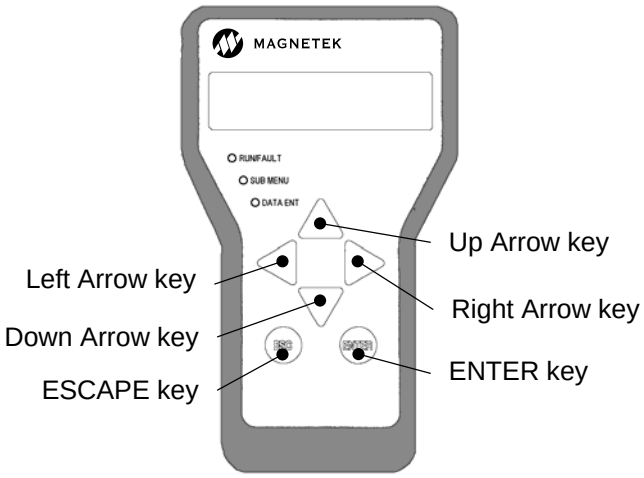


Menu/Sub-Menu Tree

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:

1) The up arrow key.
2) The down arrow key.
3) The left arrow key.
4) The right arrow key.
5) The “ENTER” key.
6) The “ESCAPE” key.

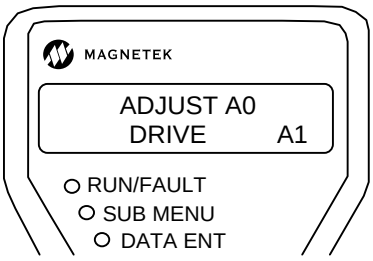


Digital Operator Keys

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 is reached (either up, down, left or right), pressing the same key will cause a wrap around.

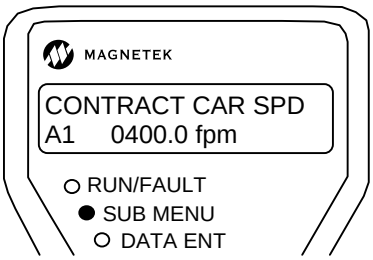


Each menu will remember the last accessed sub-menu. The left and right arrow keys will navigate between these last active sub-menus. This remembrance of last active sub-menu is volatile and will be lost at power down.

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

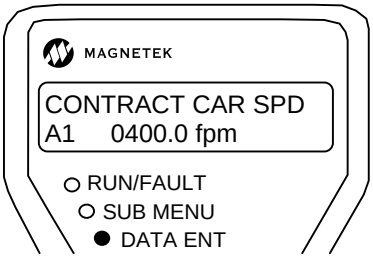
When in the sub-menu level, the SUB-MENU LED on the digital operator is lit. At the sub-menu level, the positioning keys work slightly different than they did at the menu level. The up and down arrow keys now select separate items in the sub-menu.



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 functions of keys are redefined. The “ESCAPE” key remains as the key used to move back to the higher level (in this case 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.

Closed Loop Parameters

Display D0

→ Elevator Data D1

- Speed Command
- Speed Reference
- Speed Feedback
- Speed Error
- Pre-Torque Ref
- Spd Reg Torq Cmd
- Tach Rate Cmd
- Aux Torque Cmd
- Est Inertia
- Rx Com Status
- Logic Inputs
- Logic Outputs

→ Power Data D2

- Torque Reference
- Motor Current
- % Motor Current
- Motor Voltage
- Motor Frequency
- Motor Torque
- Power Output
- DC Bus Voltage
- Flux Reference
- Flux Output
- Slip Frequency
- Motor Overload
- Drive Overload
- Flux Current
- Torque Current
- Flux Voltage
- Torque Voltage
- Base Impedance
- Est No Load Curr
- Est Rated RPM

Adjust A0

→ Drive A1

- Contract Car Spd
- Contract Mtr Spd
- Response
- Inertia
- Inner Loop Xover
- Gain Reduce Mult
- Gain Chng Level
- 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
- Spd Dev Lo Level
- Spd Dev Time
- Spd Dev Hi Level
- Spd Command Bias
- Spd Command Mult
- Pre Torque Bias
- Pre Torque Mult
- Zero Speed Level
- Zero Speed Time
- Up/Dwn Threshold
- Mtr Torque Limit
- Regen Torq Limit
- Flux Wkn Factor
- Ana Out 1 Offset
- Ana Out 2 Offset
- Ana Out 1 Gain
- Ana Out 2 Gain
- Flt Reset Delay
- Flt Resets/Hour
- Up To Spd. Level
- Mains Dip Speed
- Run Delay Timer
- Ab Zero Spd Lev
- Ab Off Delay
- Contactor Do Dly
- Trq Lim Msg Dly
- Ser2 Insp Spd
- Ser2 Rs Crp Spd
- Ser2 Rs Cpr Time
- Ser2 Flt Tol
- Rollback Gain
- Notch Filter Frq
- Notch Filt Depth
- Mspd Delay 1
- Mspd Delay 2
- Mspd Delay 3
- Mspd Delay 4
- At Mid Speed

→ 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

→ Power Convert A4

- Id Reg Diff Gain
- Id Reg Prop Gain
- Iq Reg Diff Gain
- Iq Reg Prop Gain
- PWM Frequency
- UV Alarm Level
- UV Fault Level
- Extern Reactance
- Input L-L Volts

→ Motor A5

- Motor Id
- Rated Mtr Power
- Rated Mtr Volts
- Rated Excit Freq
- Rated Motor Curr
- Motor Poles
- Rated Mtr Speed
- % No Load Curr
- Stator Leakage X
- Rotor Leakage X
- Stator Resist
- Motor Iron Loss
- Motor Mech Loss
- Ovld Start Level
- Ovld Time Out
- Flux Sat Break
- Flux Sat Slope 1
- Flux Sat Slope 2

Configure C0

→ User Switches C1

- Spd Command Src
- Run Command Src
- Hi/Lo Gain Src
- Speed Reg Type
- Motor Rotation
- Spd Ref Release
- Cont Confirm Src
- PreTorque Source
- PreTorque Latch
- PTorq Latch Clck
- Fault Reset Src
- Overspd Test Src
- Brake Pick Src
- 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
- Fast Flux
- Mains Dip Ena
- Db Protection
- Encoder Fault
- Stopping Mode
- Motor Ovrld Sel
- Auto Stop
- Serial Mode
- Ser2 Flt Mode
- Drv Fast Disable
- Mlt-Spd To Dly1
- Mlt-Spd To Dly2
- Mlt-Spd To Dly3
- Mlt-Spd To Dly4

→ Logic Inputs C2

- Logic Input 1
- Logic Input 2
- Logic Input 3
- Logic Input 4
- Logic Input 5
- Logic Input 6
- Logic Input 7
- Logic Input 8
- Logic Input 9

→ Logic Outputs C3

- Logic Output 1
- Logic Output 2
- Logic Output 3
- Logic Output 4
- Relay Coil 1
- Relay Coil 2

→ Analog Outputs C4

- Analog Output 1
- Analog Output 2

Utility U0

→ Password U1

- New Password
- Enter 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

→ Drive Info U6

- Drive Version
- Boot Version
- Cube ID
- Drive Type

→ Hex Monitor U7

- Address

→ Language Sel U8

- English
- Deutsch (German)

→ Basics U9

- Operation

Faults F0

→ Active Faults F1

- Display Active Faults
- Reset Active Faults

→ Fault History F2

- Display Fault History
- Clear Fault History

Closed-Loop Startup Procedure

The following is a recommended closed-loop start-up procedure:

Encoder Set-up

1) Verify the incremental encoder option card has been installed correctly. And the encoder has been selected and installed in accordance with the following:

   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 Considerations
   - If possible, insulate both the encoder case and shaft from the motor.
   - 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.
   - Use the proper encoder supply voltage and use the highest possible voltage available. (i.e. HPV 600 - 12VDC preferred)

   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.

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

Motor Parameter Set-up

3) Select one of the two default motors (either 4 or 6 pole) for the MOTOR ID (A5) parameter (or select a valid motor ID, if available).

   Enter / Verify the following from the motor's nameplate:
   - Motor HP or KW rating (RATED MTR POWER(A5))
   - Motor Voltage (RATED MTR VOLTS(A5))
   - Motor Excitation Frequency in Hz (RATED EXCIT FREQ(A5))
   - Rated Motor current (RATED MOTOR CURR(A5))
   - Number of Motor Poles (MOTOR POLES(A5))
   - Rated Motor Speed at full load in RPM (RATED MTR SPEED(A5))

Hoistway Parameter Set-up

4) Enter / Verify The hoistway parameters:
   - CONTRACT CAR SPD (A1) parameter programs the elevator contract speed in ft/min or m/s.
   - CONTRACT MTR SPD (A1) parameter programs the motor speed at elevator contract speed in RPM.

   NOTE: The above two parameters create the interaction that allow engineering units to be used throughout the HPV 600 software.

Low speed inspection mode

5) Run the drive in low speed inspection mode and…
   - Start with default values for INERTIA (A1) and % NO LOAD CURR (A5) parameters.
   - Verify encoder polarity… the motor phasing should match the encoder phasing. *Common failure mode: Encoder Fault with Hit Torque Limit Alarm.*
   - Verify proper hoistway direction…can be reversed with the MOTOR ROTATION (C1) parameter.
   - Verify that the Safety Chain / Emergency Stop works

High-speed mode

6) Run the drive in high speed mode and…
   - Follow the Adaptive Tune procedure
   - Follow the Estimating System Inertia procedure

This completes the recommended closed-loop start-up procedure. It is strongly recommended that the user complete the Adaptive Tune procedure on page **Error! Bookmark not defined.**.

Closed-Loop Adaptive Tune

The adaptive tune automatically calculates, under certain operating conditions, the percentage no load current and the rated rpm (slip frequency). The HPV 600 software uses these two adaptive tune calculated values to obtain the maximum performance from the motor.

Adaptive Tune Operating Conditions
The HPV 600 software estimates the motor's percent no load current and the motor's rated rpm. These estimated values are only estimated around a window of ±25% of the parameter settings for:

- percent no-load current (% NO LOAD CURR)
- rated motor speed (RATED MTR SPEED)

The adaptive tune will estimate:

- the motor's percent no load current when the motor torque is below 20%.
- the motor's rated rpm when the motor torque is above 30%.

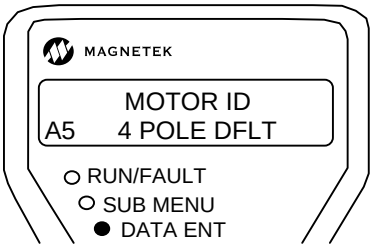
Using the Adaptive Tune to Obtain Maximum Motor Performance

The following is a step-by-step procedure to optimize the window around which the adaptive tune will estimate its two values.

NOTE: Although the listed speeds are recommended, the adaptive tune procedure can be ran initially at lower speeds, as long as the speed is greater than 10% of contract speed.

Initial Set-up

Select a valid Motor ID or one of the two default motors (either 4 or 6 pole) for the MOTOR ID parameter

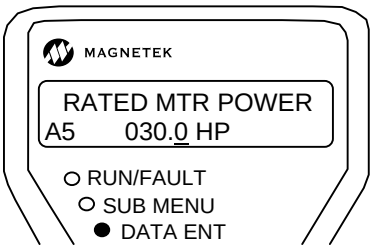


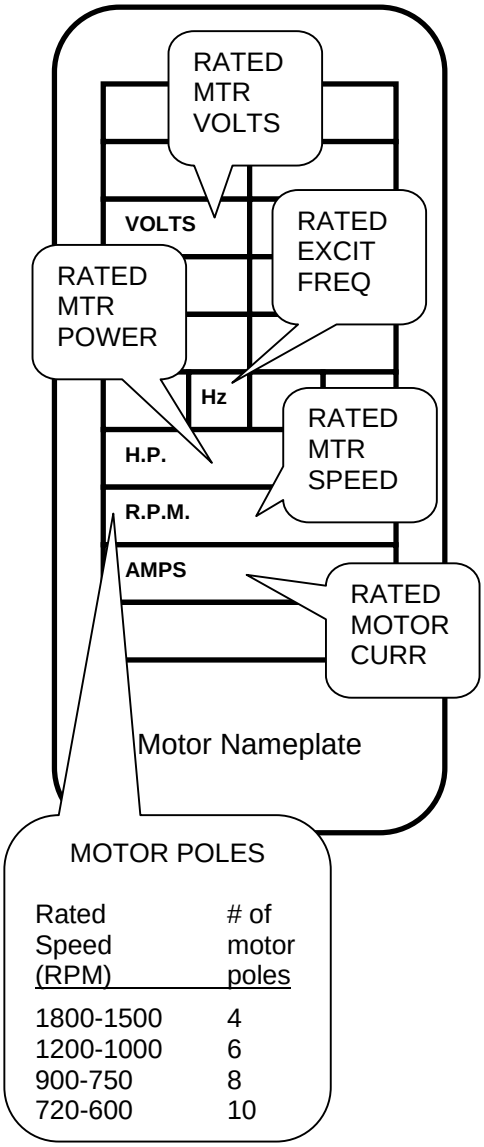
The default motor selections for the motor id will place a zero values in the motor nameplate parameters. This selection will also load nominal values for the other motor parameters listed below.

motor parameter	Motor ID	
	4 pole dflt	6 pole dflt
Rated Mtr Power	0.0 HP/KW	0.0 HP/KW
Rated Mtr Volts	0.0 V	0.0 V
Rated Excit Freq	0.0 Hz	0.0 Hz
Motor Mid Volts	0.0 V	0.0 V
Motor Mid Freq	0.0 Hz	0.0 Hz
Motor Min Volts	0.0 V	0.0 V
Motor Min Freq	0.0 Hz	0.0 Hz
Rated Motor Curr	0.0 A	0.0 A
Motor Poles	0	0
Rated Mtr Speed	0.0 rpm	0.0 rpm
% No Load Curr	35.00%	45.00%
Stator Leakage X	9.00%	7.50%
Rotor Leakage X	9.00%	7.50%
Stator Resist	1.50%	1.50%
Motor Iron Loss	0.50%	0.50%
Motor Mech Loss	1.00%	1.00%
Flux Sat Break	75%	75%
Flux Sat Slope 1	0%	0%
Flux Sat Slope 2	50%	50%

Motor ID Parameters

Now, enter the motor nameplate data into the needed motor nameplate parameters.





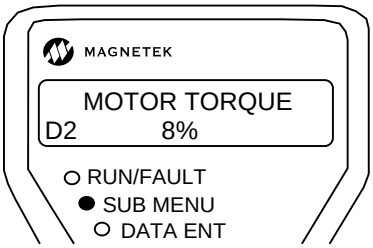
MOTOR POLES

Rated Speed (RPM)	# of motor poles
1800-1500	4
1200-1000	6
900-750	8
720-600	10

Tuning Motor No-Load Current

With a balanced car, run the car at 70% contract speed from top floor to the bottom floor then back to the top floor.

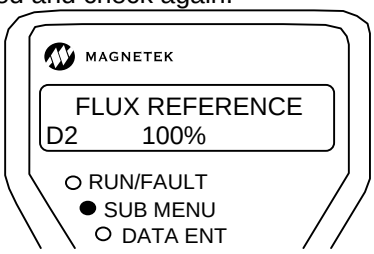
During these runs verify under DISPLAY MENU - POWER DATA D2 that the MOTOR TORQUE is between ±15%. If the value is larger then ±15% the car is not balanced correctly.



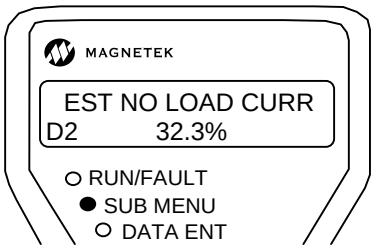
NOTE: If you are having problems getting the motor torque under 15% the cause may be:

- No compensation chains
  If the elevator system has no compensation chains, achieving balanced condition may be difficult. In that case, the MOTOR TORQUE should be between ±15% for as much of the run as possible.
- High elevator system friction
  If the elevator system has high friction, achieving motor torque of under 15% may be difficult. In that case, have less than the balance car weight in the car, thus letting the counterweight help to overcome the frictional losses. In this case, the you should look only at the estimated values in the up direction and run the car in the up direction a number of times before changing any parameter settings.

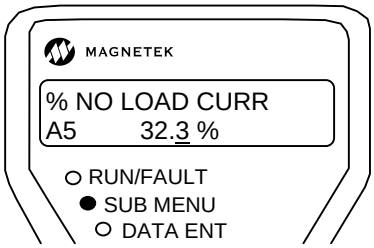
- Also, verify that the FLUX REFERENCE is 100%. If the value is not equal to 100% reduce the speed to less then 70% contract speed and check again.



- While still performing these top / bottom runs observe under DISPLAY MENU - POWER DATA D2 the EST NO LOAD CURR value.



Enter this estimated value into the motor parameter.

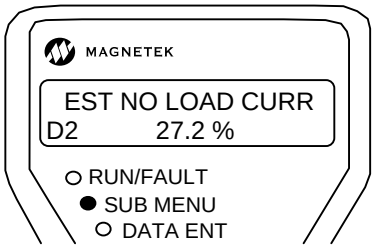


- Continue iterating the above two steps until the two values are within 2%. If the values do not converge after two iterations, verify the information entered in the initial set-up is correct.
- After the values converge, again verify the MOTOR TORQUE < 15% and the FLUX REFERENCE = 100%.

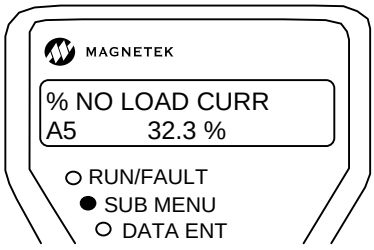
Tuning Motor's Flux Saturation Curve

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

- During these top / bottom runs observe under DISPLAY MENU - POWER DATA D2 the EST NO LOAD CURR value.

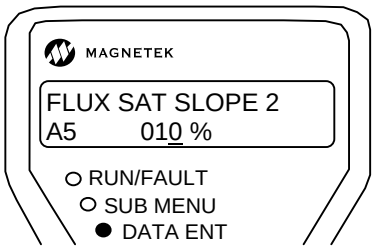


- Compare the displayed value EST NO LOAD CURR with the value entered for % NO LOAD CURR under the ADJUST MENU - MOTOR A5



If the EST NO LOAD CURR is 2% larger than the % NO LOAD CURR then, decrease the FLUX SAT SLOPE 2 by 10%.

- If the EST NO LOAD CURR is 2% smaller than the % NO LOAD CURR then, increase the FLUX SAT SLOPE 2 by 10%.



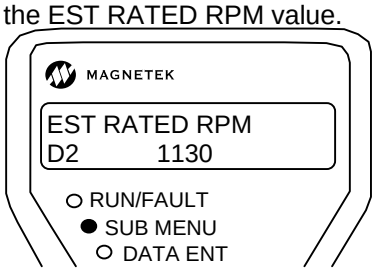
NOTE: If the EST NO LOAD CURR and % NO LOAD CURR are within 2% of each other, then continue on to Tuning the Rated Motor RPM. Continue iterating FLUX SAT SLOPE 2 in 10% increments until the EST NO LOAD CURR and % NO LOAD CURR are within 2% of each other.

NOTE: Remember change only the FLUX SAT SLOP 2 parameter DO NOT change any other parameter (these were fixed in the previous steps).

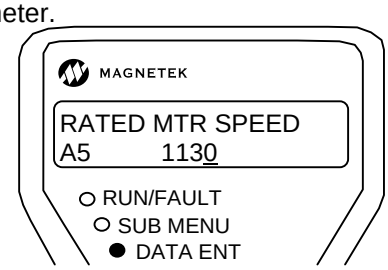
Tuning Rated Motor RPM

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

- During these top / bottom runs observe under DISPLAY MENU - POWER DATA D2 the EST RATED RPM value.



Enter this estimated value into the motor parameter.



Continue iterating the above to steps until the two values are within 3 RPM.
NOTE: Remember change only the RATED MTR SPEED parameter DO NOT change any other parameter (these were fixed in the previous steps).

Estimating System Inertia

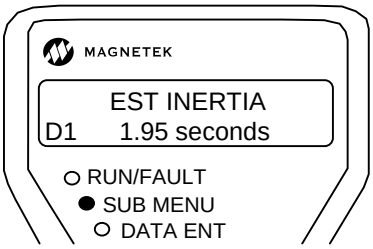
The HPV 600 software can be used to calculate the inertia of the entire elevator, which is used for accurate tuning of the speed regulator.

The following is a step-by-step procedure for using the HPV 600 to estimate the elevator system inertia.

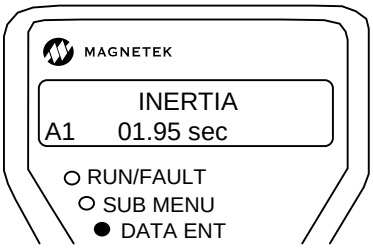
Using the Software to Estimate the System's Inertia

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

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.



Closed Loop Adjust A0 menu

Drive A1 submenu

Parameter	Description	Units	Range	Default	Hidden item	Run lock out
CONTRACT CAR SPD	(Contract Car Speed) This parameter programs the elevator contract speed in feet per minute (fpm) or meters per second (m/s).	**fpm**	**0.0 – 1500.0**	**100.0**	N	Y
		m/s	**0.000 – 8.000**	**2.000**		
CONTRACT MTR SPD	(Contract Motor Speed) This parameter programs the motor speed at elevator contract speed in revolutions per minute (rpm).	**rpm**	**50.0 –3000.0**	**1130.0**	N	Y
RESPONSE	(Response) This parameter 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 become jittery. If this number is too small, the motor will become sluggish.	**rad / sec**	**1.0 – 20.0**	**10.0**	N	N
INERTIA	(System Inertia) This parameter sets the equivalent of the system inertia in terms of the time it takes the elevator to accelerate to motor base speed at rated torque.	**sec**	**0.25 – 50.00**	**2.00**	N	N
INNER LOOP XOVER	(Inner Loop Cross Over) This parameter sets the inner speed loop cross over frequency. This parameter is only used by the Elevator Speed Regulator (Ereg).	**rad / sec**	**0.1 – 20.0**	**2.0**	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)	**%**	**10 - 100**	**100**	Y	N
GAIN CHNG LEVEL	(Gain Change Level) Speed level to change to low gain mode (only with internal gain switch). Units are in percent of rated speed. For more information, see Gain Chng Level on page 41.	**%**	**0.0 –100.0**	**100.0**	Y	N
TACH RATE GAIN	(Tach Rate Gain) This parameter can be used to help to reduce the effects of rope resonance. It should be adjusted only after the INERTIA (A1), and RESPONSE (A1) has been set correctly. The tach rate function is available for high performance systems that exhibit problems with rope resonance characteristics. This function subtracts a portion of the speed feedback derivative from the output of the speed regulator. The Tach Rate Gain parameter (TACH RATE GAIN (A1)) selects a unitless gain factor that determines how much of the derivative is subtracted.	**%**	**0.0 – 30.0**	**0.0**	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 used by the PI speed regulator.	**degs**	**45 – 90**	**80**	Y	N

Parameter	Description	Units	Range	Default	Hidden item	Run lock out
RAMPED STOP TIME	(Ramped Stop Time) This parameter is the time to ramp torque from rated torque to zero (only with torque ramp down stop function). For more information, see Ramped Stop Time on page 42.	**sec**	**0.00 – 2.50**	**0.20**	Y	N
CONTACT FLT TIME	(Contact Fault Time) When external logic outputs are used to control the closing of the motor contactor, this parameter sets the amount of time delay at start until the drive output is enabled and current flows. And when external logic inputs are used to confirm the closing of the motor contactor, this parameter sets the time allowed for the contactor's auxiliary contacts to reach the user commanded state before a CONTACTOR FLT occurs.	**sec**	**0.10 – 5.00**	**0.10**	Y	N
BRAKE PICK TIME	(Brake Pick Time) If the brake pick fault is enabled, this parameter sets the time allowed for the brake pick feedback not to match the brake pick command before a BRK PICK FLT occurs.	**sec**	**0.00 – 5.00**	**1.00**	Y	N
BRAKE HOLD TIME	(Brake Hold Time) If the brake hold fault is enabled, this parameter sets the time allowed for the brake hold feedback not match the brake hold command before a BRK HOLD FLT occurs.	**sec**	**0.00 – 5.00**	**0.20**	Y	N
OVERSPEED LEVEL	(Overspeed Level) This parameter sets the percentage of rated speed the drive uses (in conjunction with OVERSPEED TIME, below) to determine when an OVERSPEED fault occurs. Units are in percent of contract speed.	**%**	**100.0 – 150.0**	**115.0**	Y	N
OVERSPEED TIME	(Overspeed Time) This parameter sets the time that the drive can be at or above the OVERSPEED LEVEL (A1), before the drive declares an OVERSPEED FLT.	**sec**	**0.00 – 9.99**	**1.00**	Y	N
OVERSPEED MULT	(Over Speed Multiplier) This parameter sets the percentage of contract speed for the OVERSPEED TEST (U4).	**%**	**100.0 - 150.0**	**125.0**	Y	N
ENCODER PULSES	(Encoder Pulses) This parameter sets the pulses per revolution (before the x4 logic) the drive receives from the encoder.	**none**	**600 - 10000**	**1024**	N	Y
SPD DEV LO LEVEL	(Speed Deviation Lo Level) Range around the speed reference for speed deviation low logic output. For more information, see SPD DEVIATION on page 42. Units in percent of contract speed.	**%**	**0.1 – 20.0**	**10.0**	Y	N
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. For more information, see SPD DEVIATION on page 42.	**sec**	**0.00 – 9.99**	**0.50**	Y	N
SPD DEV HI LEVEL	(Speed Deviation High Level) This parameter sets the level at which a speed deviation alarm will be declared. For more information, see SPD DEVIATION on page 42. Units are in percent of contract speed.	**%**	**0.0 – 99.9**	**10.0**	Y	N

Parameter	Description	Units	Range	Default	Hidden item	Run lock out
SPD COMMAND BIAS	(Speed Command Bias) This parameter subtracts an effective voltage to the actual analog speed command voltage signal. $\left(\begin{array}{c}\text{analog}\\ \text{channel\#1}\\ \text{input}\\ \text{voltage}\end{array} - \begin{array}{c}\text{SPD}\\ \text{COMMAND}\\ \text{BIAS}\end{array}\right) \times \begin{array}{c}\text{SPD}\\ \text{COMMAND}\\ \text{MULT}\end{array} = \begin{array}{c}\text{signal}\\ \text{drive}\\ \text{software}\\ \text{uses}\end{array}$	**volts**	**0.00 – 6.00**	**0.00**	Y	Y
SPD COMMAND MULT	(Speed Command Multiplier) This parameter scales the analog speed command. $\left(\begin{array}{c}\text{analog}\\ \text{channel\#1}\\ \text{input}\\ \text{voltage}\end{array} - \begin{array}{c}\text{SPD}\\ \text{COMMAND}\\ \text{BIAS}\end{array}\right) \times \begin{array}{c}\text{SPD}\\ \text{COMMAND}\\ \text{MULT}\end{array} = \begin{array}{c}\text{signal}\\ \text{drive}\\ \text{software}\\ \text{uses}\end{array}$	**none**	**0.90 – 5.00**	**1.00**	Y	Y
PRE TORQUE BIAS	(Pre-Torque Bias) This parameter subtracts an effective voltage to the actual analog pre torque command (channel 2) voltage signal. $\left(\begin{array}{c}\text{analog}\\ \text{channel\#2}\\ \text{input}\\ \text{voltage}\end{array} - \begin{array}{c}\text{PRE}\\ \text{TORQUE}\\ \text{BIAS}\end{array}\right) \times \begin{array}{c}\text{PRE}\\ \text{TORQUE}\\ \text{MULT}\end{array} = \begin{array}{c}\text{signal}\\ \text{drive}\\ \text{software}\\ \text{uses}\end{array}$	**volts**	**0.00 – 6.00**	**0.00**	Y	Y
PRE TORQUE MULT	(Pre-Torque Multiplier) This parameter scales the analog pretorque command (channel 2). $\left(\begin{array}{c}\text{analog}\\ \text{channel\#2}\\ \text{input}\\ \text{voltage}\end{array} - \begin{array}{c}\text{PRE}\\ \text{TORQUE}\\ \text{BIAS}\end{array}\right) \times \begin{array}{c}\text{PRE}\\ \text{TORQUE}\\ \text{MULT}\end{array} = \begin{array}{c}\text{signal}\\ \text{drive}\\ \text{software}\\ \text{uses}\end{array}$	**none**	**-10.00 – +10.00**	**1.00**	Y	Y
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. Units are in percent of contract speed.	**%**	**0.00 – 99.99**	**1.00**	Y	Y
ZERO SPEED TIME	(Zero Speed Time) This parameter sets the time at which the drive is at the ZERO SPEED LEVEL (A1) before zero speed logic output is true.	**sec**	**0.00 – 9.99**	**0.10**	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 are in percent of contract speed.	**%**	**0.00 – 9.99**	**1.00**	Y	Y
MTR TORQUE LIMIT	(Motoring Current Limit) This parameter sets the maximum torque allowed at when in the motoring mode. This parameter may need adjustment to reduce the effects of field weakening. Units are in percent of rated torque.	**%**	**0.0 – 275.0**	**200.0**	N	N
REGEN TORQ LIMIT	(Regenerating Current Limit) This parameter sets the maximum amount of regenerative torque the drive will see during regeneration. This parameter may need adjustment to reduce the effects of field weakening. Units are in percent of rated torque.	**%**	**0.0 – 275.0**	**200.0**	N	N

Parameter	Description	Units	Range	Default	Hidden item	Run lock out
FLUX WKN FACTOR	(Flux Weakening Factor) This parameter limits the maximum amount of torque available at higher speeds. When the drive is commanding higher speeds, this parameter defines a percentage of the defined torque limits (MTR TORQUE LIMIT and REGEN TORQ LIMIT). This parameter is used to reduce the effects of field weakening and reduce the amount of motor current produced at higher speeds. Units in percent of torque. *For further information, see page 43.*	**%**	**60 – 100**	**100**	Y	N
ANA OUT 1 OFFSET	(Digital to Analog #1 Output Offset) Offset for scaling Analog Output Channel #1. $\left(\begin{array}{l}\text{signal}\\ \text{drive}\\ \text{software}\\ \text{creates}\end{array} - \begin{array}{c}\text{ANA}\\ \text{OUT}\\ \text{OFFSET}\end{array}\right) \times \begin{array}{l}\text{ANA}\\ \text{OUT}\\ \text{GAIN}\end{array} = \begin{array}{l}\text{analog}\\ \text{channel}\\ \text{output}\\ \text{voltage}\end{array}$	**%**	**-99.9 – +99.9**	**0.0**	Y	N
ANA OUT 2 OFFSET	(Digital to Analog #2 Output Offset) Offset for scaling Analog Output Channel #2. $\left(\begin{array}{l}\text{signal}\\ \text{drive}\\ \text{software}\\ \text{creates}\end{array} - \begin{array}{c}\text{ANA}\\ \text{OUT}\\ \text{OFFSET}\end{array}\right) \times \begin{array}{l}\text{ANA}\\ \text{OUT}\\ \text{GAIN}\end{array} = \begin{array}{l}\text{analog}\\ \text{channel}\\ \text{output}\\ \text{voltage}\end{array}$	**%**	**-99.9 – +99.9**	**0.0**	Y	N
ANA OUT 1 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. $\left(\begin{array}{l}\text{signal}\\ \text{drive}\\ \text{software}\\ \text{creates}\end{array} - \begin{array}{c}\text{ANA}\\ \text{OUT}\\ \text{OFFSET}\end{array}\right) \times \begin{array}{l}\text{ANA}\\ \text{OUT}\\ \text{GAIN}\end{array} = \begin{array}{l}\text{analog}\\ \text{channel}\\ \text{output}\\ \text{voltage}\end{array}$	**none**	**0.0 – 10.0**	**1.0**	Y	N
ANA OUT 2 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. $\left(\begin{array}{l}\text{signal}\\ \text{drive}\\ \text{software}\\ \text{creates}\end{array} - \begin{array}{c}\text{ANA}\\ \text{OUT}\\ \text{OFFSET}\end{array}\right) \times \begin{array}{l}\text{ANA}\\ \text{OUT}\\ \text{GAIN}\end{array} = \begin{array}{l}\text{analog}\\ \text{channel}\\ \text{output}\\ \text{voltage}\end{array}$	**none**	**0.0 – 10.0**	**1.0**	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**	**0 – 120**	**5**	Y	N
FLT RESETS / HOUR	(Fault Resets per Hour) When the drive is set for automatic fault reset, this is the number of faults that is allowed to be automatically reset per hour.	**faults**	**0 – 10**	**3**	Y	N
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 are in percent of contract speed.	**%**	**0.00 – 110.00**	**80.00**	Y	N

Parameter	Description	Units	Range	Default	Hidden item	Run lock out
MAINS DIP SPEED	(Mains Dip Speed Multiplier) This parameter sets the percentage of contract speed for the speed to be reduced when the drive goes into 'low voltage' mode. The Mains Dip function is enabled by the Mains Dip Enable (MAINS DIP ENA(C1)) parameter. When the drive goes into 'low voltage' mode, it reduces the speed by the percentage defined by this parameter. 'Low voltage' mode is defined as when the drive declares a UV alarm, which is defined by the Input line-to-line voltage (INPUT L-L VOLTS(A4)) parameter and the Undervoltage Alarm Level (UV ALARM LEVEL(A4)).	**%**	**5.00 – 99.99**	**25.00**	Y	N
RUN DELAY TIMER	(Run Delay Timer) Allows the user to delay the drive's recognition of the RUN signal. For more information, see RUN DELAY TIMER on page 44.	**sec**	**0.00 – 0.99**	**0.00**	Y	Y
AB ZERO SPD LEV	(Auto Brake Zero Speed Level) This parameter 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 the 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)=INTERNAL TIME or EXTERNAL TB1.	**%**	**0.00 – 2.00**	**0.00**	Y	Y
AB OFF DELAY	(Auto Brake Off Delay) This parameter 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 – 9.99**	**0.00**	Y	Y
CONTACTOR DO DLY	(Contactor Drop-out Delay) When the drive controls the motor contactor via CLOSE CONTACT logic output, this parameter, CONTACTOR DO DLY (A1), allows the user to delay the drive's dropout of the motor contactor. The CONTACTOR DO DLY Timer Delay starts when the speed regulator release signal goes false.	**sec**	**0.00 – 5.00**	**0.00**	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**	**0.00 – 10.00**	**0.50**	Y	Y
SER2 INSP SPD	(Serial Mode 2 Inspection Speed) *Used only with custom serial protocol (mode 2)* When in Serial Mode 2, this parameter defines the inspection speed to be used. To run in inspection speed via serial mode 2 requires that the run command for inspection speed come from two sources, a command sent in a serial message and via hardware as a logic input defined as "SER2 INSP ENA".	**ft / min**	**0.0 – 100.0**	**30.0**	Y	Y
		m / sec	**0.000 – 0.500**	**0.150**		

Parameter	Description	Units	Range	Default	Hidden item	Run lock out
SER2 RS CRP SPD	(Serial Mode 2 Rescue Creep Speed) *Used only with custom serial protocol (mode 2)* When in Serial Mode 2 and SER2 FLT MODE (C1)=rescue, this parameter defines the creep speed that will be used in the "rescue mode".	**ft / min**	**0.0 – 300.0**	**10.0**	Y	Y
		m / sec	**0.000 – 1.540**	**0.050**		
SER2 RS CPR TIME	(Serial Mode 2 Rescue Creep Time) *Used only with custom serial protocol (mode 2)* When in Serial Mode 2 and SER2 FLT MODE (C1)=rescue, this parameter defines the maximum time the drive will continue to run at rescue creep speed (defined by SER2 RS CRP SPD (A1) parameter) when reacting to a serial fault. The time is defined as the time running at creep speed. It does not include the time it takes to decelerate to creep speed.	**sec**	**0.0 – 200.0**	**180.0**	Y	Y
SER2 FLT TOL	(Serial Mode 2 Fault Tolerance) *Used only with custom serial protocol (mode 2)* When in Serial Mode 2, this parameter defines the maximum time that may elapse between valid run time messages while in serial run mode before a serial fault is declared.	**sec**	**0.00 – 2.00**	**0.04**	Y	Y
ROLLBACK GAIN	(Rollback Gain) Gain of anti-rollback. See ROLLBACK GAIN on page 44.	**none**	**1 – 20**	**1**	Y	Y
NOTCH FILTER FRQ	(Notch Filter Frequency) Notch filter center frequency. For more information, see NOTCH FILTER FRQ on page 45.	**Hz**	**5 – 60**	**20**	Y	Y
NOTCH FILT DEPTH	(Notch Filter Depth) This parameter determines notch filter maximum attenuation. Note: A filter depth setting of zero (NOTCH FILT DEPTH (A1) =0) removes the filter. For more information, see NOTCH FILTER FRQ on page 45.	**%**	**0 – 100**	**0**	Y	Y
MSPD DELAY 1-4	(Multi-Step Speed Delay 1-4) Determines the recognition time delay for a defined multi-step speed command. For more information, see MSPD DELAY 1-4 on page 45.	**sec**	**0.000 – 10.000**	**0.000**	Y	Y
AT MID SPEED	(Mid Speed Level) This parameter sets the level/threshold for mid speed detection. This is only used to generate the mid speed logic output. Units in percent of contract speed.	**%**	**0.00 – 110.00**	**80.00**	Y	Y

Table 1: Closed-Loop Drive A1 Submenu

Detailed descriptions

GAIN CHNG LEVEL

(Gain Change Level)

When the gain control is set to internal, the drive will control the high/low gain switch. This parameter sets the speed reference level, when the drive is in 'low gain' mode.

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 HPV 600 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:

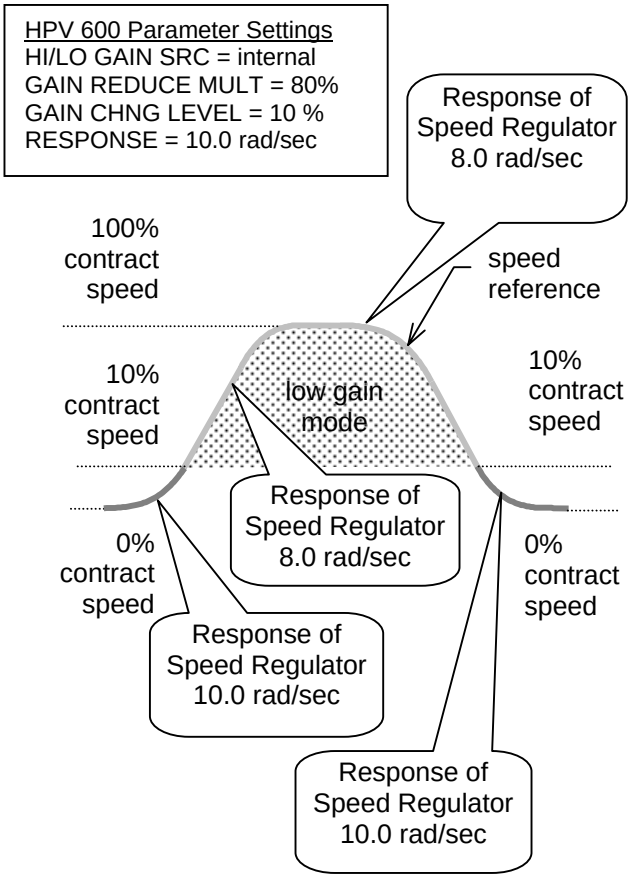
- a logic input
- the serial channel

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

RAMPED STOP TIME

(Ramped Stop Time)
This parameter is only used by the torque ramp down stop function and sets the time to ramp torque from rated torque to zero.

After the elevator lands and the brake is applied, the torque ramp down function allows the torque to ramp down at an even level. This helps eliminate the 'bump' felt upon landing caused by the torque being immediately dropped to zero.

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 selected by the RAMP DOWN EN SRC (C1)

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

A method of providing the Ramp Down Enable would be with a logic signal (EXTERNAL TB1) 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 HPV 600 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.

SPEED DEVIATION

(Speed Deviation)
The following 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 *(C3 Submenu).* 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 1. The defined range is determined by the Speed Deviation Low Level parameter (SPD DEV LO LEVEL(A1)) and the defined time is determined by the Speed Deviation Time parameter (SPD DEV TIME(A1)).

The Speed Deviation High function annunciates a Speed Deviation Alarm and has the ability to set a configurable logic output*, see Logic Outputs C3 on page 70.* 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. The defined range is determined by the Speed Deviation High Level parameter (SPD DEV HI LEVEL(A1)).

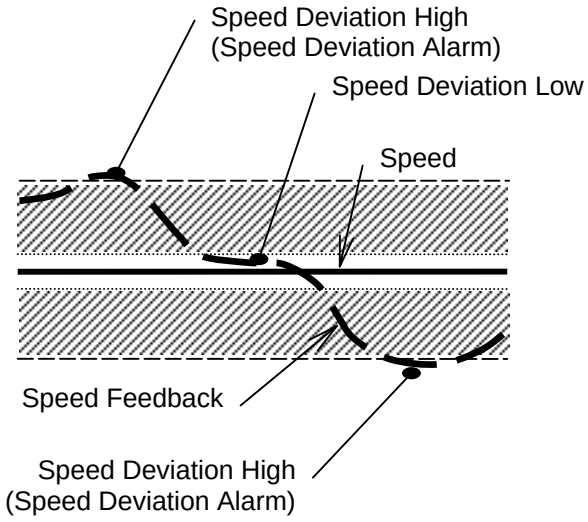


Figure 1: Speed Deviation Example

FLUX WKN FACTOR

(Flux Weakening Factor)
This parameter limits the maximum amount of torque available at higher speeds. When the drive is commanding higher speeds, this parameter defines a percentage of the defined torque limits (MTR TORQUE LIMIT (A1) and REGEN TORQ LIMIT (A1)). This parameter is used to reduce the effects of field weakening and reduce the amount of motor current produced at higher speeds.

In the HPV 600, flux weakening begins before the motor reaches rated speed.

The drive can supply more than 100% current, since the CEMF is lower. Therefore, the drive can produce more than 100% of the motor's rated torque at the rated speed.

Flux Weakening Parameters
The following three HPV 600 parameters affect both the available torque curve and flux level curve:

- Motor Torque Limit (MTR TORQUE LIMIT(A1))
- Regenerative Mode Torque Limit (REGEN TORQ LIMIT(A1))
- Flux Weakening Factor (FLUX WKN FACTOR(A1))

The highest of the two torque limits is used as the torque limit that defines the two curves.

An example of the effects of the torque limit on the amount of flux weakening needed and the amount of torque available through the entire speed range is shown below.

By lowering the torque limit you can effectively reduce the amount of field weakening needed and reduce the amount of current needed by the motor at motor's rated speed. The trade-off is you have lower over-all torque available.

In order to have more torque available at the lower speeds, the HPV 600 has the Flux Weakening Factor parameter, which effectively reduces the amount of torque available only at the higher speeds. This will allow the HPV 600 to have a higher flux level at the motor's rated speed and require less current to produce rated torque.

An example of the effects of the flux-weakening factor on the amount of flux weakening needed and the amount of torque available through the entire speed range is also shown below.

The maximum amount of torque available can be defined as the following:

- At low speeds…the torque limit parameters
- At high speeds…function of the torque limit parameters and the flux weakening factor

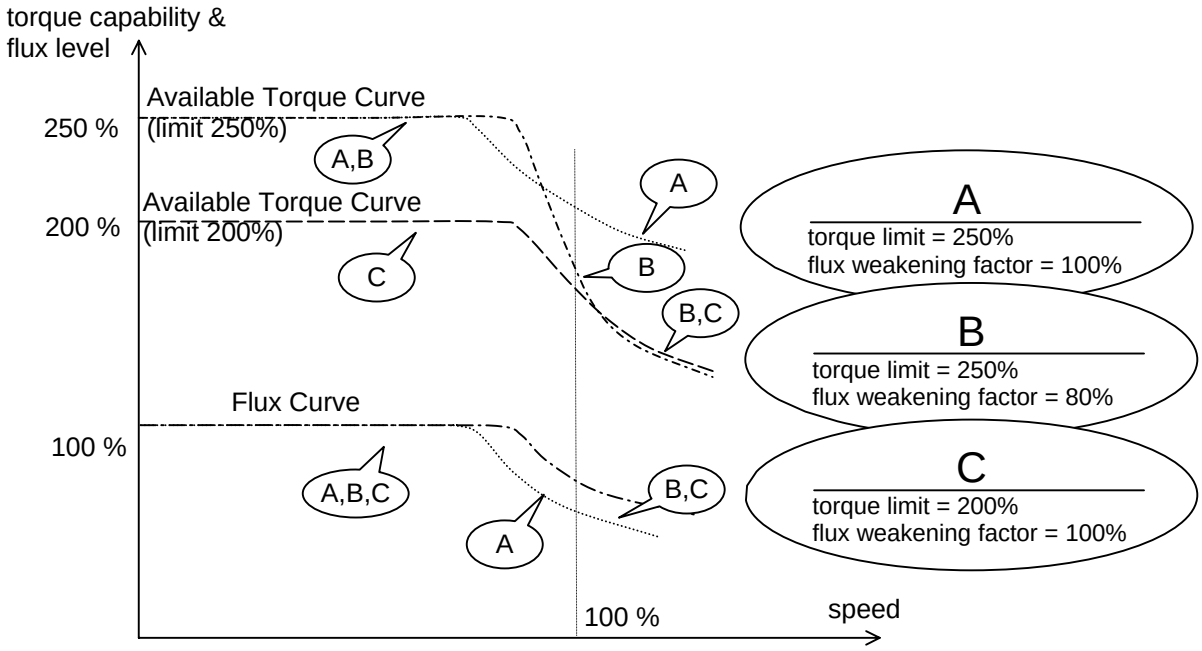
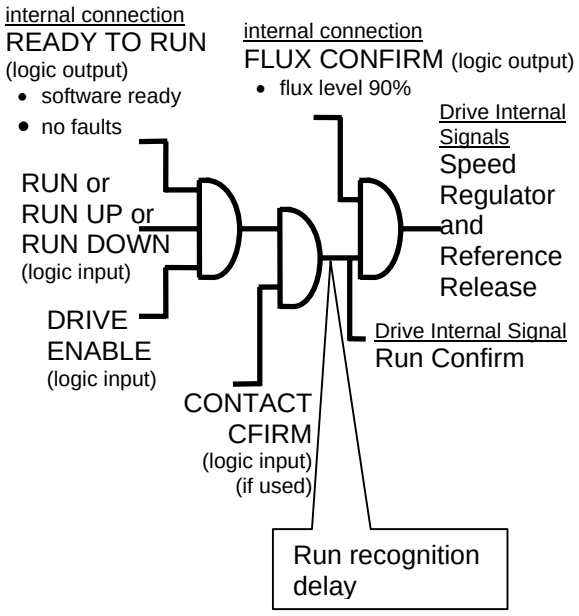


Figure 2: Torque Speed Curve

RUN DELAY TIMER

(Run Recognition Delay Timer)
This parameter allows the user to delay the drive's recognition of the RUN signal (i.e. the Run Confirm signal). The Run Delay Timer can be set from 0.00 to 0.99 seconds. The default for the RUN DELAY TIMER (A1) parameter is 0.00 seconds.



ROLLBACK GAIN

(Anti-rollback Gain)

This parameter increases the sensitivity (or gain) of the speed regulator during the start in the interval between "Speed Regulator Release" and "Reference Release". The parameter acts as a multiplier to the existing speed regulator gain.

Note: this function is only for use with multi-step speed commands (SPD COMMAND SRC (C1) = MULTI-STEP)

During the start, this function can help the drive re-establish the torque needed to control rollback (or roll forward),

Set-up
In order to the use the Anti-Rollback function, the following parameters must be set: SPD REF RELEASE(C1)=BRAKE PICKED and BRAKE PICK CFRM(C1)=INTERNAL TIME. With the these settings for SPD REF RELEASE(C1) and BRAKE PICK CFRM(C1), the BRAKE PICK TIME (A1) parameter determines the amount of time the drive will command zero speed after the Run command is given and the amount of time the drive will command zero speed after the Run command is removed.

At the start, the ROLLBACK GAIN parameter will increase the speed regulator gain during the time determined by BRAKE PICK TIME parameter when the drive is commanding zero speed (i.e. the time between the speed regulator is released and the speed reference is released). During this BRAKE PICK TIME, the mechanical brake should be picked (either by the car controller or drive).

Adjustment
Start at ROLLBACK GAIN=1 and increase in increments of 1 to help control rollback.

***IMPORTANT**: too high a setting for this parameter can lead to drive instability.*

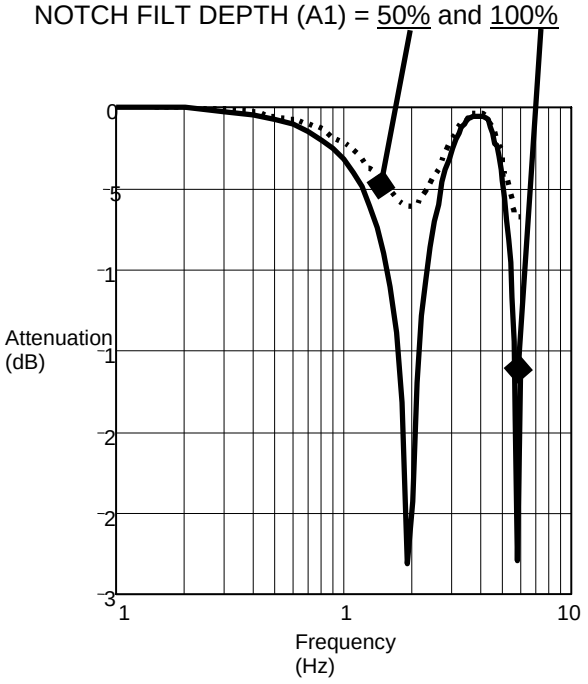
NOTCH FILTER FRQ

(Notch Filter Center Frequency)
This parameter determines the notch filter center frequency.

Notch Filter
Although originally created for gearless applications where elevator rope resonance is sometimes an issue, 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 is not 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%

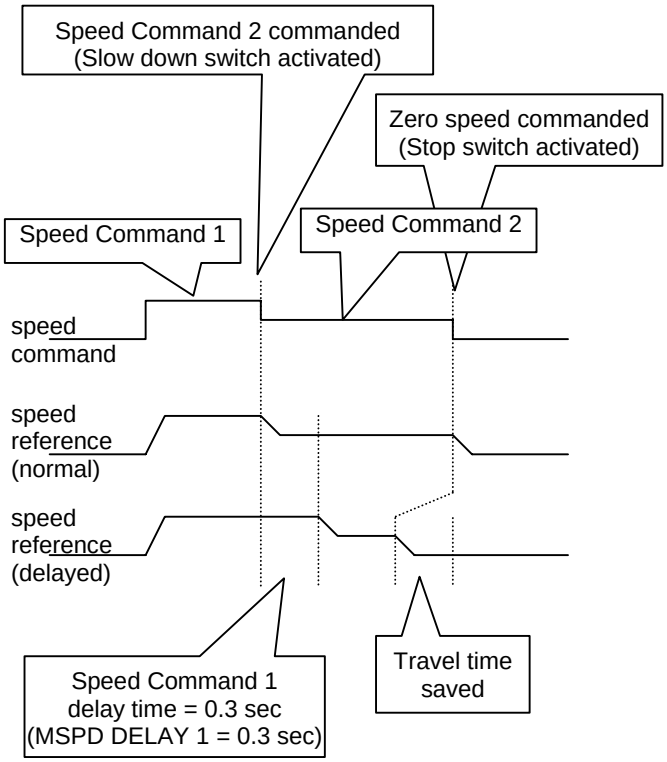


MSPD DELAY 1-4

(Multi-step Speed Delay)
These four parameters determine the recognition time delay for a multi-step speed commands defined by MLT-SPD TO DLY1-4 (C1) parameters.

When setting up an elevator, slow-down and stop switches are set at fixed locations in the shaft. Once the drive is tuned, it might require the user to move the switches in the shaft in order to minimize the time spent at leveling speed.

Under "normal" operation, the drive speed reference follows the speed command. By configuring for “delayed” operation and setting speed command 1 for a delay (MLT-SPD TO DLY 1 = MSPD 1), the recognition of the speed command change from speed command 1 to any other speed command (in this case speed command 2) will be delayed by the setting of MSPD DELAY 1 (A1) parameter.



S-Curves A2 submenu

Detailed descriptions

The HPV 600 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.

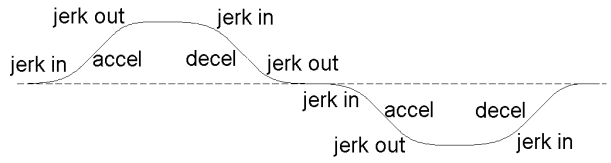
Note: If the car controller is feeding the drive a speed profile including s-curves, the s-curve settings on the drive need to be placed out of the way. In those cases, set ACCEL RATE 0 and DECEL RATE 0 to the maximum (7.99 ft/s^2 or 3.999 m/s^2) and set ACCEL JERK IN 0, ACCEL JERK OUT 0, DECEL JERK IN 0, and DECEL JERK OUT 0 to the minimum (0.0 ft/s^2 or 0.00 m/s^2).

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

S-curve Availability

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

Selecting S-curves

Setting the jerk rates to zero can turn off the jerk rates.

The accel / decel rates can also be turned off by setting them to zero. But, setting the accel / decel rates to zero is not recommended.

Parameter	Description	Units	Range	Default	Hidden item	Run lock out
ACCEL RATE 0	Acceleration rate limit	**ft/s^2**	**0.00 – 7.99**	**1.00**	N	Y
		m/s^2	**0.000 – 3.999**	**0.300**		
DECEL RATE 0	Deceleration rate limit	**ft/s^2**	**0.00 – 7.99**	**1.00**	N	Y
		m/s^2	**0.000 – 3.999**	**0.300**		
ACCEL JERK IN 0	Rate of increase of acceleration, up to ACCEL RATE, when increasing elevator speed	**ft/s^3**	**0.0 – 29.9**	**0.5**	N	Y
		m/s^3	**0.00 – 9.99**	**0.15**		
ACCEL JERK OUT 0	Rate of decrease of acceleration to zero when approaching contract elevator speed	**ft/s^3**	**0.0 – 29.9**	**0.5**	N	Y
		m/s^3	**0.00 – 9.99**	**0.15**		
DECEL JERK IN 0	Rate of increase of deceleration, up to DECEL RATE, when decreasing elevator speed	**ft/s^3**	**0.0 – 29.9**	**0.5**	N	Y
		m/s^3	**0.00 – 9.99**	**0.15**		
DECEL JERK OUT 0	Rate of decrease of deceleration to zero when slowing the elevator to leveling speed	**ft/s^3**	**0.0 – 29.9**	**0.5**	N	Y
		m/s^3	**0.00 – 9.99**	**0.15**		
ACCEL RATE 1	Acceleration rate limit	**ft/s^2**	**0.00 – 7.99**	**1.00**	N	Y
		m/s^2	**0.000 – 3.999**	**0.300**		
DECEL RATE 1	Deceleration rate limit	**ft/s^2**	**0.00 – 7.99**	**1.00**	N	Y
		m/s^2	**0.000 – 3.999**	**0.300**		
ACCEL JERK IN 1	Rate of increase of acceleration, up to ACCEL RATE, when increasing elevator speed	**ft/s^3**	**0.0 – 29.9**	**0.5**	N	Y
		m/s^3	**0.00 – 9.99**	**0.15**		
ACCEL JERK OUT 1	Rate of decrease of acceleration to zero when approaching contract elevator speed	**ft/s^3**	**0.0 – 29.9**	**0.5**	N	Y
		m/s^3	**0.00 – 9.99**	**0.15**		
DECEL JERK IN 1	Rate of increase of deceleration, up to DECEL RATE, when decreasing elevator speed	**ft/s^3**	**0.0 – 29.9**	**0.5**	N	Y
		m/s^3	**0.00 – 9.99**	**0.15**		
DECEL JERK OUT 1	Rate of decrease of deceleration to zero when slowing the elevator to leveling speed	**ft/s^3**	**0.0 – 29.9**	**0.5**	N	Y
		m/s^3	**0.00 – 9.99**	**0.15**		
ACCEL RATE 2	Acceleration rate limit	**ft/s^2**	**0.00 – 7.99**	**1.00**	N	Y
		m/s^2	**0.000 – 3.999**	**0.300**		
DECEL RATE 2	Deceleration rate limit	**ft/s^2**	**0.00 – 7.99**	**1.00**	N	Y
		m/s^2	**0.000 – 3.999**	**0.300**		
ACCEL JERK IN 2	Rate of increase of acceleration, up to ACCEL RATE, when increasing elevator speed	**ft/s^3**	**0.0 – 29.9**	**0.5**	N	Y
		m/s^3	**0.00 – 9.99**	**0.15**		
ACCEL JERK OUT 2	Rate of decrease of acceleration to zero when approaching contract elevator speed	**ft/s^3**	**0.0 – 29.9**	**0.5**	N	Y
		m/s^3	**0.00 – 9.99**	**0.15**		
DECEL JERK IN 2	Rate of increase of deceleration, up to DECEL RATE, when decreasing elevator speed	**ft/s^3**	**0.0 – 29.9**	**0.5**	N	Y
		m/s^3	**0.00 – 9.99**	**0.15**		
DECEL JERK OUT 2	Rate of decrease of deceleration to zero when slowing the elevator to leveling speed	**ft/s^3**	**0.0 – 29.9**	**0.5**	N	Y
		m/s^3	**0.00 – 9.99**	**0.15**		
ACCEL RATE 3	Acceleration rate limit	**ft/s^2**	**0.00 – 7.99**	**1.00**	N	Y
		m/s^2	**0.000 – 3.999**	**0.300**		
DECEL RATE 3	Deceleration rate limit	**ft/s^2**	**0.00 – 7.99**	**1.00**	N	Y
		m/s^2	**0.000 – 3.999**	**0.300**		
ACCEL JERK IN 3	Rate of increase of acceleration, up to ACCEL RATE, when increasing elevator speed	**ft/s^3**	**0.0 – 29.9**	**0.5**	N	Y
		m/s^3	**0.00 – 9.99**	**0.15**		
ACCEL JERK OUT 3	Rate of decrease of acceleration to zero when approaching contract elevator speed	**ft/s^3**	**0.0 – 29.9**	**0.5**	N	Y
		m/s^3	**0.00 – 9.99**	**0.15**		
DECEL JERK IN 3	Rate of increase of deceleration, up to DECEL RATE, when decreasing elevator speed	**ft/s^3**	**0.0 – 29.9**	**0.5**	N	Y
		m/s^3	**0.00 – 9.99**	**0.15**		
DECEL JERK OUT 3	Rate of decrease of deceleration to zero when slowing the elevator to leveling speed	**ft/s^3**	**0.0 – 29.9**	**0.5**	N	Y
		m/s^3	**0.00 – 9.99**	**0.15**		

Table 2: Closed-Loop S-Curves A2 Submenu

Multistep Ref A3 submenu

Detailed descriptions
The multi-step speed reference function is one possible way for the drive to accept speed commands. 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 determine 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	Range	Default	Hidden item	Run lock out
SPEED COMMAND 1	Multi-step speed command #1	**ft/min**	**-3000.0 – +3000.0**	**0.0**	N	Y
		m/sec	**-16.000 – +16.000**	**0.000**		
SPEED COMMAND 2	Multi-step speed command #2	**ft/min**	**-3000.0 – +3000.0**	**0.0**	N	Y
		m/sec	**-16.000 – +16.000**	**0.000**		
SPEED COMMAND 3	Multi-step speed command #3	**ft/min**	**-3000.0 – +3000.0**	**0.0**	N	Y
		m/sec	**-16.000 – +16.000**	**0.000**		
SPEED COMMAND 4	Multi-step speed command #4	**ft/min**	**-3000.0 – +3000.0**	**0.0**	N	Y
		m/sec	**-16.000 – +16.000**	**0.000**		
SPEED COMMAND 5	Multi-step speed command #5	**ft/min**	**-3000.0 – +3000.0**	**0.0**	N	Y
		m/sec	**-16.000 – +16.000**	**0.000**		
SPEED COMMAND 6	Multi-step speed command #6	**ft/min**	**-3000.0 – +3000.0**	**0.0**	N	Y
		m/sec	**-16.000 – +16.000**	**0.000**		
SPEED COMMAND 7	Multi-step speed command #7	**ft/min**	**-3000.0 – +3000.0**	**0.0**	N	Y
		m/sec	**-16.000 – +16.000**	**0.000**		
SPEED COMMAND 8	Multi-step speed command #8	**ft/min**	**-3000.0 – +3000.0**	**0.0**	N	Y
		m/sec	**-16.000 – +16.000**	**0.000**		
SPEED COMMAND 9	Multi-step speed command #9	**ft/min**	**-3000.0 – +3000.0**	**0.0**	N	Y
		m/sec	**-16.000 – +16.000**	**0.000**		
SPEED COMMAND 10	Multi-step speed command #10	**ft/min**	**-3000.0 – +3000.0**	**0.0**	N	Y
		m/sec	**-16.000 – +16.000**	**0.000**		
SPEED COMMAND 11	Multi-step speed command #11	**ft/min**	**-3000.0 – +3000.0**	**0.0**	N	Y
		m/sec	**-16.000 – +16.000**	**0.000**		
SPEED COMMAND 12	Multi-step speed command #12	**ft/min**	**-3000.0 – +3000.0**	**0.0**	N	Y
		m/sec	**-16.000 – +16.000**	**0.000**		
SPEED COMMAND 13	Multi-step speed command #13	**ft/min**	**-3000.0 – +3000.0**	**0.0**	N	Y
		m/sec	**-16.000 – +16.000**	**0.000**		
SPEED COMMAND 14	Multi-step speed command #14	**ft/min**	**-3000.0 – +3000.0**	**0.0**	N	Y
		m/sec	**-16.000 – +16.000**	**0.000**		
SPEED COMMAND 15	Multi-step speed command #15	**ft/min**	**-3000.0 – +3000.0**	**0.0**	N	Y
		m/sec	**-16.000 – +16.000**	**0.000**		

Table 3: Closed-Loop Multistep Ref A3 Submenu

Power Convert A4 submenu

Parameter	Description	Units	Range	Default	Hidden item	Run lock out
Id REG DIFF GAIN	(Current Regulator Differential Gain for Flux Generation) The differential gain for the current regulator flux generation. This parameter is meant for advanced operation; therefore, the parameter will rarely need to be changed from the default value.	**none**	**0.80 – 1.20**	**1.00**	Y	N
Id REG PROP GAIN	(Current Regulator Proportional Gain for Flux Generation) The proportional gain for the current regulator flux generation**.** This parameter is meant for advanced operation; therefore, the parameter will rarely need to be changed from the default value.	**none**	**0.20 – 0.40**	**0.30**	Y	N
Iq REG DIFF GAIN	(Current Regulator Differential Gain for Torque Generation) The differential gain for the current regulation of motor torque. This parameter is meant for advanced operation; therefore, the parameter will rarely need to be changed from the default value.	**none**	**0.80 – 1.20**	**1.00**	Y	N
Iq REG PROP GAIN	(Current Regulator Proportional Gain for Torque Generation) The proportional gain for the current regulator torque generation. This parameter is meant for advanced operation, therefore, the parameter will rarely need to be changed from the default value.	**none**	**0.20 – 0.40**	**0.30**	Y	N
PWM FREQUENCY	(PWM Frequency) This parameter sets the PWM or 'carrier' frequency of the drive. The carrier is defaulted at 10.0 kHz, which is well out of audible range. The drive does not derate when the PWM frequency is set to 10kHz or below.	**kHz**	**2.5 – 16.0**	**10.0**	N	N
UV ALARM LEVEL	(Undervoltage Alarm Level) This parameter sets the level (as a percentage of the INPUT L-L VOLTS(A4)) at which an under voltage alarm will be declared. Units are in percent of nominal dc bus.	**%**	**80 – 99**	**90**	Y	N
UV FAULT LEVEL	(Undervoltage Fault Level) This parameter sets the level (as a percentage of the INPUT L-L VOLTS(A4)) at which an under voltage fault will occur. Units are in percent of nominal dc bus.	**%**	**50 – 99**	**80**	Y	N
EXTERN REACTANCE	(External Reactance) This parameter sets the externally connected reactance (as a percentage of base impedance) between the drive and the motor.	**%**	**0.0 – 10.0**	**0.0**	Y	Y
INPUT L-L VOLTS	(Input Line to Line Voltage - Input Voltage) This parameter sets the input voltage or AC line input voltage to the drive. This parameter is used only to determine the UV alarm and fault levels.	**Volts**	**110 – 480**	**460 or 230**	N	N

Table 4: Closed-Loop Power Convert A4 Submenu

Motor A5 submenu

<table>
<tr><th>Parameter</th><th>Description</th><th>Units</th><th>Range</th><th>Default</th><th>Hidden item</th><th>Run lock out</th></tr>
<tr><td>MOTOR ID</td><td>(Motor Identification) This parameter allows for the selection of specific sets of motor parameters. A listing of each Motor Ids with its corresponding set of motor parameters is shown below.
<table>
<tr><td>motor parameter</td><td colspan="2">Motor ID</td></tr>
<tr><td></td><td>4 pole dflt</td><td>6 pole dflt</td></tr>
<tr><td>Rated Mtr Power</td><td>0.0 HP/KW</td><td>0.0 HP/KW</td></tr>
<tr><td>Rated Mtr Volts</td><td>0.0 V</td><td>0.0 V</td></tr>
<tr><td>Rated Excit Freq</td><td>0.0 Hz</td><td>0.0 Hz</td></tr>
<tr><td>Rated Motor Curr</td><td>0.0 A</td><td>0.0 A</td></tr>
<tr><td>Motor Poles</td><td>4</td><td>6</td></tr>
<tr><td>Rated Mtr Speed</td><td>0.0 rpm</td><td>0.0 rpm</td></tr>
<tr><td>% No Load Curr</td><td>35.00%</td><td>45.00%</td></tr>
<tr><td>Stator Leakage X</td><td>9.00%</td><td>7.50%</td></tr>
<tr><td>Rotor Leakage X</td><td>9.00%</td><td>7.50%</td></tr>
<tr><td>Stator Resist</td><td>1.50%</td><td>1.50%</td></tr>
<tr><td>Motor Iron Loss</td><td>0.50%</td><td>0.50%</td></tr>
<tr><td>Motor Mech Loss</td><td>1.00%</td><td>1.00%</td></tr>
<tr><td>Flux Sat Break</td><td>75%</td><td>75%</td></tr>
<tr><td>Flux Sat Slope 1</td><td>0%</td><td>0%</td></tr>
<tr><td>Flux Sat Slope 2</td><td>50%</td><td>50%</td></tr>
</table>
NOTE: The default motor selections need to have the motor nameplate information entered in the appropriate motor parameters. The other motor parameters are already set to nominal values.</td><td>none</td><td></td><td></td><td>N</td><td>Y</td></tr>
<tr><td>RATED MTR POWER</td><td>(Rated Motor Power) This parameter sets the rated power in horsepower (HP) or kilowatts (kW) of the motor. Note: value should be obtained from the motor nameplate</td><td>HP
kW</td><td>1.0 – 500.0
0.75 – 400.00</td><td>0.0
0.00</td><td>N</td><td>Y</td></tr>
<tr><td>RATED MTR VOLTS</td><td>(Rated Motor Voltage) This parameter sets the rated motor voltage. Note: value should be obtained from the motor nameplate</td><td>volts</td><td>190.0 – 575.0</td><td>0.0</td><td>N</td><td>Y</td></tr>
<tr><td>RATED EXCIT FREQ</td><td>(Rated Motor Excitation Frequency) This parameter sets the excitation frequency of the motor. Note: value should be obtained from the motor nameplate</td><td>Hz</td><td>5.0 – 400.0</td><td>0.0</td><td>N</td><td>Y</td></tr>
<tr><td>RATED MOTOR CURR</td><td>(Rated Motor Amps) This parameter sets the rated motor current. Note: value should be obtained from the motor nameplate</td><td>amps</td><td>1.00 – 800.00</td><td>0.00</td><td>N</td><td>Y</td></tr>
<tr><td>MOTOR POLES</td><td>(Motor Poles) This parameter sets the number of poles in the motor.
NOTE: This must be an even number or a Setup Fault #3 will occur. Note: value should be obtained from the motor nameplate or use table below as reference
<table>
<tr><td>Rated Speed of Motor</td><td># of motor poles</td></tr>
<tr><td>1300 – 1801</td><td>4</td></tr>
<tr><td>900 – 1201</td><td>6</td></tr>
<tr><td>660 – 900</td><td>8</td></tr>
</table></td><td>none</td><td>2 – 32</td><td>Per ID</td><td>N</td><td>N</td></tr>
</table>

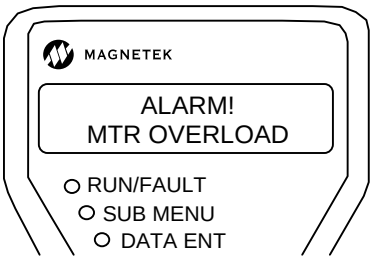
<table>
<tr><th>Parameter</th><th>Description</th><th>Units</th><th>Range</th><th>Default</th><th>Hidden item</th><th>Run lock out</th></tr>
<tr><td>RATED MTR SPEED</td><td>(Rated Motor Speed) This parameter sets the rated rpm of the motor (nameplate speed). NOTE: This is a function of the motor only and does not need to be the same as the CONTRACT MTR SPD (A1) parameter setting. Note: value should be obtained from the motor nameplate or use table below as reference
<table>
<tr><th>Rated Speed of Motor</th><th># of motor poles</th></tr>
<tr><td>1300 – 1801</td><td>4</td></tr>
<tr><td>900 – 1201</td><td>6</td></tr>
<tr><td>660 – 900</td><td>8</td></tr>
</table></td><td>RPM</td><td>50.0 – 3000.0</td><td>0.0</td><td>N</td><td>Y</td></tr>
<tr><td>% NO LOAD CURR</td><td>(Percent No Load Current) This parameter sets the percent no load current of the motor. Units are in percent of rated motor current.</td><td>%</td><td>10.0 – 80.0</td><td>Per ID</td><td>N</td><td>N</td></tr>
<tr><td>STATOR LEAKAGE X</td><td>(Stator Leakage Reactance) This parameter sets the stator reactance leakage, as a percent of the BASE IMPEDANCE (D2), which appears in the Power Data display.
NOTE: The base impedance is based on the RATED MTR PWR (A5) and RATED MTR VOLTS (A5) parameters.</td><td>%</td><td>0.0 – 20.0</td><td>Per ID</td><td>Y</td><td>N</td></tr>
<tr><td>ROTOR LEAKAGE X</td><td>(Rotor Leakage Reactance) This parameter sets the rotor reactance leakage, as a percent of the BASE IMPEDANCE (D2), which appears in the Power Data display.
NOTE: The base impedance is based on the RATED MTR PWR (A5) and RATED MTR VOLTS (A5) parameters.</td><td>%</td><td>0.0 – 20.0</td><td>Per ID</td><td>Y</td><td>N</td></tr>
<tr><td>STATOR RESIST</td><td>(Stator Resistance) This parameter sets the amount of resistance in the motor stator, as a percent of the BASE IMPEDANCE (D2), which appears in the Power Data display.
NOTE: The base impedance is based on the RATED MTR PWR (A5) and RATED MTR VOLTS (A5) parameters.</td><td>%</td><td>0.0 – 20.0</td><td>1.5</td><td>Y</td><td>N</td></tr>
<tr><td>MOTOR IRON LOSS</td><td>(Motor Iron Loss) This parameter sets the motor iron loss at rated frequency. Units are in percent of rated power.</td><td>%</td><td>0.0 – 15.0</td><td>0.5</td><td>Y</td><td>N</td></tr>
<tr><td>MOTOR MECH LOSS</td><td>(Motor Mechanical Losses) This parameter sets the motor mechanical losses at rated frequency. Units are in percent of rated power.</td><td>%</td><td>0.0 – 15.0</td><td>1.0</td><td>Y</td><td>N</td></tr>
<tr><td>OVLD START LEVEL</td><td>(Motor Overload Start Level) This parameter defines maximum current at which motor can run continuously. This parameter is also one of the two parameters that define the motor overload curve. The user can adjust the motor overload parameters. The following two parameters are used to define the motor overload curve.
• motor current overload start level (OVLD START LEVEL(A5)) parameter
• motor current time out (OVLD TIME OUT(A5)) parameter
For more information, see Motor Overload on page 53. Units are in percent of rated current.</td><td>%</td><td>100 – 150</td><td>110</td><td>Y</td><td>Y</td></tr>
</table>

Parameter	Description	Units	Range	Default	Hidden item	Run lock out
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: $\begin{pmatrix} OVLD \\ START \\ LEVEL \quad : \end{pmatrix} + \begin{pmatrix} 40\% \\ rated \\ motor \\ current \end{pmatrix}$ This is the other parameter used to define the overload curve.	**sec**	**5.0 – 120.0**	**60.0**	Y	Y
FLUX SAT BREAK	(Flux Saturation Break Point) This parameter sets the flux saturation curve slope change point. Units are in percent of flux.	**%**	**0 – 100**	**75**	Y	Y
FLUX SAT SLOPE 1	(Flux Saturation Slope #1) This parameter sets the flux saturation curve slope for low fluxes.	**PU slope**	**0.00 – 200.0**	**0.0**	Y	Y
FLUX SAT SLOPE 2	(Flux Saturation Slope #2) This parameter sets the flux saturation curve slope for high fluxes.	**PU slope**	**0.00 – 200.0**	**50.0**	Y	Y

Table 5: Closed-Loop Motor A5 Submenu

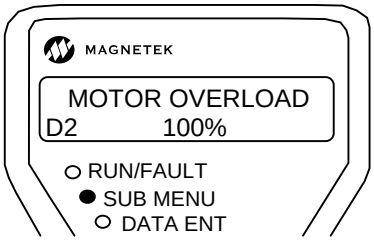
Motor Overload

When the motor had exceeded the user defined motor overload curve, the drive will declare a motor overload alarm.



The motor overload alarm can also be assigned to a logic output.

Under the POWER DATA display sub-menu, The MOTOR OVERLOAD value displays the percentage of motor overload trip level reached. Once this value reaches 100% the motor has exceeded its user defined overload curve and a motor overload alarm is declared by the drive.

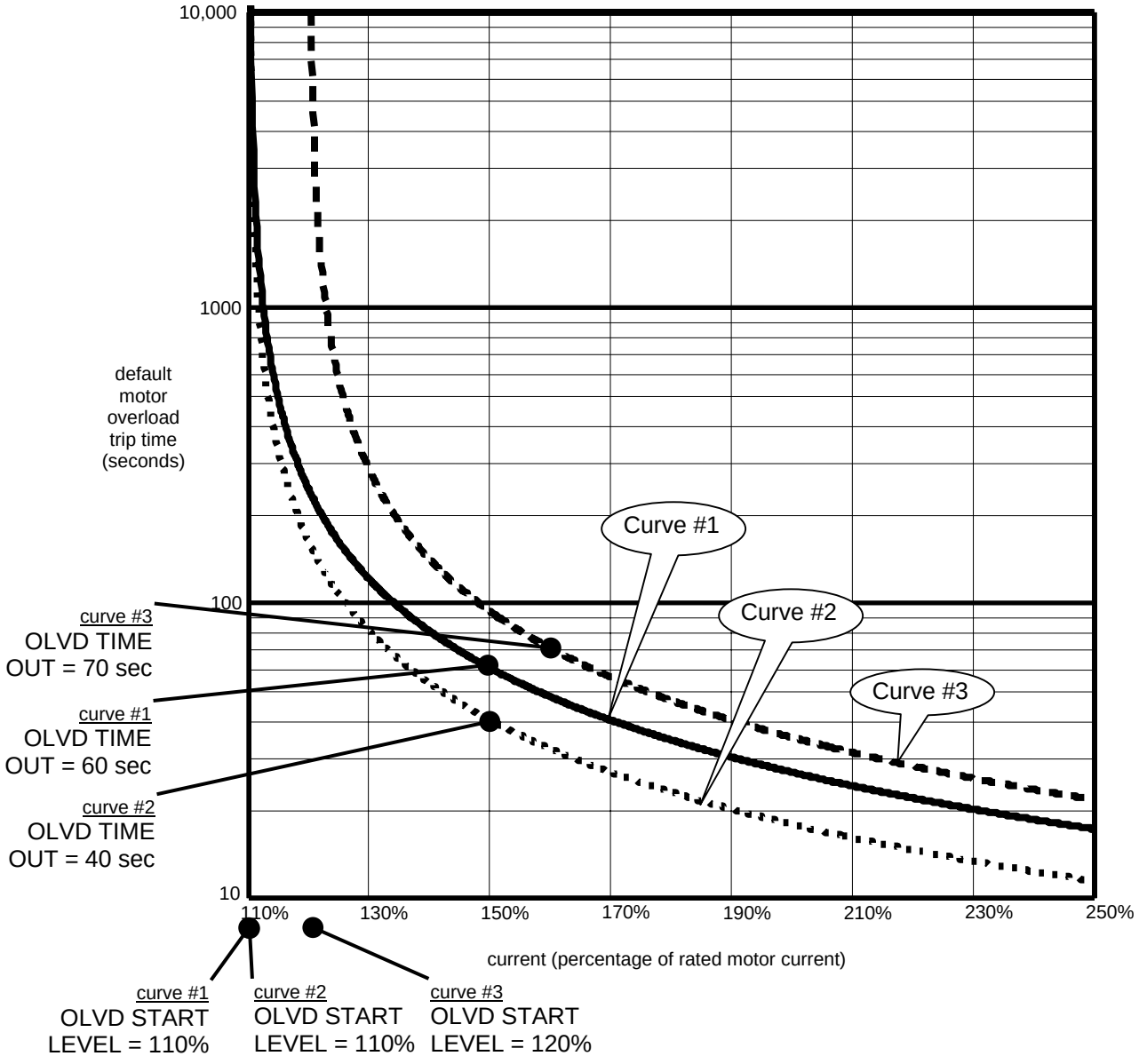


The drive will only declare a motor overload and the user is responsible for action.

But, if the user wants the drive to declare a fault on a motor overload the following need to be completed:

- logic output configured to MTR OVERLOAD
- logic input configured to EXT FAULT
- wire the EXT FAULT logic input terminal to the MTR OVERLOAD logic output terminal
- wire the logic input common terminal to the logic output common

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



Motor Overload Curve

Closed Loop Configure C0 menu

User Switches C1 submenu

Parameter	Description	Choices	Default	Hidden item	Run lock out
SPD COMMAND SRC	(Speed Command Source) This parameter designates the source of the drive's speed command. The three possible sources for the speed command are: • Serial Channel - a RS-422 serial port located on the drive control board (either speed profile or multi-step speed commands) = serial – speed profile (only used in serial mode 1) = ser mult step – serial multi-step speed commands (only used in serial mode 2) • 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). 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)	– **analog input** – **multi-step** – **serial** – **ser mult step**	**MULTI-STEP**	Y	Y
RUN COMMAND SRC	(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 tb1), 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 external tb or serial+extrn), the Run signal on TB1 must be selected.	– **external tb** – **serial** – **serial+extrn**	**EXTERNAL TB**	Y	Y
HI/LO GAIN SRC	(High / Low Gain Source) High / low gain change switch source. For more information, see HI/LO GAIN SRC on page 63.	– **external tb** – **serial** – **internal**	**INTERNAL**	Y	Y

Parameter	Description	Choices	Default	Hidden item	Run lock out
SPEED REG TYPE	(Speed Regulator Type) Chooses speed regulator: Ereg or PI regulator. Magnetek recommends the use of the Elevator Speed Regulator (Ereg) for better elevator performance. If set to external regulator, the drive will be configured as a torque controller. **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 source of the external torque command is determined by the EXT TORQ CMD SRC (C1) parameter. For more information, see SPEED REG TYPE on page 63.	– **elev spd reg** – **pi speed reg** – **external reg**	**ELEV SPD REG**	Y	Y
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 down, this parameter can be changed to allow the motor rotation to match the car controller command.	– **forward** – **reverse**	**FORWARD**	Y	Y
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 BRAKE PICKED becomes true.	– **reg release** – **brake picked**	**REG RELEASE**	Y	Y
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 Cnfirm signal on a logic input terminal.	– **none** – **external tb**	**NONE**	Y	Y

Parameter	Description	Choices	Default	Hidden item	Run lock out
PreTorque SOURCE	(Pre-Torque Source) This switch determines if a pre torque command is used and if used the source. 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 a RS-422 or 485 serial port on option card. 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** – **analog input** – **serial**	**NONE**	Y	Y
PreTorque LATCH	(PreTorque Latch) This parameter determines if the pre-torque signal is latched. NOTE: If PreTorque Source has been set to NONE, the setting does not have any effect on the operation of the drive. Some car controllers send both analog pre-torque and speed commands. To facilitate this, the HPV 600 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 latched pre-torque command is used by the speed regulator when the internal Speed Regulator Release signal is asserted. Once the pre-torque command is used the latch and the pre-torque command is cleared.	– **latched** – **not latched**	**NOT LATCHED**	Y	Y

Parameter	Description	Choices	Default	Hidden item	Run lock out
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 TB, the Pre-Trq Latch signal on TB1 must be selected.	– **serial** – **external tb**	**EXTERNAL TB**	Y	Y
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. Automatic Fault Reset 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** – **serial** – **automatic**	**EXTERNAL TB**	Y	Y
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** – **serial**	**EXTERNAL TB**	Y	Y
BRAKE PICK SRC	(Brake Pick Source) If the BRAKE PICK SRC (C1) is set to INTERNAL, the HPV 600 will attempt to pick (lift) the brake when magnetizing current has been developed in the motor.	– **internal** – **serial**	**INTERNAL**	Y	Y
BRAKE PICK CNFM	(Brake Pick Confirm) If this switch is set to EXTERNAL TB, the HPV 600 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.	– **none** – **external tb** – **internal time**	**NONE**	Y	Y
BRAKE HOLD SRC	(Brake Hold Source) If set to internal, the drive will command the mechanical brake to hold mode until confirmation of brake picked exists.	– **internal** – **serial**	**INTERNAL**	Y	Y

Parameter	Description	Choices	Default	Hidden item	Run lock out
RAMPED STOP SEL	(Ramp Stop Select) Chooses between normal stop and torque ramp down stop. For more information, see RAMPED STOP SEL on page 65.	– **none** – **ramp on stop**	**NONE**	Y	Y
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** – **run logic** – **serial**	**EXTERNAL TB**	Y	Y
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 in BRK PICK TIME (A1) parameter or a brake pick fault will be declared.	– **disable** – **enable**	**DISABLE**	Y	Y
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 in BRK HOLD TIME (A1) parameter or a brake hold fault is declared.	– **disable** – **enable**	**DISABLE**	Y	Y
EXT TORQ CMD SRC	(Torque Command Source) Sets the source of the external torque command when the SPEED REG TYPE (C1) is set to external reg. NOTE: • if SPEED REG TYPE is set to external reg and EXT TORQ CMD SRC is set to serial, the drive is a torque controller • if SPEED REG TYPE is set for a speed regulator (either pi speed reg or elev spd reg) and EXT TORQ CMD SRC is set to either serial, the torque command is an auxiliary torque command (torque feedforward command)	– **none** – **serial** – **analog input**	**NONE**	Y	Y
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** – **enabled**	**DISABLED**	Y	Y

Parameter	Description	Choices	Default	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. For more information, see S-Curve Abort on page 65.	– **disabled** – **enabled**	**DISABLED**	Y	Y
FAST FLUX	(Fast Flux Enable) This parameter addresses the method the HPV 600 uses to build up flux in the motor. Enabling the Fast Flux function can decrease the motor fluxing time significantly. By decreasing the motor's flux time, the starting takeoff time will also be decreased. For more information, see Fast Flux on page 66.	– **disabled** – **enabled**	**DISABLED**	Y	Y
MAINS DIP ENA	(Mains Dip Enable) When enabled, the function will reduce the speed (by the percentage defined by the MAINS DIP SPEED parameter) when the drive goes into 'low voltage' mode. 'Low voltage' mode is defined as when the drive declares a UV alarm, which is defined by the Input line-to-line voltage (INPUT L-L VOLTS) parameter and the Undervoltage Alarm Level (UV ALARM LEVEL)	– **disable** – **enable**	**DISABLE**	Y	Y
DB PROTECTION	(Dynamic Braking Resistor Protection Selection) The dynamic braking IGBT is limited as to when it can be turned "on" (i.e. send power to the dynamic braking resistors). The dynamic braking IGBT is allowed to be "on" while the drive is running (i.e. while the speed regulator is released) and for a period of ten (10) seconds after the drive is stopped. If the dynamic braking IGBT is still "on" ten seconds after the drive stops running, the drive will turn "off" the dynamic braking IGBT (thus stop sending power to the dynamic braking resistors) and declare a "DB VOLTAGE" fault or alarm (whether fault or alarm, depends on setting of this parameter).	– **fault** – **alarm**	**FAULT**	Y	Y
ENCODER FAULT	(Encoder Fault Enable) This parameter allows the user to temporarily disable the Encoder Fault. Adding this feature allows the user to temporarily disable the Encoder Fault during the initial start-up process, when the motor model (defined by the A5 Motor Parameters) is not clearly defined. When the Encoder Fault is disabled (ENCODER FAULT (C1) = disabled), the drive will display the warning message "EncoderFault OFF", every time the RUN command is removed. IMPORTANT: After the motor parameters in A5 have been established, the Encoder Fault should be enabled (ENCODER FAULT (C1) = enabled).	– **disable** – **enable**	**ENABLE**	Y	Y

Parameter	Description	Choices	Default	Hidden item	Run lock out
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 HPV 600. 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 “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** – **ramp to stop**	**IMMEDIATE**	Y	Y
MOTOR OVRLD SEL	(Motor Overload Select) This parameter selects the action to be taken by drive when declaring a user selectable Motor Overload. When the motor overload level is reached, the options are: – Alarm – the drive only declares a motor overload and the user is responsible for action – Flt immediate – the drive will immediately declare a fault and turn-off the drive’s output – Fault at stop – the drive will delay declaring a fault until the run command is removed	– **alarm** – **flt immediate** – **fault at stop**	**ALARM**	Y	Y
AUTO STOP	(Auto Stop Function Enable) 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 multi-step or serial (SPD COMMAND SRC (C1)=multi-step or serial). For more information, see Auto Stop on page 66.	– **disable** – **enable**	**DISABLE**	Y	Y
SERIAL MODE	(Serial Mode Selection) This parameter selects between two serial protocols. The choices are: • Mode 1 – selects the Magnetek standard protocol. • Mode 2 – selects a custom protocol. • Mode 2 Test – test mode used only when testing custom protocol serial mode 2.	– **none** – **mode 1** – **mode 2** – **mode 2 test**	**MODE 1**	Y	Y

Parameter	Description	Choices	Default	Hidden item	Run lock out
SER2 FLT MODE	(Serial Mode 2 Fault Mode) Used only with custom serial protocol (mode 2) *This parameter defines the reaction to a serial communications fault while in Serial Mode 2. There are three possible settings:* o Immediate – upon sensing a serial communications fault while in the run mode will result in an immediate stop. The equivalent to removal of the "Drive Enable" logic input. o Run Remove – upon sensing a serial communications fault while in the run mode, the drive will react in the same manner that removal of the run command would react. In this case, the type of stop will be defined by the STOPPING MODE (C1) parameter. o Rescue – upon sensing a serial communications fault while in the run mode, an attempt will be made to continue to run at a low speed to the next floor. Upon sensing the fault, the drive will decelerate to a creep speed and continue to run at that speed until the first of the two following termination conditions are reached. o The hardware "Drive Enable" logic input is removed o A timer set by parameter SER2 RS CRP TIME (A1) has elapsed.	– **immediate** – **run remove** – **rescue**	**IMMEDIATE**	Y	Y
DRV FAST DISABLE	(Drive Fast Disable Function) This function determines how fast the drive responds to the removal of DRIVE ENABLE logic input. Note: The removal of the DRIVE ENABLE logic input will turn-off the drive output gates. Disable: With the removal of the DRIVE ENABLE logic input, the drive's output gates will turn off within 4 msec. Enable: With the removal of the DRIVE ENABLE logic input, the drive's output gates will turn off within 1.5-2.0 msec.	– **disable** – **enable**	**DISABLE**	Y	Y
MLT-SPD TO DLY1	(Multi-step Speed Command Delay x) This parameter assigns multi-step speed command to recognition delay timer x as defined by the MSPD DELAY x (A1) parameter. For more information, see Multi-Step Speed Delay on page 67.	– **none** – **mspd 1 - 15**	**NONE**	Y	Y
MLT-SPD TO DLY2			**NONE**	Y	Y
MLT-SPD TO DLY3			**NONE**	Y	Y
MLT-SPD TO DLY4			**NONE**	Y	Y
PRIORITY MESSAGE	(Priority Message Enabling) With Priority Message disabled the user will not see priority messages, i.e. faults, alarms, on the operator. The faults will be placed into the fault history and active faults lists with the Fault LED on. Leave enabled when the drive is not being worked on.	– **enable** – **disable**	**ENABLE**	Y	Y
PWR MODULE LATCH	(Power Module Latch) This parameter enables or disables the bridge fault	– **enable** – **disable**	**ENABLE**	Y	Y

Table 6: Closed-Loop User Switches C1 Submenu

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 HPV 600 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:

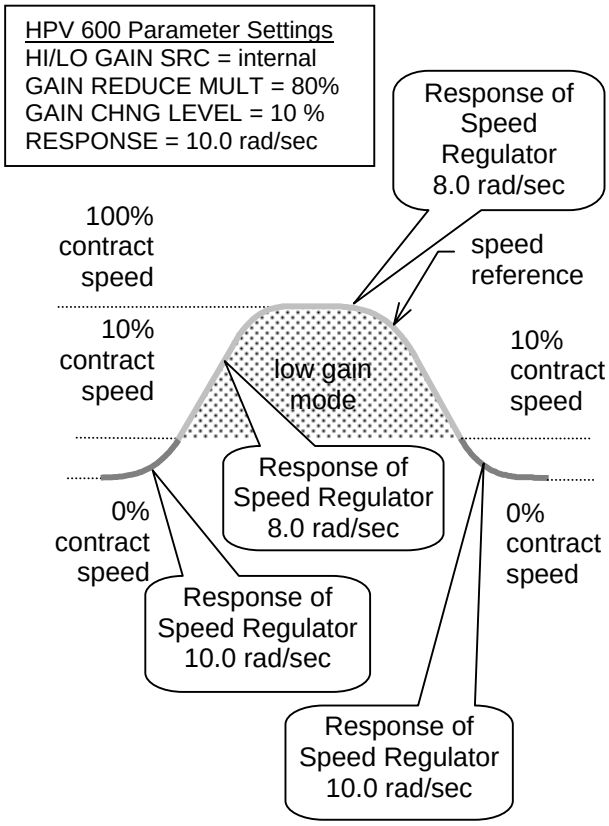
- a logic input
- the serial channel

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

SPEED REG TYPE

(Speed Regulator Type)
This switch toggles between the Elevator Speed Regulator (Ereg) and the PI Speed Regulator. Magnetek recommends the use of the Elevator Speed Regulator for better elevator performance.

If SPEED REG TYPE is set to external regulator, the drive will be configured as a torque controller.

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 source of the external torque command is determined by the EXT TORQ CMD SRC (C1) parameter.
The HPV 600 has the following two closed loop speed regulation options and an option for turning off the internal speed regulator:

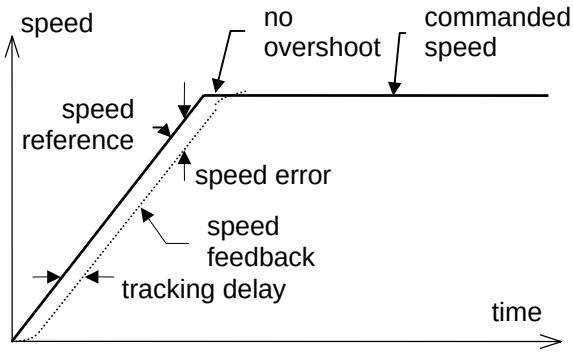
- Elevator Speed Regulator (Ereg)
- PI Speed Regulator
- External Speed Regulator

The Elevator Speed Regulator is recommended for use with elevator applications but is not required. The regulator type can be changed by using the SPEED REG TYPE (C1) parameter.

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.

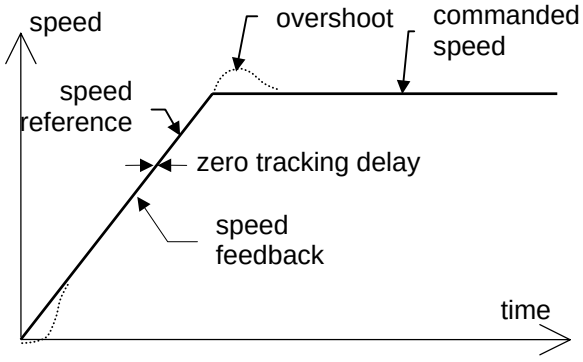
The tracking delay shown is defined as (1/RESPONSE) seconds. The tracking delay is not effected by the gain reduce multiplier.

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:

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

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



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.

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.

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 selected by the RAMP DOWN EN SRC (C1):

- An input logic bit (EXTERNAL TB1)
- The run logic – initiated by the removal of the run command
- The serial channel

A method of providing the Ramp Down Enable would be with a logic signal (EXTERNAL TB1) 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 HPV 600 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.

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 the optional S-Curve abort to be active requires that:

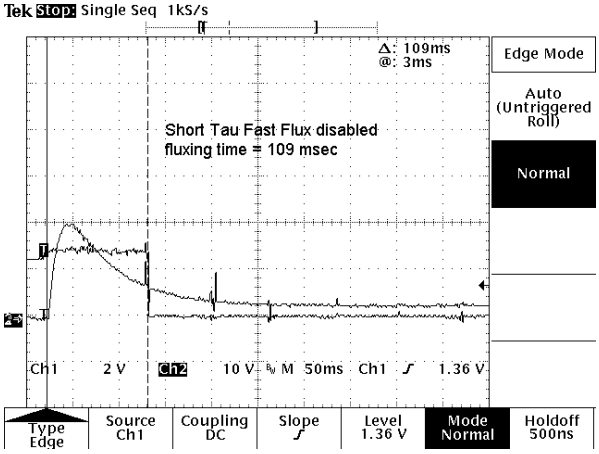
- The speed command source must be selected as Multi-step (SPD COMMAND SRC=multi-step)
- The S-curve Abort function must be ENABLED (S-CURVE ABORT = enabled)

FAST FLUX

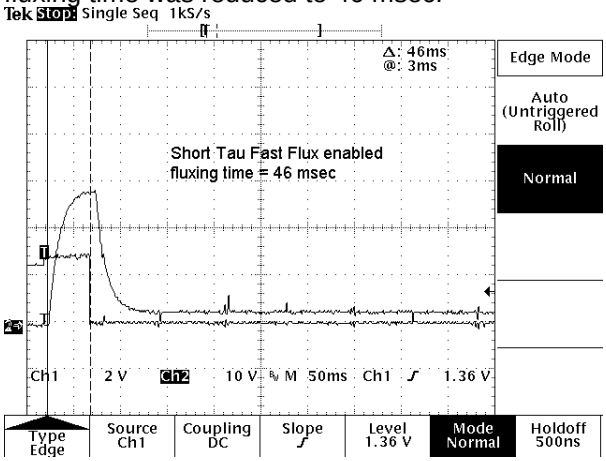
(Fast Flux Enable)
This parameter addresses the method the HPV 600 uses to build up flux in the motor. Enabling the Fast Flux function can decrease the motor fluxing time significantly. By decreasing the motor's flux time, the starting takeoff time will also be decreased.

Certain motors will have a noticeably long fluxing time, which is indicated by the time between the run command being issued and the speed regulator release output going true. Enabling the Fast Flux function will reduce this delay.

<u>Fast Flux Function with FAST FLUX = disabled</u>
In this example, the motor fluxing time was 109 msec.



<u>Fast Flux Function with FAST FLUX = enabled</u>
With the same motor example, the motor fluxing time was reduced to 46 msec.



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 multi-step or serial (SPD COMMAND SRC (C1)=multi-step or serial).

<u>Disabled</u>
When the Auto Stop function is disabled, the drive will be the act as the magnitude of the speed command plays no part in the logical starting or stopping of the drive.

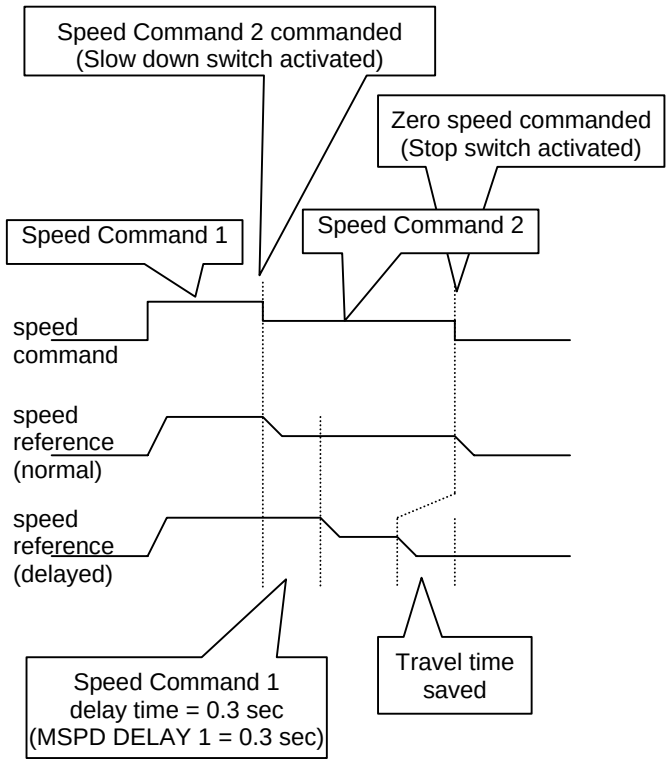
<u>Enabled</u>
When the Auto Stop function is enabled and the speed command source is either multi-step or serial, the following changes occurs to the start and stop sequence:

- 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, which signal is removed first does make a difference.

MULTI-STEP SPEED DELAY

Multi-step Speed Command Delay Function
When setting up an elevator, slow-down and stop switches are set at fixed locations in the shaft. Once the drive is tuned, it might require the user to move the switches in the shaft in order to minimize the time spent at leveling speed.
Under "normal" operation, the drive speed reference follows the speed command. By configuring for "delayed" operation and setting speed command 1 for a delay (MLT-SPD TO DLY 1 = MSPD 1), the recognition of the speed command change from speed command 1 to any other speed command (in this case speed command 2) will be delayed by the setting of MSPD DELAY 1 (A1) parameter.



Logic Inputs C2 submenu

LOGIC INPUT x

(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. When a function is assigned to an input terminal, it is removed from the list of possible selections for subsequent terminals.

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	Default	Hidden item	Run lock out
LOGIC INPUT 1	logic input #1	**DRIVE ENABLE**	Y	Y
LOGIC INPUT 2	logic input #2	**RUN**	Y	Y
LOGIC INPUT 3	logic input #3	**FAULT RESET**	Y	Y
LOGIC INPUT 4	logic input #4	**UP/DWN**	Y	Y
LOGIC INPUT 5	logic input #5	**S-CURVE SEL 0**	Y	Y
LOGIC INPUT 6	logic input #6	**STEP REF B0**	Y	Y
LOGIC INPUT 7	logic input #7	**STEP REF B1**	Y	Y
LOGIC INPUT 8	logic input #8	**STEP REF B2**	Y	Y
LOGIC INPUT 9	logic input #9	**EXTRN FAULT 1**	Y	Y

choices…	*choice descriptions…*	
contact cfirm	(Contact Confirm Signal) Closure of the auxiliary contacts confirming closure of the motor contactor.	
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 wiling cause the drive declare a fault and perform a shutdown.	
fault reset	(Fault Reset) If the FAULT RESET SRC (C1) switch is set to EXTERNAL TB1, 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 (A1)) will be reset to zero. NOTE: This input is edge sensitive and the fault is reset on the transition from false to true.	
low gain sel	(Low Gain Select Signal) 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 brake hold	(Mechanical Brake Hold Signal) Auxiliary contact closures confirming when the mechanical brake is in the hold mode (engaged).	
mech brake pick	(Mechanical Brake Pick Signal) 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.	
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.	
run	(Run) If drive is enabled through the DRIVE ENABLE logic input, this function will start drive operation.	

choices…	*choice descriptions…*	
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	(S-Curve Select bit-0) Bit 0 of S-curve selection	These two bits are used to select one of four s-curve selections.
s-curve sel 1	(S-Curve Select bit-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	Four inputs, which must be used together as a 4-bit command for multi-step speed selection.
step ref b1	Bit 1 of multi-step speed command selection	
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 7: Closed-Loop 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	Default	Hidden item	Run lock out
LOGIC OUTPUT 1	logic output #1	READY TO RUN	Y	Y
LOGIC OUTPUT 2	logic output #2	RUN COMMANDED	Y	Y
LOGIC OUTPUT 3	logic output #3	MTR OVERLOAD	Y	Y
LOGIC OUTPUT 4	logic output #4	READY TO RUN	Y	Y
RELAY COIL 1	relay output #1	FAULT	Y	Y
RELAY COIL 2	relay output #2	SPEED REG RLS	Y	Y

choices…	*choice descriptions…*
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.
brake alarm	(Brake Alarm) The output is true when the dynamic brake resistor is in an overcurrent condition and the drive is in a run condition.
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 igbt flt	(Brake Fault) The output is true when the dynamic brake resistor is in an overcurrent condition and the drive is not in a run condition.
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 drive is declaring an encoder fault.
fan alarm	(Fan Alarm) The output is true when the fan on the drive is not functioning.
fault	(Fault) The output is true when a fault is declared by the drive.
flux confirm	(Motor Flux Confirmation) The output is true when the drive has confirmed there is enough flux to issue a speed regulator release (the drive's estimate of flux must reach 75% of reference).
fuse fault	(Fuse Fault) The output is true when the DC bus fuse has blown.
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" mode.

choices…	*choice descriptions…*
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 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.
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 90°C (194°F).
overvolt flt	(Over Voltage Fault) The output is true when the DC bus voltage exceeds 850VDC for a 460V class drive or 425VDC for a 230V class drive.
ovrtemp alarm	(Drive Over Temperature Alarm) The output is true when the drive's heatsink temperature has exceeded 80°C (176°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 to run	(Ready to Run) The output is true when the drive's software has been initialized and no faults are present.
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).
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	(Low 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 8: Closed-Loop Logic Outputs C3 Submenu

Analog Outputs C4 submenu

ANALOG OUTPUT 1
(Analog Outputs 1)
Default: TORQUE REF
This parameter defines the function of the analog output #1.
NOTE: The *current* setting of each parameter is displayed in all caps; all other choices in the list are displayed in lower case.

ANALOG OUTPUT 2
(Analog Outputs 2)
Default: SPEED FEEDBK
This parameter defines the function of the analog output #2.
NOTE: The *current* setting of each parameter is displayed in all caps; all other choices in the list are displayed in lower case.

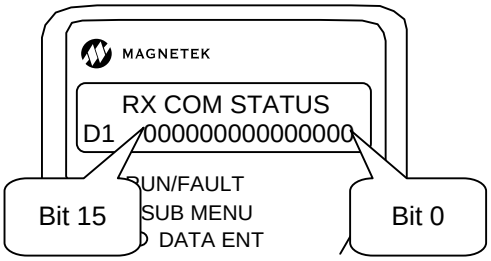
Parameter	**Description**	**Default**	**Hidden item**	**Run lock out**
ANALOG OUTPUT 1	analog output #1	TORQUE REF	N	Y
ANALOG OUTPUT 2	analog output #2	SPEED FEEDBK	N	Y

Choices…	*choice descriptions…*	*D/A Units*
aux torq cmd	(Auxiliary Torque Command) Additional torque command from auxiliary source, when used.	% rated torque
bus voltage	(DC Bus Voltage Output) Measured DC bus voltage.	% of peak in
current out	(Current Output) Percent motor current.	% rated current
drv overload	(Drive Overload) Percent of drive overload trip level reached.	% of trip point
flux current	(Flux Producing Current) Measured flux producing current.	% rated current
flux output	(Flux Output) Measured flux output.	% rated flux
flux ref	(Flux Reference) Flux reference used by vector control.	% rated flux
flux voltage	(Flux Producing Voltage) Flux producing voltage reference.	% rated volts
frequency out	(Frequency Output) Electrical frequency.	% rated freq
mtr overload	(Motor Overload) Percent of motor overload trip level reached.	% of trip point
power output	(Power Output) Calculated power output.	% rated power
pretorque ref	(PreTorque Reference) Pre-torque reference.	% base torque
slip freq	(Motor Slip Frequency) Commanded slip frequency.	% rated freq
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
torq current	(Torque Producing Current) Measured torque producing current.	% rated current
torq voltage	(Torque Producing Voltage) Torque producing voltage reference.	% rated volts
torque output	(Torque Output) Calculated torque output.	% rated torque
torque ref	(Torque Reference) Torque reference used by vector control.	% base torque
voltage out	(Voltage Output) RMS motor terminal voltage.	% rated volts

Table 9: Closed-Loop Analog Outputs C4 Submenu

Closed Loop 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>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:
$\left\| \begin{pmatrix} speed \\ reference \end{pmatrix} - \begin{pmatrix} speed \\ feedback \end{pmatrix} \right| = \begin{matrix} speed \\ error \end{matrix}$</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>SPD REG TORQ CMD</td><td>(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 when 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</td><td>(Serial Communications Status) Serial communication status display.
 

<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>
<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>
</table></td><td>1=true
0=false</td><td>N</td></tr>
</table>

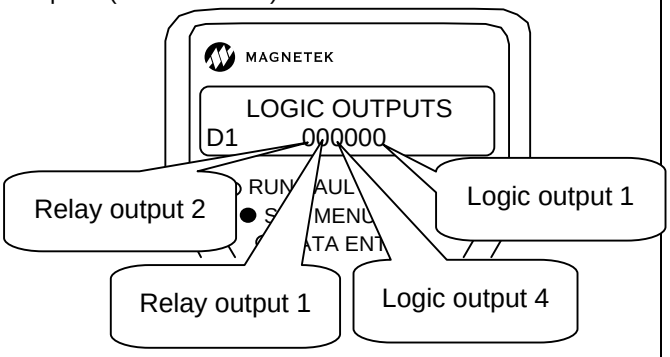
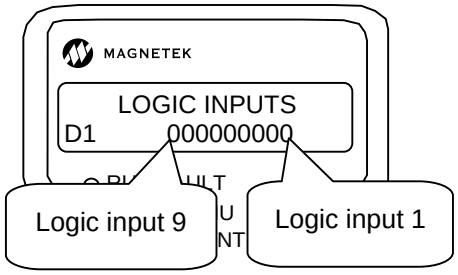
<table>
<tr><th>Parameter</th><th>Description</th><th>Units</th><th>Hidden item</th></tr>
<tr><td>RX COM STATUS</td><td>
<table>
<tr><td>Bit</td><td>Severity</td><td>Name Description/Reason</td></tr>
<tr><td>7</td><td>Info</td><td>RX_INVALID_MONITOR_ID (Not available in Mode 2) Set if the Monitor_Id 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>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 10: Closed-Loop Elevator Data D2 Submenu

Power Data D2 submenu

Parameter	Description	Units	Hidden item
TORQUE REFERENCE	(Torque Reference) Monitors the torque reference used by the drive control.	% rated torque	N
MOTOR CURRENT	(RMS Motor Current Output) Monitors the RMS motor output current.	Amps	N
% MOTOR CURRENT	(Percent Motor Current) Monitors the motor current as a percent of rated motor current.	%rated current	N
MOTOR VOLTAGE	(Motor Voltage Output) Monitors the RMS motor terminal line-line voltage.	Volts	N
MOTOR FREQUENCY	(Motor Frequency Output) Monitors the electrical frequency of the motor output.	Hz	N
MOTOR TORQUE	(Motor Torque Output) Calculated motor output torque in terms of percent rated torque.	% rated torque	N
POWER OUTPUT	(Power Output) Calculated drive power output.	KW	N
DC BUS VOLTAGE	(DC Bus Voltage) Measured voltage of the DC bus.	Volts	N
FLUX REFERENCE	(Flux Reference) Flux reference used by the vector control of the drive.	% rated flux	Y
FLUX OUTPUT	(Flux Output) Measured value of the flux output.	% rated flux	Y
SLIP FREQUENCY	(Slip Frequency) Displays the commanded slip frequency of the motor.	Hz	Y
MOTOR OVERLOAD	(Motor Overload) Displays the percentage of motor overload trip level reached. Once this value reaches 100% the motor has exceeded its user defined overload curve and a motor overload alarm is declared by the drive.	%	Y
DRIVE OVERLOAD	(Drive Overload) Displays the percentage of drive overload trip level reached. Once this value reaches 100% the drive has exceeded its overload curve and a drive overload fault is declared.	%	Y
FLUX CURRENT	(Flux Current) Displays the flux producing current of the motor.	%rated current	Y
TORQUE CURRENT	(Torque Current) Displays the torque producing current of the motor.	%rated current	Y
FLUX VOLTAGE	(Flux Voltage) Displays the flux voltage reference.	% rated volts	Y
TORQUE VOLTAGE	(Torque Voltage) Displays the torque voltage reference.	% rated volts	Y
BASE IMPEDANCE	(Base Impedance) Displays the drive calculated base impedance, which is based on the RATED MTR PWR and the RATED MTR VOLTS parameters. This value is used to calculate the Per Unit values of the system impedances (i.e. EXTERN REACTANCE and STATOR RESIST).	Ohms	Y
EST NO LOAD CURR	(Estimated No Load Current) Estimated no load current of the motor calculated by the adaptive tune.	%rated current	N
EST RATED RPM	(Estimated Rated RPM) Estimated rated rpm of the motor calculated by the adaptive tune.	RPM	N

Table 11: Closed-Loop Power Data D2 Submenu

Open Loop Parameters

Submenu	Parameter	Units	Range	Default	Site Setting
A1	***Open-Loop Drive A1 submenu – For more information, see page 94.***				
A1	CONTRACT CAR SPD	fpm	0.0 – 1500.0	100.0	
		m/s	0.000 – 16.000	2.000	
A1	CONTRACT MTR SPD	RPM	50.0 – 3000.0	1130.0	
A1	CONTACT FLT TIME	sec	0.10 – 5.00	0.10	
A1	CONT DWELL TIME	sec	0.00 – 5.00	0.50	
A1	BRAKE PICK TIME	sec	0.00 – 5.00	1.00	
A1	BRAKE HOLD TIME	sec	0.00 – 5.00	0.20	
A1	BRAKE PICK DELAY	sec	0.00 – 5.00	0.50	
A1	BRAKE DROP DELAY	sec	0.00 – 5.00	0.50	
A1	DC START LEVEL	%	0.0 – 150.0	80.0	
A1	DC STOP LEVEL	%	0.0 – 150.0	50.0	
A1	DC STOP FREQ	Hz	0.0 – 150.0	0.5	
A1	DC START TIME	sec	0.00 – 15.00	1.00	
A1	DC STOP TIME	sec	0.00 – 15.00	1.00	
A1	OVERSPEED MULT	%	100.0 – 150.0	125.0	
A1	STALL TEST LEVEL	%	0.0 – 200.0	200.0	
A1	STALL FAULT TIME	sec	0.00 – 20.00	5.00	
A1	SLIP COMP TIME	sec	0.00 – 20.00	1.50	
A1	SLIP COMP GAIN	none	0.00 – 20.00	1.00	
A1	TORQ BOOST TIME	sec	0.00 – 20.00	0.05	
A1	TORQ BOOST GAIN	none	0.00 – 20.00	0.00	
A1	SPD COMMAND BIAS	volts	0.00 – 6.00	0.00	
A1	SPD COMMAND MULT	none	0.90 – 5.00	1.00	
A1	MAINS DIP SPEED	%	5.00 – 99.99	25.00	
A1	ZERO SPEED LEVEL	%	0.00 – 99.99	1.00	
A1	ZERO SPEED TIME	sec	0.00 – 9.99	0.10	
A1	UP/DWN THRESHOLD	%	0.00 – 9.99	1.00	
A1	MTR TORQUE LIMIT	%	0.0 – 275.0	200.0	
A1	REGEN TORQ LIMIT	%	0.0 – 275.0	200.0	
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	#	0 – 10	3	
A1	UP TO SPD LEVEL	%	0.00 – 110.00	80.00	
A1	TRQ LIM MSG DLY	sec	0.0 – 10.00	0.50	
A1	SER2 INSP SPD	fpm	0.0 – 100.0	30.0	
A1	SER2 RS CRP SPD	fpm	0.0 – 300.0	10.0	
A1	SER2 RS CPR TIME	sec	0.0 – 200.0	180.0	
A1	SER2 FLT TOL	sec	0.00 – 2.00	0.04	
A1	ENCODER PULSES	none	600 – 10000	1024	

Submenu	Parameter	Units	Range	Default	Site Setting
A2	***Open-Loop S-Curves A2 submenu – For more information, see page 103.***				
A2	ACCEL RATE 0	ft/s^2	0.00 – 7.99	1.00	
		m/s^2	0.000 – 3.999	0.300	
A2	DECEL RATE 0	ft/s^2	0.00 – 7.99	1.00	
		m/s^2	0.000 – 3.999	0.300	
A2	ACCEL JERK IN 0	ft/s^3	0.0 – 29.9	0.5	
		m/s^3	0.00 – 9.99	0.15	
A2	ACCEL JERK OUT 0	ft/s^3	0.0 – 29.9	0.5	
		m/s^3	0.00 – 9.99	0.15	
A2	DECEL JERK IN 0	ft/s^3	0.0 – 29.9	0.5	
		m/s^3	0.00 – 9.99	0.15	
A2	DECEL JERK OUT 0	ft/s^3	0.0 – 29.9	0.5	
		m/s^3	0.00 – 9.99	0.15	
A2	ACCEL RATE 1	ft/s^2	0.00 – 7.99	1.00	
		m/s^2	0.000 – 3.999	0.300	
A2	DECEL RATE 1	ft/s^2	0.00 – 7.99	1.00	
		m/s^2	0.000 – 3.999	0.300	
A2	ACCEL JERK IN 1	ft/s^3	0.0 – 29.9	0.5	
		m/s^3	0.00 – 9.99	0.15	
A2	ACCEL JERK OUT 1	ft/s^3	0.0 – 29.9	0.5	
		m/s^3	0.00 – 9.99	0.15	
A2	DECEL JERK IN 1	ft/s^3	0.0 – 29.9	0.5	
		m/s^3	0.00 – 9.99	0.15	
A2	DECEL JERK OUT 1	ft/s^3	0.0 – 29.9	0.5	
		m/s^3	0.00 – 9.99	0.15	
A2	ACCEL RATE 2	ft/s^2	0.00 – 7.99	1.00	
		m/s^2	0.000 – 3.999	0.300	
A2	DECEL RATE 2	ft/s^2	0.00 – 7.99	1.00	
		m/s^2	0.000 – 3.999	0.300	
A2	ACCEL JERK IN 2	ft/s^3	0.0 – 29.9	0.5	
		m/s^3	0.00 – 9.99	0.15	
A2	ACCEL JERK OUT 2	ft/s^3	0.0 – 29.9	0.5	
		m/s^3	0.00 – 9.99	0.15	
A2	DECEL JERK IN 2	ft/s^3	0.0 – 29.9	0.5	
		m/s^3	0.00 – 9.99	0.15	
A2	DECEL JERK OUT 2	ft/s^3	0.0 – 29.9	0.5	
		m/s^3	0.00 – 9.99	0.15	
A2	ACCEL RATE 3	ft/s^2	0.00 – 7.99	1.00	
		m/s^2	0.000 – 3.999	0.300	
A2	DECEL RATE 3	ft/s^2	0.00 – 7.99	1.00	
		m/s^2	0.000 – 3.999	0.300	
A2	ACCEL JERK IN 3	ft/s^3	0.0 – 29.9	0.5	
		m/s^3	0.00 – 9.99	0.15	
A2	ACCEL JERK OUT 3	ft/s^3	0.0 – 29.9	0.5	
		m/s^3	0.00 – 9.99	0.15	
A2	DECEL JERK IN 3	ft/s^3	0.0 – 29.9	0.5	
		m/s^3	0.00 – 9.99	0.15	
A2	DECEL JERK OUT 3	ft/s^3	0.0 – 29.9	0.5	
		m/s^3	0.00 – 9.99	0.15	

Open-Loop Quick Reference Parameters

Submenu	Parameter	Units	Range	Default	Site Setting
A3	***Open-Loop Multi-step Ref A3 submenu – For more information, see page 105.***				
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	SPEED COMMAND 14	ft/min	-3000.0 –+3000.0	0.0	
		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	
A4	***Open-Loop Power Convert A4 submenu – For more information, see page 107.***				
A4	Id REG DIFF GAIN	none	0.80 – 1.20	1.00	
A4	Id REG PROP GAIN	none	0.20 – 0.40	0.30	
A4	Iq REG DIFF GAIN	none	0.80 – 1.20	1.00	
A4	Iq REG PROP GAIN	none	0.20 – 0.40	0.30	
A4	Id DIST LOOP GN	none	0.00 – 1.50	0.50	
A4	Iq DIST LOOP GN	none	0.00 – 1.50	0.30	
A4	Id DIST LOOP Fc	Hz	0.1 – 30.0	5.0	
A4	Iq DIST LOOP Fc	Hz	0.1 – 30.0	5.0	
A4	I REG CROSS FREQ	%	0.0 – 300.0	100.0	
A4	DIST LP OFF FREQ	Hz	0.0 – 99.9	60.0	
A4	ILIMT INTEG GAIN	none	0.00 – 9.99	1.00	
A4	HUNT PREV GAIN	none	0.00 – 4.00	1.00	
A4	HUNT PREV TIME	sec	0.001 – 7.000	0.200	
A4	PWM FREQUENCY	kHz	2.5 – 16.0	10.0	
A4	SWITCHING DELAY	µsec	-5.00 – +5.00	0.00	
A4	VC CORRECTION	volts	0.00 – 5.00	2.50	
A4	UV ALARM LEVEL	%	80 – 99	90	
A4	UV FAULT LEVEL	%	50 – 99	80	
A4	EXTERN REACTANCE	%	0.0 – 10.0	0.0	
A4	INPUT L-L VOLTS	volts	110 – 480	460 or 230	

Submenu	Parameter	Units	Range	Default	Site Setting
A5	***Open-Loop Motor A5 submenu – For more information, see page 110.***				
A5	MOTOR ID	-	-	-	
A5	RATED MTR POWER	HP	1.0 – 500.0	0.0	
		kW	0.75 – 400.00		
A5	RATED MTR VOLTS	volts	190.0 – 575.0	0.0	
A5	RATED EXCIT FREQ	Hz	5.0 – 400.0	0.0	
A5	MOTOR MID VOLTS	volts	0.1 – 575.0	Per ID	
A5	MOTOR MID FREQ	Hz	0.1 – 400.0	3.0	
A5	MOTOR MIN VOLTS	volts	0.1 – 100.0	Per ID	
A5	MOTOR MIN FREQ	Hz	0.1 – 10.0	1.0	
A5	RATED MOTOR CURR	amps	1.00 – 800.00	0.00	
A5	MOTOR POLES	none	2 – 32	Per ID	
A5	RATED MTR SPEED	RPM	50.0 – 3000.0	0.0	
A5	% NO LOAD CURR	%	10.0 – 80.0	Per ID	
A5	STATOR LEAKAGE X	%	0.0 – 20.0	Per ID	
A5	ROTOR LEAKAGE X	%	0.0 – 20.0	Per ID	
A5	STATOR RESIST	%	0.0 – 20.0	2.5	
A5	MOTOR IRON LOSS	%	0.0 – 15.0	0.5	
A5	MOTOR MECH LOSS	%	0.0 – 15.0	1.0	
A5	OVLD START LEVEL	%	100 – 150	110	
A5	OVLD TIME OUT	sec	5.0 – 120.0	60.0	
C1	***Open-Loop User Switches C1 submenu – For more information, see page 115.***				
C1	SPD COMMAND SRC	none	– analog input – multi-step – serial – ser mult step	MULTI-STEP	
C1	RUN COMMAND SRC	none	– external tb – serial – serial+extrn	EXTERNAL TB	
C1	MOTOR ROTATION	none	– forward – reverse	FORWARD	
C1	SPD REF RELEASE	none	– reg release – brake picked	REG RELEASE	
C1	CONT CONFIRM SRC	none	– none – external tb	NONE	
C1	FAULT RESET SRC	none	– external tb – serial – automatic	EXTERNAL TB	
C1	OVERSPD TEST SRC	none	– external tb – serial	EXTERNAL TB	
C1	BRAKE PICK SRC	none	– internal – serial	INTERNAL	
C1	BRAKE PICK CNFM	none	– none – external tb	NONE	
C1	BRAKE HOLD SRC	none	– internal – serial	INTERNAL	
C1	BRK PICK FLT ENA	none	– disable – enable	DISABLE	
C1	BRK HOLD FLT ENA	none	– disable – enable	DISABLE	
C1	DIR CONFIRM	none	– disabled – enabled	DISABLED	
C1	STALL TEST ENA	none	– disable – enable	ENABLE	
C1	STALL PREV ENA	none	– disable – enable	DISABLE	

Open-Loop Quick Reference Parameters

Submenu	Parameter	Units	Range	Default	Site Setting
C1	***User Switches C1 Submenu continued …***				
C1	S-CURVE ABORT	none	– disabled – enabled	DISABLED	
C1	STOPPING MODE	none	– immediate – ramp to stop	IMMEDIATE	
C1	MAINS DIP ENA	none	– disable – enable	DISABLE	
C1	AUTO STOP ENA	none	– disable – enable	DISABLE	
C1	DB PROTECTION	none	– fault – alarm	FAULT	
C1	MOTOR OVRLD SEL	none	– alarm – flt immediate – fault at stop	ALARM	
C1	TORQUE CALC SEL	none	– gap power – stator flux	STATOR FLUX	
C1	SERIAL MODE	none	– none – mode 1 – mode 2 – mode 2 test	NONE	
C1	SER2 FLT MODE	none	– immediate – run remove – rescue	IMMEDIATE	
C1	DRV FAST DISABLE	none	– disable – enable	DISABLE	
C1	PWR MODULE LATCH	none	– disable – enable	ENABLE	
C2	***Open-Loop logic Inputs C2 submenu – For more information, see page 121.***				
C2	LOGIC INPUT 1	– contact cfirm – drive enable – extrn fault 1 – extrn fault 2 – extrn fault 3 – extrn /flt 4 – fault reset – mech brk hold – mech brk pick – nc cntct cfm – no function – ospd test src	– run – 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 – up/dwn	DRIVE ENABLE	
C2	LOGIC INPUT 2			RUN	
C2	LOGIC INPUT 3			FAULT RESET	
C2	LOGIC INPUT 4			UP/DWN	
C2	LOGIC INPUT 5			S-CURVE SEL 0	
C2	LOGIC INPUT 6			STEP REF B0	
C2	LOGIC INPUT 7			STEP REF B1	
C2	LOGIC INPUT 8			STEP REF B2	
C2	LOGIC INPUT 9			EXTRN FAULT 1	

Submenu	Parameter	Units	Range	Default	Site Setting
C3	***Open-Loop Logic Outputs C3 submenu – For more information, see page 123.***				
C3	LOGIC OUTPUT 1	– alarm – alarm+flt – brake alarm – brake hold – brake pick – brk hold flt – brk igbt flt – brk pick flt – car going dwn – car going up – charge fault – close contact – contactor flt – drv overload – fan alarm – fault – flux confirm – fuse fault – ground fault – motor trq lim	– mtr overload – no function – not alarm – over curr flt – overtemp flt – overvolt flt – ovrtemp alarm – phase fault – ready to run – regen trq lim – run commanded – run confirm – speed ref rls – spd ref rel2 – speed reg rls – stltst active – undervolt flt – up to speed – uv alarm – zero speed	READY TO RUN	
C3	LOGIC OUTPUT 2			RUN COMMANDED	
C3	LOGIC OUTPUT 3			MTR OVERLOAD	
C3	LOGIC OUTPUT 4			READY TO RUN	
C3	RELAY COIL 1			FAULT	
C3	RELAY COIL 2			SPEED REG RLS	
C4	***Open-Loop Analog Outputs C4 submenu – For more information, see page 125.***				
C4	ANALOG OUTPUT 1	– bus voltage – current out – drv overload – flux current – flux voltage – frequency out – mtr overload – no function – power output	– slip freq – speed command – speed feedbk – speed ref – torq current – torq voltage – torque output – voltage out	SPEED REF	
C4	ANALOG OUTPUT 2			SPEED FEEDBK	

Sub menu	Parameter	Units
D1	***Elevator Data D1 Submenu***	
D1	Speed Command	ft/min or m/s
D1	Speed Reference	ft/min or m/s
D1	Speed Feedback	ft/min or m/s
D1	Encoder Speed	rpm
D1	Logic Outputs	1 = true; 0 = false
D1	Logic Inputs	1 = true; 0 = false
D2	***Power Data D2 Submenu***	
D2	Motor Current	Amps
D2	% Motor Current	% rated current
D2	Motor Voltage	Volts
D2	Motor Frequency	Hz
D2	Motor Torque	% rated torque
D2	Power Output	kW
D2	DC Bus Voltage	Volts
D2	Slip Frequency	Hz
D2	Motor Overload	%
D2	Drive Overload	%
D2	Flux Current	%
D2	Torque Current	% rated current
D2	Flux Voltage	% rated volts
D2	Torque Voltage	% rated volts
D2	Base Impedance	Ohms
D2	Est Stator Resist	%

Sub menu	Parameter	Site Setting
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 Dflts	
U5	Restore Drive Dflts	
U6	***Drive Info U6 Submenu***	
U6	Drive Version	
U6	Boot Version	
U6	Cube ID	
U6	Drive Type	
U7	***Hex Monitor U7 Submenu***	
U7	Address	
U8	***Language Sel***	
U8	Language Select	
U9	***Basics***	
U9	Operation	
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	-

Open-loop Start-Up Procedure

The following is a recommended open-loop start-up procedure:

Motor Parameter Set-up

1) Select one of the four default motors (listed in Table 12) for the MOTOR ID (A5) parameter (or select a valid motor ID, if available).
   These typical V/Hz patterns are selectable via the MOTOR ID (A5) are given in the following table. It is best to start with one of the default V/Hz patterns.

parameter	4 pole 400 v	4 pole 200 v	6 pole 400 v	6 pole 200 v
motor mid volts (A5)	28.0V	14.0V	28.0V	14.0V
motor mid freq (A5)	3.0Hz	3.0Hz	3.0Hz	3.0Hz
motor min volts (A5)	9.0V	4.0V	9.0V	4.0V
motor min freq (A5)	1.0Hz	1.0Hz	1.0Hz	1.0Hz

Table 12: V/Hz patterns via Motor ID

2) Enter / Verify the following from the motor's nameplate:
   - Motor HP or KW rating (RATED MTR POWER(A5))
   - Motor Voltage (RATED MTR VOLTS(A5))
   - Motor Excitation Frequency in Hz (RATED EXCIT FREQ(A5))
   - Rated Motor Current (RATED MOTOR CURR(A5))
   - Number of Motor Poles (MOTOR POLES(A5))

rated motor speed (rpm)	# of motor poles
1800-1500	4
1200-1000	6
900-750	8
720-600	10

Table 13: Motor Poles Reference

   - Rated Motor Speed at full load in RPM (RATED MTR SPEED (A5))
     Note: The rated motor rpm must be full load speed. If synchronous speed is given, the motor rated rpm can be estimated by:
     - 97.5% of synchronous speed for Nema type B motor design
     - 94% of synchronous speed for Nema type D motor design

# of motor poles	rated motor speed (rpm)	
	at 60 Hz	at 50 Hz
4	1800	1500
6	1200	1000
8	900	750
10	700	600

Table 14: Synchronous Motor Speeds Reference

3) Use the default value of 2.5% for Stator Resistance (STATOR RESIST(A5))
   NOTE: if there are operation issues, the stator resistance can be measured, refer the procedure detailed on page 90.

Hoistway Parameter Set-up

4) Enter / Verify the hoistway parameters:
   - CONTRACT CAR SPD (A1) parameter programs the elevator contract speed in ft/min or m/s.
   - CONTRACT MTR SPD (A1) parameter programs the motor speed at elevator contract speed in RPM.

   NOTE: The above two parameters create the interaction that allow engineering units to be used throughout the HPV 600 software.

Verify Parameters at Default

5) Verify that the following A1 and A4 parameters are set at default:

parameter name	*default*
DC START LEVEL (A1)	80.0
DC STOP LEVEL (A1)	50.0
DC STOP FREQ (A1)	0.5
DC START TIME (A1)	1.00
DC STOP TIME (A1)	1.00
SLIP COMP TIME (A1)	1.50
SLIP COMP GAIN (A1)	1.00
TORQ BOOST TIME (A1)	0.05
TORQ BOOST GAIN (A1)	0.00
MTR TORQUE LIMIT (A1)	200.0
REGEN TORQ LIMIT (A1)	200.0
ILIMT INTEG GAIN (A4)	1.00
HUNT PREV GAIN (A4)	1.00
HUNT PREV TIME (A4)	0.20

Low speed inspection mode

6) Run the drive in low speed inspection mode and…
   - Verify proper hoistway direction…can be reversed with the MOTOR ROTATION (C1) parameter.
   - Verify that the Safety Chain / Emergency Stop works

Adjust Motor RPM (Slip)

7) At Empty Car, run the drive at 10% of contract speed and complete the Motor RPM Adjustment Procedure detailed on page 84.
8) At Full-load, run the drive at 10% of contract speed and complete the Motor RPM Adjustment Procedure detailed on page 84.

High-speed mode

9) Run the drive in high-speed mode (Balanced, Full-load and Empty Car) and observe operation…if operational issues please refer to the Performance Adjustments section.

This completes the recommended open-loop start-up procedure.

Motor RPM Adjustment Procedure

- Run the car in the UP direction
  - measure and record the car speed using a hand tach on the sheave (wait for speed to stabilize)

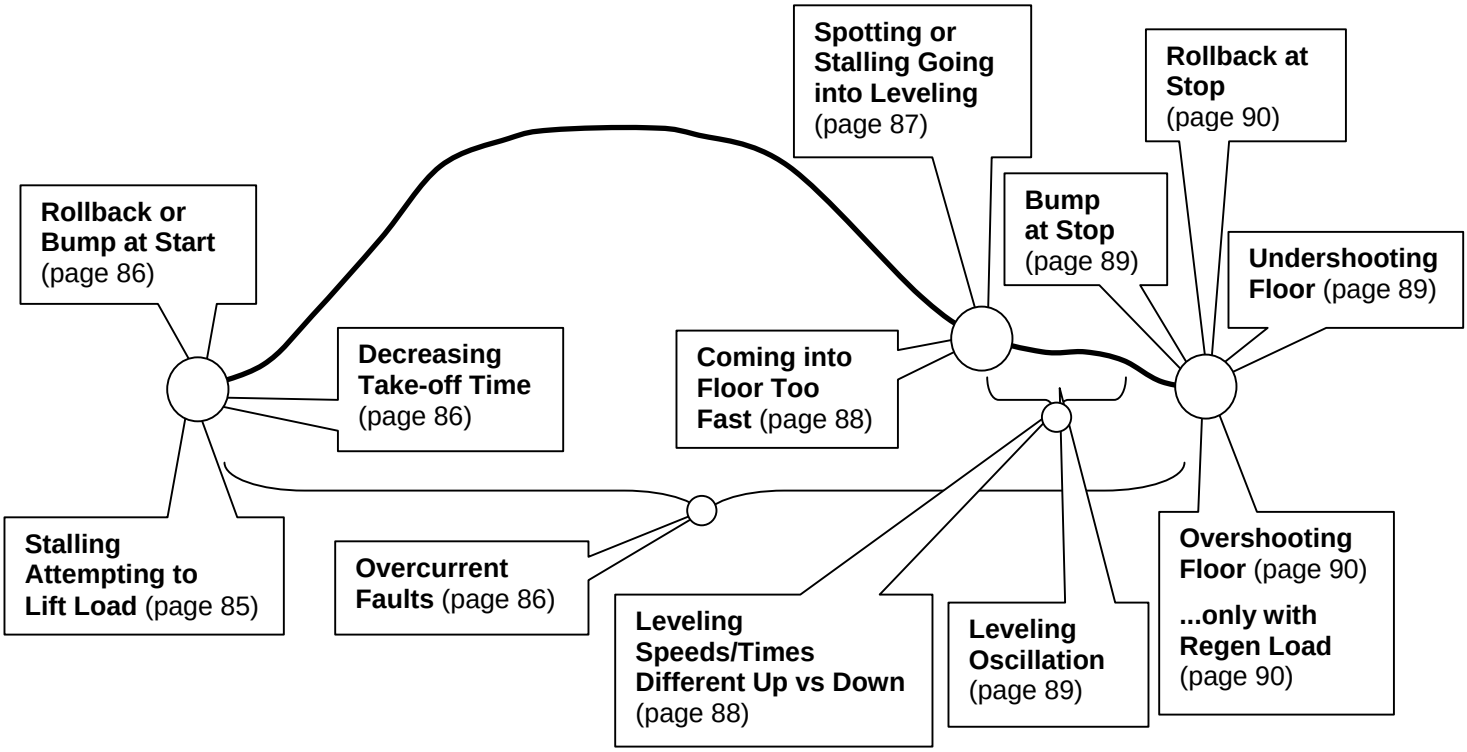
  OR
  - time one complete rotation of the sheave and record the time (in seconds) it takes for exactly one sheave rotation
- Run the car in the DOWN direction
  - measure and record the car speed using a hand tach on the sheave (wait for speed to stabilize)

  OR
  - time one complete rotation of the sheave and record the time (in seconds) it takes for exactly one sheave rotation
- If the speeds/times are different UP vs. DOWN…increment or decrement the RATED MTR SPEED (A5) parameter and run UP and DOWN again
- Continue until the speeds/times UP vs. DOWN are the same.

  Note: If an OVERCURR FLT occurs, refer to “Overcurrent Faults” in the Performance Adjustments section (page 86)

  Note: If stalling occurs when attempting to lift the load, refer to “Stalling Attempting to Lift Load” in the Performance Adjustments section (page 85). Additionally, sometimes the adjustments made to help with stalling attempting to lift load can be set to default once the RATED MTR SPEED (A5) parameter is adjusted properly.

Performance Adjustments



Stalling Attempting to Lift Load

If the motor stalls as it attempts to lift the load, then until resolved, try the following (in order):

1. Increase the Torque Boost Gain parameter
2. Adjust the Motor Stator Resistance parameter
3. Adjust the Motor Mid Voltage parameter

Note: if no performance change is observed after any one step, set any changed value(s) back to the original value(s) before proceeding onto the next step.

<u>Increase the Torque Boost Gain Parameter</u>

- The Torque Boost function is defaulted off (TORQ BOOST GAIN (A1)= 0).
- Increase the TORQ BOOST GAIN (A1) in 0.1 intervals and observe performance.

<u>Adjust the Motor's Stator Resistance</u>

- Measure the stator resistance by completing the procedure detailed on page 90.
- If still stalling after measuring stator resistance, additionally increase STATOR RESIST (A5) parameter by increments of 0.1 and observe performance

<u>Adjust the Motor Mid Voltage Parameter</u>

- Complete the Mid-volts Adjustment Procedure detailed on page 91.
- If still stalling after completing mid-volts adjustment procedure, additionally increase MOTOR MID VOLTS (A5) parameter by increments of 0.5 and observe performance

Note: Avoid increasing the MOTOR MID VOLTS (A5) parameter too high, since this effects stopping performance (i.e. coming into the floor too fast) or can create Overcurrent Faults

Rollback or Bump at Start

If rollback is observed or a bump is felt at the start, then until resolved, try the following (in order):

1. Verify Mechanical Brake Timing
2. Increase DC Injection Start Level

Note: if no performance change is observed after any one step, set any changed value(s) back to the original value(s) before proceeding onto the next step.

Verify Mechanical Brake Timing

- The mechanical brake should be picked during the DC injection start time (DC START TIME (A1) parameter), see "Mechanical Brake Timing at Start" on page 91.

Increase DC Injection Start Level

- Increase the DC START LEVEL (A1) parameter by increments of 5% and observe performance.

Decreasing Take-off Time

The following can help to decrease take-off time, try the following (in order):

1. Increase DC Injection Start Level
2. Increase the Accel S-curve parameters
3. Increase the Torque Boost Gain parameter

Note: if no performance change is observed after any one step, set any changed value(s) back to the original value(s) before proceeding onto the next step.

Increase DC Injection Start Level

- Increase the DC START LEVEL (A1) parameter by increments of 5% and observe performance.

Increase the Accel S-curve parameters

- Increase take-off jerk rate via ACCEL JERK IN x (A2) parameter
- Increase acceleration rate via ACCEL x (A2) parameter

Note: When increasing both jerk and accel rates, watch for Overcurrent Faults or decreased ride quality. If these occur, set the rates back to the original values.

Increase the Torque Boost Gain Parameter

- The Torque Boost function is defaulted off (TORQ BOOST GAIN (A1)= 0).
- Increase the TORQ BOOST GAIN (A1) in 0.1 intervals and observe take-off time and performance.

Note: When increasing the torque boost, watch for Overcurrent Faults or decreased ride quality. If these occur, set the gain back.

Overcurrent Fault

If an "OVERCURR FLT" occurs it can indicate the s-curve settings are too high (jerk, accel, decel rates) or too much motor voltage is generated. Until resolved, try the following (in order):

1. Verify Mechanical Brake Timing
2. Verify Torque Limits
3. Decrease the S-curve parameters
4. Verify Motor Min/Mid Voltage parameters
5. Increase DC Injection Start Level
6. Measure the Motor's Stator Resistance
7. Decrease the Torque Boost

Note: if no change is observed after any one step, set any changed value(s) back to the original value(s) before proceeding onto the next step.

Verify Mechanical Brake Timing

- The mechanical brake should be lifted before the drive is given a non-zero speed command
- The mechanical brake should be picked during the DC injection start time (DC START TIME (A1) parameter), see "Mechanical Brake Timing at Start" on page 91.

Verify Torque Limits

- The Torque Limits are defaulted at 200% (MTR TORQUE LIMIT(A1) and REGEN TORQ LIMIT(A1)= 200%).
- Decrease MTR TORQUE LIMIT (A1) and REGEN TORQ LIMIT (A1) parameters until default (200%).
  Note: may need to set torque limits below 200% if motor's current rating is larger than the drive's current rating

Decrease the S-curve Parameters

- Decrease jerk rates via
  - ACCEL JERK IN x (A2),
  - ACCEL JERK OUT x (A2)
  - DECEL JERK IN x (A2)
  - DECEL JERK OUT x (A2)
- Decrease accel/decel rates via
  - ACCEL x (A2),
  - DECEL x (A2)

Verify Motor Min/Mid Voltage Parameters

- MOTOR MID VOLTS (A5) and MOTOR MIN VOLTS (A5) parameters should usually be set at default, see Table 12on page 83.
- These parameters would only be adjusted slightly with certain issues (see Stalling Attempting to Lift Load (page 85); Spotting or Stalling Going

into Leveling (page 87); or Overshooting Floor only with Regen Load (page 90)).

Increase DC Injection Start Level

- Increase the DC START LEVEL (A1) parameter by increments of 5% and observe performance.

Measuring the Stator Resistance

- Complete the procedure detailed on page 90.

Decrease the Torque Boost

- Decrease TORQ BOOST GAIN (A1) parameter in increments of 0.1 until the fault goes away or zero is reached (and the function is turned off)
- Secondly, decrease STATOR RESIST (A5) parameter in increments of 0.1% Note: set TORQ BOOST GAIN (A1)=0, before adjusting STATOR RESIST (A5))

Spotting or Stalling Going into Leveling

If the motor stalls or spots as it transitions from deceleration to leveling speed then until resolved, try the following (in order):

1. Decrease Decel Jerk Out and Decel Rates
2. Increase the Torque Boost Gain parameter
3. Measure the Stator Resistance
4. Adjust the Motor Mid Volts parameter

Note: if no performance change is observed after any one step, set any changed value(s) back to the original value(s) before proceeding onto the next step.

Decrease Decel Jerk Out and Decel Rates

- Decrease jerk rate via DECEL JERK OUT x (A2) parameter and observe performance
- Secondly, decrease decel rate via DECEL RATE x (A2) parameter and observe performance

Note: the combination of these two parameters is usually primary cause of spotting or stalling going into leveling

Increase the Torque Boost Gain Parameter

- The Torque Boost function is defaulted off (TORQ BOOST GAIN (A1)= 0).
- Increase the TORQ BOOST GAIN (A1) in 0.1 intervals and observe performance.

Measure the Stator Resistance

- Measure the stator resistance by completing the procedure detailed on page 90 and observe performance.

Adjust the Motor Mid Volts parameter

- Complete the Mid-volts Adjustment Procedure detailed on page 91 and observe performance.

Note: Avoid increasing the MOTOR MID VOLTS (A5) parameter too high, since this effects stopping performance (i.e. coming into the floor too fast) or can create Overcurrent Faults

Coming into Floor Too Fast

If the car is coming into the floor too fast then until resolved, try the following (in order):

1. Decrease Decel Jerk Out and Decel Rates
2. Decrease Motor Mid Voltage parameter

Note: if no performance change is observed after any one step, set any changed value(s) back to the original value(s) before proceeding onto the next step.

Decrease Decel Jerk Out and Decel Rates

- Decrease jerk rate via DECEL JERK OUT x (A2) parameter and observe performance
- Secondly, decrease decel rate via DECEL RATE x (A2) parameter and observe performance

Decrease the Motor Mid Voltage Parameter

- MOTOR MID VOLTS (A5) and MOTOR MIN VOLTS (A5) parameters should usually be set at default, see Table 12on page 83.
- These parameters would only be adjusted slightly with certain issues (see Stalling Attempting to Lift Load (page 85); Spotting or Stalling Going into Leveling (page 87); or Overshooting Floor only with Regen Load (page 90)).
- Decrease MOTOR MID VOLTS (A5) parameter (decrease increments of 0.5 and observe performance)

Note: When decreasing the Motor Mid Volts parameter, watch that the drive does not start stalling (especially with full-load)

Leveling Times Different Up vs. Down

If the elevator exhibits significantly different leveling speeds/times up vs. down then until resolved, try the following (in order):

1. Verify the Slip Compensation parameters
2. Complete Motor RPM Adjustment Procedure

Verify Slip Compensation parameters

- Verify SLIP COMP TIME (A1) parameter is at default of 1.50.
- Verify SLIP COMP GAIN (A1) parameter is at default of 1.00.

Complete Motor RPM Adjustment Procedure

- At Empty Car, run the drive at 10% of contract speed and complete the Motor RPM Adjustment Procedure detailed on page 84.
- At Full-load, run the drive at 10% of contract speed and complete the Motor RPM Adjustment Procedure detailed on page 84.

Leveling Oscillation

If the elevator exhibits a leveling speed oscillation then until resolved, try the following (in order):

1. Increase the Hunt Prevention Time Parameter
2. Decrease Distortion Loop Gain parameters

Note: if no performance change is observed after any one step, set any changed value(s) back to the original value(s) before proceeding onto the next step.

Increase the Hunt Prevention Time Parameter

- The Hunt Prevention Time Constant is defaulted as 0.2 seconds (HUNT PREV TIME (A4)= 0.2).
- Increase the HUNT PREV TIME (A4) parameter in 0.1 intervals and observe performance.
- Note: if no performance change is observed, set the values back to default

Decrease the Distortion Loop Gain Parameters

- The Distortion Loop Gain parameters are defaulted at Id DIST LOOP GN (A4) = 0.50 and Iq DIST LOOP GN (A4) = 0.30
  Note: to view these parameter enabled hidden items (HIDDEN ITEMS (U2) = enabled)
- Decrease Id DIST LOOP GN (A4) and Iq DIST LOOP GN (A4) parameters in 0.1 intervals and observe performance.
- Note: if no performance change is observed, set the values back to default

Bump at Stop

If a bump is felt at the stop, then until resolved, try the following (in order):

1. Verify Mechanical Brake Timing
2. Decrease Decel Jerk Out Rate
3. Decrease DC Injection Stop Frequency

Note: if no performance change is observed after any one step, set any changed value(s) back to the original value(s) before proceeding onto the next step.

Verify Mechanical Brake Timing

The mechanical brake should be dropped during the DC injection stop time (DC STOP TIME (A1) parameter), see “Mechanical Brake Timing at Stop” on page 91.

Decrease Decel Jerk Out Rate

- Decrease jerk rate via DECEL JERK OUT x (A2) parameter and observe performance.

Decrease DC Injection Stop Frequency

- Decrease the DC STOP FREQ (A1) parameter in increments of 0.1 Hz and observe performance.

Undershooting Floor

If the car is undershooting the floor then until resolved, try the following (in order):

1. Verify Mechanical Brake Timing
2. Increase Leveling Speed
3. Decrease Decel Jerk Out and Decel Rates

Note: if no performance change is observed after any one step, set any changed value(s) back to the original value(s) before proceeding onto the next step.

Verify Mechanical Brake Timing

The mechanical brake should be dropped during the DC injection stop time (DC STOP TIME (A1) parameter), see “Mechanical Brake Timing at Stop” on page 91.

Increase Leveling Speed

- Increase leveling speed and observe performance

Increase Decel Jerk Out and Decel Rates

- Decrease jerk rate via DECEL JERK OUT x (A2) parameter and observe performance
- Secondly, decrease decel rate via DECEL RATE x (A2) parameter and observe performance

Overshooting Floor

If the car is overshooting the floor then until resolved, try the following (in order):

- Verify Mechanical Brake Timing
- Decrease Leveling Speed
- Increase Decel Jerk Out and Decel Rates
- Decrease Motor Mid Voltage parameter

Note: if no performance change is observed after any one step, set any changed value(s) back to the original value(s) before proceeding onto the next step.

Verify Mechanical Brake Timing

The mechanical brake should be dropped during the DC injection stop time (DC STOP TIME (A1) parameter), see "Mechanical Brake Timing at Stop" on page 91.

Decrease Leveling Speed

- Decrease leveling speed and observe performance
- Note: practical minimum for leveling speed is about 2.5 Hz.

Increase Decel Jerk Out and Decel Rates

- Increase jerk rate via DECEL JERK OUT x (A2) parameter and observe performance
- Secondly, increase decel rate via DECEL RATE x (A2) parameter and observe performance
- Note: When increasing the Decel and Jerk Rates watch for spotting or stalling.

Decrease the Motor Mid Voltage Parameter

- Decrease MOTOR MID VOLTS (A5) parameter (decrease increments of 0.5 and observe performance)
- Note: When decreasing the Motor Mid Volts parameter, watch that the drive does not start stalling (especially with full-load)

Overshooting Floor only with Regen Load

If the car overshoots the floor only with a regen load (i.e. empty-up) then:

- Verify the car DOES NOT overshoot with balanced car and empty-down…if it does refer to Overshooting Floor section on page 90.
- If only overshoots empty-up, increase MOTOR MIN VOLTS (A5) in increments of 0.1 V and observe performance.

Note: if no performance change is observed, set the Motor Min Volts parameter to the original value.

Rollback at Stop

If rollback is observed at the stop, then until resolved, try the following (in order):

1. Verify Mechanical Brake Timing
2. Decrease Decel Jerk Out Rate
3. Increase DC Injection Stop Level

Note: if no performance change is observed after any one step, set any changed value(s) back to the original value(s) before proceeding onto the next step.

Verify Mechanical Brake Timing

The mechanical brake should be dropped during the DC injection stop time (DC STOP TIME (A1) parameter), see "Mechanical Brake Timing at Stop" on page 91.

Decrease Decel Jerk Out Rate

- Decrease jerk rate via DECEL JERK OUT x (A2) parameter and observe performance.

Increase DC Injection Stop Level

- Increase the DC STOP LEVEL (A1) parameter in increments of 5% and observe performance.

Measuring Stator Resistance Procedure

The stator resistance value can be measured by:

- Remove any two motor wires directly at the terminals of the motor. Since the stator resistance is low, the resistance needs to be measured at the motor terminals in order to avoid the resistance of the motor wires
- Connect the two meter leads together and measure the resistance of the meter leads in ohms (*meter resistance*). Since the stator resistance is low, the resistance of the meter leads need to be taken into account.

- Measure the resistance between the two motor terminals in ohms (*stator resistance*)
- With the motor nameplate values entered in the A5 menu, use the BASE IMPEDANCE (D2) value (in ohms) to calculate the STATOR RESIST (A5) parameter (as a percentage of base impedance):

$$= \frac{stator\ \ resistance\ \ - meter\ \ resistance}{2 \text{ x BASE IMPEDANCE (D2)}} \times 100$$

Mid-volts Adjustment Procedure

- Run the drive (Balanced) at 10% of contract speed
- Verify the running currents are approximately equal in both directions. The middle voltage level (via MOTOR MID VOLTS (A5) parameter) should be adjusted in 1 or 2 volt increments and the current monitored in both the up and down directions until the running currents are approximately equal.
- Note: If the middle voltage is set too high, the drive will begin to trip on over current faults during normal operation or effect stopping performance (i.e. coming into the floor too fast)
- Note: If after raising the midpoint voltage spotting again begins to occur, set mid voltage back to previous value

Mechanical Brake Timing at Start

The mechanical brake should be picked during the DC injection start time (DC START TIME (A1) parameter).

- But allow 0.5 seconds for the motor to build up flux before lifting the mechanical brake.
- Also, do not have the DC injection last more than 0.5 seconds after the mechanical brake is lifted.
- If drive controls the mechanical brake, the DC inject start time should be at least 0.5 seconds greater than the brake pick delay (BRAKE PICK DELAY (A1)).
- AUTO STOP EN (C1) parameter
  - Enabled - The drive will start DC injection phase when it receives a run command and a non-zero speed command.
  - Disabled - The drive will start DC injection phase when it receives a run command.

Mechanical Brake Timing at Stop

The mechanical brake should be dropped during the DC injection stop time (DC STOP TIME (A1) parameter).

- But allow additional stopping dc injection time after the mechanical brake is dropped for it to close.
- If drive controls the mechanical brake via BRAKE PICK logic output, the DC inject stop time should be greater than the brake pick delay (BRAKE PICK DELAY (A1)) by the time it takes for the mechanical brake to close.
- AUTO STOP ENA (C1)=DISABLED STOPPING MODE SEL (C1) =
  - RAMP
    - Run command removed - the drive will ramp to DC injection phase.
    - Commanding zero speed - the drive will try to hold zero speed (not DC injection).
  - IMMEDIATE
    - Run command removed - the drive will immediate turn off its outputs (coast to stop).
    - Commanding zero speed - the drive will ramp to DC injection phase.
- AUTO STOP ENA (C1) =ENABLED STOPPING MODE SEL (C1) =
  - RAMP
    - Run command removed - the drive will ramp to DC injection phase.
    - Commanding zero speed - the drive will ramp to DC injection phase.
  - IMMEDIATE
    - Run command removed - the drive will immediately turn off its outputs (coast to stop).
    - Commanding zero speed - the drive will immediately turn off its outputs (coast to stop).

Display D0

→ Elevator Data D1

- Speed Command
- Speed Reference
- Speed Feedback
- Encoder Speed
- Rx Com Status
- Logic Outputs
- Logic Inputs

→ Power Data D2

- Motor Current
- % Motor Current
- Motor Voltage
- Motor Frequency
- Motor Torque
- Power Output
- DC Bus Voltage
- Slip Frequency
- Motor Overload
- Drive Overload
- Flux Current
- Torque Current
- Flux Voltage
- Torque Voltage
- Base Impedance

Adjust A0

→ Drive A1

- Contract Car Spd
- Contract Mtr Spd
- Contact Flt Time
- Cont Dwell Time
- Brake Pick Time
- Brake Hold Time
- Brake Pick Delay
- Brake Drop Delay
- DC Start Level
- DC Stop Level
- DC Stop Freq
- DC Start Time
- DC Stop Time
- Overspeed Mult
- Stall Test Level
- Stall Fault Time
- Slip Comp Time
- Slip Comp Gain
- Torq Boost Time
- Torq Boost Gain
- Spd Command Bias
- Spd Command Mult
- Mains Dip Speed
- Zero Speed Level
- Zero Speed Time
- Up/Dwn Threshold
- Mtr Torque Limit
- Regen Torq Limit
- Ana 1 Out Offset
- Ana 2 Out Offset
- Ana 1 Out Gain
- Ana 2 Out Gain
- Flt Reset Delay
- Flt Resets/Hour
- Up To Spd. Level
- Trq Lim Msg Dly
- Ser2 Insp Spd
- Ser2 Rs Crp Spd
- Ser2 Rs Cpr Time
- Ser2 Flt Tol
- Encoder Pulses

→ 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

→ Power Convert A4

- Id Reg Diff Gain
- Id Reg Prop Gain
- Iq Reg Diff Gain
- Iq Reg Prop Gain
- Id Dist Loop Gn
- Iq Dist Loop Gn
- Id Dist Loop Fc
- Iq Dist Loop Fc
- I Reg Cross Freq
- Dist Lp Off Freq
- ILimt Integ Gain
- Hunt Prev Gain
- Hunt Prev Time
- PWM Frequency
- Switching Delay
- Vc Correction
- UV Alarm Level
- UV Fault Level
- Extern Reactance
- Input L-L Volts

→ Motor A5

- Motor Id
- Rated Mtr Power
- Rated Mtr Volts
- Rated Excit Freq
- Motor Mid Volts
- Motor Mid Freq
- Motor Min Volts
- Motor Min Freq
- Rated Motor Curr
- Motor Poles
- Rated Mtr Speed
- % No Load Curr
- Stator Leakage X
- Rotor Leakage X
- Stator Resist
- Motor Iron Loss
- Motor Mech Loss
- Ovld Start Level
- Ovld Time Out

Configure C0

→ User Switches C1

- Spd Command Src
- Run Command Src
- Motor Rotation
- Spd Ref Release
- Cont Confirm Src
- Fault Reset Src
- Overspd Test Src
- Brake Pick Src
- Brake Pick Cnfm
- Brake Hold Src
- Brk Pick Flt Ena
- Brk Hold Flt Ena
- Dir Confirm
- Stall Test Ena
- Stall Prev Ena
- S-curve Abort
- Stopping Mode
- Mains Dip Ena
- Auto Stop Ena
- Db Protection
- Motor Ovrld Sel
- Torque Calc Sel
- Serial Mode
- Ser2 Flt Mode
- Drv Fast Disable
- Pwr Module Latch

→ Logic Inputs C2

- Logic Input 1
- Logic Input 2
- Logic Input 3
- Logic Input 4
- Logic Input 5
- Logic Input 6
- Logic Input 7
- Logic Input 8
- Logic Input 9

→ Logic Outputs C3

- Logic Output 1
- Logic Output 2
- Logic Output 3
- Logic Output 4
- Relay Coil 1
- Relay Coil 2

→ Analog Outputs C4

- Analog Output 1
- Analog Output 2

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

→ Drive Info U6

- Drive Version
- Boot Version
- Cube ID
- Drive Type

→ Hex Monitor U7

- Address

→ Basics U9

- Operation

Faults F0

→ Active Faults F1

- Display Active Faults
- Reset Active Faults

→ Fault History F2

- Display Fault History
- Clear Fault History

Open Loop Adjust A0 menu

Drive A1 submenu

Parameter	Description	Unit	Range	Default	Hidden item	Run lock out
CONTRACT CAR SPD	(Contract Car Speed) This parameter programs the elevator contract speed in feet per minute (fpm) or meters per second (m/s).	**fpm**	**0.0 – 1500.0**	**100.0**	N	Y
		m/s	**0.000 – 16.000**	**2.000**		
CONTRACT MTR SPD	(Contract Motor Speed) This parameter programs the motor speed at elevator contract speed in revolutions per minute (rpm).	**rpm**	**50.0 – 3000.0**	**1130.0**	N	Y
CONTACT FLT TIME	(Contact Fault Time) When external logic outputs are used to control the closing of the motor contactor, this parameter sets the amount of time delay at start until the drive output is enabled and current flows. And when external logic inputs are used to confirm the closing of the motor contactor, this parameter sets the time allowed for the contactor's auxiliary contacts to reach the user commanded state before a CONTACTOR FLT occurs.	**sec**	**0.10 – 5.00**	**0.10**	N	N
CONT DWELL TIME	(Contact Dwell Time) When external logic outputs are used to control the closing of the motor contactor, this parameter sets the amount of time delay from disabling the drive outputs following a stop until the motor contactor opens. And when external logic inputs are used to confirm the closing of the motor contactor, this parameter extends the time allowed for the contactor's auxiliary contacts to reach the user commanded state before a CONTACTOR FLT occurs.	**sec**	**0.00 – 5.00**	**0.50**	N	N
BRAKE PICK TIME	(Brake Pick Time) If the brake pick fault is enabled, this parameter sets the time allowed for the brake pick feedback not to match the brake pick command before a BRK PICK FLT occurs.	**sec**	**0.00 – 5.00**	**1.00**	N	N
BRAKE HOLD TIME	(Brake Hold Time) If the brake hold fault is enabled, this parameter sets the time allowed for the brake hold feedback not match the brake hold command before a BRK HOLD FLT occurs.	**sec**	**0.00 – 5.00**	**0.20**	N	N
BRAKE PICK DELAY	(Brake Pick Delay) When external logic outputs are used to control the mechanical brake, this is the time delay from a drive run command until the brake is picked. This time delay needs to be set for the following: have DC injection current before the mechanical brake is picked and have DC injection current after the mechanical brake is picked to allow the brake to fully open.	**sec**	**0.00 – 5.00**	**0.50**	N	Y

Parameter	Description	Unit	Range	Default	Hidden item	Run lock out
BRAKE DROP DELAY	(Brake Drop Delay) When external logic outputs are used to control the mechanical brake and ramp to stop is selected, this parameter sets the time delay to set the brake after decelerating to the DC Stop Freq. This time delay needs to be set for the following: have DC injection current before the mechanical brake is closed and have DC injection current after the mechanical brake is closed to allow the brake to fully close.	**sec**	**0.00 – 5.00**	**0.50**	N	Y
DC START LEVEL	(DC Injection Current Start Level) The level of DC injection current at start is a percent of motor rated current. The DC injection current will hold the motor shaft in a fixed position as the drive outputs a DC current to the motor. At the start, it is important to have DC injection current before the mechanical brake is picked and to have DC injection current after the mechanical brake is picked to allow the brake to fully open.	**%**	**0.0 – 150.0**	**80.0**	N	Y
DC STOP LEVEL	(DC Injection Current Stop Level) The level of DC injection current at stop is a percent of motor rated current. To hold the motor shaft in a fixed position the drive will output a DC current to the motor. At the stop, it is important to have DC injection current before the mechanical brake is closed and to have DC injection current after the mechanical brake is closed to allow the brake to fully close.	**%**	**0.0 – 150.0**	**50.0**	N	Y
DC STOP FREQ	(DC Injection Stopping Frequency) The frequency at which DC injection begins to occur when the drive is decelerating to a stop. If ramp to stop is selected and the run command is removed, the drive decelerates from its current speed to the DC stop frequency and then DC injection is applied.	**Hz**	**0.0 – 150.0**	**0.5**	N	Y
DC START TIME	(DC Injection Current Start Time) The time DC injection current is applied following a valid run command until the release of the speed command. After receiving a valid run command the drive will maintain DC Start Level current for DC Start Time in seconds before releasing the internal speed reference allowing the drive to ramp up in speed. At the start, it is important to have DC injection current before the mechanical brake is picked and to have DC injection current after the mechanical brake is picked to allow the brake to fully open.	**sec**	**0.00 – 15.00**	**1.00**	N	Y

Parameter	Description	Unit	Range	Default	Hidden item	Run lock out
DC STOP TIME	(DC Injection Current Stop Time) The time the level of DC injection current at stop is at DC STOP LEVEL. If ramp to stop is selected, the drive will ramp down in speed following removal of the run command to the DC Stop Freq and will then output DC Stop Level current for DC Stop Time seconds. At the stop, it is important to have DC injection current before the mechanical brake is closed and to have DC injection current after the mechanical brake is closed to allow the brake to fully close.	**sec**	**0.00 – 15.00**	**1.00**	N	Y
OVERSPEED MULT	(Over Speed Multiplier) This parameter sets the percentage of contract speed for the OVERSPEED TEST (U4). Units in percent of contract speed.	**%**	**100.0 – 150.0**	**125.0**	N	N
STALL TEST LEVEL	(Stall Test Level) This parameter sets the percentage of motor current the drive uses (in conjunction with STALL FAULT TIME(A1)) to determine when an STALL FAULT occurs. In order for a STALL TEST FAULT to occur, it must be enabled by the STALL TEST ENA (C1) parameter. Units in percent of rated motor current.	**%**	**0.0 – 200.0**	**200.0**	N	Y
STALL FAULT TIME	(Stall Fault Time) This parameter sets the time that the drive can be at or above the STALL TEST LVL(A1), before the drive declares an STALL TEST FAULT. In order for a STALL TEST FAULT to occur, it must be enabled by the STALL TEST ENA (C1) parameter.	**sec**	**0.00 – 20.00**	**5.00**	N	N

Parameter	Description	Unit	Range	Default	Hidden item	Run lock out
SLIP COMP TIME	(Slip Compensation Time Constant) Slip compensation filter time constant. Adjusted for slip compensation response and stability. By increasing the value of the parameter, the response time of the slip compensation function will become slower. Reducing the parameter to a lower value makes the slip compensation function respond more quickly. Note: Setting the parameter too low may result in unstable motor operation or setting the parameter too high will result in very poor response. NOTE: it is usually best to leave this parameter set at default of 1.5 seconds. Slip compensation allows an open-loop drive to maintain constant motor speed regardless of loading. The function adjusts the drive's output frequency (and output voltage) to compensate for motor slip as the motor load is increased. The compensation is based on the motor rated speed, frequency and calculated motor torque, therefore a valid value must be entered for the Rated Motor Speed (RATED MTR SPEED(A5))	**sec**	**0.00 – 20.00**	**1.50**	N	N
SLIP COMP GAIN	(Slip Compensation Gain) Multiplier of motor rated slip at rated torque. Setting the parameter to 1.00 compensates the drive output frequency by rated slip at rated torque. Setting the Slip Compensation Gain to 0.00 disables the slip compensation function. NOTE: it is usually best to leave this parameter set at the default of 1.0. Slip compensation allows an open-loop drive to maintain constant motor speed regardless of loading. The function adjusts the drive's output frequency (and output voltage) to compensate for motor slip as the motor load is increased. The compensation is based on the motor rated speed, frequency and calculated motor torque, therefore a valid value must be entered for the Rated Motor Speed (RATED MTR SPEED(A5))	**none**	**0.00 – 20.00**	**1.00**	N	N

Parameter	Description	Unit	Range	Default	Hidden item	Run lock out
TORQ BOOST TIME	(Torque Boost Time Constant) This parameter is the torque boost filter time constant. Adjusted for torque compensation response and stability. Increasing the value of the parameter, decreases response. Reducing the parameter to a lower value increases response. NOTE: it is usually best to leave this parameter set at the default of 0.5 seconds. Torque compensation automatically boosts the drive's output voltage, in excess of the programmed V/Hz pattern, as the load demand increases. Torque compensation counters the voltage drop in the motor stator resistance. This function has the greatest effect at low speeds improving load response. When using torque compensation, a valid value must be entered for the motor's no-load current (% NO LOAD CURR(A5))	**sec**	**0.00 – 20.00**	**0.05**	N	N
TORQ BOOST GAIN	(Torque Boost Gain) This gain controls the differential term in the voltage boost function. This affects the rate of response of the torque boost. Setting the Torque Boost Gain to 0.00 disables the torque boost function. NOTE: this function is defaulted off (TORQ BOOSTGAIN=0.0). If adjustments need to be made follow the guidelines listed in the "Performance Adjustments" on page 85. Torque compensation automatically boosts the drive's output voltage, in excess of the programmed V/Hz pattern, as the load demand increases. Torque compensation counters the voltage drop in the motor stator resistance. This function has the greatest effect at low speeds improving load response. When using torque compensation, a valid value must be entered for the motor's no-load current (% NO LOAD CURR(A5))	**none**	**0.00 – 20.00**	**0.00**	N	N
SPD COMMAND BIAS	(Speed Command Bias) This parameter subtracts an effective voltage to the actual analog speed command voltage signal. $\left(\begin{matrix}\text{analog}\\ \text{channel}\\ \text{input}\\ \text{voltage}\end{matrix}\ \begin{matrix}\text{SPD}\\ -\text{COMMAND}\\ \text{BIAS}\end{matrix}\right) \times \left(\begin{matrix}\text{SPD}\\ \text{COMMAND}\\ \text{MULT}\end{matrix}\right) = \left(\begin{matrix}\text{signal}\\ \text{dirve}\\ \text{software}\\ \text{uses}\end{matrix}\right)$	**volts**	**0.00 – 6.00**	**0.00**	N	Y

Parameter	Description	Unit	Range	Default	Hidden item	Run lock out
SPD COMMAND MULT	(Speed Command Multiplier) This parameter scales the analog speed command. $\left(\begin{matrix}\text{analog}\\ \text{channel}\\ \text{input}\\ \text{voltage}\end{matrix} - \begin{matrix}\text{SPD}\\ \text{COMMAND}\\ \text{BIAS}\end{matrix}\right) \times \left(\begin{matrix}\text{SPD}\\ \text{COMMAND}\\ \text{MULT}\end{matrix}\right) = \left(\begin{matrix}\text{signal}\\ \text{dirve}\\ \text{software}\\ \text{uses}\end{matrix}\right)$	**none**	**0.90 – 5.00**	**1.00**	N	Y
MAINS DIP SPEED	(Mains Dip Speed Multiplier) This parameter sets the percentage of contract speed for the speed to be reduced when the drive goes into 'low voltage' mode. The Mains Dip function is enabled by the Mains Dip Enable (MAINS DIP ENA(C1)) parameter. When the drive goes into 'low voltage' mode, it reduces the speed by the percentage defined by this parameter. 'Low voltage' mode is defined as when the drive declares a UV alarm, which is defined by the Input line-to-line voltage (INPUT L-L VOLTS(A4)) parameter and the Undervoltage Alarm Level (UV ALARM LEVEL(A4)). Units in percent of contract speed.	**%**	**5.00 – 99.99**	**25.00**	N	Y
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. Units in percent of contract speed.	**%**	**0.00 – 99.99**	**1.00**	N	Y
ZERO SPEED TIME	(Zero Speed Time) This parameter sets the time at which the drive is at the ZERO SPEED LEVEL (A1) before zero speed logic output is true.	**sec**	**0.00 – 9.99**	**0.10**	N	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.	**%**	**0.00 – 9.99**	**1.00**	N	Y

Parameter	Description	Unit	Range	Default	Hidden item	Run lock out
MTR TORQUE LIMIT	(Motoring Current Limit) This parameter sets the motoring current limit as a percentage of the drive's rated current. This parameter helps define the Stall Prevention (Current Limit) function. Stall prevention causes the drive to deviate from the commanded speed to limit motor current to a user set level. When the motoring current limit is reached (MTR TORQUE LIMIT(A1)), the stall prevention function will reduce speed. Also, the responsiveness of the stall prevention function is determined by the Current Limit Integral Gain (ILIMT INTEG GAIN(A4)) parameter. Units in percent of rated torque.	**%**	**0.0 – 275.0**	**200.0**	N	N
REGEN TORQ LIMIT	(Regenerating Current Limit) This parameter sets the regenerative current limit as a percentage of the drive's rated current. This parameter helps define the Stall Prevention (Current Limit) function. Stall prevention causes the drive to deviate from the commanded speed to limit motor current to a user set level. When the regenerating current limit is reached (REGEN TORQ LIMIT(A1)), the stall prevention function will increase speed in an effort to shed load. Stall prevention can optionally be disabled in regeneration by the Stall Prevention Regen Enable (STALLP REGEN ENA(C1)) parameter. Also, the responsiveness of the stall prevention function is determined by the Current Limit Integral Gain (ILIMT INTEG GAIN) parameter. Units in percent of rated torque.	**%**	**0.0 – 275.0**	**200.0**	N	N
ANA 1 OUT OFFSET	(Digital to Analog #1 Output Offset) Offset for scaling Analog Output Channel #1. $\left(\begin{array}{l}\text{signal}\\ \text{drive}\\ \text{software}\\ \text{creates}\end{array} - \begin{array}{c}\text{ANA}\\ \text{OUT}\\ \text{OFFSET}\end{array}\right) \times \begin{array}{c}\text{ANA}\\ \text{OUT}\\ \text{GAIN}\end{array} = \begin{array}{l}\text{analog}\\ \text{channel}\\ \text{output}\\ \text{voltage}\end{array}$	**%**	**-99.9 –+99.9**	**0.00**	N	Y
ANA 2 OUT OFFSET	(Digital to Analog #2 Output Offset) Offset for scaling Analog Output Channel #2. $\left(\begin{array}{l}\text{signal}\\ \text{drive}\\ \text{software}\\ \text{creates}\end{array} - \begin{array}{c}\text{ANA}\\ \text{OUT}\\ \text{OFFSET}\end{array}\right) \times \begin{array}{c}\text{ANA}\\ \text{OUT}\\ \text{GAIN}\end{array} = \begin{array}{l}\text{analog}\\ \text{channel}\\ \text{output}\\ \text{voltage}\end{array}$	**%**	**-99.9 –+99.9**	**0.00**	N	Y

Parameter	Description	Unit	Range	Default	Hidden item	Run lock out
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. $\left(\begin{matrix}\text{signal}\\ \text{drive}\\ \text{software}\\ \text{creates}\end{matrix} - \begin{matrix}\text{ANA}\\ \text{OUT}\\ \text{OFFSET}\end{matrix}\right) \times \begin{matrix}\text{ANA}\\ \text{GAIN}\end{matrix} = \begin{matrix}\text{analog}\\ \text{channel}\\ \text{output}\\ \text{voltage}\end{matrix}$	**none**	**0.0 – 10.0**	**1.0**	N	Y
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. $\left(\begin{matrix}\text{signal}\\ \text{drive}\\ \text{software}\\ \text{creates}\end{matrix} - \begin{matrix}\text{ANA}\\ \text{OUT}\\ \text{OFFSET}\end{matrix}\right) \times \begin{matrix}\text{ANA}\\ \text{GAIN}\end{matrix} = \begin{matrix}\text{analog}\\ \text{channel}\\ \text{output}\\ \text{voltage}\end{matrix}$	**none**	**0.0 – 10.0**	**1.0**	N	Y
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**	**0 – 120**	**5**	N	N
FLT RESETS / HOUR	(Fault Resets per Hour) When the drive is set for automatic fault reset, this is the number of faults that is allowed to be automatically reset per hour.	**#**	**0 – 10**	**3**	N	N
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.	**%**	**0.00 – 110.00**	**80.00**	N	N
TRQ LIM MSG DLY	(Torque Limit Message Delay) This parameter will delay posting the Torque Limit Hit message for the time set by this parameter. This prevents nuisance postings of this alarm message.	**sec**	**0.00 – 10.00**	**0.50**	N	Y
SER2 INSP SPD	(Serial Mode 2 Inspection Speed) *Used only with custom serial protocol (mode 2)* When in Serial Mode 2, this parameter defines the inspection speed to be used. To run in inspection speed via serial mode 2 requires that the run command for inspection speed come from two sources, a command sent in a serial message and via hardware as a logic input defined as “SER2 INSP ENA”.	**ft / min**	**0.0 – 100.0**	**30.0**	Y	Y
		m / sec	**0.000 – 0.500**	**0.150**		

Parameter	Description	Unit	Range	Default	Hidden item	Run lock out
SER2 RS CRP SPD	(Serial Mode 2 Rescue Creep Speed) *Used only with custom serial protocol (mode 2)* When in Serial Mode 2 and SER2 FLT MODE (C1)=rescue, this parameter defines the creep speed that will be used in the "rescue mode".	**ft / min**	**0.0 – 300.0**	**10.0**	Y	Y
		m / sec	**0.000 – 1.540**	**0.050**		
SER2 RS CPR TIME	(Serial Mode 2 Rescue Creep Time) *Used only with custom serial protocol (mode 2)* When in Serial Mode 2 and SER2 FLT MODE (C1)=rescue, this parameter defines the maximum time the drive will continue to run at rescue creep speed (defined by SER2 RS CRP SPD (A1) parameter) when reacting to a serial fault. The time is defined as the time running at creep speed. It does not include the time it takes to decelerate to creep speed.	**sec**	**0.0 – 200.0**	**180.0**	Y	Y
SER2 FLT TOL	(Serial Mode 2 Fault Tolerance) *Used only with custom serial protocol (mode 2)* When in Serial Mode 2, this parameter defines the maximum time that may elapse between valid run time messages while in serial run mode before a serial fault is declared.	**sec**	**0.00 – 2.00**	**0.04**	Y	Y
ENCODER PULSES	(Encoder Pulses) Only used for diagnostics… This parameter sets the pulses per revolution (before the x4 logic) the drive receives from the encoder for only by the ENCODER SPEED (D1) display.	**ppr**	**600 – 10000**	**1024**	N	Y

Table 15: Open-Loop Drive A1 Submenu

S-Curves A2 submenu

Detailed descriptions

The HPV 600 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.

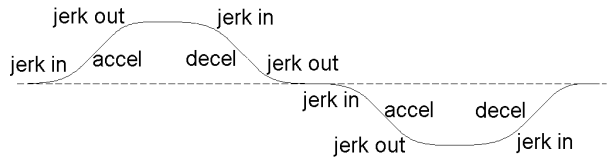
Note: If the car controller is feeding the drive a speed profile including s-curves, the s-curve settings on the drive need to be placed out of the way. In those cases, set ACCEL RATE 0 and DECEL RATE 0 to the maximum (7.99 ft/s^2 or 3.999 m/s^2) and set ACCEL JERK IN 0, ACCEL JERK OUT 0, DECEL JERK IN 0, and DECEL JERK OUT 0 to the minimum (0.0 ft/s^2 or 0.00 m/s^2).

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

S-curve Availability

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

Selecting S-curves

Setting the jerk rates to zero can turn off the jerk rates.

The accel / decel rates can also be turned off by setting them to zero. But, setting the accel / decel rates to zero is not recommended.

Parameter	Description	Units	Range	Default	Hidden item	Run lock out
ACCEL RATE 0	Acceleration rate limit	**ft/s²**	**0.00 – 7.99**	**1.00**	N	Y
		m/s²	**0.000 – 3.999**	**0.300**		
DECEL RATE 0	Deceleration rate limit	**ft/s²**	**0.00 – 7.99**	**1.00**	N	Y
		m/s²	**0.000 – 3.999**	**0.300**		
ACCEL JERK IN 0	Rate of increase of acceleration, up to ACCEL RATE, when increasing elevator speed	**ft/s³**	**0.0 – 29.9**	**0.5**	N	Y
		m/s³	**0.00 – 9.99**	**0.15**		
ACCEL JERK OUT 0	Rate of decrease of acceleration to zero when approaching contract elevator speed	**ft/s³**	**0.0 – 29.9**	**0.5**	N	Y
		m/s³	**0.00 – 9.99**	**0.15**		
DECEL JERK IN 0	Rate of increase of deceleration, up to DECEL RATE, when decreasing elevator speed	**ft/s³**	**0.0 – 29.9**	**0.5**	N	Y
		m/s³	**0.00 – 9.99**	**0.15**		
DECEL JERK OUT 0	Rate of decrease of deceleration to zero when slowing the elevator to leveling speed	**ft/s³**	**0.0 – 29.9**	**0.5**	N	Y
		m/s³	**0.00 – 9.99**	**0.15**		
ACCEL RATE 1	Acceleration rate limit	**ft/s²**	**0.00 – 7.99**	**1.00**	N	Y
		m/s²	**0.000 – 3.999**	**0.300**		
DECEL RATE 1	Deceleration rate limit	**ft/s²**	**0.00 – 7.99**	**1.00**	N	Y
		m/s²	**0.000 – 3.999**	**0.300**		
ACCEL JERK IN 1	Rate of increase of acceleration, up to ACCEL RATE, when increasing elevator speed	**ft/s³**	**0.0 – 29.9**	**0.5**	N	Y
		m/s³	**0.00 – 9.99**	**0.15**		
ACCEL JERK OUT 1	Rate of decrease of acceleration to zero when approaching contract elevator speed	**ft/s³**	**0.0 – 29.9**	**0.5**	N	Y
		m/s³	**0.00 – 9.99**	**0.15**		
DECEL JERK IN 1	Rate of increase of deceleration, up to DECEL RATE, when decreasing elevator speed	**ft/s³**	**0.0 – 29.9**	**0.5**	N	Y
		m/s³	**0.00 – 9.99**	**0.15**		
DECEL JERK OUT 1	Rate of decrease of deceleration to zero when slowing the elevator to leveling speed	**ft/s³**	**0.0 – 29.9**	**0.5**	N	Y
		m/s³	**0.00 – 9.99**	**0.15**		
ACCEL RATE 2	Acceleration rate limit	**ft/s²**	**0.00 – 7.99**	**1.00**	N	Y
		m/s²	**0.000 – 3.999**	**0.300**		
DECEL RATE 2	Deceleration rate limit	**ft/s²**	**0.00 – 7.99**	**1.00**	N	Y
		m/s²	**0.000 – 3.999**	**0.300**		
ACCEL JERK IN 2	Rate of increase of acceleration, up to ACCEL RATE, when increasing elevator speed	**ft/s³**	**0.0 – 29.9**	**0.5**	N	Y
		m/s³	**0.00 – 9.99**	**0.15**		
ACCEL JERK OUT 2	Rate of decrease of acceleration to zero when approaching contract elevator speed	**ft/s³**	**0.0 – 29.9**	**0.5**	N	Y
		m/s³	**0.00 – 9.99**	**0.15**		
DECEL JERK IN 2	Rate of increase of deceleration, up to DECEL RATE, when decreasing elevator speed	**ft/s³**	**0.0 – 29.9**	**0.5**	N	Y
		m/s³	**0.00 – 9.99**	**0.15**		
DECEL JERK OUT 2	Rate of decrease of deceleration to zero when slowing the elevator to leveling speed	**ft/s³**	**0.0 – 29.9**	**0.5**	N	Y
		m/s³	**0.00 – 9.99**	**0.15**		
ACCEL RATE 3	Acceleration rate limit	**ft/s²**	**0.00 – 7.99**	**1.00**	N	Y
		m/s²	**0.000 – 3.999**	**0.300**		
DECEL RATE 3	Deceleration rate limit	**ft/s²**	**0.00 – 7.99**	**1.00**	N	Y
		m/s²	**0.000 – 3.999**	**0.300**		
ACCEL JERK IN 3	Rate of increase of acceleration, up to ACCEL RATE, when increasing elevator speed	**ft/s³**	**0.0 – 29.9**	**0.5**	N	Y
		m/s³	**0.00 – 9.99**	**0.15**		
ACCEL JERK OUT 3	Rate of decrease of acceleration to zero when approaching contract elevator speed	**ft/s³**	**0.0 – 29.9**	**0.5**	N	Y
		m/s³	**0.00 – 9.99**	**0.15**		
DECEL JERK IN 3	Rate of increase of deceleration, up to DECEL RATE, when decreasing elevator speed	**ft/s³**	**0.0 – 29.9**	**0.5**	N	Y
		m/s³	**0.00 – 9.99**	**0.15**		
DECEL JERK OUT 3	Rate of decrease of deceleration to zero when slowing the elevator to leveling speed	**ft/s³**	**0.0 – 29.9**	**0.5**	N	Y
		m/s³	**0.00 – 9.99**	**0.15**		

Table 16: Open-Loop S-Curves A2 Submenu

Multistep Ref A3 submenu

Detailed descriptions

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 a logic input s (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	Range	Default	Hidden item	Run lock out
SPEED COMMAND 1	Multi-step speed command #1	**ft/min**	**-3000.0 – +3000.0**	**0.0**	N	Y
		m/sec	**-16.000 – +16.000**	**0.000**		
SPEED COMMAND 2	Multi-step speed command #2	**ft/min**	**-3000.0 – +3000.0**	**0.0**	N	Y
		m/sec	**-16.000 – +16.000**	**0.000**		
SPEED COMMAND 3	Multi-step speed command #3	**ft/min**	**-3000.0 – +3000.0**	**0.0**	N	Y
		m/sec	**-16.000 – +16.000**	**0.000**		
SPEED COMMAND 4	Multi-step speed command #4	**ft/min**	**-3000.0 – +3000.0**	**0.0**	N	Y
		m/sec	**-16.000 – +16.000**	**0.000**		
SPEED COMMAND 5	Multi-step speed command #5	**ft/min**	**-3000.0 – +3000.0**	**0.0**	N	Y
		m/sec	**-16.000 – +16.000**	**0.000**		
SPEED COMMAND 6	Multi-step speed command #6	**ft/min**	**-3000.0 – +3000.0**	**0.0**	N	Y
		m/sec	**-16.000 – +16.000**	**0.000**		
SPEED COMMAND 7	Multi-step speed command #7	**ft/min**	**-3000.0 – +3000.0**	**0.0**	N	Y
		m/sec	**-16.000 – +16.000**	**0.000**		
SPEED COMMAND 8	Multi-step speed command #8	**ft/min**	**-3000.0 – +3000.0**	**0.0**	N	Y
		m/sec	**-16.000 – +16.000**	**0.000**		
SPEED COMMAND 9	Multi-step speed command #9	**ft/min**	**-3000.0 – +3000.0**	**0.0**	N	Y
		m/sec	**-16.000 – +16.000**	**0.000**		
SPEED COMMAND 10	Multi-step speed command #10	**ft/min**	**-3000.0 – +3000.0**	**0.0**	N	Y
		m/sec	**-16.000 – +16.000**	**0.000**		
SPEED COMMAND 11	Multi-step speed command #11	**ft/min**	**-3000.0 – +3000.0**	**0.0**	N	Y
		m/sec	**-16.000 – +16.000**	**0.000**		
SPEED COMMAND 12	Multi-step speed command #12	**ft/min**	**-3000.0 – +3000.0**	**0.0**	N	Y
		m/sec	**-16.000 – +16.000**	**0.000**		
SPEED COMMAND 13	Multi-step speed command #13	**ft/min**	**-3000.0 – +3000.0**	**0.0**	N	Y
		m/sec	**-16.000 – +16.000**	**0.000**		
SPEED COMMAND 14	Multi-step speed command #14	**ft/min**	**-3000.0 – +3000.0**	**0.0**	N	Y
		m/sec	**-16.000 – +16.000**	**0.000**		
SPEED COMMAND 15	Multi-step speed command #15	**ft/min**	**-3000.0 – +3000.0**	**0.0**	N	Y
		m/sec	**-16.000 – +16.000**	**0.000**		

Table 17: Open-Loop Multistep Ref A3 Submenu

Power Convert A4 submenu

Parameter	Description	Units	Range	Default	Hidden item	Run lock out
Id REG DIFF GAIN	(Current Regulator Differential Gain for Flux Generation) This parameter is meant for advanced operation; therefore, the parameter will rarely need to be changed from the default value.	**none**	**0.80 – 1.20**	**1.00**	Y	N
Id REG PROP GAIN	(Current Regulator Proportional Gain for Flux Generation) This parameter is meant for advanced operation, therefore, the parameter will rarely need to be changed from the default value.	**none**	**0.20 – 0.40**	**0.30**	Y	N
Iq REG DIFF GAIN	(Current Regulator Differential Gain for Torque Generation of Motor Torque) This parameter is meant for advanced operation; therefore, the parameter will rarely need to be changed from the default value.	**none**	**0.80 – 1.20**	**1.00**	Y	N
Iq REG PROP GAIN	(Current Regulator Proportional Gain for Torque Generation) This parameter is meant for advanced operation; therefore, the parameter will rarely need to be changed from the default value.	**none**	**0.20 – 0.40**	**0.30**	Y	N
Id DIST LOOP GN	(Distortion Loop Gain on Flux Current Generation) This parameter is meant for advanced operation; therefore, the parameter will rarely need to be changed from the default value.	**none**	**0.00 – 1.50**	**0.50**	Y	N
Iq DIST LOOP GN	(Distortion Loop Gain on Torque Current Generation) This parameter is meant for advanced operation; therefore, the parameter will rarely need to be changed from the default value.	**none**	**0.00 – 1.50**	**0.30**	Y	N
Id DIST LOOP Fc	(Corner Frequency on Distortion Loop for Flux Current) This parameter is the high-pass corner frequency on the distortion loop regulator for flux current. This parameter is meant for advanced operation; therefore, the parameter will rarely need to be changed from the default value.	**Hz**	**0.1 – 30.0**	**5.0**	Y	N
Iq DIST LOOP Fc	(Corner Frequency on Distortion Loop for Torque Current) The parameter is the high-pass corner frequency on the distortion loop regulator for torque current. This parameter is meant for advanced operation; therefore, the parameter will rarely need to be changed from the default value.	**Hz**	**0.1 – 30.0**	**5.0**	Y	N
I REG CROSS FREQ	(Current Regulator Crossover Frequency) Transition frequency between control at low frequency and higher frequency. This parameter is meant for advanced operation; therefore, the parameter will rarely need to be changed from the default value. Units in percent of DC Stop Freq.	**%**	**0.0 – 300.0**	**100.0**	Y	N

Parameter	Description	Units	Range	Default	Hidden item	Run lock out
DIST LP OFF FREQ	(Distortion Loop Rolloff Frequency) The frequency at which the distortion loops begins to be phased out. This parameter is meant for advanced operation; therefore, the parameter will rarely need to be changed from the default value.	**Hz**	**0.0 – 99.9**	**60.0**	Y	N
ILIMT INTEG GAIN	(Current Limit Integral Gain) The Stall Prevention (Current Limit) function's integral gain. This determines the response of the function. Stall prevention causes the drive to deviate from the commanded speed to limit motor current to a user set level. When the motoring current limit is reached (MTR TORQUE LIMIT(A1)), the stall prevention function will reduce speed. When the regenerating current limit is reached (REGEN TORQ LIMIT(A1)), the stall prevention function will increase speed in an effort to shed load. Stall prevention can optionally be disabled in regeneration by the Stall Prevention Regen Enable (STALLP REGEN ENA(C1)) parameter.	**none**	**0.00 – 9.99**	**1.00**	N	N
HUNT PREV GAIN	(Hunt Prevent Gain) Determines the response to changes in torque (torque slew rate gain). Increasing the gain slows drive torque response (more dampening). Be cautious not to set the parameter too high or the drive will become unstable. NOTE: it is usually best to leave this parameter set at the default of 1.0 second. Hunting can occur following a load change, but it may also occur when the motor is settling into a steady speed. Hunting may cause the motor to vibrate at lower speeds. The Hunt Prevention function will help to reduce or suppress this oscillation.	**none**	**0.00 – 4.00**	**1.00**	N	N
HUNT PREV TIME	(Hunt Prevention Time Constant) Hunt prevention filter time constant. Adjusted for hunt prevention response and stability. By increasing the value of the parameter, the response time of the hunt prevention function will become slower. Reducing the parameter to a lower value makes the hunt prevention function respond more quickly. Note: the function works better with a lower time constant. NOTE: it is usually best to leave this parameter set at the default of 0.2 seconds. Hunting can occur following a load change, but it may also occur when the motor is settling into a steady speed. Hunting may cause the motor to vibrate at lower speeds. The Hunt Prevention function will help to reduce or suppress this oscillation.	**sec**	**0.001 – 7.000**	**0.200**	N	N

Parameter	Description	Units	Range	Default	Hidden item	Run lock out
PWM FREQUENCY	(PWM Frequency) This parameter sets the PWM or 'carrier' frequency of the drive. The carrier is defaulted at 10.0 kHz, which is well out of audible range. The drive does not derate when the PWM frequency is set to 10kHz or below.	**kHz**	**2.5 – 16.0**	**10.0**	N	N
SWITCHING DELAY	(Transistor Switching Delay) This parameter is hardware dependent and should not be adjusted.	**μsec**	**-5.00 - +5.00**	**0.00**	Y	N
VC CORRECTION	(Conduction Voltage Correction) This parameter is hardware dependent and should not be adjusted.	**V**	**0.00 – 5.00**	**2.50**	Y	N
UV ALARM LEVEL	(Undervoltage Alarm Level) This parameter sets the level (as a percentage of the INPUT L-L VOLTS(A4)) at which an under voltage alarm will be declared. Units in percent of nominal dc bus.	**%**	**80 – 99**	**90**	N	N
UV FAULT LEVEL	(Undervoltage Fault Level) This parameter sets the level (as a percentage of the INPUT L-L VOLTS(A4)) at which an under voltage fault will occur. Units in percent of nominal dc bus.	**%**	**50 –99**	**80**	N	N
EXTERN REACTANCE	(External Reactance) This parameter sets the externally connected reactance (as a percentage of base impedance) between the drive and the motor.	**%**	**0.0 –10.0**	**0.0**	N	Y
INPUT L-L VOLTS	(Input Line to Line Voltage - Input Voltage) This parameter sets the input voltage or AC line input voltage to the drive. This parameter is used only to determine the UV alarm and fault levels.	**volts**	**110 – 480**	**460 or 230**	N	N

Table 18: Open-Loop Power Convert A4 Submenu

Motor A5 submenu

<table>
<tr><th>Parameter</th><th>Description</th><th>Units</th><th>Range</th><th>Default</th><th>Hidden item</th><th>Run lock out</th></tr>
<tr><td>MOTOR ID</td><td>(Motor Identification) This parameter allows for the selection of specific sets of motor parameters. A listing of each Motor Ids with its corresponding set of motor parameters is shown below.
<table>
<tr><td></td><td colspan="4">Motor ID</td></tr>
<tr><td>motor parameter</td><td>4 pole 400 v</td><td>4 pole 200 v</td><td>6 pole 400 v</td><td>6 pole 200 v</td></tr>
<tr><td>Rated Mtr Power</td><td>0.0 HP/KW</td><td>0.0 HP/KW</td><td>0.0 HP/KW</td><td>0.0 HP/KW</td></tr>
<tr><td>Rated Mtr Volts</td><td>0.0 V</td><td>0.0 V</td><td>0.0 V</td><td>0.0 V</td></tr>
<tr><td>Rated Excit Freq</td><td>0.0 Hz</td><td>0.0 Hz</td><td>0.0 Hz</td><td>0.0 Hz</td></tr>
<tr><td>Motor Mid Volts</td><td>28.0V</td><td>14.0V</td><td>28.0V</td><td>14.0V</td></tr>
<tr><td>Motor Mid Freq</td><td>3.0Hz</td><td>3.0Hz</td><td>3.0Hz</td><td>3.0Hz</td></tr>
<tr><td>Motor Min Volts</td><td>9.0V</td><td>4.0V</td><td>9.0V</td><td>4.0V</td></tr>
<tr><td>Motor Min Freq</td><td>1.0Hz</td><td>1.0Hz</td><td>1.0Hz</td><td>1.0Hz</td></tr>
<tr><td>Rated Motor Curr</td><td>0.0 A</td><td>0.0 A</td><td>0.0 A</td><td>0.0 A</td></tr>
<tr><td>Motor Poles</td><td>4</td><td>4</td><td>6</td><td>6</td></tr>
<tr><td>Rated Mtr Speed</td><td>0.0 rpm</td><td>0.0 rpm</td><td>0.0 rpm</td><td>0.0 rpm</td></tr>
<tr><td>% No Load Curr</td><td>35.0%</td><td>35.0%</td><td>45.0%</td><td>45.0%</td></tr>
<tr><td>Stator Leakage X</td><td>9.0%</td><td>9.0%</td><td>7.5%</td><td>7.5%</td></tr>
<tr><td>Rotor Leakage X</td><td>9.0%</td><td>9.0%</td><td>7.5%</td><td>7.5%</td></tr>
<tr><td>Stator Resist</td><td>2.5%</td><td>2.5%</td><td>2.5%</td><td>2.5%</td></tr>
<tr><td>Motor Iron Loss</td><td>0.5%</td><td>0.5%</td><td>0.5%</td><td>0.5%</td></tr>
<tr><td>Motor Mech Loss</td><td>1.0%</td><td>1.0%</td><td>1.0%</td><td>1.0%</td></tr>
</table>
Motor ID Parameters
NOTE: The default motor selections need to have the motor nameplate information entered in the appropriate motor parameters. The other motor parameters are already set to nominal values.</td><td>none</td><td></td><td></td><td>N</td><td>Y</td></tr>
<tr><td rowspan="2">RATED MTR POWER</td><td rowspan="2">(Rated Motor Power) This parameter sets the rated power in horsepower (HP) or kilowatts (kW) of the motor. Note: value should be obtained from the motor nameplate</td><td>HP</td><td>1.0 – 500.0</td><td>0.0</td><td rowspan="2">N</td><td rowspan="2">Y</td></tr>
<tr><td>KW</td><td>0.75 – 400.00</td><td>0.00</td></tr>
<tr><td>RATED MTR VOLTS</td><td>(Rated Motor Voltage) This parameter sets the rated motor voltage. Note: value should be obtained from the motor nameplate</td><td>Volts</td><td>190.0 – 575.0</td><td>0.0</td><td>N</td><td>Y</td></tr>
<tr><td>RATED EXCIT FREQ</td><td>(Rated Motor Excitation Frequency) This parameter sets the excitation frequency of the motor. Note: value should be obtained from the motor nameplate</td><td>Hz</td><td>5.0 – 400.0</td><td>0.0</td><td>N</td><td>Y</td></tr>
</table>

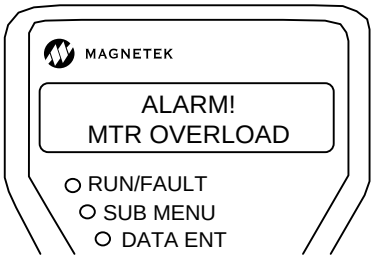
Parameter	Description	Units	Range	Default	Hidden item	Run lock out
MOTOR MID VOLTS	(V/Hz Pattern Voltage at Middle Frequency) This parameter sets rated voltage at the V/Hz pattern middle frequency. This setting is limited by the motor's rated voltage (RATED MTR VOLTS(A5)). Note: a SETUP FLT #9 will occur if the below formula is not meet. $\begin{pmatrix} MOTOR \\ MIN \\ VOLTS \end{pmatrix} < \begin{pmatrix} MOTOR \\ MID \\ VOLTS \end{pmatrix} < \begin{pmatrix} RATED \\ MTR \\ VOLTS \end{pmatrix}$	**Volts**	**0.1 – 575.0**	**Per ID**	N	Y
MOTOR MID FREQ	(V/Hz Pattern Middle Frequency) This parameter sets middle frequency used to define the V/Hz pattern. Note: a SETUP FLT #9 will occur if the below formula is not meet. $\begin{pmatrix} MOTOR \\ MIN \\ FREQ \end{pmatrix} < \begin{pmatrix} MOTOR \\ MID \\ FREQ \end{pmatrix} < \begin{pmatrix} RATED \\ EXCIT \\ FREQ \end{pmatrix}$	**Hz**	**0.1 – 400.0**	**3.0**	N	Y
MOTOR MIN VOLTS	(V/Hz Pattern Voltage at Minimum Frequency) This parameter sets voltage at the V/Hz pattern minimum frequency. Note: a SETUP FLT #9 will occur if the below formula is not meet. $\begin{pmatrix} MOTOR \\ MIN \\ VOLTS \end{pmatrix} < \begin{pmatrix} MOTOR \\ MID \\ VOLTS \end{pmatrix} < \begin{pmatrix} RATED \\ MTR \\ VOLTS \end{pmatrix}$	**Volts**	**0.1 – 100.0**	**Per ID**	N	Y
MOTOR MIN FREQ	(V/Hz Pattern Minimum Frequency) This parameter sets minimum frequency used to define the V/Hz pattern. Note: a SETUP FLT #9 will occur if the below formula is not meet. $\begin{pmatrix} MOTOR \\ MIN \\ FREQ \end{pmatrix} < \begin{pmatrix} MOTOR \\ MID \\ FREQ \end{pmatrix} < \begin{pmatrix} RATED \\ EXCIT \\ FREQ \end{pmatrix}$	**Hz**	**0.1 – 10.0**	**1.0**	N	Y
RATED MOTOR CURR	(Rated Motor Amps) This parameter sets the rated motor current. Note: value should be obtained from the motor nameplate	**Amps**	**1.00 – 800.00**	**0.00**	N	Y
MOTOR POLES	(Motor Poles) This parameter sets the number of poles in the motor. NOTE: This must be an even number or a Setup Fault #3 will occur. Note: value should be obtained from the motor nameplate or use table below as reference Rated Speed (RPM) / # of motor poles 1300 – 1800 / 4 900 – 1200 / 6 660 – 900 / 8	**none**	**2 – 32**	**Per ID**	N	N
RATED MTR SPEED	(Rated Motor Speed) This parameter sets the rated rpm of the motor (nameplate speed). NOTE: This is a function of the motor only and does not need to be the same as the CONTRACT MTR SPD (A1) parameter setting. Note: value should be obtained from the motor nameplate or use table below as reference Rated Speed (RPM) / # of motor poles 1300 – 1800 / 4 900 – 1200 / 6 660 – 900 / 8	**RPM**	**50.0 – 3000.0**	**0.0**	N	N

Parameter	Description	Units	Range	Default	Hidden item	Run lock out
% NO LOAD CURR	(Percent No Load Current) This parameter sets the percent no load current of the motor. Units in percent of rated motor current.	**%**	**10.0 – 80.0**	**Per ID**	N	N
STATOR LEAKAGE X	(Stator Leakage Reactance) This parameter sets the stator reactance leakage, as a percent of the BASE IMPEDANCE, which appears in the Power Data display. NOTE: The base impedance is based on the RATED MTR PWR (A5) and RATED MTR VOLTS (A5) parameters.	**%**	**0.0 – 20.0**	**Per ID**	Y	N
ROTOR LEAKAGE X	(Rotor Leakage Reactance) This parameter sets the rotor reactance leakage, as a percent of the BASE IMPEDANCE (D2), which appears in the Power Data display. NOTE: The base impedance is based on the RATED MTR PWR (A5) and RATED MTR VOLTS (A5) parameters.	**%**	**0.0 – 20.0**	**Per ID**	Y	N
STATOR RESIST	(Stator Resistance) This parameter sets the amount of resistance in the motor stator, as a percent of the BASE IMPEDANCE (D2), which appears in the Power Data display. NOTE: The base impedance is based on the RATED MTR PWR (A5) and RATED MTR VOLTS (A5) parameters.	**%**	**0.0 – 20.0**	**2.5**	Y	N
MOTOR IRON LOSS	(Motor Iron Loss) This parameter sets the motor iron loss at rated frequency. Units in percent of rated power.	**%**	**0.0 – 15.0**	**0.5**	Y	N
MOTOR MECH LOSS	(Motor Mechanical Losses) This parameter sets the motor mechanical losses at rated frequency. Units in percent of rated power.	**%**	**0.0 – 15.0**	**1.0**	Y	N
OVLD START LEVEL	(Motor Overload Start Level) This parameter defines maximum current at which motor can run continuously. This parameter is also one of the two parameters that define the motor overload curve. The user can adjust the motor overload parameters. The following two parameters are used to define the motor overload curve. • motor current overload start level (OVLD START LEVEL(A5)) parameter • motor current time out (OVLD TIME OUT(A5)) parameter For more information, see Motor Overload on page 113.	**%**	**100 – 150**	**110**	Y	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: $\left(\begin{array}{l}OVLD\\START\\LEVEL\end{array}:\right)+\left(\begin{array}{l}40\ \%\\rated\\motor\\current\end{array}\right)$ This is the other parameter used to define the overload curve. For more information, see Motor Overload on page 113.	**sec**	**5.0 – 120.0**	**60.0**	Y	Y

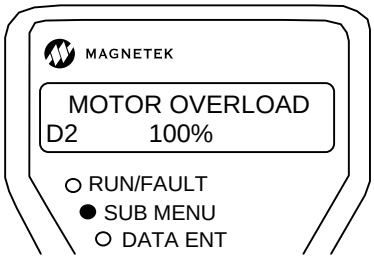
Table 19: Open-Loop Motor A5 Submenu

Motor Overload

When the motor had exceeded the user defined motor overload curve, the drive will declare a motor overload alarm.



The motor overload alarm can also be assigned to a logic output.
Under the POWER DATA display sub-menu, The MOTOR OVERLOAD value displays the percentage of motor overload trip level reached. Once this value reaches 100% the motor has exceeded its user defined overload curve and a motor overload alarm is declared by the drive.

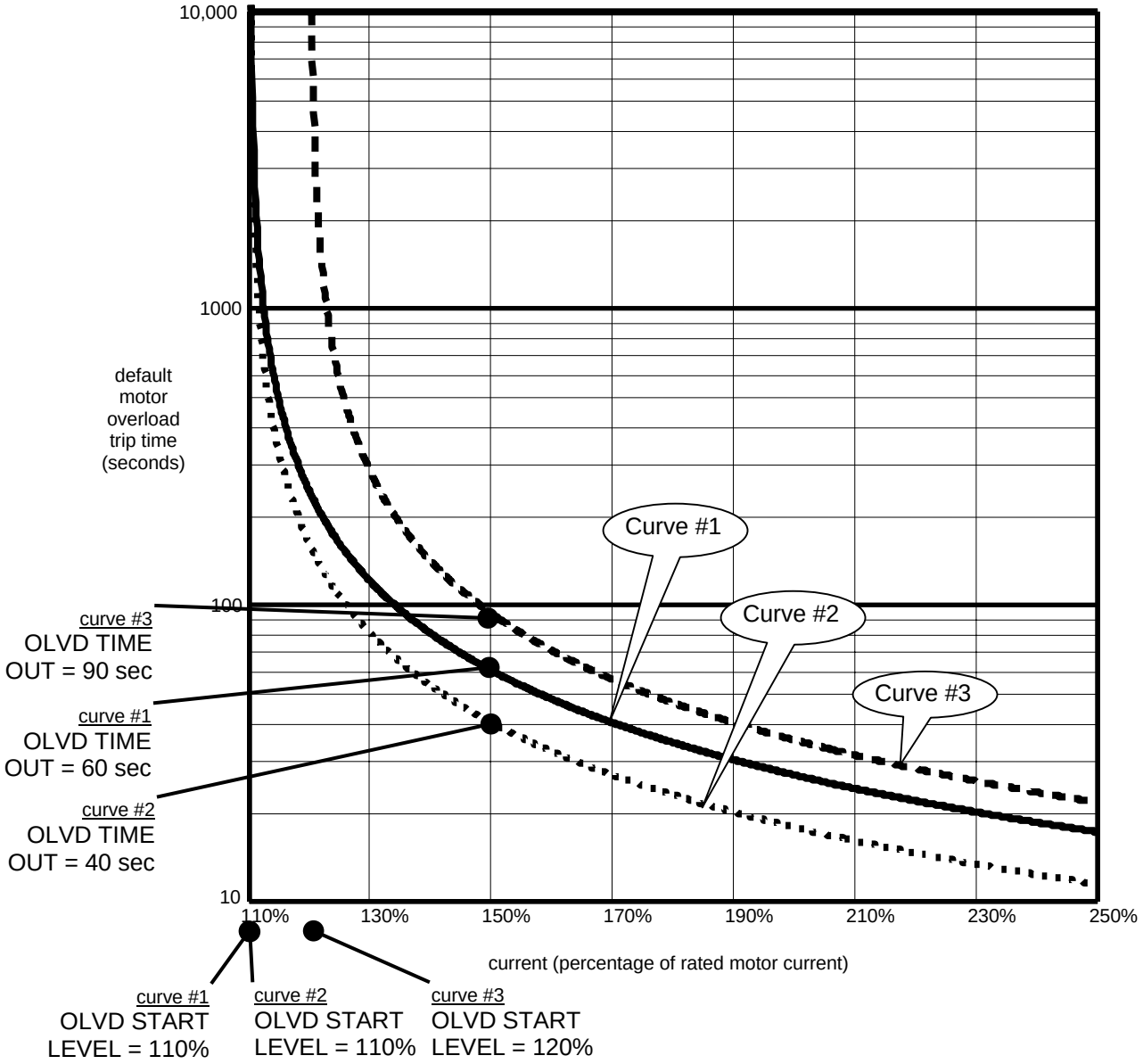


The drive will only declare a motor overload and the user is responsible for action.
But, if the user wants the drive to declare a fault on a motor overload the following need to be completed:

- logic output configured to MTR OVERLOAD
- logic input configured to EXT FAULT
- wire the EXT FAULT logic input terminal to the MTR OVERLOAD logic output terminal
- wire the logic input common terminal to the logic output common

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

.



Motor Overload Curve

Open Loop Configure C0 menu

User Switches C1 submenu

Parameter	Description	Default	Choices	Hidden item	Run lock out
SPD COMMAND SRC	(Speed Command Source) This parameter designates the source of the drive's speed command. The three possible sources for the speed command are: • Multi-Step Command - user defined fifteen discrete speed commands (CMD1 - CMD15). 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) • 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. • Serial Channel – need a RS-422 serial port option card installed.	**MULTI-STEP**	– **analog input** – **multi-step** – **serial** – **ser mult step**	N	Y
RUN COMMAND SRC	(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 external tb or serial+extrn), the Run signal on TB1 and in Logic Inputs C2 submenu must be selected.	**EXTERNAL TB**	– **external tb** – **serial** – **serial+extrn**	N	Y
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 down, this parameter can be changed to allow the motor rotation to match the car controller command.	**FORWARD**	– **forward** – **reverse**	N	Y
SPD REF RELEASE	(Speed Reference Release) The user can select between the following two choices 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 BRAKE PICKED becomes true.	**REG RELEASE**	– **reg release** – **brake picked**	N	Y

Parameter	Description	Default	Choices	Hidden item	Run lock out
CONT CONFIRM SRC	(Contactor Confirm Source) This switch selects if hardware confirmation of motor contactor closure is necessary before the drive attempts to pass current through a motor. If hardware confirmation is available set to EXTERNAL TB and select the Contact Cnfirm signal on a logic input terminal.	**NONE**	– **none** – **external tb**	N	Y
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**	N	Y
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**	N	Y
BRAKE PICK SRC	(Brake Pick Source) If the BRAKE PICK SRC (C1) is set to INTERNAL, the HPV 600 will attempt to pick (lift) the brake when magnetizing current has been developed in the motor.	**INTERNAL**	– **internal** – **serial**	N	Y
BRAKE PICK CNFM	(Brake Pick Confirm) If this switch is set to EXTERNAL TB, the HPV 600 will wait for brake pick confirmation before releasing the speed reference. When set to EXTERNAL TB, the MECH BRK PICK signal on TB1 and a logic input in the C2 Submenu must also be selected.	**NONE**	– **none** – **external tb**	N	Y

Parameter	Description	Default	Choices	Hidden item	Run lock out
BRAKE HOLD SRC	(Brake Hold Source) If set to internal, the drive will command the mechanical brake to hold mode until confirmation of brake picked exists.	**INTERNAL**	– **internal** – **serial**	N	Y
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 in BRK PICK TIME (A1) parameter or a brake pick fault is declared.	**DISABLE**	– **disable** – **enable**	N	Y
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 in BRK HOLD TIME (A1) parameter or a brake hold fault is declared.	**DISABLE**	– **disable** – **enable**	N	Y
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**	N	Y
STALL TEST ENA	(Stall Test Enable) When enabled, the function checks that motor current goes at or above a percentage (defined by STALL TEST LVL(A1)) for defined amount of time (defined by STALL FAULT TIME(A1)). If the motor current exceeds the defined parameters a STALL TEST FAULT will be declared.	**ENABLE**	– **disable** – **enable**	N	Y
STALL PREV ENA	(Regeneration Stall Prevention Enable) When enabled, the Stall Prevention (Current Limit) function is enabled during regeneration. When the defined regeneration current limit is reached (REGEN TORQ LIMIT(A1)), the stall prevention function will increase speed in an effort to shed load. Also, the responsiveness of the stall prevention function is determined by the Current Limit Integral Gain (ILIMT INTEG GAIN(A4)) parameter.	**DISABLE**	– **disable** – **enable**	N	Y

Parameter	Description	Default	Choices	Hidden item	Run lock out
S-CURVE ABORT	(S-Curve Abort) This parameter 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. Requirements for optional S-Curve abort are: • The speed command source must be selected as Multi-step (SPD COMMAND SRC (C1) =multi-step). • The S-curve Abort function must be ENABLED (S-CURVE ABORT (C1) = enabled).	**DISABLED**	– **disabled** – **enabled**	N	Y
STOP MODE SEL	(Stopping Mode Selection) This parameter defines the stopping method. If the parameter is set to 'ramp', the drive will do a controller stop, apply DC injection braking, and set the BRAKE PICK logic output to false (or set mechanical brake, if drive is controlling the brake). If the parameter is set to 'coast', the drive will immediately disable the drive outputs and set the BRAKE PICK logic output to false (or set mechanical brake, if drive is controlling the brake).	**IMMEDIATE**	– **ramp to stop** – **immediate**	N	Y
MAINS DIP ENA	(Mains Dip Enable) When enabled, the function will reduce the speed (by the percentage defined by the MAINS DIP SPEED (A1) parameter) when the drive goes into 'low voltage' mode. 'Low voltage' mode is defined as when the drive declares a UV alarm, which is defined by the Input line-to-line voltage (INPUT L-L VOLTS(A4)) parameter and the Undervoltage Alarm Level (UV ALARM LEVEL(A4))	**DISABLE**	– **disable** – **enable**	N	Y
AUTO STOP ENA	(Auto Stop Enable) When enabled, this function will cause the drive to perform a controlled stop when the speed reference is removed but the run input is maintained. The drive will resume running if a new speed reference is issued.	**DISABLE**	– **disable** – **enable**	N	Y

Parameter	Description	Default	Choices	Hidden item	Run lock out
DB PROTECTION	(Dynamic Braking Resistor Protection Selection) The dynamic braking IGBT is limited as to when it can be turned "on" (i.e. send power to the dynamic braking resistors). The dynamic braking IGBT is allowed to be "on" while the drive is running (i.e. while the speed regulator is released) and for a period of ten (10) seconds after the drive is stopped. If the dynamic braking IGBT is still "on" ten seconds after the drive stops running, the drive will turn "off" the dynamic braking IGBT (thus stop sending power to the dynamic braking resistors) and declare a "DB VOLTAGE" fault or alarm (whether fault or alarm, depends on setting of this parameter).	**FAULT**	– **fault** – **alarm**	Y	Y
MOTOR OVRLD SEL	(Motor Overload Select) This parameter selects the action to be taken by drive when declaring a user selectable Motor Overload. When the motor overload level is reached, the options are: 1. Alarm – the drive only declares a motor overload and the user is responsible for action 2. Flt immediate – the drive will immediately declare a fault and turn-off the drive's output 3. Fault at stop – the drive will delay declaring a fault until the run command is removed	**ALARM**	– **alarm** – **flt immediate** – **fault at stop**	Y	Y
TORQUE CALC SEL	(Torque Calculation Select) This parameter selects between two methods for calculating torque in the motor. The result is used to produce the proper voltage boost at low speed. This parameter is meant for advanced operation; therefore, the parameter will rarely need to be changed from the default value.	**STATOR FLUX**	– **gap power** – **stator flux**	Y	Y
SERIAL MODE	(Serial Mode Selection) This parameter selects between two serial protocols. The choices are: • Mode 1 – selects the Magnetek standard protocol. • Mode 2 – selects a custom protocol. • Mode 2 Test – test mode used only when testing custom protocol serial mode 2.	– **none** – **mode 1** – **mode 2** – **mode 2 test**	**MODE 1**	Y	Y

Parameter	Description	Default	Choices	Hidden item	Run lock out
SER2 FLT MODE	(Serial Mode 2 Fault Mode) Used only with custom serial protocol (mode 2) *This parameter defines the reaction to a serial communications fault while in Serial Mode 2. There are three possible settings:* o Immediate – upon sensing a serial communications fault while in the run mode will result in an immediate stop. The equivalent to removal of the "Drive Enable" logic input. o Run Remove – upon sensing a serial communications fault while in the run mode, the drive will react in the same manner that removal of the run command would react. In this case, the type of stop will be defined by the STOPPING MODE (C1) parameter. o Rescue – upon sensing a serial communications fault while in the run mode, an attempt will be made to continue to run at a low speed to the next floor. Upon sensing the fault, the drive will decelerate to a creep speed and continue to run at that speed until the first of the two following termination conditions are reached. o The hardware "Drive Enable" logic input is removed o A timer set by parameter SER2 RS CRP TIME (A1) has elapsed.	– **immediate** – **run remove** – **rescue**	**IMMEDIATE**	Y	Y
DRV FAST DISABLE	(Drive Fast Disable Function) This function determines how fast the drive responses to the removal of DRIVE ENABLE logic input. Note: The removal of the DRIVE ENABLE logic input will turn-off the drive output gates. <u>Disable</u> With the removal of the DRIVE ENABLE logic input, the drive's output gates will turn off within 4 msec. <u>Enable</u> With the removal of the DRIVE ENABLE logic input, the drive's output gates will turn off within 1.5-2.0 msec.	**DISABLE**	– **disable** – **enable**	Y	Y
PWR MODULE LATCH	(Power Module Latch) This parameter enables or disables the bridge fault	–**enable** –**disable**	**ENABLE**	Y	Y

Table 20: Open-Loop User Switches C1 Submenu

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. When a function is assigned to an input terminal, it is removed from the list of possible selections for subsequent terminals.
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	Default	Hidden item	Run lockout
LOGIC INPUT 1	logic input #1	DRIVE ENABLE	N	Y
LOGIC INPUT 2	logic input #2	RUN	N	Y
LOGIC INPUT 3	logic input #3	FAULT RESET	N	Y
LOGIC INPUT 4	logic input #4	UP/DWN	N	Y
LOGIC INPUT 5	logic input #5	S-CURVE SEL 0	N	Y
LOGIC INPUT 6	logic input #6	STEP REF B0	N	Y
LOGIC INPUT 7	logic input #7	STEP REF B1	N	Y
LOGIC INPUT 8	logic input #8	STEP REF B2	N	Y
LOGIC INPUT 9	logic input #9	EXTRN FAULT 1	N	Y

choices	*choice descriptions…*
contact cfirm	(Contact Confirm Signal) Closure of the auxiliary contacts confirming closure of the motor contactor (normally open).
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 – normally open – fault active when input is on
extrn fault 2	(External Fault 2) User input fault #2 – normally open – fault active when input is on
extrn fault 3	(External Fault 3) User input fault #3 – normally open – fault active when input is on
extrn /flt 4	(External Fault 4) User input fault #4 – normally closed – fault active when input is off
fault reset	(Fault Reset) If the FAULT RESET SRC (C1) switch is set to EXTERNAL TB1, 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 (A1)) will be reset to zero. NOTE: This input is edge sensitive and the fault is reset on the transition from false to true.
mech brk hold	(Mechanical Brake Hold Signal) Auxiliary contact closures confirming when the mechanical brake is in the hold mode (engaged).
mech brk pick	(Mechanical Brake Pick Signal) Closure of auxiliary contacts confirming the mechanical brake has been picked (lifted).
nc cntct cfirm	(NC - Contact Confirm Signal) Closure of the auxiliary contacts confirming closure of the motor contactor (normally closed).
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.
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 (A1) 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 (A1), 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.
run	(Run) If drive is enabled through the DRIVE ENABLE logic input, this function 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.

choices	*choice descriptions…*	
s-curve sel 0	Bit 0 of S-curve selection	These two bits are used to select one of four s-curve selections.
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	Four inputs, which must be used together as a 4-bit command for multi-step speed selection.
step ref b1	Bit 1 of multi-step speed command selection	
step ref b2	Bit 2 of multi-step speed command selection	
step ref b3	Bit 3 of multi-step speed command selection	
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 21: Open-Loop 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	Default	Hidden item	Run lock out
LOGIC OUTPUT 1	logic output #1	READY TO RUN	N	Y
LOGIC OUTPUT 2	logic output #2	RUN COMMANDED	N	Y
LOGIC OUTPUT 3	logic output #3	MTR OVERLOAD	N	Y
LOGIC OUTPUT 4	logic output #4	READY TO RUN	N	Y
RELAY COIL 1	relay output #1	FAULT	N	Y
RELAY COIL 2	relay output #2	SPEED REG RLS	N	Y

choices…	*choice descriptions…*
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.
brake alarm	(Brake Alarm) The output is true when the dynamic brake resistor is in an overcurrent condition and the drive is in a run condition.
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 igbt flt	(Brake IGBT Fault) The output is true when the dynamic brake resistor is in an overcurrent condition and the drive is not in a run condition.
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.
drv overload	(Drive Overload) The output is true when the drive has exceeded the drive overload curve.
fan alarm	(Fan Alarm) The output is true when the fan on the drive is not functioning.
fault	(Fault) The output is true when a fault is declared by the drive.
flux confirm	(Motor Flux Confirmation) The output is true when the drive has confirmed the initial current level is equal to 75% of the dc inject at start current level. This is done to ensure flux is present in the motor before releasing the speed reference.
fuse fault	(Fuse Fault) The output is true when the DC bus fuse has blown.
ground fault	(Ground Fault) The output is true when the sum of all phase current exceeds 50% of rated current of the drive.
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.

choices…	*choice descriptions…*
mtr overload	(Motor Overload) The output is true when the motor has exceeded the user defined motor overload curve.
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.
over curr flt	(Motor overload current fault) The output is true when the phase current has exceeded 250% of rated current.
overtemp flt	(Heatsink Over Temperature Fault) The output is true when the drive's heatsink has exceeded 90°C (194°F).
overvolt flt	(Over Voltage Fault) The output is true when the DC bus voltage exceeds 850VDC for a 460V class drive or 425VDC for a 230V class drive.
ovrtemp alarm	(Drive Over Temperature Alarm) The output is true when the drive's heatsink temperature has exceeded 80°C (176°F).
phase fault	(Phase Loss) The output is true when the drive senses an open motor phase.
ready to run	(Ready to Run) The output is true when the drive's software has been initialized and no faults are present.
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).
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 ref rls	(Speed Reference Release) The output is true when the flux is confirmed and drive is NOT in DC injection.
spd ref rel2	(Speed Reference Release 2) The output is true when: • software initialized and no faults present • drive being commanded to run (contact confirm true, if used) • not in DC injection • SPEED COMMAND SRC(C1) parameter = multi-step
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)
stltst active	(Stall Test Active) The output is true when the drive is declaring a Stall Test Fault. The Stall Test Fault checks that motor current goes at or above a percentage (defined by STALL TEST LVL(A1)) for defined amount of time (defined by STALL FAULT TIME(A1)). If the motor current exceeds the defined parameters a STALL TEST FAULT will be declared.
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	(Low 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 22: Open-Loop Logic Outputs C3 Submenu

Analog Outputs C4 submenu

ANALOG OUTPUT 1
(Analog Outputs 1)
Default:
This parameter defines the function of the analog output #1.
NOTE: The *current* setting of each parameter is displayed in all caps; all other choices in the list are displayed in lower case.

ANALOG OUTPUT 2
(Analog Outputs 2)
Default:
This parameter defines the function of the analog output #2.
NOTE: The *current* setting of each parameter is displayed in all caps; all other choices in the list are displayed in lower case.

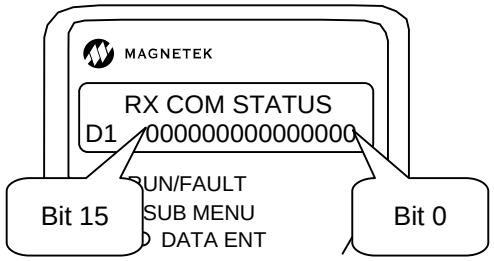
Parameter	Description	Default	Hidden item	Run lock out
ANALOG OUTPUT 1	analog output #1	SPEED REF	N	Y
ANALOG OUTPUT 2	analog output #2	SPEED FEEDBK	N	Y

choices	*choice descriptions…*	*D/A Units*
bus voltage	(DC Bus Voltage Output) Measured DC bus voltage.	% of peak bus
current out	(Current Output) Percent motor current.	% rated current
drv overload	(Drive Overload) Percent of drive overload trip level reached.	% of trip point
flux current	(Flux Producing Current) Measured flux producing current.	% rated current
flux voltage	(Flux Producing Voltage) Flux producing voltage reference.	% rated volts
frequency out	(Frequency Output) Electrical frequency.	% rated freq
mtr overload	(Motor Overload) Percent of motor overload trip level reached.	% of trip point
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.	none
power output	(Power Output) Calculated power output	% rated power
slip freq	(Motor Slip Frequency) Commanded slip frequency	% rated freq
speed command	(Speed Command) Speed command before S-Curve	% rated speed
speed feedbk	(Speed Feedback) Speed reference including all compensations included (slip comp, etc.)	% rated speed
speed ref	(Speed Reference) Speed reference after S-Curve	% rated speed
torq current	(Torque Producing Current) Measured torque producing current.	% rated current
torq voltage	(Torque Producing Voltage) Torque producing voltage reference.	% rated volts
torque output	(Torque Output) Calculated torque output.	% rated torque
voltage out	(Voltage Output) RMS motor terminal voltage.	% rated volts

Table 23: Open-Loop Analog Outputs C4 Submenu

Open Loop 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 reference being used by the drive that includes all compensations (slip comp, etc.)</td><td>ft/min or m/s</td><td>N</td></tr>
<tr><td>ENCODER SPEED</td><td>Only used for diagnostics…
Monitors encoder speed in rpm.</td><td>rpm</td><td>N</td></tr>
<tr><td>RX COM STATUS</td><td>(Serial Communications Status) Serial communication status display.
 

<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>
<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>
</table></td><td>1=true
0=false</td><td>N</td></tr>
</table>

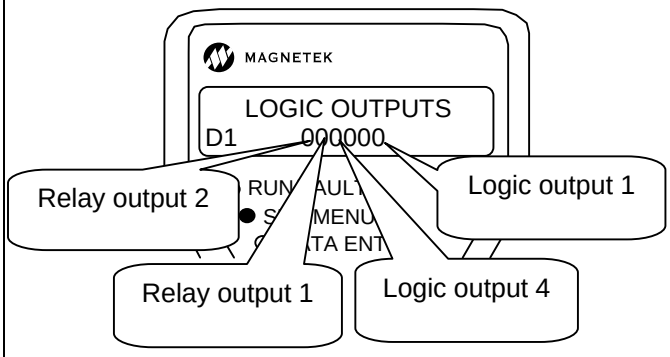
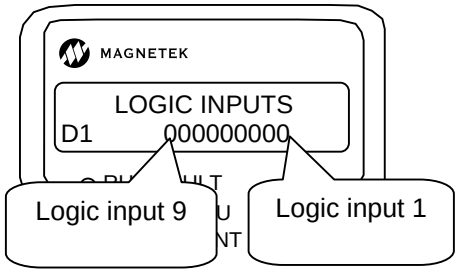
<table>
<tr><th>Parameter</th><th>Description</th><th>Units</th><th>Hidden item</th></tr>
<tr><td>RX COM STATUS</td><td>
<table>
<tr><td>Bit</td><td>Severity</td><td>Name Description/Reason</td></tr>
<tr><td>7</td><td>Info</td><td>RX_INVALID_MONITOR_ID (Not available in Mode 2) Set if the Monitor_Id 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>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 24: Open-Loop Elevator Data D1 Submenu

Power Data D2 submenu

Parameter	Description	Units	Hidden item
MOTOR CURRENT	(RMS Motor Current Output) Monitors the RMS motor output current.	Amps	N
% MOTOR CURRENT	(Percent Motor Current) Monitors the motor current as a percent of rated motor current.	%rated current	N
MOTOR VOLTAGE	(Motor Voltage Output) Monitors the RMS motor terminal line-line voltage.	Volts	N
MOTOR FREQUENCY	(Motor Frequency Output) Monitors the electrical frequency of the motor output.	Hz	N
MOTOR TORQUE	(Motor Torque Output) Calculated motor output torque in terms of percent rated torque.	% rated torque	N
POWER OUTPUT	(Power Output) Calculated drive power output.	KW	N
DC BUS VOLTAGE	(DC Bus Voltage) Measured voltage of the DC bus.	Volts	N
SLIP FREQUENCY	(Slip Frequency) Displays the commanded slip frequency of the motor.	Hz	Y
MOTOR OVERLOAD	(Motor Overload) Displays the percentage of motor overload trip level reached. Once this value reaches 100% the motor has exceeded its user defined overload curve and a motor overload alarm is declared by the drive. For more information on the motor overload curve, see page 112.	%	Y
DRIVE OVERLOAD	(Drive Overload) Displays the percentage of drive overload trip level reached. Once this value reaches 100% the drive has exceeded its overload curve and a drive overload fault is declared.	%	Y
FLUX CURRENT	(Flux Current) Displays the flux producing current of the motor.	% rated current	Y
TORQUE CURRENT	(Torque Current) Displays the torque producing current of the motor.	%rated current	Y
FLUX VOLTAGE	(Flux Voltage) Displays the flux voltage reference.	% rated volts	Y
TORQUE VOLTAGE	(Torque Voltage) Displays the torque voltage reference.	% rated volts	Y
BASE IMPEDANCE	(Base Impedance) Displays the drive calculated base impedance, which is based on the RATED MTR PWR (A5) and the RATED MTR VOLTS (A5) parameters. This value is used to calculate the Per Unit values of the system impedances (i.e. EXTERN REACTANCE (A4) and STATOR RESIST(A5)).	Ohms	Y

Table 25: Open-Loop Power Data D2 Submenu

Utility U0 menu

U0	Parameter	Description	Default	Choices	Hidden item	Run lock out
U1	PASSWORD	*For more information, see Password on page 130.*				
	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 130.*				
	HIDDEN ITEMS	Selects if the "hidden" parameters will be displayed on the Digital Operator.	ENABLED (closed-loop) DISABLED (open-loop)	enabled disabled	N	N
U3	UNITS	*For more information, see Units on page 130*				
	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 130.*				
	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 131.*				
	RESTORE MOTOR DEFAULTS?	Resets all parameters to default values except parameters in MOTOR A5			N	Y
	RESTORE DRIVE DEFAULTS?	Resets the parameters in the MOTOR A5 to the defaults defined by the MOTOR ID			N	Y
U6	DRIVE INFO	*For more information, see Drive Info on page 132.*				
	DRIVE VERSION	Shows the software version of the drive software			N	N
	BOOT VERSION	Shows the lower level software version of the drive			N	N
	CUBE ID	Displays the cube identification number of the drive			N	N
U7	HEX MONITOR	*For Magnetek personnel. For more information, see Hex Monitor on page 133.*			N	N
U8	LANGUAGE SEL	*(closed-loop only) For more information, see Language Sel on page 133.*				
	LANGUAGE SELECT	Selects language for operator text	ENGLISH	english deutsch *(german)*	N	N
U9	BASICS	*For more information, see Basics on page 133.*				
	OPERATION	Selects open-loop or closed-loop drive operation	CLOSED LOOP	Open loop Closed loop	N	Y

Detailed Description

PASSWORD

(Password Function)
The following three different screens are used by the password function:

- ENTER PASSWORD
- NEW PASSWORD
- PASSWORD LOCKOUT

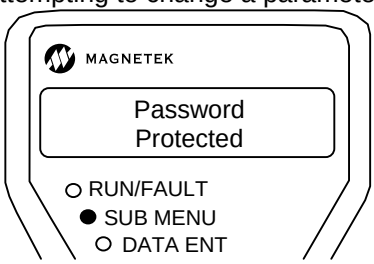
Password Function

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.

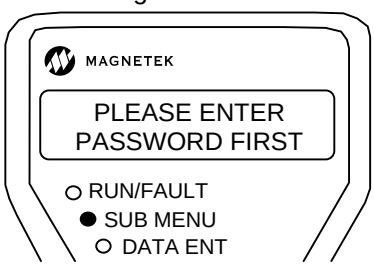


In order to change a parameter after password lockout has been enabled, the following two steps must be followed in the PASSWORD sub-menu:
1) A valid password must be entered in the ENTER PASSWORD screen.
2) The password lockout must be DISABLED in the PASSWORD LOCKOUT screen.

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 TB
- 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.

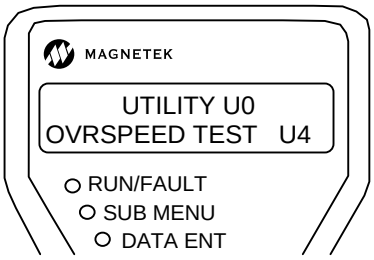
Overspeed Test via Serial Channel

Setting Overspeed Test Source parameter to serial can use the serial channel.

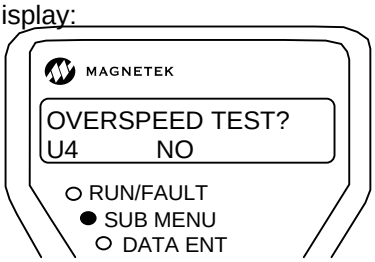
Overspeed Test via Operator

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

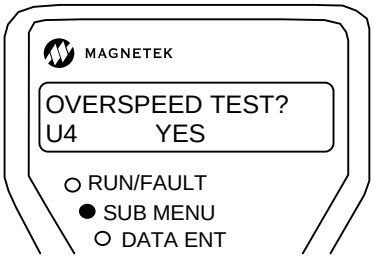
- While the Digital Operator display shows



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



- Press the ENTER key again. The submenu 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 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 removed 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.

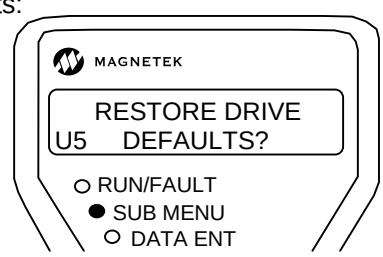
RESTORE DFLTS

(Restore Parameter Defaults)
Two different functions are included in this sub-menu.

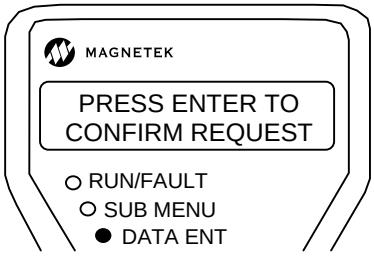
RESTORE DRIVE DEFAULTS

This function resets all parameters to their default values except the parameters in the MOTOR A5 sub-menu.

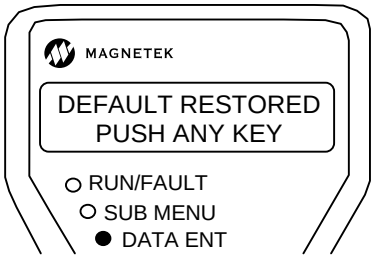
The following shows how to restore the drive defaults:



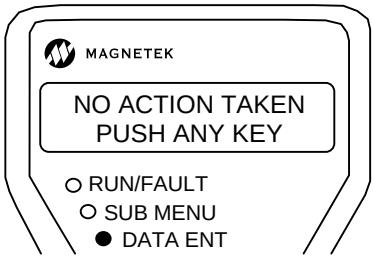
Press the enter key



Press the enter key again

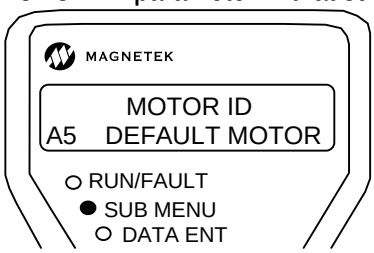


If the esc key is pressed instead, the reset action will be aborted

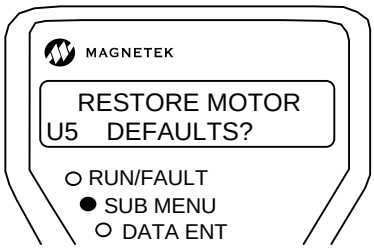


RESTORE MOTOR DEFAULTS

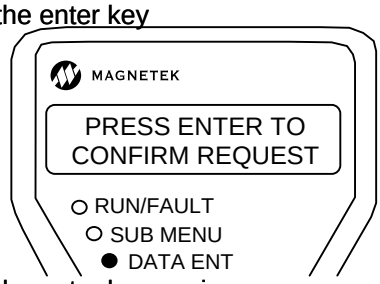
This function resets the parameters in the MOTOR A5 sub-menu to the defaults defined by the MOTOR ID parameter in that sub-menu.



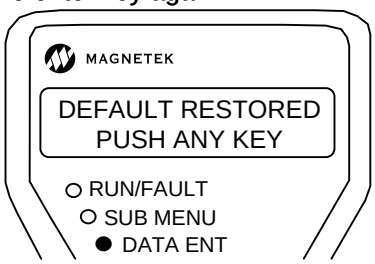
The following shows how to restore the motor defaults for the defined motor ID:



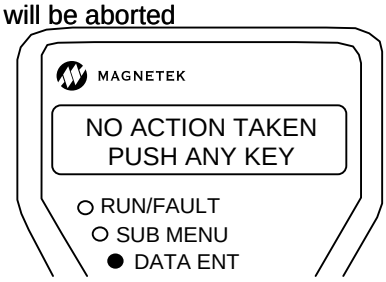
Press the enter key



Press the enter key again



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

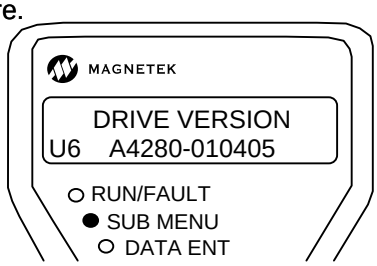


DRIVE INFO

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

DRIVE VERSION Screen

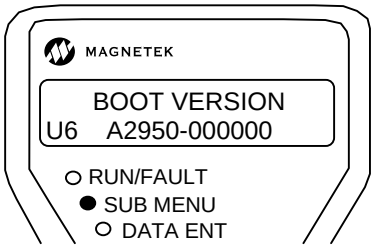
Shows the software version of the drive software.



HPV 600 Software

BOOT VERSION Screen

Shows the lower level software version of the drive.



CUBE ID Screen

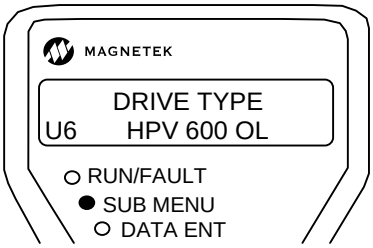
Displays the cube identification number of the drive.

volts	hp	kw	model	cube size	ID#
380V to 480V	10	7.5	-4018	B	5
	15	11	-4024	B	6
	20	15	-4034	C	7
	25	18	-4039	C	8
200V to 240V	7.5	5.5	-2028	A	11
	10	7.5	-2035	B	12
	15	11	-2047	B	13
	20	15	-2060	C	14
380V to 440V	-	4	-4011	A	17
	-	5.5	-4015	A	18
	-	7.5	-4021	B	19
	-	11	-4028	B	20
	-	15	-4039	C	21
	-	18.5	-4047	C	22
	-	22	-4057	C	16

Cube ID Numbers

DRIVE TYPE Screen

Shows the drive software type HPV 600 and OL (open-loop) or CL (closed-loop)

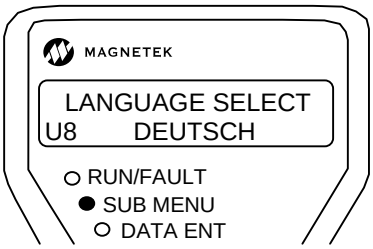


HEX MONITOR

(Hex Monitor)
The hex monitor was designed for fault and parameter diagnostics. It is intended for use by Magnetek personnel.

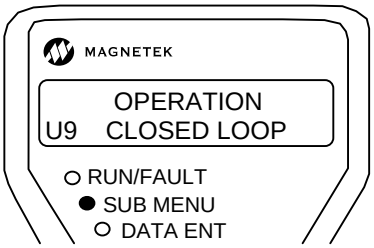
LANGUAGE SEL

(Language Selection Function)
When the Language Selection sub-menu is displayed, the user can choose either English or Deutsch (German) for the operator's text.
Note: Closed-loop only.



BASICS

(Basics)
When the Basics sub-menu is displayed, the user can choose either open-loop or closed-loop operation of the drive via the Operation (U9) parameter.



Fault F0 menu

Parameter	Description	Hidden item	Run lockout
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
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	N	N

Detailed Descriptions

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.

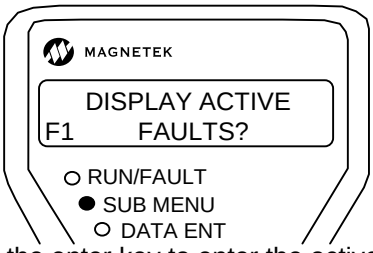
ACTIVE FAULTS

(Active Faults)

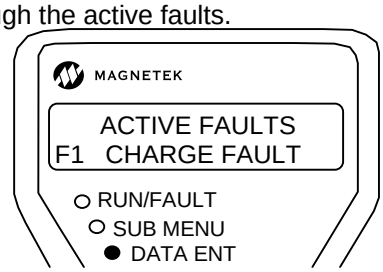
This sub-menu contains a list of the active faults. This sub-menu also allows the user to reset the active faults.

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.



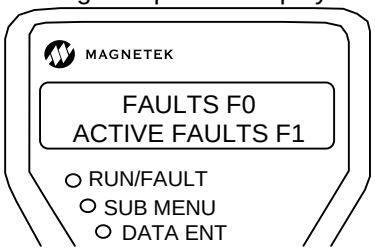
Press the enter key to enter the active fault list. Use the up and down arrow keys to scroll through the active faults.



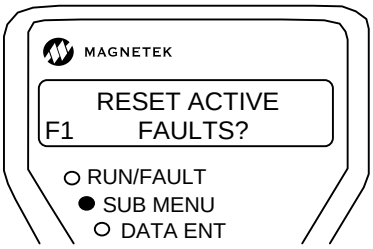
Resetting Active Faults

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.

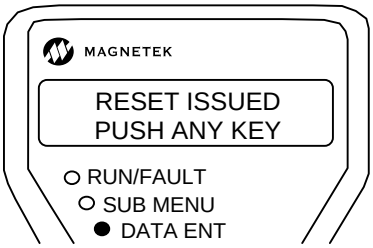
While the Digital Operator display shows:



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.



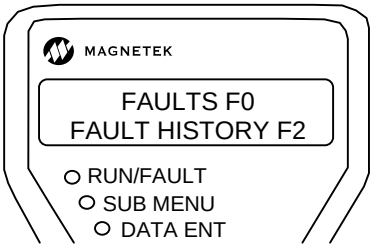
FAULT HISTORY

(Fault History)
This sub-menu contains a list of up to the last sixteen faults.

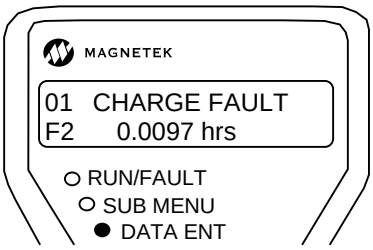
NOTE: The fault history is not affected by the fault reset or a power loss. The fault history can only be cleared by a function in this sub-menu.

Fault History

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



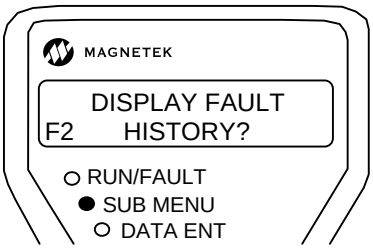
Press the enter key to enter the fault history. Use the up and down arrow keys to scroll through the faults.



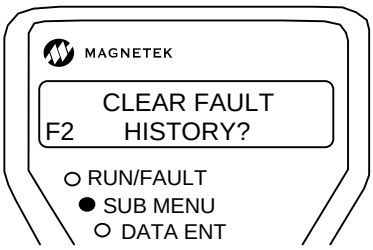
Clearing Fault History

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.

While the Digital Operator display shows:

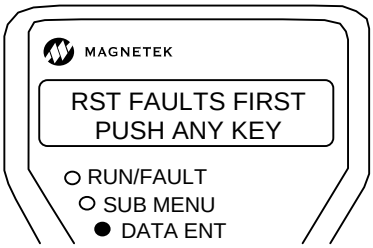


Press the ENTER key. The sub-menu LED will turn ON, and the Digital Operator will display:

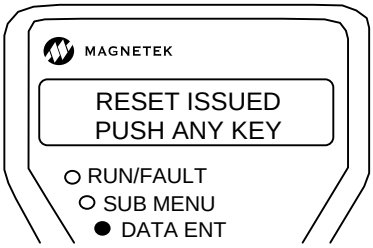


Press the ENTER key again to begin the fault reset procedure.

The 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

Preventative maintenance is primarily a matter of routine inspection and cleaning. The most important maintenance factors are the following:
Is their sufficient airflow to cool the drive?
Has vibration loosened any connections?

The HPV 600 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.

Drive Servicing

Remember when servicing the HPV 600:
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.

even with the light out, we recommend that you use a voltmeter between (+3) and (-) to verify that no voltage is present.

If after 5 minutes the DC bus charge light remains ON or voltage remains between terminals (+3) and (-):
First, check that the incoming three phase power is disconnected

Once the incoming three-phase power is disconnected, it will be necessary to discharge the DC bus with a “bleeder” resistor.

Discharging DC bus with “Bleeder” Resistor

IMPORTANT

Use extreme caution when connecting the bleeding resistor.

Using a 250ohm/100 watt “bleeder” resistor, connect the resistor leads to the (+3) and (-) terminals located on the brake resistor terminal.
The resistor leads should be connected for 20 seconds or until the DC bus charge light extinguishes.
Once the DC bus charge light is out, verify with a voltmeter that no voltage exists between the (+3) and (-) terminals.
It will be necessary to have the drive repaired or replaced.

Reforming Bus Capacitors

The following is a procedure for reforming the electrolytic bus capacitors.

If the drive has been stored for more than 9-months, it is recommended that the bus capacitors be reformed.

After 18 months of storage it is ***mandatory*** that the bus capacitors be reformed.

The bus capacitors in the HPV 600 can be reformed *without removing them from the drive.*

To reform the capacitors, voltage must be gradually increased as follows:
Increase the AC input voltage from zero at a very slow rate, approximately 7 VAC per minute, reaching full rated voltage after about an hour.
This will reform the capacitors.

Parameters Locked Out

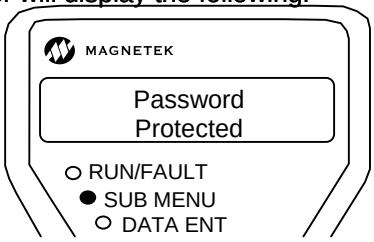
The following three conditions would cause parameter changes to be locked out.

The password protection is enabled.

The drive is running and Run Lockout protects the parameter from being changed.

The hidden items are disabled and the parameter to be change is a hidden parameter.

When the password protection is enabled and a parameter is trying to be changed, the digital operator will display the following:



Troubleshooting

Faults and Alarms

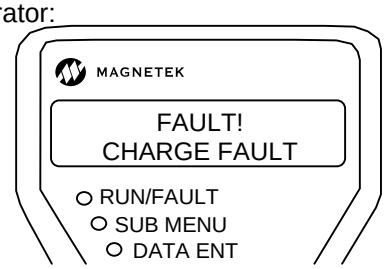
The HPV 600 reports two classes of warnings; these are identified as Faults and Alarms.

Faults and Fault Annunciation

A 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.

There are four means of fault annunciation.

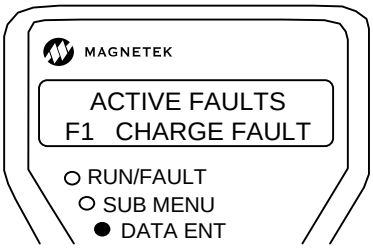
A priority message will be seen on the Digital Operator:



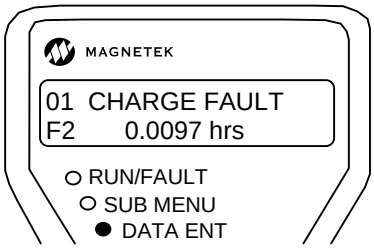
A priority message will overwrite the currently displayed item. The user can clear this message by pressing any key on the Digital Operator keypad. If another fault is present, the next fault will appear as a priority message.

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.

The fault will be placed on the active fault list. The active fault list will display and record currently active faults. The faults will remain on the fault list until an active fault reset is initiated.



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.



The user can assign a fault to an external logic output.

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

CAUTION
If the run signal is asserted at the time of a fault reset, the drive will immediately go into a run state.

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.

A fault reset can also be done via the Digital Operator.

Below lists the HPV 600's faults, alarms, and operator messages along with possible causes and corrective actions.

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
A to D Fault	The Analog to Digital conversion on the drive's control board is not working properly.	**Drive Control PCB Failure** ⇩ Replace Drive Control board
Brake Alarm *(alarm***)**	Dynamic brake resistor overcurrent. Note: After the run command has been dropped, this alarm becomes a Brake IGBT fault.	**Brake Resistor problem** ⇩ Braking Resistor is shorted
Brk Hold Flt	The brake hold command and the brake feedback did not match for the time specified with Brake Hold Time parameter.	**Check Parameter Settings** ⇩ Check BRAKE HOLD SRC (C1) parameter for the correct source of brake hold feedback ⇩ Check BRAKE HOLD TIME (A1) parameter for the correct brake hold time If nuisance fault, the fault can be disabled by BRK HOLD FLT ENA (C1) parameter.
Brk IGBT Flt	Dynamic brake resistor overcurrent.	**Brake Resistor problem** ⇩ Braking Resistor is shorted When this fault occurs while the elevator is in motion, it will be declared as a brake fault alarm until the run condition is removed. If the drive is in regeneration an Overvolt Fault may occur instead.
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 and Mechanical Brake Pick Signal Wiring** ⇩ Check the correct logic input is configured for the correct TB1 terminal and set to MECH BRK PICK (C2) ⇩ Check wiring between the mechanical brake and the terminal on TB1 ⇩ 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 If nuisance fault, the fault can be disabled by BRK PICK FLT ENA (C1) parameter.

Name	Description	Possible Causes & Corrective Action
Bridge Fault	The integrated power module is sensing an overcurrent or overtemperature condition *(only B and C-cubes)*	**Overcurrent Problem** ⇩ Check for a possible short between the motor windings ⇩ Verify dynamic brake resistor size (could be too small) **Overtemperature Problem** ⇩ Reduce Ambient Temperature ⇩ Clean heat sink ⇩ Check for cooling fan failure **Check Parameter Setting** ⇩ If nuisance fault, set PWR MODULE LATCH (C1) to disable The drive may need to be replaced, if no other problem found.
Charge Fault	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 (A4) and UV FAULT LEVEL (A4) parameters	**DC Choke Connection** ⇩ Check that the DC choke link is present or if using DC choke, check DC choke connections **Low Input Voltage** ⇩ Check INPUT L-L VOLTS (A4) and UV FAULT LEVEL (A4) parameters ⇩ Disconnect Dynamic Braking resistor and re-try ⇩ 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 **Drive Accurately Reading the Dc Bus** ⇩ Measure the dc bus with a meter ⇩ Compare that with the value on the digital operator, DC BUS VOLTAGE (D2) Drive may need to be replaced
Comm Fault	The drive is being operated by serial communications and one of the following has occurred: • Communication time-out – if the serial run bit is set and the drive does not receive a run-time message for 40 msec • Bad message checksum – drive has detected three 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 ⇩ Also, the drive's control board may need to be replaced **Check Parameter Setting** ⇩ If not using serial communications, check SERIAL MODE (C1) = none
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 of the operator does 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 of the operator does not work, the operator or the drive's control board may need to be replaced.

Name	Description	Possible Causes & Corrective Action
Contactor Flt	The command to close the contactor and the contactor feedback do not match for the time specified by the Contact Flt Time parameter. May also occur is RUN command is active the CONTACT FLT TIME (A1) without CONTACT CFIRM active.	**Check Parameter Settings and Contactor** ⇩ Check CONTACT FLT TIME (A1) parameter for the correct contactor fault time ⇩ Check wiring to logic input configured as CONTACT CFIRM ⇩ Contactor hardware problem If nuisance fault, the fault can be disabled by CONT CONFIRM SRC (C1) parameter (set to none).
Cube data Flt	The cube (drive) parameters checksum is invalid.	**Parameters Corrupted** ⇩ Re-enter parameters and power-cycle ⇩ If re-occurs, replace Drive Control board
Cube ID Fault	The identification number for the drive is invalid.	**Hardware Problem** ⇩ Power cycle the drive ⇩ If re-occurs, replace Drive Control board ⇩ If re-occurs, the drive needs to be replaced
Curr Reg Flt *[closed-loop]*	Actual current does not match the command current. The drive is commanding more motor voltage then is available on the input.	**Current Regulation problem** ⇩ Check for a low input line ⇩ Check if drive accurately reading the dc bus • Measure the dc bus with a meter • Compare that with the value on the digital operator, DC BUS VOLTAGE (D2) ⇩ Complete Adaptive Tune and Inertia procedure ⇩ Check for a possible motor open phase ⇩ Check if contactor is closing ⇩ Check for accurate motor parameters (A5) • Verify motor nameplate values are entered correctly • Complete Adaptive Tune and Inertia procedure • As a last step, calculate motor parameters from motor's equivalent circuit Otherwise, replace the drive
DB VOLTAGE or **DB VOLTAGE** *(alarm)*	Dynamic braking IGBT is still on ten seconds after the drive stops running	**Too High of Braking Resistor Value** ⇩ Check for no braking resistor ⇩ Possible Brake IGBT Failure ⇩ Possible brake resistor is open **Dynamic Braking Wiring Problem** ⇩ Check dynamic brake hardware wiring **High Input Voltage** ⇩ Decrease input AC voltage with the proper range (see specifications in technical manual) ⇩ Use reactor to minimize voltage spikes **Drive Accurately Reading the DC Bus** ⇩ Measure the dc bus with a meter ⇩ Compare that with the value on the digital operator, DC BUS VOLTAGE (D2) **Hardware Problem** ⇩ Replace Drive Control board ⇩ Replace Drive

Name	Description	Possible Causes & Corrective Action
DCU data Flt	The DCU parameters checksum is invalid.	**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 Ovrload	The drive has exceeded the drive overload curve.	**Excessive Field Weakening** ⇩ Decrease FLUX WKN FACTOR (A1) parameter ⇩ Decrease both MTR TORQUE LIMIT (A1) and REGEN TORQ LIMIT (A1) parameters ⇩ Watch for the "**Hit Torque Limit" alarm message**, if message appears the torque limits or the flux weakening factor parameters were decreased too much **Accurate Motor Parameters** ⇩ Verify motor nameplate values are entered correctly ⇩ Complete Adaptive Tune and Inertia procedure ⇩ As a last step, calculate motor parameters from motor's equivalent circuit **Excessive Current Draw** ⇩ Decrease accel/decel rate ⇩ Is elevator car being held in position? (i.e. mechanical brake not releasing) ⇩ Mechanical brake may not have properly released **Encoder Problem** ***(closed-loop only)*** ⇩ Check encoder coupling: align or replace ⇩ Encoder failure (replace encoder) ⇩ Check encoder count parameter ENCODER PULSES (A1) **Motor Problem** ⇩ Check for motor failure **Drive Sizing** ⇩ Verify drive sizing. May need a larger capacity HPV 600

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 is not proper with the motor	**Encoder Should Match Motor Phasing** ⇩ Usually drive's "HIT TORQUE LIMIT" alarm message is displayed (depending on setting of TRQ LIM MSG DLY (A1) parameter) ⇩ Switch either two motor phases or swap two encoder wires (A and /A) **Encoder Power Supply Loss** ⇩ Check 12 or 5 volt supply on terminal strip **Accurate Motor Parameters** ⇩ Verify motor nameplate values are entered correctly ⇩ Complete Adaptive Tune and Inertia procedure ⇩ As a last step, calculate motor parameters from motor's equivalent circuit **Response of Speed Regulator** ⇩ Enter accurate INERTIA (A1) parameter ⇩ Increase RESPONSE (A1) parameter **Encoder Coupling Sloppy or Broken** ⇩ Check encoder to motor coupling **Excessive Noise on Encoder Lines** ⇩ Check encoder connections. Separate encoder leads from power wiring (cross power lead at 90°) **Other Conditions Causing Fault** ⇩ Check encoder count parameter ENCODER PULSES (A1) ⇩ Possible motor phase loss **Hardware Problem** ⇩ Encoder Option Card not connected to main control board ⇩ Replace Drive Control board
EncoderFault OFF *(alarm)* *[closed-loop]*	*When the Encoder Fault is disabled (ENCODER FAULT (C1) = disabled), the drive will display the warning message "EncoderFault OFF", every time the RUN command is removed.*	**Check Parameter Settings** ⇩ Check the setting of parameter ENCODER FAULT (C1)
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) ⇩ Check external fault is on the correct terminal on TB1
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) ⇩ Check external fault is on the correct terminal on TB1

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) ⇩ Check external fault is on the correct terminal on TB1
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) ⇩ Check external fault is on the correct terminal on TB1
Fan Alarm *(alarm)*	The heatsink cooling fan on the drive is not functioning.	**Excessive Heat** ⇩ Reduce Ambient Temperature ⇩ Clean heat sink ⇩ Check for cooling fan failure
Fuse Fault	The DC bus fuse on the drive is open.	**Hardware Problem** ⇩ Check if motor is faulty ⇩ Check if any output phases shorted to ground ⇩ The drive may need to be replaced
Ground Fault	The sum of all phase currents has exceeded 50% of the rated amps of the drive.	**Improper Wiring** ⇩ Reset drive faults ⇩ Retry ⇩ If cleared, reconnect motor and control. If problem continues possible short between the motor windings and chassis ⇩ If problem continues, check system grounding ⇩ Also, the drive may need to be replaced
HIT TORQUE LIMIT *(alarm)*	The drive has reached its torque limit.	**Incorrect Wiring** ⇩ Motor phasing should match the encoder feedback phasing. If the phasing is not correct, the motor will not accelerate up to speed. It will typically oscillate back and forth at zero speed, and the current will be at the torque limit ⇩ Switch either two motor phases or swap two encoder wires (A and /A) **Drive and/or Motor is Undersized** ⇩ Verify drive and/or motor sizing. May need a larger capacity HPV 600 and or motor **Check Parameter Settings** ⇩ Check the torque limit parameters MTR TORQUE LIMIT and REGEN TORQ LIMIT (A1) ⇩ Check speed regulator parameters RESPONSE and INERTIA (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

Name	Description	Possible Causes & Corrective Action
HW/SW Mismatch	Software not compatible with hardware	**Incorrect Software** ⇩ HPV 900 software installed in a HPV 600 ⇩ Replace software with correct version
Motor id Flt	Motor parameters checksum is invalid.	**Parameters Corrupted** ⇩ Check parameters and reset ⇩ If re-occurs, replace Drive Control board
Mtr data Flt	Motor parameters checksum is invalid.	**Parameters Corrupted** ⇩ Check parameters and reset ⇩ If re-occurs, replace Drive Control board
Mspd Tmr Flt *[closed-loop]*	This fault is declared if at least two MLT-SPD TO DLY x (C1) parameters are defined to the same multi-step speed command.	**Check Parameters Settings:** ⇩ Check MLT-SPD TO DLY 1 (C1) parameter for setting ⇩ Check MLT-SPD TO DLY 2 (C1) parameter for setting ⇩ Check MLT-SPD TO DLY 3 (C1) parameter for setting ⇩ Check MLT-SPD TO DLY 4 (C1) parameter for setting
Mtr Overload *(fault or alarm)*	The motor had exceeded the user defined motor overload curve. Note: fault or alarm setting dependant on setting of MOTOR OVRLD SEL (C1) parameter.	**Verify Overload Curve Parameters** ⇩ Check both OVLD START LEVEL (A5) and OVLD TIME OUT (A5) parameters **Excessive Field Weakening** ⇩ Decrease FLUX WKN FACTOR (A1) parameter ⇩ Decrease both MTR TORQUE LIMIT (A1) and REGEN TORQ LIMIT (A1) parameters ⇩ Watch for the "**Hit Torque Limit" alarm message**, if message appears the torque limits or the flux weakening factor parameters were decreased too much **Accurate Motor Parameters** ⇩ Verify motor nameplate values are entered correctly ⇩ Complete Adaptive Tune and Inertia procedure ⇩ As a last step, calculate motor parameters from motor's equivalent circuit **Excessive Current Draw** ⇩ Decrease accel/decel rate ⇩ Is elevator car being held in position? (i.e. mechanical brake not releasing) ⇩ Mechanical brake may not have properly released **Encoder Problem** ***(closed-loop only)*** ⇩ Check encoder coupling: align or replace ⇩ Encoder failure (replace encoder) ⇩ Check encoder count parameter ENCODER PULSES (A1) **Motor Problem** ⇩ Check for motor failure

Name	Description	Possible Causes & Corrective Action
Overcurr Flt	The phase current exceeded 250% of rated current.	**Motor Problem** ⇩ Possible motor lead short ⇩ Check for motor failure **Excessive Load** ⇩ Verify motor and drive sizing ⇩ May need a larger capacity HPV 600 **Accurate Motor Parameters** ⇩ Verify motor nameplate values are entered correctly ⇩ Complete Adaptive Tune and Inertia procedure ⇩ As a last step, calculate motor parameters from motor's equivalent circuit **Hardware Problem** ⇩ The drive may need to be replaced
Overspeed Flt *[closed-loop]*	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 Note: This fault is defined by Overspeed Level parameter and Overspeed Time parameter
Ovrtemp Alarm *(alarm)*	The heatsink on the drive has exceeded 80°C (176°F). *(only A-cubes)*	**Excessive Heat** ⇩ Reduce Ambient Temperature ⇩ Clean heat sink ⇩ Check for cooling fan failure
Overtemp Flt	The heatsink on the drive has exceeded 90°C (194°F). *(only A-cubes)*	**Excessive Heat** ⇩ Reduce Ambient Temperature ⇩ Clean heat sink ⇩ Check for cooling fan failure
Overvolt Flt	The DC bus voltage of the drive exceeded: • 850 Volts for a 460/400V class drives • 425 Volts for a 230V class drives	**Too High of Braking Resistor Value** ⇩ Check for no braking resistor ⇩ Possible Brake IGBT Failure ⇩ Possible brake resistor is open **Dynamic Braking Wiring Problem** ⇩ Check dynamic brake hardware wiring **High Input Voltage** ⇩ Decrease input AC voltage with the proper range ⇩ Use reactor to minimize voltage spikes **Drive Accurately Reading the Dc Bus** ⇩ Measure the dc bus with a meter ⇩ Compare that with the value on the digital operator, DC BUS VOLTAGE (D2) **Hardware Problem** ⇩ Replace Drive Control board
PCU data Flt	PCU parameters checksum is invalid.	**Parameters Corrupted** ⇩ Check parameters and power cycle ⇩ If re-occurs, replace Drive Control board
Phase Flt	The drive senses an open motor phase. The drive senses more than one motor phase crossing zero at the same time.	**Motor Problem** ⇩ Check motor wiring ⇩ Check for motor failure ⇩ Check for bad contactor or contactor timing issue

Name	Description	Possible Causes & Corrective Action
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 or the drive's control board may need to be replaced.
Ser2 Spd Flt *[closed-loop]*	This fault is declared if the SER2 INSP SPD (A1) or SER2 RS CRP SPD (A1) parameters have exceeded contract speed (CONTRACT CAR SPD (A1) parameter).	**Check Parameters Settings:** ⇩ Check SER2 INSP SPD (A1) parameter, if greater than CONTRACT CAR SPD (A1) parameter ⇩ Check SER2 RS CRP SPD (A1) parameter, if greater than CONTRACT CAR SPD (A1) parameter
Setup Fault 1	This fault is declared if the rated motor speed and excitation frequency do not satisfy: $9.6 < \left[120\left(\begin{matrix}rated\\excitation\\frequency\end{matrix}\right)\right] - \left[\left(\begin{matrix}\#\\poles\end{matrix}\right)\left(\begin{matrix}rated\\motor\\speed\end{matrix}\right)\right] < 12$ *…checks for too low or too high value of slip*	**Check Parameters Settings:** ⇩ Check RATED EXCIT FREQ (A5) parameter for correct setting ⇩ Check RATED MTR SPEED (A5) parameter for correct setting ⇩ Check MOTOR POLES (A5) parameter for correct setting
Setup Fault 2 *[closed-loop]*	This fault is declared if the number of poles and encoder pulses per revolution do not satisfy: $\frac{\left(\begin{matrix}encoder\\pulses\end{matrix}\right)}{\left(\begin{matrix}\#\\poles\end{matrix}\right)} > 64$	**Check Parameters Settings:** ⇩ Check ENCODER PULSES (A1) parameter for correct setting ⇩ Check MOTOR POLES (A5) parameter for correct setting
Setup Fault 3	This fault is declared if the number of poles is not an even number.	**Check Parameters Settings:** ⇩ Check MOTOR POLES (A5) parameter for correct setting
Setup Fault 4 *[closed-loop]*	This fault is declared if the contract motor speed (in rpm) and encoder pulses/revolution do not satisfy: $300,000 < \left(\begin{matrix}contract\\motor\\speed\end{matrix}\right)\left(\begin{matrix}encoder\\pulses\end{matrix}\right) < 18,000,000$	**Check Parameters Settings:** ⇩ Check ENCODER PULSES (A1) parameter for correct setting ⇩ Check CONTRACT MTR SPD (A1) parameter for correct setting
Setup Fault 5	This fault is declared if the rated motor power (in watts) and rated motor voltage do not satisfy: $(0.07184)\left[\frac{\left(\begin{matrix}rated\\motor\\power\end{matrix}\right)}{\left(\begin{matrix}rated\\motor\\voltage\end{matrix}\right)}\right] < \begin{matrix}general\\purpose\\current\\rating\\of\\drive\end{matrix}$	**Check Parameters Settings:** ⇩ Check RATED MOTOR PWR (A5) parameter for correct setting ⇩ Check RATED MTR VOLTS (A5) 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 110% of CONTRACT CAR SPD (A1) parameter
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
Setup Fault 9 *[open-loop]*	This fault is following two formulas are not satisfied: $\begin{pmatrix} MOTOR \\ MIN \\ VOLTS \end{pmatrix} < \begin{pmatrix} MOTOR \\ MID \\ VOLTS \end{pmatrix} < \begin{pmatrix} RATED \\ MTR \\ VOLTS \end{pmatrix}$ $\begin{pmatrix} MOTOR \\ MIN \\ FREQ \end{pmatrix} < \begin{pmatrix} MOTOR \\ MID \\ FREQ \end{pmatrix} < \begin{pmatrix} RATED \\ EXCIT \\ FREQ \end{pmatrix}$ *... Checks the V/Hz pattern*	**Check Parameters Settings:** ⇩ Check RATED MTR VOLTS (A5) parameter for correct setting ⇩ Check MOTOR MID VOLTS (A5) parameter for correct setting ⇩ Check MOTOR MIN VOLTS (A5) parameter for correct setting ⇩ Check RATED EXCIT FREQ (A5) parameter for correct setting ⇩ Check MOTOR MID FREQ (A5) parameter for correct setting ⇩ Check MOTOR MIN FREQ (A5) parameter for correct setting
Speed Dev *(alarm)* *[closed-loop]*	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 Torque 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%

Name	Description	Possible Causes & Corrective Action
Stall Test Fault	Generated when the motor current goes at or above a percentage (defined by STALL TEST LVL) for defined amount of time (defined by STALL FAULT TIME).	**Check Parameter Settings** ⇩ Check STALL TEST LVL (A1) parameter for the correct percentage of motor current ⇩ Check CONTACT FLT TIME (A1) parameter for the correct time ⇩ If nuisance fault, the fault can be disabled by STALL TEST ENA (C1) parameter (set to disabled) **Excessive Current Draw** ⇩ Decrease accel/decel rate ⇩ Is elevator car being held in position? (i.e. mechanical brake not releasing) ⇩ Mechanical brake may not have properly released **Motor Problem** ⇩ Check for motor failure **Accurate Motor Parameters** ⇩ Verify motor nameplate values are entered correctly ⇩ Complete Adaptive Tune and Inertia procedure ⇩ As a last step, calculate motor parameters from motor's equivalent circuit
Tb Inp Fault	Open-loop and Closed-loop has different defintions for the same logic input function	**Verify Parameters** ⇩ Check Logic Inputs (C2 for different definitions open-loop vs. closed-loop) ⇩ Change definition to 'no function' then re-define
Tq Lim **2Hi 4cube** *[closed-loop]*	The torque limits (based on the defined motor) exceed the cube's capacity	**Check Parameters Settings** ⇩ Verify motor nameplate values are entered correctly in the A5 sub-menu ⇩ Decrease both MTR TORQUE LIMIT (A1) and REGEN TORQ LIMIT (A1) parameters **Drive Sizing** ⇩ Verify drive sizing. May need a larger capacity HPV 600
Undervolt Flt	Generated during a run condition when the DC bus voltage drops below the user specified percent of the input line-to-line voltage. The input line-to-line voltage is specified by the Input L-L Volts parameter and the fault level is specified by the Undervoltage Fault Level parameter.	**Low Input Voltage** ⇩ Check INPUT L-L VOLTS (A4) and UV FAULT LEVEL (A4) parameters ⇩ Disconnect Dynamic Braking resistor and re-try ⇩ 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 **Drive Accurately Reading the DC Bus** ⇩ Measure the dc bus with a meter ⇩ Compare that with the value on the digital operator, DC BUS VOLTAGE (D2) **Hardware Problem** ⇩ The drive may need to be replaced.

Name	Description	Possible Causes & Corrective Action
Uv Alarm	Generated during a run condition when the DC bus voltage drops below the user specified percent of the input line-to-line voltage. The input line-to-line voltage is specified by the Input L-L Volts parameter and the fault level is specified by the Undervoltage Alarm Level parameter.	**Low Input Voltage** ⇩ Check INPUT L-L VOLTS (A4) and UV ALARM LEVEL (A4) parameters ⇩ Disconnect Dynamic Braking resistor and re-try ⇩ 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 **Drive Accurately Reading the Dc Bus** ⇩ Measure the dc bus with a meter ⇩ Compare that with the value on the digital operator, DC BUS VOLTAGE (D2) **Hardware Problem** ⇩ The drive may need to be replaced

Table 26: Troubleshooting Guide

Appendix

CE Guidelines

Below are guidelines for CE compliance.

Standards

EN 12015
Electromagnetic compatibility – Product family standard for lifts, escalators, and moving walkways – Emission
Rated input currents 0-25A or 25-100A
EN 61800-3
Adjustable speed electrical power drive systems – Part 3: EMC product standard including specific test methods.
EN 12016
Electromagnetic compatibility – Product family standard for lifts, escalators and passenger conveyors – Part 2: Immunity.

Recommended Line/Harmonics Filter

Since the revision of EN12015 became mandatory in June 2006, harmonic filters must be used to maintain the mains current harmonics below the required levels. Therefore, a line filter must be connected between the main power supply and input three phase input terminals to comply with the standards listed above. The filters recommended for use with the HPV 600 can be found on page 164.

Installation Guidelines for EMI/RFI Issues

The HPV 600 drive should be installed in a control panel or metal enclosure. Enclosure manufacturers' designs vary and it is not the intent of this document to cover all designs. Some designs require different countermeasures than other designs. This Section covers only the general points of enclosure design when the HPV 600 drive is used.

Countermeasures For the Enclosure

Radio frequency interference of various wavelengths emitted by electrical components are scattered randomly inside a control panel. This RFI induces noise on the cables within the control panel. When these cables are led out of the control panel, the cables containing the RFI noise act as antenna and radiate noise externally.

If drives or other control equipment are connected to a power supply without using a line filter, high frequency noise generated in the equipment can flow into the power supply.

Problems related to these emissions include:

- Radiated noise from the electric components inside the control panel or from the connecting cables.
- Radiated noise from the cables leading out of the control panel.
- Conducted noise and radiated noise (due to conducted noise) flowing from the control panel into the main input cables.

The basic countermeasures against the above conditions include modification of the control panel structure. Using EMI gaskets, ferrite cores, shielded cable, and enhanced grounding is also beneficial. The separation of signal, power, and motor wires is essential.

To help comply it is necessary to prevent the leakage or penetration of radio waves through cable entrances and installation holes in the enclosure.

Modifications to the enclosure include the following:

1. The enclosure should be made of ferrous metal and the joints at the top, bottom, and side panels should be continuously welded to make them electrically conductive.
2. The paint on the joint sections should be removed back to the bare metal to provide good electrical conductance.
3. Be careful to avoid gaps, which could be created when panels become warped due to over tightening of retaining screws.
4. The section where the cabinet and door fit should have a ridged structure to avoid any gaps where RFI may leak.
5. There should be no conducting sections, which are left floating electrically.
6. Both the cabinet and drive unit should be connected to a common ground.

Enclosure Door Construction

To help comply it is necessary to reduce RFI by eliminating gaps around doors used for opening/closing the control panel.

1. The door should be made of ferrous metal.
2. Conductive packing should be used between the doors and the main unit. Assure conductivity by removing the paint on the sections, which contact the door.
3. Be careful to avoid gaps, which could be opened when panels are warped due to the tightening retaining screws, etc.

Wiring External to the Enclosure

To help comply, the treatment of cables is the most important countermeasure. The grounding and the treatment of gaps in the external connection sections between the control panel and the machine are also important. It is recommended that the OEM / installer examine the present structure of all cable entrances.
Screened/shielded cable must be used for the motor cable (20 meters, 65 feet. max). The best method would be to use appropriate EMI couplings, but as an alternative, the screen of the motor cable must be grounded at both ends by a short connection using as large an area as practical. The output lead section of the control panel should be treated to minimize leakage of RFI by eliminating clearances. The grounding surfaces should be metal conductors (steel solid or flexible conduit) and conductance should be assured by the following:

- Ground the connectors at both ends.
- The motor should be grounded.
- Flexible conduit (metallic) connected to a junction box should be grounded.

Group the wiring external to the enclosure into six separate steel conduits:

1. AC main input power,
2. AC control input power,
3. output to the motor,
4. motor encoder/thermistor wiring,
5. low voltage control including analog and digital inputs and outputs,
6. dynamic braking resistor.

Wiring Internal to the Enclosure

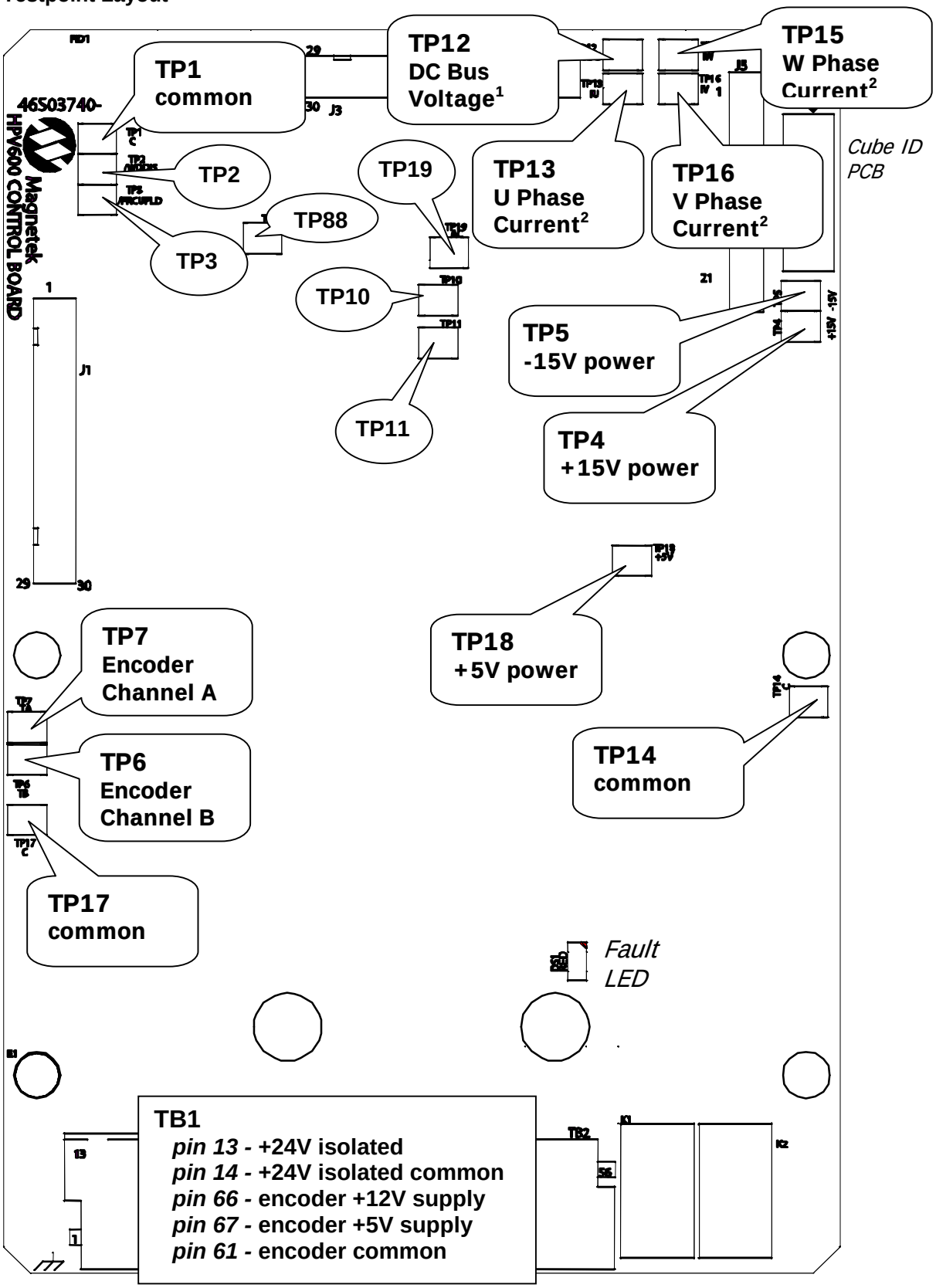
The most effective treatment for cables is shielding. Screened / shielded cable is recommended within the control panel. Use cables with a woven screen with coverage of 70% or better. The screen of the cable should be securely grounded using the largest area and shortest distance practical. Shield terminations must be as short as possible. It is recommended to ground the screen of the cable by clamping the cable to the grounding plate. Minimize the length of any ungrounded portion of power or motor leads.

Panel Layout

The line filter and the drive must be mounted on the same metal panel. The metal panel should be securely grounded. The filter should be mounted as close as possible to the drive. Power cables should be kept as short as possible.

Appendix

Testpoint Layout



Appendix
Testpoints

Checking Power Supplies

- **TP4 +15V Power**
- **TP5 -15V Power**
- **TP18 +5V Power**
- **TP88 +2.5V Power**

- **TB1-13 +24V isolated**
- **TB1-14 +24V isolated common**
- **TB1-66 encoder +12V supply**
- **TB1-67 encoder +5V supply**
- **TB1-61 encoder common**

Other Useful Testpoints

- **TP6 Encoder Channel B**
- **TP7 Encoder Channel A**

- **TP12 DC Bus Voltage**

  [1]Scaling: 10v=910v (460v/400v class)
  10v=450v (230v class)

- **TP13 U Phase Current**
- **TP15 W Phase Current**
- **TP16 V Phase Current**

  [2]Scaling:

volts	hp	kw	model	cube size	cube ID#	TP scaling (amps/volts)
380V to 480V	10	7.5	-4018	B	5	6.7
	15	11	-4024	B	6	8.9
	20	15	-4034	C	7	12.5
	25	18	-4039	C	8	14.4
200V to 240V	7.5	5.5	-2028	A	11	10.3
	10	7.5	-2035	B	12	12.9
	15	11	-2047	B	13	17.3
	20	15	-2060	C	14	22.1
380V to 440V		4	-4011	A	17	4.1
		5.5	-4015	A	18	5.5
		7.5	-4021	B	19	7.8
		11	-4028	B	20	10.3
		15	-4039	C	21	14.4

- **TP2, TP3, TP10, TP11, TP19** – no function (at this time)

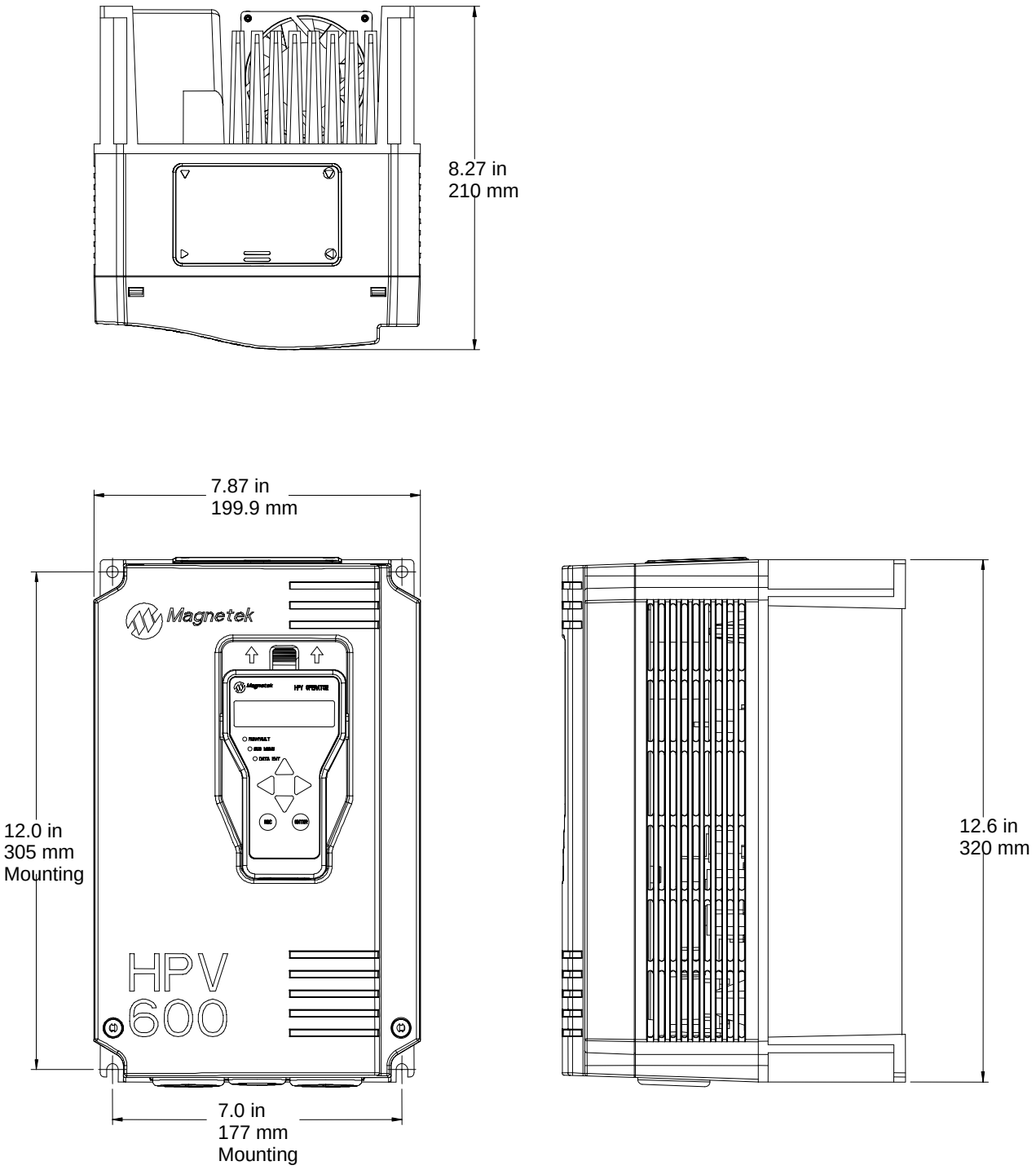
Appendix
Dimensions / Weights

North America

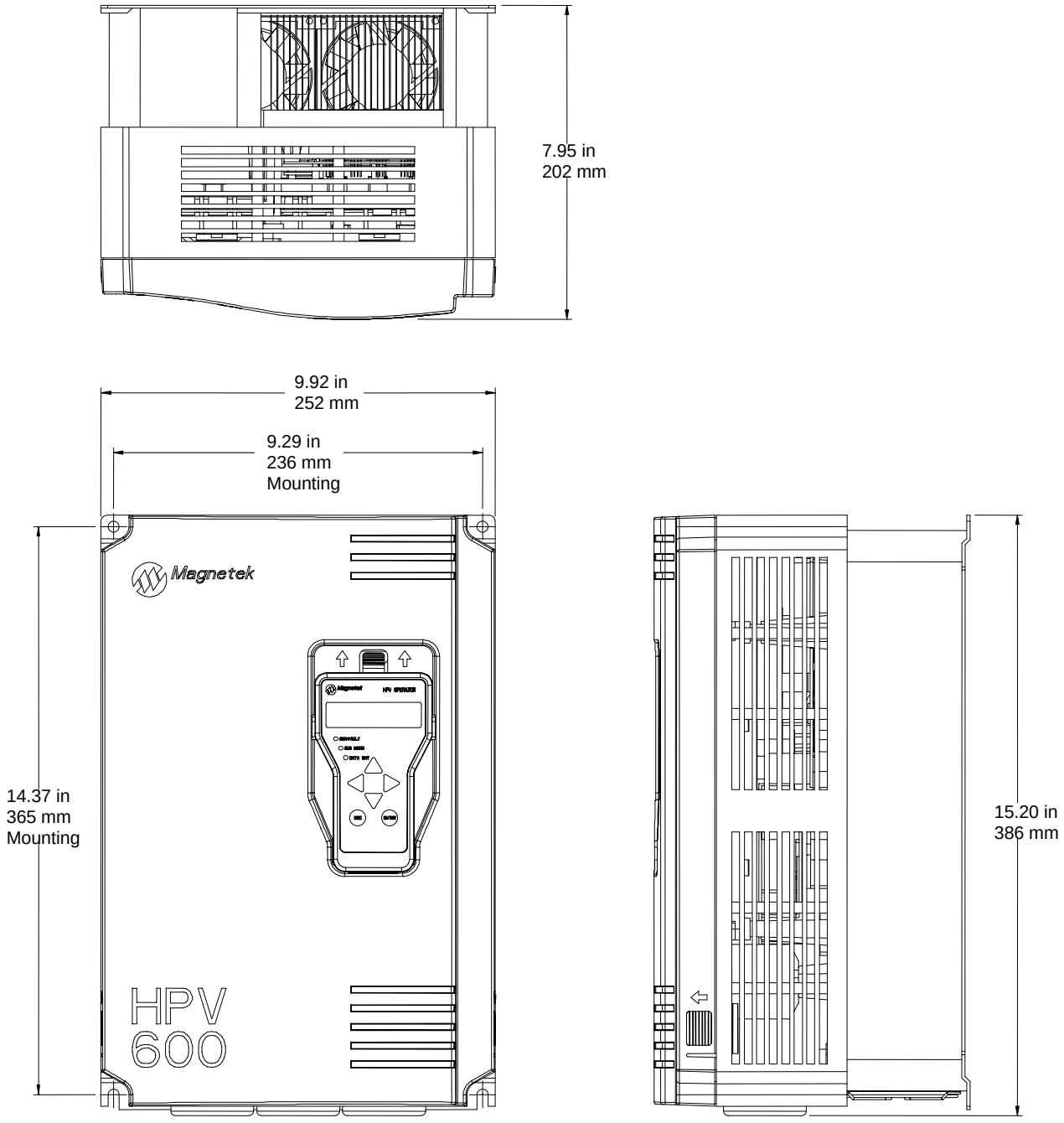
Rated Input Voltage	*Rated HP*	*Rated kW*	*Model Number*	*Cube size*	*Dimensions Height*	*Width*	*Depth*	*Weight*
380V to 480V	10	7.5	-4018	B	15in (390mm)	10in (250mm)	8in (200mm)	22 lbs (10 kg)
	15	11	-4024	B				
	20	15	-4034	C	19in (460mm)	13in (320mm)	11in (265mm)	70 lbs (32 kg)
	25	18	-4039	C				
200V to 240V	7.5	5.5	-2028	A	13in(320mm)	8in (200mm)	8in(210mm)	18 lbs (8 kg)
	10	7.5	-2035	B	15in (390mm)	10in (250mm)	8in (200mm)	22 lbs (10 kg)
	15	11	-2047	B				
	20	15	-2060	C	19in (460mm)	13in (320mm)	11in (265mm)	70 lbs (32 kg)

European

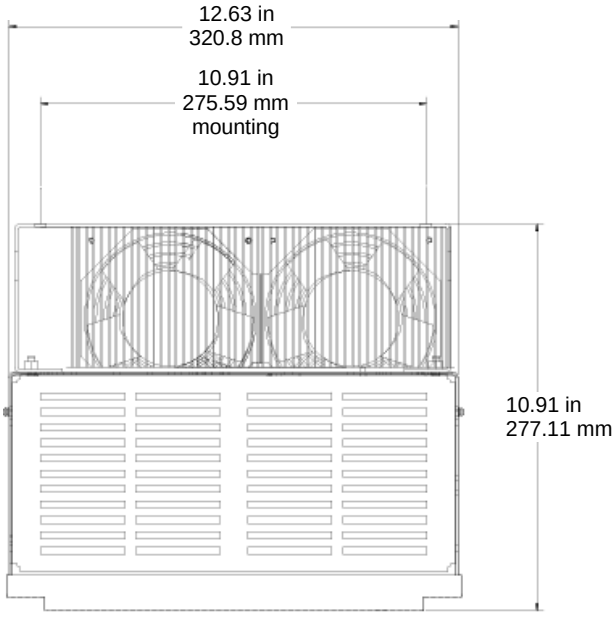
Rated Input Voltage	*Rated kW*	*Model Number*	*Cube size*	*Dimensions Height*	*Width*	*Depth*	*Weight*
380V to 440V	4	-4011	A	13in(320mm)	8in (200mm)	8in(210mm)	18 lbs (8 kg)
	5.5	-4015	A				
	7.5	-4021	B	15in (390mm)	10in (250mm)	8in (200mm)	22 lbs (10 kg)
	11	-4028	B				
	15	-4039	C	19in (460mm)	13in (320mm)	11in (265mm)	70 lbs (32 kg)
	18.5	-4047	C				
	22	-4057	C				

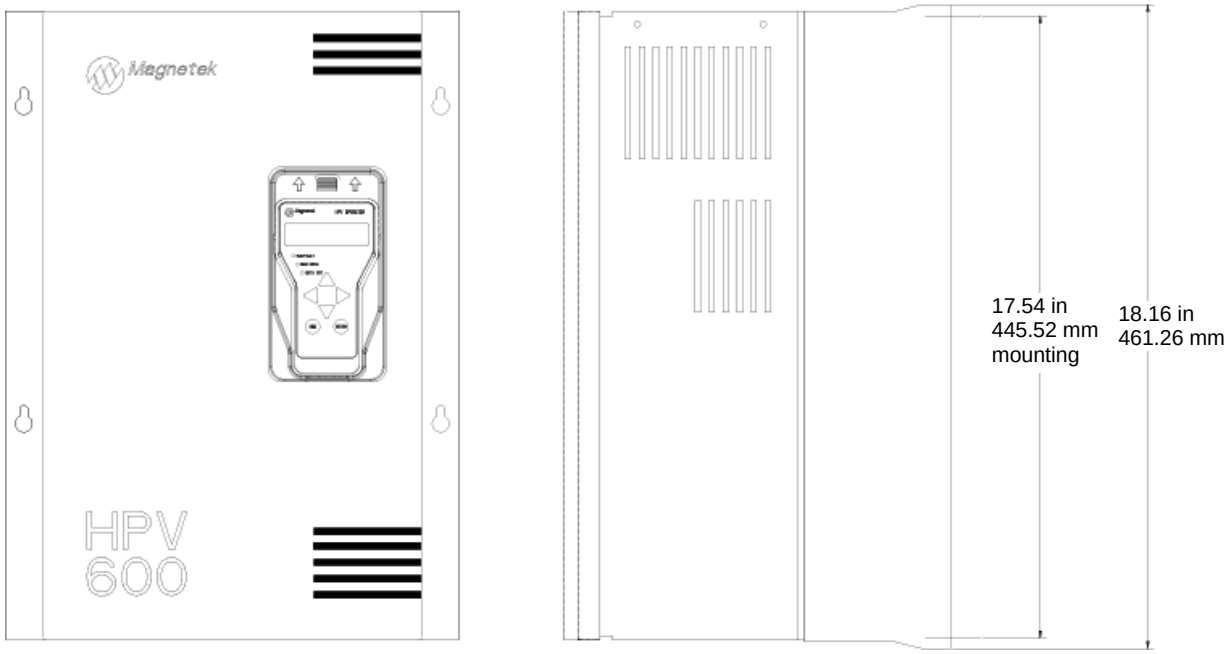


A-cube Dimensions and Mounting Holes



B-cube Dimensions and Mounting Holes





C-cube Dimensions and Mounting Holes

Appendix

Dynamic Braking Resistor Selection

North America

Rated Input Voltage	*Rated HP*	*Rated kW*	*Model Number*	*Cube size*	*Power Dissipation kW (Worm Gear)*	*Resistor Value Range (Worm Gear)*	*Power Dissipation kW (Planetary Gear)*	*Resistor Value (Planetary Gear)*
380V to 480V	10	7.5	-4018	B	1.6 kW	100 Ω - 32 Ω	3.4 kW	47 Ω - 32 Ω
	15	11	-4024	B	2.4 kW	68 Ω - 24 Ω	5 kW	32 Ω - 24 Ω
	20	15	-4034	C	3.2 kW	50 Ω - 20 Ω	6.8 kW	24 Ω - 20 Ω
	25	18	-4039	C	3.8 kW	42 Ω - 20 Ω	8.1 kW	20 Ω
200V to 240V	7.5	5.5	-2028	A	1.6 kW	25 Ω - 8 Ω	3.4 kW	12 Ω - 8 Ω
	10	7.5	-2035	B	2.4 kW	17 Ω - 8 Ω	5 kW	8 Ω
	15	11	-2047	B	3.2 kW	12 Ω - 5 Ω	6.8 kW	6 Ω - 5 Ω
	20	15	-2060	C	3.8 kW	10 Ω - 4 Ω	8.1 kW	5 Ω - 4 Ω

European

Rated Input Voltage	*Rated kW*	*Model Number*	*Cube size*	*Power Dissipation kW (Worm Gear)*	*Resistor Value Range (Worm Gear)*	*Power Dissipation kW (Planetary Gear)*	*Resistor Value Range (Planetary Gear)*
380V to 440V	4	-4011	A	0.9 kW	187Ω - 53 Ω	1.8 kW	89 Ω - 53 Ω
	5.5	-4015	A	1.6 kW	100 Ω - 32 Ω	3.4 kW	47 Ω - 32 Ω
	7.5	-4021	B	2.4 kW	68 Ω - 32 Ω	5 kW	32 Ω
	11	-4028	B	3.2 kW	50 Ω - 24 Ω	6.8 kW	24 Ω
	15	-4039	C	3.8 kW	42 Ω - 20 Ω	8.1 kW	20 Ω
	18.5	-4047	C	3.8 kW	42 Ω - 20 Ω	8.1 kW	20 Ω
	22	-4057	C	3.8 kW	42 Ω - 20 Ω	8.1 kW	20 Ω

Assumptions for Brake Resistor Recommendations

1) Peak regenerative requirement is: (Cube KW) * 2.0 * (Gear Efficiency) * (Motor Efficiency). This occurs at start of deceleration under maximum overhauling load (for counterweight < 50%, this is full load car, start of decel going down). From peak regen power the maximum resistor is calculated as: $R = V_{dc}^2 / P_{peak}$
2) Motor efficiency is 95%, jerk out is assumed to be infinite
3) 200% regenerative torque limit
4) Worm gear efficiency = 45%; planetary gears = 95%
5) For power dissipations, a 50% duty cycle is assumed (i.e. elevator runs continuously up and down but regenerates 50% of the time). Also, 100% regenerative power required. Average power = (Cube KW) * 1.0 * (Gear Efficiency) * (Motor Efficiency) * 0.5
6) Minimum resistor values based on 100% of device rated current

Appendix

Three-Phase AC Input Reactor Selection

North America

Rated Input Voltage	*Rated HP*	*Rated kW*	*Model Number*	*Cube size*	*Inductance (mH)*	*Amps*
380V to 480V	10	7.5	-4018	B	0.88 mH	25 A
	15	11	-4024	B	0.63 mH	35 A
	20	15	-4034	C	n/a *	n/a
	25	18	-4039	C	n/a *	n/a
200V to 240V	7.5	5.5	-2028	A	0.63 mH	35 A
	10	7.5	-2035	B	0.49 mH	45 A
	15	11	-2047	B	0.28 mH	80 A
	20	15	-2060	C	n/a *	n/a

* DC choke internal to drive

European

Rated Input Voltage	*Rated kW*	*Model Number*	*Cube size*	*Inductance (mH)*	*Amps*
380V to 440V	4	-4011	A	1.4 mH	18 A
	5.5	-4015	A	1.4 mH	18 A
	7.5	-4021	B	0.88 mH	25 A
	11	-4028	B	0.63 mH	35 A
	15	-4039	C	n/a *	n/a
	18.5	-4047	C	n/a *	n/a
	22	-4057	C	n/a *	n/a

* DC choke internal to drive

Manufacturer Considerations:

When selecting an input reactor, the elevator load profile needs to be taking into account. Consider the following when selecting a manufacturer.

- Repeated 200% overloads current values
- Heating of inductors due to overloads and harmonics
- Saturation of inductor
- Life of reactor
- Ambient temperature vs. inductor current curve. The drive can operate at 50°C (120°F).

Appendix
DC Choke Selection

North America

Rated Input Voltage	*Rated HP*	*Rated kW*	*Model Number*	*Cube size*	*Inductance (mH)*	*Amps*
380V to 480V	10	7.5	-4018	B	0.38 mH	36 A
	15	11	-4024	B	0.38 mH	36 A
	20	15	-4034	C	n/a *	n/a
	25	18	-4039	C	n/a *	n/a
200V to 240V	7.5	5.5	-2028	A	0.38 mH	36 A
	10	7.5	-2035	B	0.38 mH	36 A
	15	11	-2047	B	0.12 mH	72 A
	20	15	-2060	C	n/a *	n/a

* DC choke internal to drive

European

Rated Input Voltage	*Rated kW*	*Model Number*	*Cube size*	*Inductance (mH)*	*Amps*
380V to 440V	4	-4011	A	1.5 mH	18 A
	5.5	-4015	A	1.5 mH	18 A
	7.5	-4021	B	0.38 mH	36 A
	11	-4028	B	0.38 mH	36 A
	15	-4039	C	n/a *	n/a
	18.5	-4047	C	n/a *	n/a
	22	-4057	C	n/a *	n/a

* DC choke internal to drive

Manufacturer Considerations:
When selecting an input reactor, the elevator load profile needs to be taking into account.
Consider the following when selecting a manufacturer.

- Repeated 200% overloads current values
- Heating of inductors due to overloads and harmonics
- Saturation of inductor
- Life of reactor
- Ambient temperature vs. inductor current curve. The drive can operate at 50°C (120°F).

Appendix
AC Input Fusing Selection

North America

Rated Input Voltage	*Rated HP*	*Rated kW*	*Model Number*	*Cube size*	*Fuse Size (in Amps)*
380V to 480V	10	7.5	-4018	B	25 to 45 A
	15	11	-4024	B	35 to 45 A
	20	15	-4034	C	45 to 100 A
	25	18	-4039	C	50 to 100 A
200V to 240V	7.5	5.5	-2028	A	45 to 100 A
	10	7.5	-2035	B	60 to 100 A
	15	11	-2047	B	80 to 100 A
	20	15	-2060	C	100 to 200 A

All fuses should be Class J, Low Peak Dual Element, Time delay 600VAC fuses.

European

Rated Input Voltage	*Rated kW*	*Model Number*	*Cube size*	*Fuse Size (in Amps)*
380V to 440V	4	-4011	A	16 to 45 A
	5.5	-4015	A	25 to 45 A
	7.5	-4021	B	25 to 45 A
	11	-4028	B	35 to 45 A
	15	-4039	C	45 to 100 A
	18.5	-4047	C	75 to 120A
	22	-4057	C	75 to 120A

All fuses should be Class J, Low Peak Dual Element, Time delay 600VAC fuses.

NOTE: With all models circuit breakers can be substituted for fuses in accordance with local codes

Appendix

Dynamic Braking Resistor Fusing Selection

North America

Rated Input Voltage	*Rated HP*	*Rated kW*	*Model Number*	*Cube size*	*Fuse Type (Bussmann pn)*	*Fuse Size (in Amps)*
380V to 480V	10	7.5	-4018	B	FWJ-20A14F	20 A
	15	11	-4024	B	FWJ-25A14F	25 A
	20	15	-4034	C	FWJ-30A14F	30 A
	25	18	-4039	C	FWJ-40A	40 A
					All fuses should be rated for 800VDC	
200V to 240V	7.5	5.5	-2028	A	FWH-25A14F	25 A
	10	7.5	-2035	B	FWH-35B	35 A
	15	11	-2047	B	FWH-50B	50 A
	20	15	-2060	C	FWH-70B	70 A
					All fuses should be rated for at least 400VDC	

European

Rated Input Voltage	*Rated kW*	*Model Number*	*Cube size*	*Fuse Type (Bussmann pn)*	*Fuse Size (in Amps)*
380V to 440V	4	-4011	A	FWS-10A20F	10 A
	5.5	-4015	A	FWJ-20A14F	20A
	7.5	-4021	B	FWJ-20A14F	20 A
	11	-4028	B	FWJ-25A14F	25 A
	15	-4039	C	FWJ-30A14F	30 A
	18.5	-4047	C	FWJ-30A14F	30A
	22	-4057	C	FWJ-30A14F	30A
				All fuses should be rated for 800VDC	

IMPORTANT: Dynamic Braking Resistor Fusing:

1. Fusing is intended to limit drive damage in the event of an external resistor failure or short circuit.
2. Fusing will NOT protect DB resistors or wiring in the event of an overload.
3. Fuse both resistor legs mounting fuses as close to the drive as possible.
4. Always use fast acting semiconductor type fuses of sufficient voltage rating.

Appendix
Watts Loss

North America

Rated Input Voltage	*Rated HP*	*Rated kW*	*Model Number*	*Cube size*	*Power Loss (in Watts)*
380V to 480V	10	7.5	-4018	B	383 W
	15	11	-4024	B	510 W
	20	15	-4034	C	722 W
	25	18	-4039	C	826 W
200V to 240V	7.5	5.5	-2028	A	286 W
	10	7.5	-2035	B	354 W
	15	11	-2047	B	477 W
	20	15	-2060	C	609 W

European

Rated Input Voltage	*Rated kW*	*Model Number*	*Cube size*	*Power Loss (in Watts)*
380V to 440V	4	-4011	A	194 W
	5.5	-4015	A	265 W
	7.5	-4021	B	370 W
	11	-4028	B	465 W
	15	-4039	C	689 W
	18.5	-4047	C	816 W
	22	-4057	C	989 W

Note: values calculated from the worse case condition of 116% of general purpose continuous current rating, 10kHz carrier frequency.

Appendix
Line Filter Selection

The recommended Line Filters are required to help meet the requirements for the following CE standards:

- EN 12015 (Electromagnetic compatibility – Product family standard for lifts, escalators, and moving walkways – Emission. Rated input currents 0-25A or 25-100A)
- EN 61800-3 (Adjustable speed electrical power drive systems – Part 3: EMC product standard including specific test methods)
- EN 12016 (Electromagnetic compatibility – Product family standard for lifts, escalators and passenger conveyors Part 2: Immunity)

Note: also see page 150 for additional installation guidelines

RFI Filter – Option 1

Rated Input Voltage	*Rated kW*	*Model Number*	*Cube size*	*Filter Part Number*	*Filter Part Number*	*Current Rating (A)*	*Voltage Rating (V)*
380V to 440V	4	-4011	A	HPV600-FP4	footprint mount type	16 A	500 V
	5.5	-4015	A	HPV600-FP5.5	footprint mount type	30 A	500 V
	7.5	-4021	B	HPV600-FP7.5	footprint mount type	30 A	500 V
	11	-4028	B	HPV600-FP11	footprint mount type	42 A	500 V
	15	-4039	C	HPV600-SA15	standalone type	42 A	500 V
	18.5	-4047	C	B0105033 – HLD110-500/55	standalone type	55 A	500 V
	22	-4057	C	B0105033 – HLD110-500/55	standalone type	55 A	500 V

RFI Filter – Option 2

Rated Input Voltage	*Rated kW*	*Model Number*	*Cube size*	*Filter Part Number*	*Filter Part Number*	*Current Rating (A)*	*Voltage Rating (V)*
380V to 440V	4	-4011	A	HPV600-FPA	footprint mount type	20A	520 V
	5.5	-4015	A	HPV600-FPA	footprint mount type	20 A	520 V
	7.5	-4021	B	HPV600-FPB	footprint mount type	42 A	520 V
	11	-4028	B	HPV600-FPB	footprint mount type	42 A	520 V
	15	-4039	C	HPV600-SAC	standalone type	55 A	520 V
	18.5	-4047	C	HPV600-SAC	standalone type	55 A	520 V
	22	-4057	C	HPV600-SAC	standalone type	55 A	520 V

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HPV 600

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