MAGNETEK
ELEVATOR

M1000 AC

M1000 AC Elevator Drive

Technical Manual

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

TM7358 rev 03
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1 Start-Up Guides

◆ Closed Loop Induction Motor Quick Start-Up Guide

Note: This quick start-up guide outlines the general parameters that should be changed/verified when a drive is installed with information that are readily available. The drive will not run if ONLY these parameters are set. Because different elevator controller manufacturers have different interfaces, it is recommended that the parameters in the drive be set to settings recommended by the elevator controller in their technical documentation.

■ Start-Up Steps

1. Set/verify that the drive is set up to run in Closed Loop Vector for Control Method (U8).
2. Verify that the drive has an encoder board: PG-X3 is the most common card used for closed-loop induction motors. Refer to ***PG-X3 Option Card on page 185*** for encoder setup.
3. Set/verify that the hoistway parameters are set up properly:
   a. The Contract Car Speed (A1) should be set to the elevator contract speed in ft/min.
   b. The Contract Mtr Speed (A1) should be set to an RPM where the elevator contract speed can be achieved (measured with a hand tachometer).
4. Set/verify that the Input Voltage (A4) is the same as the measured incoming voltage.
5. Perform the U9 Autotune.
   a. Perform the “Tune-No Rotate1” for Tuning Mode Sel (U9).
      i. Enter the motor nameplate HP.
      ii. Enter the motor nameplate voltage.
      iii. Enter the motor nameplate current.
      iv. Enter the motor nameplate frequency.
      v. Enter the motor poles.
      vi. Enter the nameplate rated speed (where slip is incorporated in).
      vii. Enter the encoder PPR.
      viii. Leave the pre-calculated default for no-load current unless the no-load current is printed on the nameplate.
6. If you are running on construction/inspection and run into the following:
   a. If the motor is running slowly/uncontrolled and drawing high current:
      i. Swap Encoder Connect (C1).
      ii. Verify that the encoder is working.
   b. If the elevator is running at controlled/proper speed but in the opposite direction of what it is being told:
      i. Swap both the Encoder Connect (C1) and Motor Rotation (C1).

Key Drive Parameters

Table 1 A1 Drive

Parameter	Description	Default	Units	Suggested Adjustments
Contract Car Spd	Elevator contract speed	400	fpm	Set to the speed the elevator will be certified at.
Contract Mtr Spd	Rotational motor shaft speed that will make the elevator run at contract speed	1130	RPM	Adjust this value to ensure the actual running speed of the elevator matches the Contract Car Spd. If the elevator is traveling too fast, lower this value. If the elevator is traveling too slow, increase this value. **Note:** A power cycle may be required for this to have an effect.
Response	Sets the sensitivity of the speed regulator	10.0	--	Normally, the default of 10 is used. An increase to 20 will make the drive more responsive. Too low of a value will cause the drive to have sluggish responsiveness.
Inertia	System inertia	2.00	sec	Normally, the default of 2 is used.
Encoder Pulses	The encoder's pulses per revolution	1024	PPR	Set this to match the encoder nameplate PPR.
Mtr Torque Limit	This parameter sets the maximum motoring torque the drive can produce.	200	%	It is recommended to set this to 250%.
Regen Torq Limit	This parameter sets the maximum regenerative torque the drive can produce.	200	%	It is recommended to set this to 250%.

Table 2 A4 Power Convert

Parameter	Description	Default	Units	Suggested Adjustments
Input Voltage	Nominal line-to-line AC input voltage in RMS	Per drive model	VAC	Set this to match the measured voltage across R, S, and T.

Table 3 A5 Motor

Parameter	Description	Default	Units	Suggested Adjustments
Mtr Rated Power	Motor rated output power on the nameplate	Per drive model	HP	This parameter should be set to match the motor nameplate power. This parameter will be automatically populated after a successful U9 AUTOTUNE.
Mtr Rated Voltage	Motor rated voltage on the nameplate	Per drive model	VAC	This parameter should be set to match the motor nameplate voltage. This parameter will be automatically populated after a successful U9 AUTOTUNE.
Max Frequency	Motor rated frequency on the nameplate	60	Hz	This parameter should be set to match the motor nameplate frequency. This parameter will be automatically populated after a successful U9 AUTOTUNE.
Motor Rated FLA	Motor rated current on the nameplate	Per drive model	A	This parameter should be set to match the motor nameplate current. This parameter will be automatically populated after a successful U9 AUTOTUNE.
Number of Poles	The number of poles the motor has	4	--	This parameter should be set to match the number of poles inside the motor. This parameter will be automatically populated after a successful U9 AUTOTUNE.
Motor Rated Slip	The slip frequency of the motor	Per drive model	Hz	It is recommended that this setting be determined by a U9 AUTOTUNE.
No-Load Current	The magnetizing current of the motor	Per drive model	A	It is recommended that this setting be determined by a U9 AUTOTUNE.
Leak Inductance	The inductance of the motor	Per drive model	%	It is recommended that this setting be determined by a U9 AUTOTUNE.
Term Resistance	The resistance of the motor	Per drive model	Ω	It is recommended that this setting be determined by a U9 AUTOTUNE.

Table 4 C1 User Switches

Parameter	Description	Default	Choices	Suggested Adjustments
Motor Rotation	Rotation of the motor that the drive interprets as up or down.	Forward	- Forward - Reverse	If the elevator is running controlled but in the wrong direction, swap BOTH this parameter and Encoder Connect.

Parameter	Description	Default	Choices	Suggested Adjustments
Encoder Connect	Rotation of the encoder that the drive interprets as forward or reverse.	Reverse	- Forward - Reverse	This should be set to a phase orientation that will let the motor run without excessive motor current.

Table 5 U8 Basic

Parameter	Description	Default	Choices	Suggested Adjustments
Control Method	This parameter will set the type of motor control technique.	Closed Loop Vect	- Closed Loop - Open Loop Vector - PM ClosedLoopVct - V/f Control	Set this parameter to Closed Loop Vect.

Table 6 U9 Autotune

Parameter	Description	Default	Choices	Suggested Adjustments
Tuning Mode Sel	This parameter will set the type of autotuning the drive will perform.	Tune-No Rotate1	- Standard Tuning - Tune-No Rotate1 - Term Resistance - Tune-No Rotate2	For convenience, it is recommended that the Tune-No Rotate1 is performed.

◆ Closed Loop Permanent Magnet Motor Quick Start-Up Guide

Note: This quick start-up guide outlines the general parameters that should be changed/verified when a drive is installed with information that are readily available. The drive will not run if ONLY these parameters are set. Because different elevator controller manufacturers have different interfaces, it is recommended that the parameters in the drive be set to the settings recommended by the elevator controller in their technical documentation.

■ Start-Up Steps

1. Set/verify that the drive is set up to run in PM ClosedLoopVct for Control Method (U8).
2. Verify that the drive has an encoder board: PG-F3 is the most common card used for closed-loop permanent magnet motors. Refer to ***PG-F3 Option Card on page 192*** for encoder setup.
3. Set/verify that the hoistway parameters are set up properly:
   a. The Contract Car Speed (A1) should be set to the elevator contract speed in ft/min.
   b. The Contract Mtr Speed (A1) should be set to an RPM where the elevator contract speed can be achieved (measured with a hand tachometer).
4. Set/verify that the Input Voltage (A4) is the same as the measured incoming voltage.
5. Perform the U9 Autotune.
   a. Perform the “Tune-No Rotate” for PM Tuning Mode (U9).
      i. Enter the motor nameplate HP.
      ii. Enter the motor nameplate voltage.
      iii. Enter the motor nameplate current.
      iv. Enter the motor poles.
      v. Enter the nameplate rated speed.
      vi. Enter the encoder PPR.
   b. Perform the InitPoleEstPrms for PM Tuning Mode (U9).
      i. Note: If this fails with an angle deviation fault, a non-rotational alignment should not be performed. Skip the below step for PolePos-norotate and refer to ***PM Motor Autotune on page 114***.
   c. Perform the PolePos-norotate for PM Tuning Mode (U9).
6. If you are running on construction/inspection and run into the following:
   a. If the motor is running slowly/uncontrolled and drawing high current:
      i. Swap Encoder Connect (C1) then repeat step 5c.
      ii. Verify that the encoder is working.
   b. If the elevator is running at controlled/proper speed but in the opposite direction of what it is being told:
      i. Swap both the Encoder Connect (C1) and Motor Rotation (C1), then repeat step 5c.

Key Drive Parameters

Table 7 A1 Drive

Parameter	Description	Default	Units	Suggested Adjustments
Contract Car Spd	Elevator contract speed	400	fpm	Set to the speed the elevator will be certified at.
Contract Mtr Spd	Rotational motor shaft speed that will make the elevator run at contract speed	1130	RPM	Adjust this value to ensure the actual running speed of the elevator matches the Contract Car Spd. If the elevator is traveling too fast, lower this value. If the elevator is traveling too slow, increase this value. **Note:** A power cycle may be required for this to have an effect.
Response	Sets the sensitivity of the speed regulator	10.0	--	Normally, the default of 10 is used. Increase to 20 will make the drive more responsive. Too low of a value will cause the drive to have sluggish responsiveness.
Inertia	System inertia	2.00	sec	It is recommended to set this to 0.5 to prevent the speed regulator from being too responsive.
Encoder Pulses	The encoder's pulses per revolution	2048	PPR	Set this to match the encoder nameplate PPR.
Mtr Torque Limit	This parameter sets the maximum motoring torque the drive can produce.	200	%	It is recommended to set this to 250%.
Regen Torq Limit	This parameter sets the maximum regenerative torque the drive can produce.	200	%	It is recommended to set this to 250%.

Table 8 A4 Power Convert

Parameter	Description	Default	Units	Suggested Adjustments
Input Voltage	Nominal line-to-line AC input voltage in RMS	Per drive model	VAC	Set this to match the measured voltage across R, S, and T.

Table 9 A5 Motor

Parameter	Description	Default	Units	Suggested Adjustments
PM Mtr Power	Motor rated output power on the nameplate	Per drive model	HP	This parameter should be set to match the motor nameplate power. This parameter will be automatically populated after a successful U9 AUTOTUNE.
Mtr Rated Voltage	Motor rated voltage on the nameplate	Per drive model	VAC	This parameter should be set to match the motor nameplate voltage. This parameter will be automatically populated after a successful U9 AUTOTUNE.
PM Mtr Rated FLA	Motor rated current on the nameplate	Per drive model	A	This parameter should be set to match the motor nameplate current. This parameter will be automatically populated after a successful U9 AUTOTUNE.
PM Motor Poles	The number of poles the motor has.	12	--	This parameter should be set to match the number of poles inside the motor. This parameter will be automatically populated after a successful U9 AUTOTUNE.
Max Motor Speed	Sets the maximum speed the motor can rotate	96	RPM	This parameter should be set to a value that is greater or equal to the RPM stamped on the nameplate. This parameter will be automatically populated after a successful U9 AUTOTUNE.
Rated Motor Speed	Motor rated speed on the nameplate	96	RPM	This parameter should be set to match the motor nameplate speed in RPM. This parameter will be automatically populated after a successful U9 AUTOTUNE.
PM Mtr Arm Ohms	The resistance of the motor.	Per drive model	Ω	It is recommended that this setting be determined by a U9 AUTOTUNE.
PM Mtr d Induct	Inductance in the D-Axis	Per drive model	mH	It is recommended that this setting be determined by a U9 AUTOTUNE.
PM Mtr q Induct	Inductance in the Q-Axis	Per drive model	mH	It is recommended that this setting be determined by a U9 AUTOTUNE.
Enc Z-Pulse Offs	The angular offset position of the magnets to the encoder zero position.	0.0	Deg	It is recommended that this setting be determined by a U9 AUTOTUNE.

Table 10 C1 User Switches

Parameter	Description	Default	Choices	Suggested Adjustments
Motor Rotation	Rotation of the motor that the drive interprets as up or down.	Forward	- Forward - Reverse	If the elevator is running in the wrong direction controlled, swap BOTH this parameter and Encoder Connect. Then another alignment will need to be performed.
Encoder Select	The type of absolute encoder interface.	EnDat Sin/Cos	- EnDat SerialOnly - EnDat Sin/Cos - Hiperface	Typically this parameter should be left at default.
Ser Enc Comm Spd	Communication speed between the drive and absolute encoder.	1M/9600bps	- 1M/9600bps - 500k/19200bps - 1M/38400bps - 1M/38400bps	This parameter should be left at default.
Encoder Connect	Rotation of the encoder that the drive interprets as forward or reverse.	Forward	- Forward - Reverse	This should be set to a phase orientation that will let the motor run without excessive motor current.

Table 11 U8 Basic

Parameter	Description	Default	Choices	Suggested Adjustments
Control Method	This parameter will set the type of motor control technique.	Closed Loop Vect	- Closed Loop Vect - Open Loop Vector - PM ClosedLoopVct - V/f Control	Set this parameter to PM ClosedLoopVct.

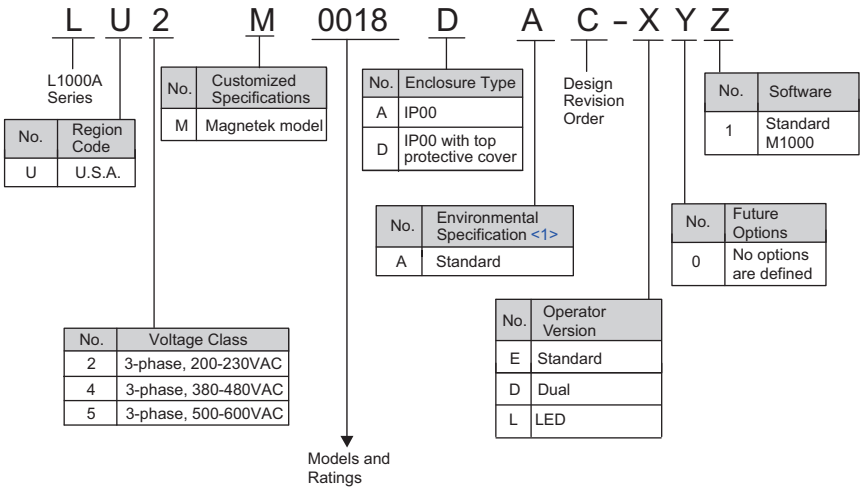
Table 12 U9 Autotune

Parameter	Description	Default	Choices	Suggested Adjustments
PM Tuning Mode	This parameter will set the type of autotuning the drive will perform.	Tune-No Rotate	- Standard Tuning - Tune-No Rotate - Term Resistance - InitPoleEstPrms - PolePos-norotate - PolePos - rotate - Ind VoltageConst	Perform the Tune-No Rotate, InitPoleEstPrms, and PolePos-norotate in that order.

2 Receiving

◆ Model Numbers and Ratings

■ Model Number



<1> Drives with these specifications do not guarantee complete protection for the environmental conditions indicated.

Table 13 Current Ratings by Input Voltage and Model Number

Input Voltage	Continuous Output Current (in Amps)	Peak Accelerating Current for 5 sec (in Amps)	Maximum Stall Current for 3 Sec (in Amps)	M1000 Model	Dimensions mm (in) (W x H x D)
200 - 240V	17.5	26.5	23	LU2M0018DAC-D01	140 x 260 x 164 (5.51 x 10.24 x 6.46)
	25	39.5	33	LU2M0025DAC-D01	140 x 260 x 167 (5.51 x 10.24 x 6.57)
	33	54.5	46	LU2M0033DAC-D01	140 x 260 x 167 (5.51 x 10.24 x 6.57)
	47	74	62	LU2M0047DAC-D01	180 x 300 x 187 (7.09 x 11.81 x 7.36)
	60	99	84	LU2M0060DAC-D01	220 x 350 x 197 (8.66 x 13.78 x 7.76)
	75	134.5	106	LU2M0075DAC-D01	220 x 365 x 197 (8.66 x 14.37 x 7.76)
	85	155.5	120	LU2M0085DAC-D01	250 x 400 x 258 (9.84 x 15.75 x 10.16)
	115	186	162	LU2M0115DAC-D01	275 x 450 x 258 (10.83 x 17.72 x 10.16)
	128	233	180	LU2M0145DAC-D01	325 x 550 x 283 (12.80 x 21.65 x 11.14)
	158.5	289.5	223.5	LU2M0180DAC-D01	325 x 550 x 283 (12.80 x 21.65 x 11.14)
	189	315	267	LU2M0215AAC-D01	450 x 705 x 330 (17.72 x 27.76 x 12.99)
	249	387	351	LU2M0283AAC-D01	450 x 705 x 330 (17.72 x 27.76 x 12.99)
	304	556	429	LU2M0346AAC-D01	500 x 800 x 350 (19.69 x 31.50 x 13.78)
	365	651.5	515	LU2M0415AAC-D01	500 x 800 x 350 (19.69 x 31.50 x 13.78)

Input Voltage	Continuous Output Current (in Amps)	Peak Accelerating Current for 5 sec (in Amps)	Maximum Stall Current for 3 Sec (in Amps)	M1000 Model	Dimensions mm (in) (W x H x D)
380 - 480V	9	14	12	LU4M0009DAC-D01	140 x 260 x 164 (5.51 x 10.24 x 6.46)
	15	23	20	LU4M0015DAC-D01	140 x 260 x 167 (5.51 x 10.24 x 6.57)
	18	31	25.5	LU4M0018DAC-D01	140 x 260 x 167 (5.51 x 10.24 x 6.57)
	24	43	34	LU4M0024DAC-D01	180 x 300 x 167 (7.09 x 11.81 x 6.57)
	31	55	44	LU4M0031DAC-D01	180 x 300 x 187 (7.09 x 11.81 x 7.36)
	39	63	55	LU4M0039DAC-D01	220 x 350 x 197 (8.66 x 13.78 x 7.76)
	45	82	63.5	LU4M0045DAC-D01	250 x 400 x 258 (9.84 x 15.75 x 10.16)
	60	106	85	LU4M0060DAC-D01	275 x 450 x 258 (10.83 x 17.72 x 10.16)
	75	114.5	106	LU4M0075DAC-D01	325 x 510 x 258 (12.80 x 20.08 x 10.16)
	91	127	127	LU4M0091DAC-D01	325 x 510 x 258 (12.80 x 20.08 x 10.16)
	92	141	129.5	LU4M0112DAC-D01	325 x 550 x 283 (12.80 x 21.65 x 11.14)
	123	185	173.5	LU4M0150DAC-D01	325 x 550 x 283 (12.80 x 21.65 x 11.14)
	148	250.5	208	LU4M0180AAC-D01	450 x 705 x 330 (17.72 x 27.76 x 12.99)
	177	269	250	LU4M0216AAC-D01	500 x 800 x 350 (19.69 x 31.50 x 13.78)
500 - 600V	3.5	6.5	5	LU5M0003DAC-D01	140 x 260 x 147 (5.51 x 10.24 x 5.79)
	4	7.5	6	LU5M0004DAC-D01	140 x 260 x 164 (5.51 x 10.24 x 6.46)
	6	11.5	9.5	LU5M0006DAC-D01	140 x 260 x 164 (5.51 x 10.24 x 6.46)
	10	18	14	LU5M0010DAC-D01	140 x 260 x 167 (5.51 x 10.24 x 6.57)
	12.5	22.5	17	LU5M0013DAC-D01	180 x 300 x 187 (7.09 x 11.81 x 7.36)
	17	31	23	LU5M0017DAC-D01	180 x 300 x 187 (7.09 x 11.81 x 7.36)
	22	40	30	LU5M0022DAC-D01	220 x 350 x 197 (8.66 x 13.78 x 7.76)
	27	49	37	LU5M0027DAC-D01	220 x 350 x 197 (8.66 x 13.78 x 7.76)
	32	58	46.5	LU5M0032DAC-D01	275 x 450 x 258 (10.83 x 17.72 x 10.16)
	41	74.5	59.5	LU5M0041DAC-D01	275 x 450 x 258 (10.83 x 17.72 x 10.16)
	52	92.5	73	LU5M0052DAC-D01	325 x 550 x 283 (12.80 x 21.65 x 11.14)
	62	92.5	87.5	LU5M0062DAC-D01	325 x 550 x 283 (12.80 x 21.65 x 11.14)

◆ Drive Specifications

Note: **1.** Perform rotational autotuning to obtain the performance specifications given below.
2. For optimum performance life of the drive, install the drive in an environment that meets the required specifications.

Item		Specification
Control Characteristics	Control Method	The following control methods can be set using drive parameters: • V/f Control (V/f) • Open Loop Vector Control (OLV) • Closed Loop Vector Control (CLV) • Closed Loop Vector Control for PM (CLV/PM)
	Frequency Control Range	0.01 to 200 Hz
	Frequency Accuracy (Temperature Fluctuation)	Digital input: within ±0.01% of the max output speed [-10 to 40°C (14 to 104°F)] Analog input: within ±0.1% of the max output speed [25 ±10°C (77 ±18°F)]
	Frequency Setting Resolution	Digital inputs: 0.01 Hz Analog inputs: 1/2048 of the maximum output speed setting (11 bit plus sign)
	Output Speed Resolution	0.001 Hz
	Frequency Setting Signal	Main speed frequency reference: DC -10 to +10 V (20 kΩ), DC 0 to +10 V (20 kΩ), 4 to 20 mA (250 Ω), 0 to 20 mA (250 Ω)
	Starting Torque <1>	V/f: 150% at 3 Hz OLV: 200% at 0.3 Hz CLV, CLV/PM: 200% at 0 r/min
	Speed Control Range <1>	V/f: 1:40 OLV: 1:200 CLV, CLV/PM: 1:1500
	Speed Control Accuracy <1>	OLV: ±0.2% [25 ±10°C (77 ±18°F)] CLV: ±0.02% [25 ±10°C (77 ±18°F)]
	Speed Response <1>	OLV: 10 Hz [25 ±10°C (77 ±18°F)] CLV: 100 Hz <2> CLV/PM: 100 Hz <2>
	Torque Limit	Parameters setting allow separate limits in four quadrants (available in OLV, CLV, CLV/PM)
	Accel/Decel Ramp	0.0 to 6000.0 s (4 selectable combinations of independent acceleration and deceleration settings, unit changeable to m/s^2 or ft/s^2)
	Braking Transistor	Models LU2M0008 to 2M0115, 4M0005 to 4M0060, and 5M0003 to 5M0041 have a built-in braking transistor.
	V/f Characteristics	Freely programmable
	Main Control Functions	Inertia Compensation, Position Lock at Start and Stop/Anti-Rollback Function, Overtorque/Undertorque Detection, Torque Limit, Speed Reference, Accel/decel Switch, 5 Zone Jerk Settings, Autotuning (Stationary and Rotational Motor/Encoder Offset Tuning), Dwell, Cooling Fan on/off Switch, Slip Compensation, Torque Compensation, DC Injection Braking at Start and Stop, MEMOBUS/Modbus Comm. (RS-422/485 max, 115.2 kbps), Fault Reset, Removable Terminal Block with Parameter Backup Function, Online Tuning, High Frequency Injection, Short Floor, Rescue Operation (Light Load Direction Search Function), Inspection Run, Brake Sequence, Speed related parameters with elevator units display, etc.

Item		Specification
Protection Functions	Motor Protection	Electronic thermal overload relay
	Momentary Overcurrent Protection	Drive stops when output current exceeds 200% of rated output current
	Overload Protection	Drive stops after 60 s at 150% of rated output current <3>
	Overvoltage Protection	200 V class: Stops when DC bus voltage exceeds approx. 410 V 400 V class: Stops when DC bus voltage exceeds approx. 820 V 600 V class: Stops when DC bus voltage exceeds approx. 1040 V
	Undervoltage Protection	200 V class: Stops when DC bus voltage falls below approx. 190 V 400 V class: Stops when DC bus voltage falls below approx. 380 V 600 V class: Stops when DC bus voltage falls below approx. 500 V
	Heatsink Overheat Protection	Thermistor
	Stall Prevention	Stall Prevention is available during acceleration, and during run.
	Ground Protection	Electronic circuit protection <4>
	DC Bus Charge LED	Remains lit until DC bus voltage falls below 50 V
Environment	Area of Use	Indoors
	Ambient Temperature	IP00 enclosure with top protective cover: [-10 to 40°C (14 to 104°F)] IP00 enclosure: [-10 to 50°C (14 to 122°F)]
	Humidity	95 RH% or less (no condensation)
	Storage Temperature	[-20 to 60°C (-4 to 140°F)] (short-term temperature during transportation)
	Altitude	Up to 1000 meters (3280 ft.) without derating, up to 3000 meters (9842 ft.) with output current and voltage derating
	Vibration/Shock	10 to 20 Hz: 9.8 m/s^2 20 to 55 Hz: 5.9 m/s^2 (LU2M0008 to 2M0180, 4M0005 to 4M0150, and 5M0003 to 5M0077) or 2.0 m/s^2 (LU2M0215 to 2M0415, 4M0180 to 4M0260, and 5M0099 to 5M0200)
Standards		• UL Underwriters Laboratories Inc: UL508C Power Conversion Equipment • IEC/EN 61800-3, IEC/EN 61800-5-1 • ISO International Organization for Standardization: ISO/EN 13849-1 Cat. 3 PLd Safety of machinery - Safety-related parts of control systems • IEC International Electrotechnical Commission: IEC/EN 61508 SIL2 Functional safety of electrical/electronic/programmable electronic safety-related systems safety integrity level 2 • CSA Canadian Standards Association International <5>: 2411-02 Elevator Equipment - Enclosed Elevator-and Escalator Electrical Equipment 3211-06 Industrial Control Equipment - Motor Controllers - Miscellaneous C22.2 No.04-04 Bonding and Grounding of Electrical Equipment C22.2 No.14-05 Industrial Control Equipment B44.1/ASME-A17.5-2004 Safety Code for Elevators and Escalator Electrical Equipment used by CSA to evaluate the L1000 to Class 2411 (Elevator Equipment) • ANSI/ASME American Society of Mechanical Engineers/American National Standards Institute: ANSI/ASME A17.1-2007/B44-04 Safety Code for Elevators and Escalators, Dumbwaiters, Moving Walks, Material Lifts, and Dumbwaiters with Automatic Transfer Devices using IEC/EN 12016:2004 immunity requirements. ANSI/ASME-A17.5-2004/CSA B44.1 - Elevator and Escalator Electrical Equipment, used by CSA to evaluate the L1000 to Class 2411 (Elevator Equipment)
Protection Design		IP00 enclosure with top protective cover, IP00

<1> The accuracy of these values depends on motor characteristics, ambient conditions, and drive settings. Specifications may vary with different motors and with changing motor temperature. Contact Magnetek for consultation.
<2> For drives with B or earlier as the design revision order, 50 Hz is required. The design revision order and software version are printed on the nameplate affixed to the side of the drive. ***Refer to Model Number on page 10*** for details.
<3> Overload protection may be triggered when operating with 150% of the rated output current if the output speed is less than 6 Hz.
<4> Ground protection cannot be provided when the impedance of the ground fault path is too low, or when the drive is powered up while a ground fault is present at the output.
<5> Terminals H1, H2, DM+, and DM- on 600 V class models are designed to the functionality, but are not certified to IEC/EN 61800-5-1, ISO/EN 13849 Cat. 3, IEC/EN 61508 SIL2, Insulation coordination: class 1.

3 Interconnections

◆ Standard Connection Diagram

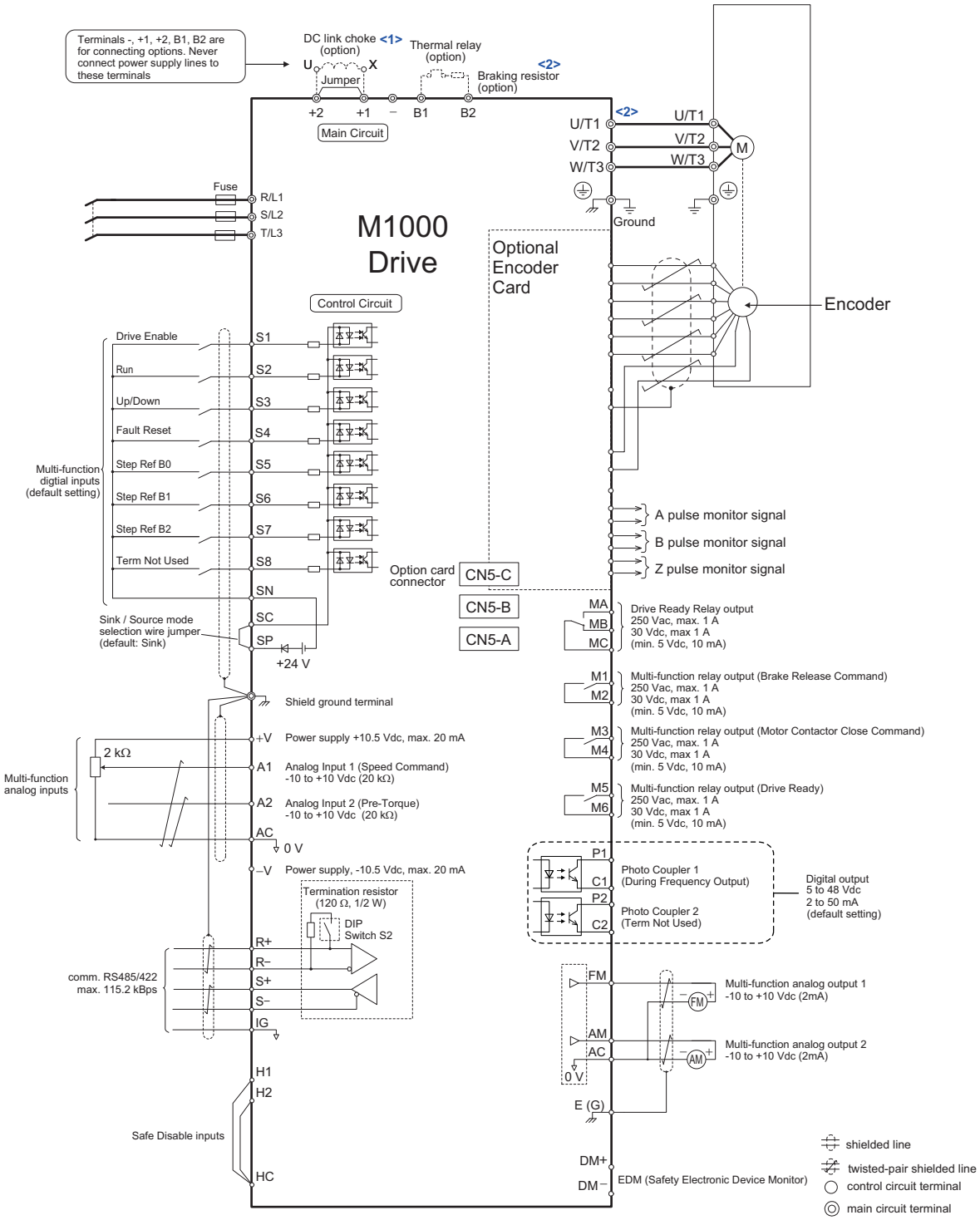


Figure 1 Drive Standard Connection Diagram (example: LU2M0033)

<1> Remove the jumper when installing a DC link choke. Models LU2M0085 through 2M0415, 4M0045 through 4M0216 and 5M0032 through 5M0062 come with a built-in DC link choke.

<2> Set DB TR Protection (C1) to disabled to disable the protection function of the built-in braking transistor of the drive when using an optional regenerative converter or dynamic braking option.

◆ Main Circuit Connection Diagram

Refer to the ***Figure 2*** when wiring the main circuit of the drive. Connections may vary based on drive capacity. The DC power supply for the main circuit also provides power to the control circuit.

NOTICE: *Do not use the negative DC bus terminal "-" as a ground terminal. This terminal is at high DC voltage potential. Improper wiring connections could damage the drive.*

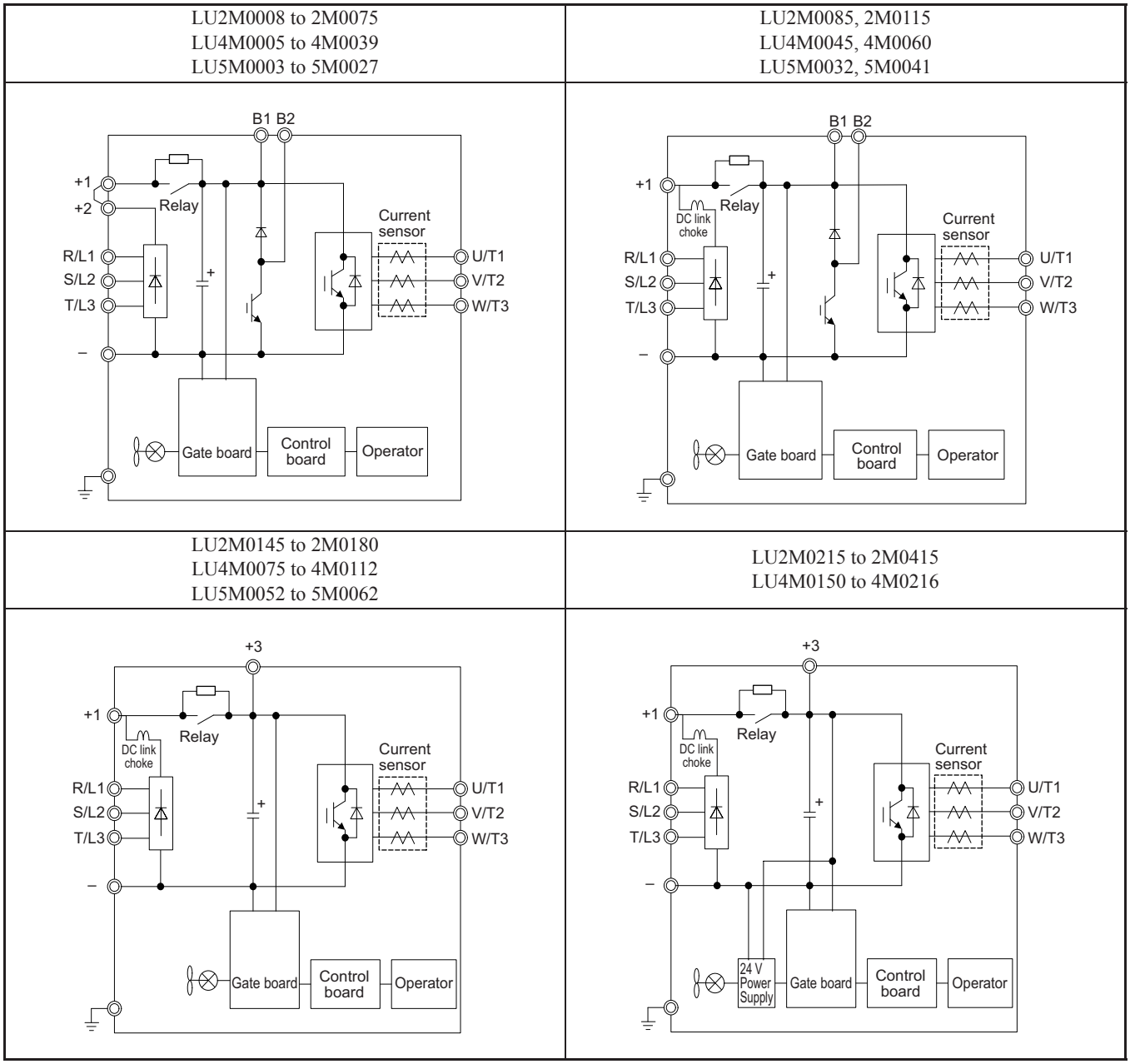


Figure 2 Drive main circuit configurations

■ Main Circuit Wiring

This section describes the functions, specifications, and procedures required to safely and properly wire the main circuit in the drive.

NOTICE: *Only connect recommended devices to the drives braking transistor terminals. Failure to comply could result in damage to the drive or braking circuit. Carefully review instruction manual when connecting a braking option to the drive.*

NOTICE: *Do not use the negative DC bus terminal "-" as a ground terminal. This terminal is at high DC voltage potential. Improper wiring connections could damage the drive.*

Main Circuit Terminal Functions

Table 14 Main Circuit Terminal Functions

<table>
<tr><th colspan="2" rowspan="2">Terminal</th><th colspan="3">Type</th><th rowspan="2">Function</th><th rowspan="2">Page</th></tr>
<tr><th>2M0008 to 2M0075</th><th>2M0085, 2M0115</th><th>2M0145 to 2M0415</th></tr>
<tr><td>200 V Class</td><td rowspan="3">Model LU</td><td rowspan="2">2M0008 to 2M0075</td><td rowspan="2">2M0085, 2M0115</td><td rowspan="2">2M0145 to 2M0415</td><td rowspan="3">Function</td><td rowspan="3">Page</td></tr>
<tr><td>400 V Class</td></tr>
<tr><td>600 V Class</td><td>4M0005 to 4M0039</td><td>4M0045, 4M0060</td><td>4M0075 to 4M0216</td></tr>
<tr><td colspan="2">R/L1</td><td colspan="3" rowspan="3">Main circuit power supply input</td><td rowspan="3">Connects line power to the drive</td><td rowspan="3">15</td></tr>
<tr><td colspan="2">S/L2</td></tr>
<tr><td colspan="2">T/L3</td></tr>
<tr><td colspan="2">U/T1</td><td colspan="3" rowspan="3">Drive output</td><td rowspan="3">Connects to the motor</td><td rowspan="3">15</td></tr>
<tr><td colspan="2">V/T2</td></tr>
<tr><td colspan="2">W/T3</td></tr>
<tr><td colspan="2">B1</td><td colspan="2" rowspan="2">Braking resistor</td><td rowspan="2">Not available</td><td rowspan="2">Available for connecting a braking resistor or a braking resistor unit option</td><td rowspan="2">–</td></tr>
<tr><td colspan="2">B2</td></tr>
<tr><td colspan="2">+2</td><td rowspan="3">• DC reactor connection (+1, +2) (remove the shorting bar between +1 and +2)
• DC power supply input (+1, –)</td><td colspan="2">not available</td><td rowspan="4">For connection
• of the drive to a DC power supply (terminals +1 and – are not UL approved)
• of dynamic braking options</td><td rowspan="4">–</td></tr>
<tr><td colspan="2">+1</td><td rowspan="3">• DC power supply input (+1, –)</td><td rowspan="3">• DC power supply input (+1, –)
• Braking unit connection (+3, –)</td></tr>
<tr><td colspan="2">–</td></tr>
<tr><td colspan="2">+3</td><td colspan="2">not available</td></tr>
<tr><td colspan="2">⏚</td><td colspan="3">For 200 V class: 100 Ω or less
For 400 V class: 10 Ω or less
For 600 V class: 10 Ω or less</td><td>Grounding terminal</td><td>207</td></tr>
</table>

Note: Use terminal B1 and - terminals when installing the braking unit (CDBR type) to the drives with built-in braking transistor (2M0008 to 2M0115, 4M0005 to 4M0060, and 5M0003 to 5M0041).

◆ Control Circuit Terminals

■ Control Circuit Terminal Block Functions

Drive parameters determine which functions apply to the multi-function digital inputs (S1 to S8), multi-function digital outputs (M1 to M6), multi-function photocoupler outputs (P1-C1, P2-C2), multi-function analog inputs (A1, A2), and multi-function analog monitor output (FM, AM). The default setting is listed next to each terminal in *Figure 1* on page *15*.

Input Terminals

Table 15 lists the input terminals on the drive. Text in parenthesis indicates the default setting for each multi-function input.

Table 15 Control Circuit Input Terminals

Type	No.	Terminal Name (Function)	Function (Signal Level) Default Setting
Digital Inputs	S1	Terminal S1 Function Selection (Drive Enable)	Photocoupler 24 Vdc, 8 mA Use the wire link between terminals SC and SN or between SC and SP to select sinking or sourcing, and to select the power supply.
	S2	Terminal S2 Function Selection (Run)	
	S3	Terminal S3 Function Selection (Up/Down)	
	S4	Terminal S4 Function Select (Fault Reset)	
	S5	Terminal S5 Function Select (Step Reference B0)	
	S6	Terminal S6 Function Select (Step Reference B1)	
	S7	Terminal S7 Function Select (Step Reference B2)	
	S8	Terminal S8 Function Select (Terminal Not Used)	
Digital Input Power Supply	SC	Multi-function input common	24 Vdc, 150 mA (only when DI-A3 is not used) Use the wire jumper between terminals SC and SN or between SC and SP to select sinking or sourcing, and to select the power supply.
	SN	0 V	
	SP	+24 Vdc	
Safe Disable Inputs <1>	H1	Safe Disable input 1 <2>	24 Vdc, 8 mA One or both open: Drive output disabled Both closed: Normal operation Internal impedance: 3.3 kΩ Off time of at least 1 ms Set the S3 jumper to select sinking or sourcing, and to select the power supply.
	H2	Safe Disable input 2 <2>	
	HC	Safe Disable function common	Common for the Safe Disable function
Analog Inputs	+V	Power supply for analog inputs	10.5 Vdc (max allowable current 20 mA)
	-V	Power supply for analog inputs	-10.5 Vdc (max allowable current 20 mA)
	A1	Multi-function analog input 1 (Speed Command)	-10 to 10 Vdc, 0 to 10 Vdc (input impedance: 20 kΩ)
	A2	Multi-function analog input 2 (Pre-Torque)	-10 to 10 Vdc, 0 to 10 Vdc (input impedance: 20 kΩ)
	AC	Analog input common	0 V
	E (G)	Ground for shielded lines and option cards	–

<1> Setting jumper S3 for an external power supply makes the wire jumper between terminals H1, H2, and HC ineffective. Remove the wire jumper and connect an external power supply that can supply terminals H1, H2, and HC continuously.
<2> Terminals H1, H2, DM+, and DM- on 600 V class models are designed to the functionality, but are not certified to IEC/EN 61800-5-1,ISO/EN 13849 Cat.3, IEC/EN 61508 SIL2, Insulation coordination: class 1.

◆ Control I/O Configuration

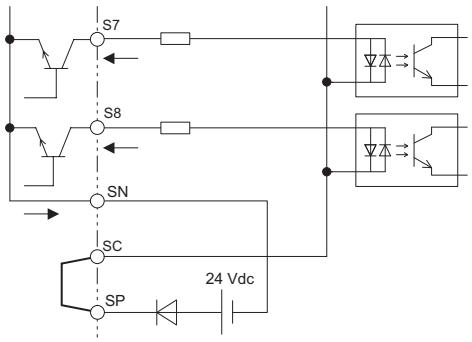
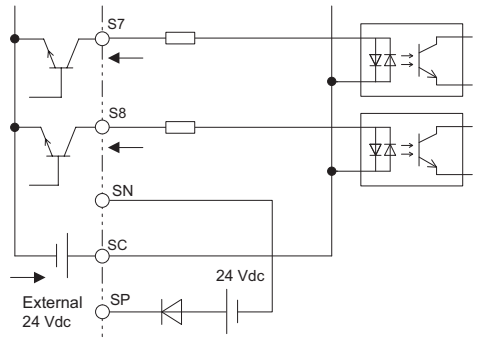
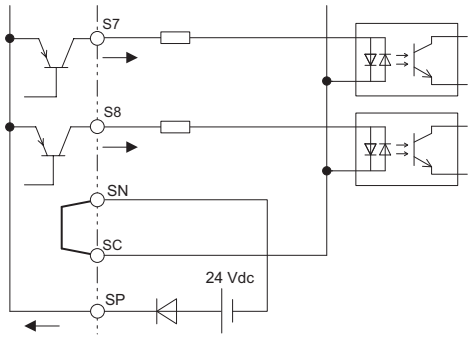
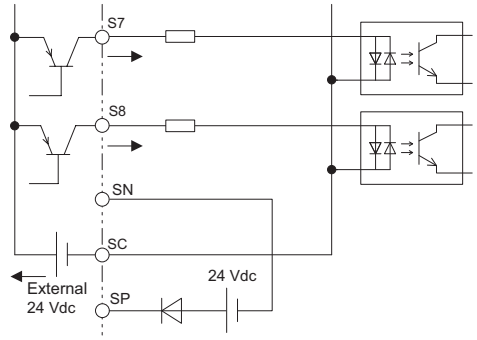
■ Setting Sink/Source with Input Terminals SN and SP

Note: Terminals H1, H2, DM+, and DM- on 600 V class models are designed to the functionality, but are not certified to IEC/EN 61800-5-1, ISO/EN 13849 Cat.3, IEC/EN 61508 SIL2, Insulation coordination: class 1.

Use the wire jumper between terminals SC and SP or SC and SN to select between Sink mode, Source mode or external power supply for the digital inputs S1 to S8 as shown in ***Table 16*** (Default: Sink mode, internal power supply).

NOTICE: *Damage to Equipment. Do not short terminals SP and SN. Failure to comply will damage the drive.*

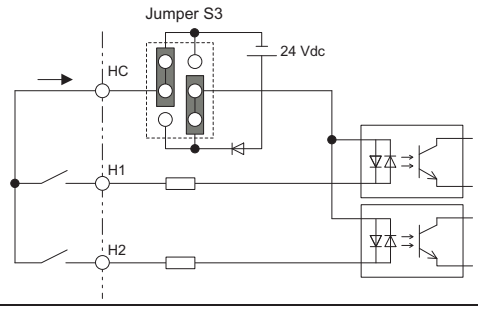
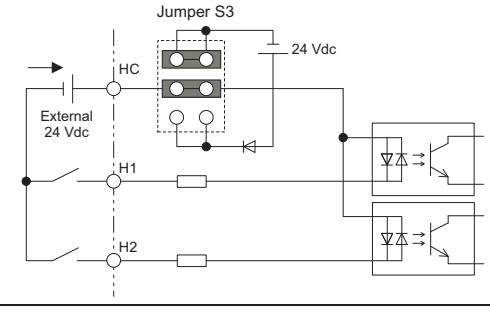
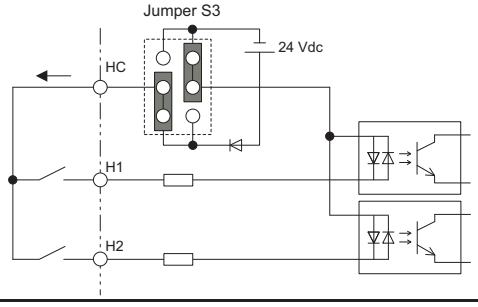
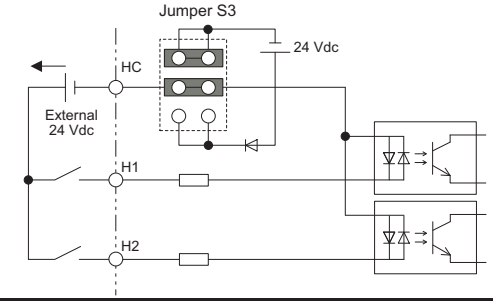
Table 16 Digital Input Sink / Source / External Power Supply Selection

	Drive Internal Power Supply (Terminal SN and SP)	External 24 Vdc Power Supply
Sinking Mode (NPN)		
Sourcing Mode (PNP)		

■ Sinking/Sourcing Mode Selection for Safe Disable Inputs

Use jumper S3 on the terminal board to select between Sink mode, Source mode or external power supply for the Safe Disable inputs H1 and H2 as shown in ***Table 17*** (Default: Sink mode, internal power supply).

Table 17 Safe Disable Input Sink / Source / External Power Supply Selection

	Drive Internal Power Supply	External 24 Vdc Power Supply
Sinking Mode		
Sourcing Mode		

4 Electrical Installation

◆ Output Terminals

Table 18 lists the output terminals on the drive. Text in parenthesis indicates the default setting for each multi-function output.

Multi-function relay output terminals are rated at a minimum of 10 mA. If less than 10 mA is required, use the photocoupler outputs (P1-C1, P2-C2). Using the wrong current output level may cause the output to malfunction when the terminal is activated.

Table 18 Control Circuit Output Terminals

Type	No.	Terminal Name (Function)	Function (Signal Level) Default Setting
Fault Relay	MA	N.O. (Drive Ready)	30 Vdc, 10 mA to 1 A; 250 Vac, 10 mA to 1 A Minimum load: 5 Vdc, 10 mA
	MB	N.C. output (Drive Ready)	
	MC	Output common	
Multi-Function Relay Output <1>	M1	Multi-function relay output 1 (Brake Control)	Contact relay output 30 Vdc, 10 mA to 1 A 250 Vac, 10 mA to 1 A Minimum load: 5 Vdc, 10 mA
	M2		
	M3	Multi-function relay output 2 (Motor Contactor Control)	
	M4		
	M5	Multi-function relay output 3 (Drive ready)	
	M6		
Multi-Function Photocoupler Output	P1	Photocoupler output 1 (During RUN 2)	48 Vdc, 2 to 50 mA <2>
	C1		
	P2	Photocoupler output 2 (Terminal Not Used)	
	C2		
Monitor Output	FM	Analog monitor output 1 (Speed Reference)	-10 to +10 Vdc or 0 to +10 Vdc
	AM	Analog monitor output 2 (Speed Feedback)	
	AC	Monitor common	0 V
Safety Monitor Output <3>	DM+	Safety monitor output	Outputs status of Safe Disable function. Closed when both Safe Disable channels are closed. Up to +48 Vdc 50 mA
	DM-	Safety monitor output common	

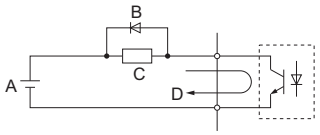
<1> Refrain from assigning functions to terminals M1 thru M6 that involve frequent switching, as doing so may shorten relay performance life. Switching life is estimated at 200,000 times (assumes 1 A, resistive load).
<2> Connect a suppression diode as shown in *Figure 3* when driving a reactive load such as a relay coil. Make sure the diode rating is greater than the circuit voltage.
<3> Terminals H1, H2, DM+, and DM- on 600 V class models are designed to the functionality, but are not certified to IEC/EN 61800-5-1,ISO/EN 13849 Cat.3, IEC/EN 61508 SIL2, Insulation coordination: class 1.

◆ Serial Communication Terminals

Table 19 Control Circuit Terminals: Serial Communications

Type	No.	Signal Name	Function (Signal Level)	
Serial Comm <1>	R+	Communications input (+)	Use an RS-485 or RS-422 cable to connect the drive.	RS-485/422 communication protocol 115.2 kbps (max.)
	R-	Communications input (-)		
	S+	Communications output (+)		
	S-	Communications output (-)		
	IG	Shield ground	0 V	

<1> Enable the termination resistor in the communication network by setting DIP switch S2 to the ON position.



A – External power, 48 V max.
B – Suppression diode
C – Coil
D – 50 mA or less

Figure 3 Connecting a Suppression Diode

◆ Switches and Jumpers on the Terminal Board

The terminal board is equipped with several switches used to adapt the drive I/Os to the external control signals. *Figure 4* shows the location of these switches. Refer to *Control I/O Configuration on page 18* for setting instructions.

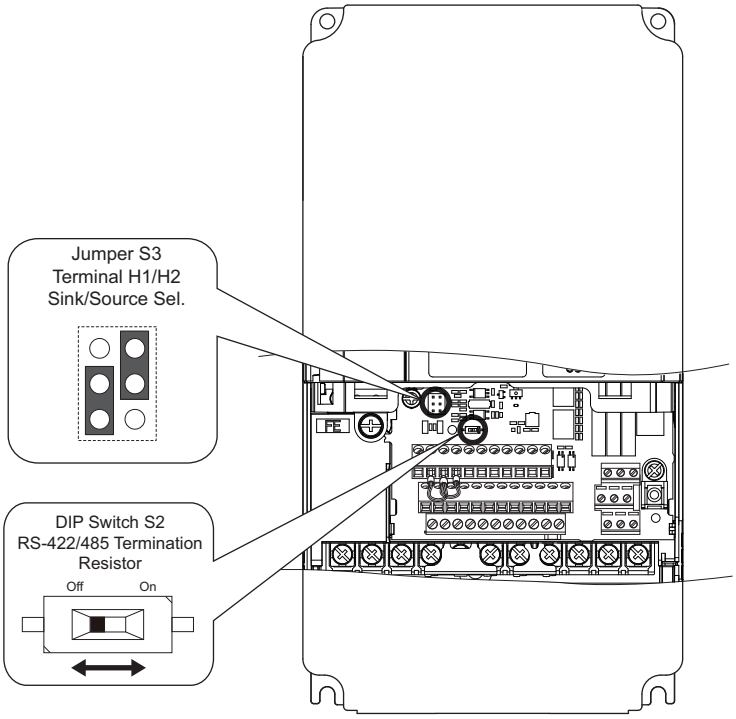


Figure 4 Locations of Jumpers and Switches on the Terminal Board

5 Parameter Table - Dual Operator

◆ Dual Operator Overview

■ Operator Power Up

When the operator is powered up, the Dual Operator will display the drive software and the Dual Operator software for a split second after a Magnetek Logo splash screen.

The software versions shown in this screen can be viewed in the drive U6 sub-menu.

■ Dual Operator LED

The Dual Operator has two operational status LEDs: one ALARM LED and one RUN LED.

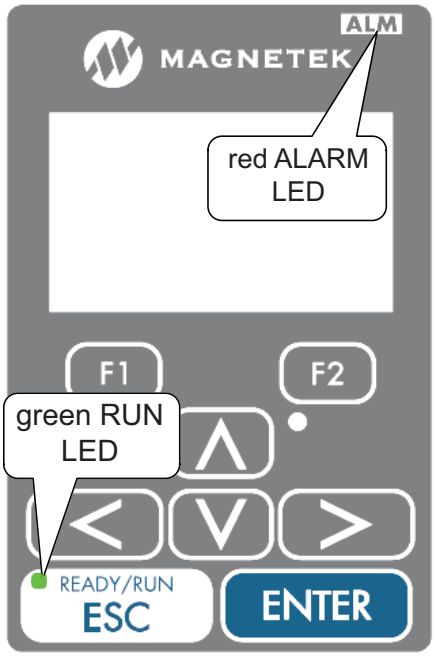


Figure 5 Dual Operator Status LED

Alarm (ALM) LED Operation

When the drive detects an alarm that does not warrant a drive operation shut down, the ALM LED will begin to flash red. If the drive detects a fault (drive operation shut down), the ALM LED will be a solid red light. *Refer to Troubleshooting on page 130* for more details.

RUN LED Operation

The RUN LED will turn green when the drive is commanded to run.

Alarm / Fault Display

When the drive detects an alarm or a fault, it will display the name and the code on a splash screen (as shown below). *Refer to Troubleshooting on page 130* for more details.

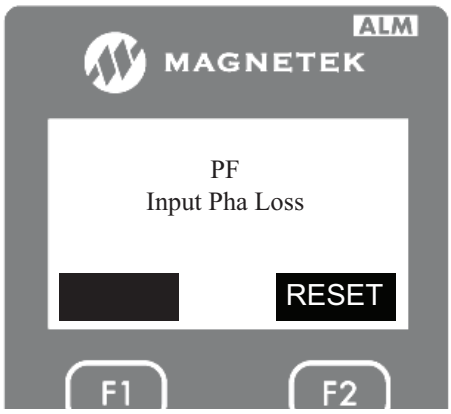


Figure 6 Alarm/Fault Splash Screen

To remove the splash screen, press the F2 key to select the reset.

■ Operator Keys

The Dual Operator has eight functional keys as shown below:

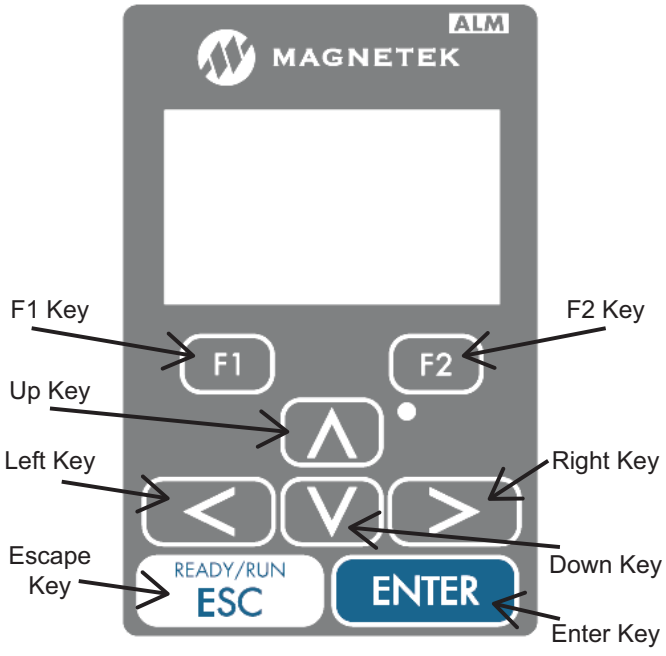


Figure 7 Dual Operator Keys

■ Menu Introduction

This section will briefly describe the two menu structures on the M1000 with the Dual Operator. Parameters can be set up to display as the Magnetek menu or the Standard Navigation menu.

When the drive powers up, the drive parameters will be organized in the Magnetek menu. The Magnetek menu has the parameters grouped into six major menus:

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

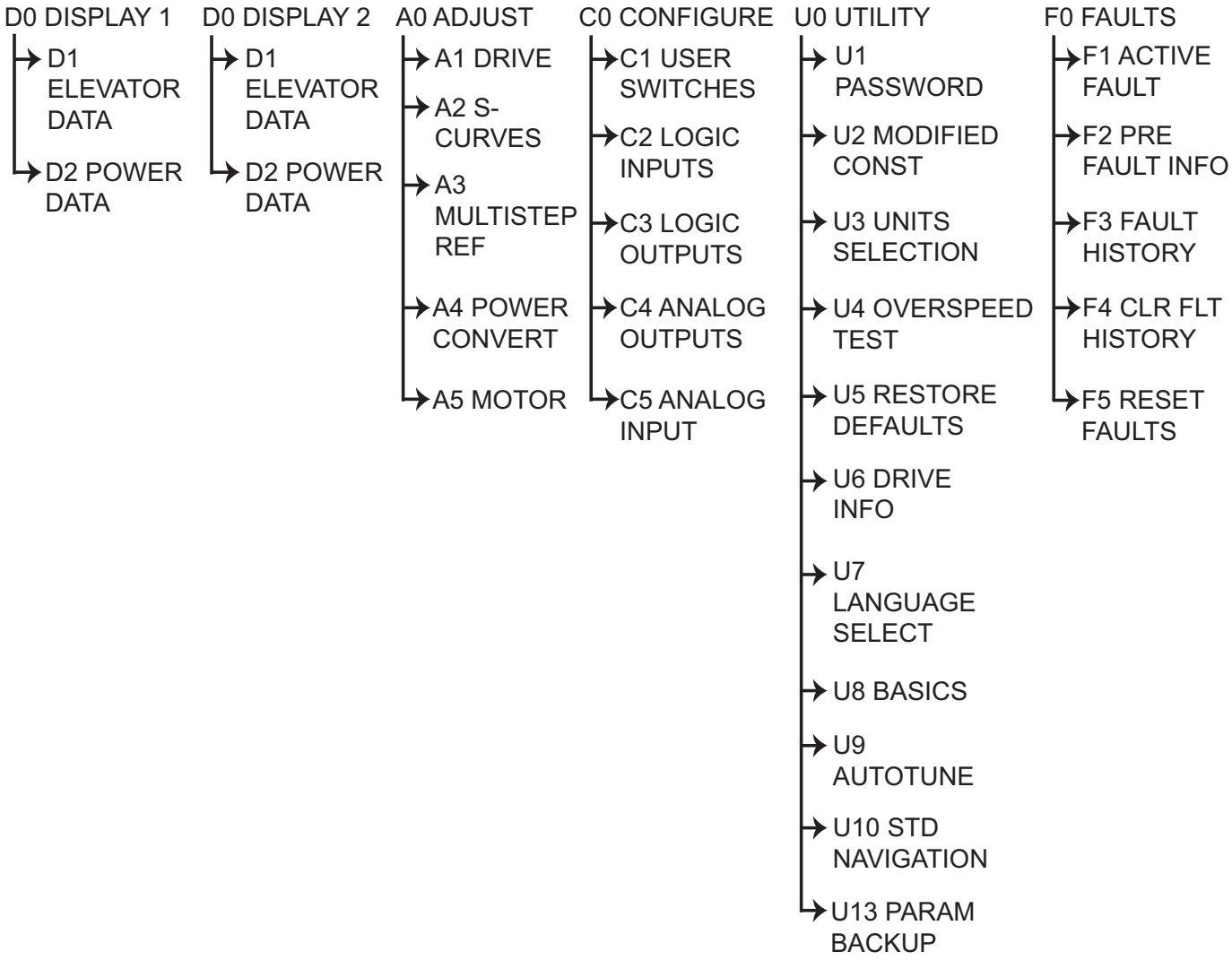
If it is desired to navigate the drive parameters with the Standard Navigation menu, navigate to the U10 sub-menu in the Magnetek menu.

- INITIALIZATION PARAMETERS - A
- APPLICATION - b
- TUNING - C
- SPEED REFERENCES - d
- MOTOR PARAMETERS - E
- OPTION SETTINGS - F
- MULTI-FUNCTION TERMINALS - H
- PROTECTION FUNCTIONS - L
- ADVANCED PERFORMANCE SET-UP - n
- OPERATOR RELATED PARAMETERS - o
- MAGNETEK SET-UP - P
- ELEVATOR PARAMETERS - S
- MOTOR TUNING - T
- MONITORS - U

◆ Magnetek Menus

■ Magnetek Menu Navigation

The Magnetek menu operates on three levels: the menu level, the sub-menu level and the entry level. At the menu level, it allows the user to navigate between menus or sub-menus. At the sub-menu level, it allows users to navigate between sub-menus or menu items. At the entry level, it allows the user to change values or select different options. Below is the menu tree of the Magnetek Menu.



Magnetek Menu Navigation at the Menu Level

The menu level (such as the D0, A0, C0, U0, and F0) is the top level display that allows the user to navigate between sub-menus within a menu level. For example, the user will be able to navigate the A1 - A5 sub-menus if the A0 menu level is being viewed.

At the menu level, the up and down arrow keys cause the display to show the sub-menus of the menu level the user is in. Using the left or right key will cause the display to move to a different menu level. At the end of either the menu level list or the sub-menu level list (either left, right, up, or down), 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 shown in ***Figure 8***.

Note: This remembrance of the last active sub-menu is volatile and will be lost at power down.

Magnetek Navigation at the Sub-Menu Level

To access the sub-menu from the menu level, press the “ENTER” key when the display is showing you the sub-menu you would like to go into. While in the sub-menu level, the text “SUB” will be shown in between the arrows on the screen as shown in ***Figure 8***. 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 parameters in the sub-menu.

At any time while in the sub-menu, pressing the “ESC” key will return the display to the menu level. Upon exiting a sub-menu via the “ESC” key, the last viewed parameter is “remembered”. The next time that same sub-menu is entered, it is entered at the “remembered” parameter.

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 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 parameters.

Note: This remembrance of sub-menus and sub-menu items is volatile and is lost at power down.

Magnetek Navigation at the Entry Level

To access the entry level from the sub-menu level, press the “ENTER” key on the parameter while it is being displayed. While in the entry level, the text “Ent” will be displayed in between the arrows on the screen as shown in ***Figure 8***. At the entry level, the functions of the 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.

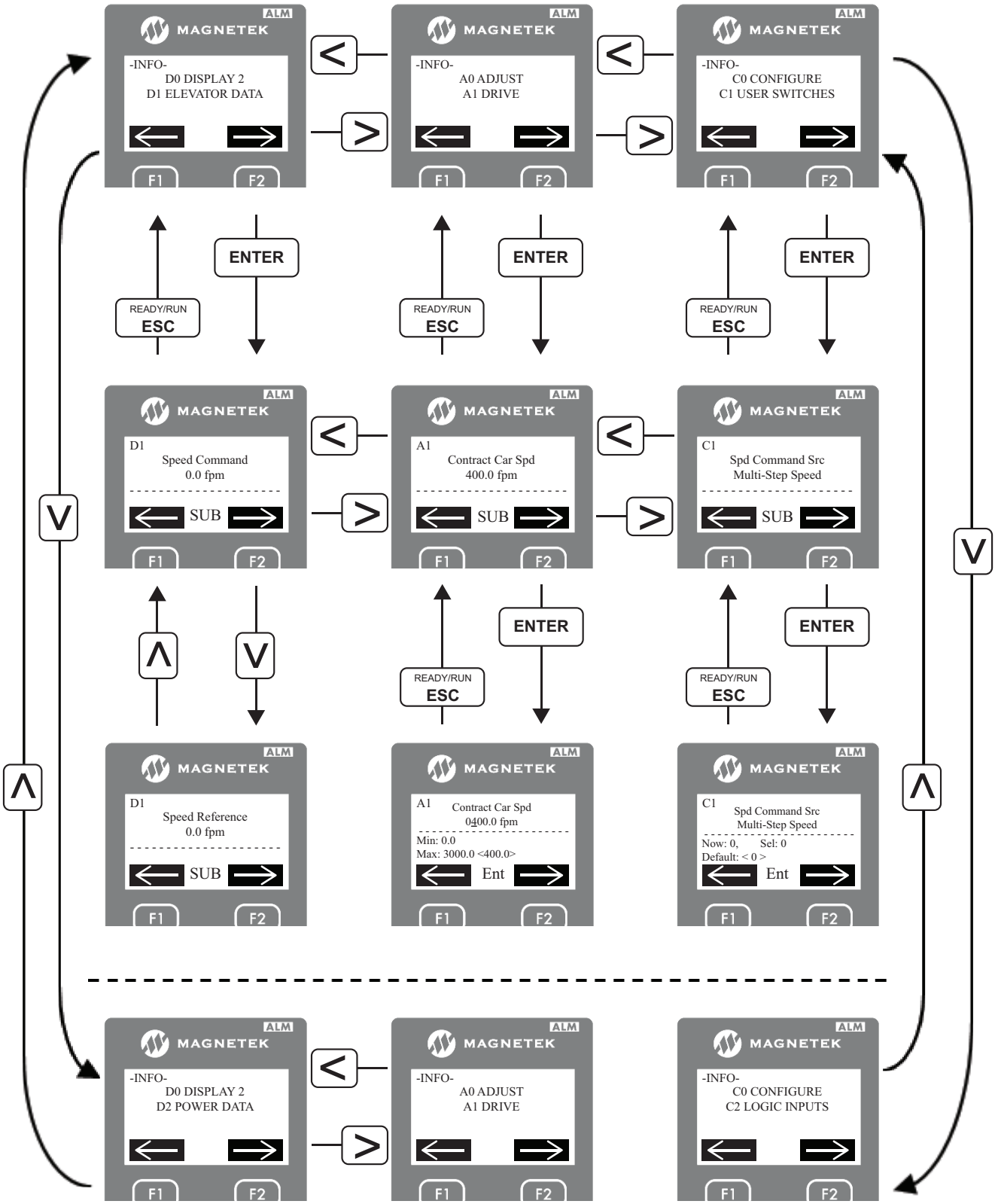


Figure 8 Magnetek Operator Navigation

◆ Adjust A0 Menu

■ DRIVE A1 Sub-menu

Table 20 Drive A1 Parameter List

A1 Parameter Name	Description	Units	Range	Default	Standard Parameter Numbers
Contract Car Spd	**Contact Car Speed:** Sets the elevator contract car speed. The value entered here will be the number that is displayed on the drive when commanded to run at high speed	fpm	0.1 - 3000.0	400.0	o1-25
Contract Mtr Spd	**Contract Motor Speed:** Motor speed (in rpm) that will allow the elevator to travel at elevator contract car speed. **Note:** A power cycle may be required for this to have an effect.	RPM	5.0 - 6000.0	1130.0	o1-26
Response iii, iv	**Response:** Sets the sensitivity of the drive's speed regulator in terms of the speed regulator bandwidth in radians. The responsiveness of the drive as it follows the speed reference will increase as this number increases. If the number is too large, the motor current and speed will become jittery. If this number is too small, the motor will become sluggish.	--	1.0 - 50.0 iii, iv	10.0 iii, iv	P5-02
Inertia iii, iv	**Inertia:** 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 iii, iv	0.25 - 50.00 iii, iv	2.00 iii, iv	P5-03
Encoder Pulses	**Encoder Pulses:** Sets the encoder resolution (number of pulses per revolution).	PPR	1 - 60000 i, ii, iii	1024 i, ii, iii	F1-01
			1 - 15000 iv	2048 iv	
Mtr Torque Limit ii, iii, iv	**Motor Torque Limit:** Sets the maximum torque allowed during the motoring region.	% ii, iii, iv	0.0 - 275.0 ii, iii, iv	200.0 ii, iii, iv	P5-08
Regen Torq Limit ii, iii, iv	**Regenerative Torque Limit:** Sets the maximum torque allowed during the regeneration region.	% ii, iii, iv	0.0 - 275.0 ii, iii, iv	200.0 ii, iii, iv	P5-09
Gain Change Level iii, iv	**Gain Change Level:** Sets the speed level at which the Response (A1) gain will begin to be reduced for low gain mode	% iii, iv	0.0 - 100.0 iii, iv	100.0 iii, iv	P5-07

i Parameter accessible in V/f control mode
ii Parameter accessible in Open Loop Vector control mode
iii Parameter accessible in Closed Loop Vector control mode
iv Parameter accessible in PM Closed Loop Vector control mode
v Default / Range is dependent on drive voltage class: either 200V, 400V, or 500V
vi Default is dependent on drive model number
vii Range depends on drive setting. Maximum setting = DC Brk TimeStart - Gain2 Reduce T. Maximum setting = DC Brk TimeStart - Gain2 Dec Time.

A1 Parameter Name	Description	Units	Range	Default	Standard Parameter Numbers
Gain Reduce Mult [iii, iv]	**Gain Reduce Multiplier:** This parameter is the percentage that the Response (A1) value will be reduced by when in low gain mode.	% [iii, iv]	10 - 100 [iii, iv]	100 [iii, iv]	P5-06
Notch Frequency [iii, iv]	**Notch Filter Frequency:** Sets the center frequency of the notch filter.	Hz [iii, iv]	5 - 60 [iii, iv]	20 [iii, iv]	P5-11
Notch Depth [iii, iv]	**Notch Filter Depth:** Sets the attenuation level of the notch filter.	% [iii, iv]	0 - 100 [iii, iv]	0 [iii, iv]	P5-12
Tach Rate Gain [iii, iv]	**Tach Rate Gain:** Setting of this parameter helps with reducing the effects of rope resonance	--	0.0 - 30.0 [iii, iv]	0.0 [iii, iv]	P5-05
Inner Loop Xover [iii, iv]	**Inner Loop Crossover:** This parameter sets the frequency of the inner loop speed regulator.	--	0.1 - 20.0 [iii, iv]	10.0 [iii, iv]	P5-04
Num of Restarts	**Number of Restarts:** Sets the number of times the drive may attempt to reset after the following faults occur: GF, LF, oC, ov, rr, oH1, oL1, oL2, oL3, oL4, UL3, UL4.	--	0 - 10	0	L5-01
Brake Open Delay	**Brake Open Delay:** Only if the logic outputs are used to control the mechanical brakes. This sets how long the drive should wait after a RUN before the brake is picked with Brake Control (C3)	Sec	0.00 - 10.00	0.20	S1-06
SE4 Delay Time	**Sequencing Error 4 Delay Time:** Only applicable if one of the logic input in the C2 sub-menu is set to Brake Feedback. Sets the amount of time allowed for the "Brake Feedback" in the C2 sub-menu signal to not match the "Brake Control" output in the C3 sub-menu before a SE4 fault occurs.	ms	0 - 10000	500	S6-05
Brake CloseDelay	**Brake Close Delay:** Only if the logic outputs are used to control the mechanical brakes. This sets how long the drive should wait before the brakes are dropped.	Sec	0.00 - 10.00	0.10	S1-07
DC Brk I @ Start [i, ii]	**DC Brake Current @ Start:** Determines the amount of current to use for DC Injection at start. Set as a percentage of the drive rated current.	% [i, ii]	0 - 100 [i, ii]	50 [i, ii]	S1-02
DC Brk I @ Stop [i, ii]	**DC Brake Current @ Stop:** Determines the amount of current to use for DC Injection at stop. Set as a percentage of the drive rated current.	% [i, ii]	0 - 100 [i, ii]	50 [i, ii]	S1-03

i Parameter accessible in V/f control mode
ii Parameter accessible in Open Loop Vector control mode
iii Parameter accessible in Closed Loop Vector control mode
iv Parameter accessible in PM Closed Loop Vector control mode
v Default / Range is dependent on drive voltage class: either 200V, 400V, or 500V
vi Default is dependent on drive model number
vii Range depends on drive setting. Maximum setting = DC Brk TimeStart - Gain2 Reduce T. Maximum setting = DC Brk TimeStart - Gain2 Dec Time.

A1 Parameter Name	Description	Units	Range	Default	Standard Parameter Numbers
ZeroSpeed@Stop	**Zero Speed Level at Stop:** Determines the speed to begin applying DC Injection or Position Lock when the drive is ramping to a stop. Set as a percentage of the contract car speed. **Note:** This is disable when Stopping Method (C1) is set to Coast to Stop	%	0.000 - 9.999	2.400 [i] 1.000 [ii] 0.200 [iii] 0.350 [iv]	S1-01
DC Brk TimeStart	**DC Brake Time Start:** Determines how long the drive should perform DC Brk I @ Start (A1). or In Closed Loop Vect (U8) or PM ClosedLoopVct (U8) mode, this parameter determines how long Position Lock should be performed at the start. A setting of 0.00 disables this function.	Sec	0.00 - 10.00	0.40	S1-04
DC Brk Time Stop	**DC Brake Time Stop:** Determines how long the drive should perform DC Injection at stop. or In Closed Loop Vect (U8) or PM ClosedLoopVct (U8) mode, this parameter determines how long Position Lock should be performed at the stop. A setting of 0.00 disables this function.	Sec	0.00 - 10.00	0.60	S1-05
Gain2 Dec Time [iii, iv]	**Gain 2 Decrease Time:** Amount of time the drive spends at the higher gain in StrPosLckGain 2 (A1) before it starts to decrease to the lower gain.	Sec [iii, iv]	0.00 - vii	0.00 [iii, iv]	S3-42
Gain2 Reduce T [iii, iv]	**Gain 2 Reduction Time:** The rate [in units of seconds] at which the StrPosLckGain 2 (A1) will reduce to the lower gain.	Sec [iii, iv]	0.00 - vii	0.10 [iii, iv]	S3-46
SpCtrlGn@PosLck [iii, iv]	**Speed Control Gain at Position Lock:** Sets the proportional gain for the speed regulator during Position Lock. If this is set too high, vibration can be introduced.	--	0.00 - 300.00 [iii, iv]	40.00 [iii] 10.00 [iv]	C5-19

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iv Parameter accessible in PM Closed Loop Vector control mode
v Default / Range is dependent on drive voltage class: either 200V, 400V, or 500V
vi Default is dependent on drive model number
vii Range depends on drive setting. Maximum setting = DC Brk TimeStart - Gain2 Reduce T. Maximum setting = DC Brk TimeStart - Gain2 Dec Time.

A1 Parameter Name	Description	Units	Range	Default	Standard Parameter Numbers
SpCtrlTim@PosLck [iii, iv]	**Speed Control Time at Position Lock:** Sets the integral time for the speed regulator during Position Lock. If this is set too low, vibration can be introduced.	Sec	0.000 - 10.000 [iii, iv]	0.100 [iii, iv]	C5-20
StrPosLckGain 1 [iii, iv]	**Start Position Lock Gain 1:** Sets gain levels for the Position Lock function at the start of a run. Setting too low of a gain will cause the drive to be less responsive. Setting too high of a gain will cause vibration.	--	0 - 100 [iii, iv]	5 [iii, iv]	S3-01
StrPosLckGain 2 [iii, iv]	**Start Position Lock Gain 2:** Sets gain levels for the Position Lock function at the start of a run. Setting too low of a gain will cause the drive to be less responsive. Setting too high of a gain will cause vibration.	--	0.00 - 100.00 [iii, iv]	0.00 [iii, iv]	S3-02
Gain2 Redc Fact [iii, iv]	**Gain 2 Reduction Factor:** Sets the factor that StrPosLckGain 2 (A1) reduces to at the end of Position Lock.	--	0.00 – 1.00 [iii, iv]	0.50 [iii, iv]	S3-41
Overspd Det Lvl [iii, iv]	**Overspeed Detection Level:** Sets the speed at which an oS fault is declared as a percentage of Contract Car Speed (A1).	% [iii, iv]	0 - 120 [iii, iv]	115 [iii, iv]	F1-08
Overspd Det Time [iii, iv]	**Overspeed Detection Time:** Sets the time in seconds for an overspeed situation to trigger an oS fault.	Sec [iii, iv]	0.0 - 2.0 [iii, iv]	1.0 [iii, iv]	F1-09
Ovrspd Tst Mult	**Overspeed Test Multiplier:** The amount the elevator should be over-sped to trip the overspeed safety device in the hoistway during the Overspeed Test in the U4 sub-menu.	%	0.0 - 150.0	125.0	P1-06
Over Accel Lvl [iv]	**Overacceleration Detection Level:** Determines the how fast a PM motor can accelerate before a dv6 fault is triggered.	fps^2 [iv]	0.0 - 20.0 [iv]	8.0 [iv]	S6-10
Over Accel Time [iv]	**Overacceleration Time:** Sets how long in seconds the PM motor can accelerate above the setting of Over Accel Lvl (A1) before a dv6 fault is declared.	ms [iv]	0 - 5000 [iv]	50 [iv]	S6-11

i Parameter accessible in V/f control mode
ii Parameter accessible in Open Loop Vector control mode
iii Parameter accessible in Closed Loop Vector control mode
iv Parameter accessible in PM Closed Loop Vector control mode
v Default / Range is dependent on drive voltage class: either 200V, 400V, or 500V
vi Default is dependent on drive model number
vii Range depends on drive setting. Maximum setting = DC Brk TimeStart - Gain2 Reduce T. Maximum setting = DC Brk TimeStart - Gain2 Dec Time.

A1 Parameter Name	Description	Units	Range	Default	Standard Parameter Numbers
Spd Dev Low Lvl iii, iv	Speed Deviation Low Level: This parameter sets the range the speed feedback can vary from the speed reference within the time set in Spd Dev Low Time (A1), before the Speed Deviation Low digital output is open. Setting of 0.0 disabled this feature (output will always be closed). For more details, refer to ***Speed Deviation on page 41***.	% iii, iv	0.0 - 50.0 iii, iv	10.0 iii, iv	P2-01
Spd Dev Low Time iii, iv	**Speed Deviation Low Time:** The amount of time the speed feedback can vary above the tolerance of Spd Dev Low Lvl (A1) from the speed reference before the Speed Deviation Low digital output is open. For more details, refer to ***Speed Deviation on page 41***.	Sec iii, iv	0.00 - 10.00 iii, iv	0.50 iii, iv	P2-02
Spd Dev Alm Lvl iii, iv	**Speed Deviation Alarm Level:** This parameter sets the range the speed feedback can vary from the speed reference within the time set in Spd Dev Alm Time (A1), before a dEv alarm is declared. Setting of 0.0 disabled this feature. For more details, refer to ***Speed Deviation on page 41***.	% iii, iv	0.0 - 50.0 iii, iv	15.0 iii, iv	P2-03
Spd Dev Flt Lvl iii, iv	**Speed Deviation Fault Level:** This parameter sets the range the speed feedback can vary from the speed reference within the time set in Spd Dev Flt Time (A1), before a dEv fault is declared. Setting of 0.0 disabled this feature. For more details, refer to ***Speed Deviation on page 41***.	% iii, iv	0.0 - 50.0 iii, iv	25.0 iii, iv	P2-05
Spd Dev Alm Time iii, iv	**Speed Deviation Alarm Time:** The amount of time the speed feedback can vary above the tolerance of Spd Dev Alm Lvl (A1) from the speed reference before a dEv alarm is declared. For more details, refer to ***Speed Deviation on page 41***.	Sec iii, iv	0.00 - 10.00 iii, iv	0.10 iii, iv	P2-04

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iv Parameter accessible in PM Closed Loop Vector control mode
v Default / Range is dependent on drive voltage class: either 200V, 400V, or 500V
vi Default is dependent on drive model number
vii Range depends on drive setting. Maximum setting = DC Brk TimeStart - Gain2 Reduce T. Maximum setting = DC Brk TimeStart - Gain2 Dec Time.

A1 Parameter Name	Description	Units	Range	Default	Standard Parameter Numbers
Spd Dev Flt Time [iii, iv]	**Speed Deviation Fault Time:** The amount of time the speed feedback can vary above the tolerance of Spd Dev Flt Lvl (A1) from the speed reference before a dEv fault is declared. For more details, refer to *Speed Deviation on page 41*.	Sec [iii, iv]	0.00 - 10.00 [iii, iv]	0.50 [iii, iv]	P2-06
Term A1 Gain	**Terminal A1 Gain:** Sets the gain level of the input value when 10 V is applied at terminal A1.	%	-999.9 - 999.9	100.0	H3-03
Terminal A1 Bias	**Terminal A1 Bias:** Sets the level of the input value when 0 V is applied at terminal A1	%	-999.9 - 999.9	0.0	H3-04
Ana In A1 Offset	**Analog Input A1 Offset:** Applies an offset to analog input A1. Can be used for zero adjustment of the analog input.	--	-500 - 500	0	H3-16
Terminal A2 Gain	**Terminal A2 Gain:** Sets the gain level of the input value when 10 V is applied at terminal A2.	%	-999.9 - 999.9	100.0	H3-11
Terminal A2 Bias	**Terminal A2 Bias:** Sets the level of the input value when 0 V is applied at terminal A2.	%	-999.9 - 999.9	0.0	H3-12
Ana In A2 Offset	**Analog Input A2 Offset:** Applies an offset to analog input A2. Can be used for zero adjustment of the analog input.	--	-500 - 500	0	H3-17
A1/A2 Filter T	**A1 and A2 Filter Time:** Sets a primary delay filter time constant for terminals A1 and A2. Used for noise filtering.	Sec	0.00 - 2.00	0.03	H3-13
Terminal FM Gain	**Terminal FM Gain:** Sets the signal level at terminal FM that is equal to 100% of the selected monitor value.	%	-999.9 - 999.9	100.0	H4-02
Terminal FM Bias	**Terminal FM Bias:** Sets the bias value added to the terminal FM output signal.	%	-999.9 - 999.9	0.0	H4-03
Terminal AM Gain	**Terminal AM Gain:** Sets the signal level at terminal AM that is equal to 100% of the selected monitor value.	%	-999.9 - 999.9	100.0	H4-05
Terminal AM Bias	**Terminal AM Bias:** Sets the bias value added to the terminal AM output signal.	%	-999.9 - 999.9	0.0	H4-06

i Parameter accessible in V/f control mode
ii Parameter accessible in Open Loop Vector control mode
iii Parameter accessible in Closed Loop Vector control mode
iv Parameter accessible in PM Closed Loop Vector control mode
v Default / Range is dependent on drive voltage class: either 200V, 400V, or 500V
vi Default is dependent on drive model number
vii Range depends on drive setting. Maximum setting = DC Brk TimeStart - Gain2 Reduce T. Maximum setting = DC Brk TimeStart - Gain2 Dec Time.

A1 Parameter Name	Description	Units	Range	Default	Standard Parameter Numbers
Pre-Torq Ramp T iii, iv	**Pre-Torque Ramp Time:** Sets a time constant for the torque reference to reach 300%. Enabled by setting an analog terminal for Pre-Torque. Effective only when Trq Comp Type (C1) is set to Pre-Torque.	ms iii, iv	0 - 5000 iii, iv	500 iii, iv	S3-10
PreTorqBias@Down iii, iv	**Pre-Torque Bias at Down:** Adds a bias to Pre-torque compensation value from the load cell when moving in the down direction. Effective only when Trq Comp Type (C1) is set to Pre-Torque	% iii, iv	-40.0 - 40.0 iii, iv	0.0 iii, iv	S3-12
Pre-Torq Value 1	**Pre-Torque Value 1:** Sets the amount of torque the drive should apply when the drive is given a pre-torque input reference equal to the setting of Pre-Torque Input 1 (A1) for Pre-Torque Condition 1. For more details, refer to ***Pre-Torque on page 59***.	%	-100.0 – 100.0	-100.0	S3-27
Pre-Torq Value 2	**Pre-Torque Value 2:** Sets the amount of torque the drive should apply when the drive is given a pre-torque input reference equal to the setting of Pre-Torque Input 2 (A1) for Pre-Torque Condition 2. For more details, refer to ***Pre-Torque on page 59***.	%	-100.0 – 100.0	100.0	S3-28
Pre-Torq Input 1	**Pre-Torque Input 1:** Sets the pre-torque input reference for Pre-Torque Condition 1. **Note:** For analog pre-torque, ±100% pre-torque input is equivalent to $\pm 10V_{DC}$. For more details, refer to ***Pre-Torque on page 59***.	%	-100.0 – 100.0	-100.0	S3-29
Pre-Torq Input 2	**Pre-Torque Input 2:** Sets the pre-torque input reference for Pre-Torque Condition 2. **Note:** For analog pre-torque, ±100% pre-torque input is equivalent to $\pm 10V_{DC}$. For more details, refer to ***Pre-Torque on page 59***.	%	-100.0 – 100.0	100.0	S3-30

i Parameter accessible in V/f control mode
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iv Parameter accessible in PM Closed Loop Vector control mode
v Default / Range is dependent on drive voltage class: either 200V, 400V, or 500V
vi Default is dependent on drive model number
vii Range depends on drive setting. Maximum setting = DC Brk TimeStart - Gain2 Reduce T. Maximum setting = DC Brk TimeStart - Gain2 Dec Time.

A1 Parameter Name	Description	Units	Range	Default	Standard Parameter Numbers
SlipComp G Motor [i, ii]	**Slip Compensation Gain in the Motoring Mode:** Slip compensation for leveling speed in the motoring region.	--	0.0 - 5.0 [i, ii]	0.7 [i, ii]	S2-02
SlipComp G Regen [i, ii]	**Slip Compensation Gain in the Regenerative Mode:** Slip compensation for leveling speed in the regenerative region.	--	0.0 - 5.0 [i, ii]	1.0 [i, ii]	S2-03
Trq Det Dly Time [i, ii]	**Torque Detection Delay Time:** Sets a delay time before detecting torque for slip compensation.	ms [i, ii]	0 - 10000 [i, ii]	1000 [i, ii]	S2-05
Trq Det FltrTime [i, ii]	**Torque Detection Filter Time:** Sets the filter time constant applied to the torque signal used for the slip compensation value calculation.	ms [i, ii]	0 - 2000 [i, ii]	500 [i, ii]	S2-06
Slip CompGain [ii, iii]	**Slip Compensation Gain:** Sets the gain for the motor slip compensation function.	--	0.0 - 2.5 [ii, iii]	1.0 [ii, iii]	C3-01
Slip Comp Time [ii]	**Slip Compensation Time:** Adjusts the slip compensation function delay time.	ms [ii]	0 - 10000 [ii]	2000 [ii]	C3-02
Slip Comp Limit [ii]	**Slip Compensation Limit:** Sets an upper limit for the slip compensation function as a percentage of motor rated slip.	% [ii]	0 - 250 [ii]	200 [ii]	C3-03
Output V Lim Sel [ii, iii, iv]	**Output Voltage Limit Selection:** Function that will automatically decrease motor flux when the output voltage reaches the saturation range. **Note:** Available control modes open loop vector and closed loop vector for drive model: LU2M0008 through 2M0415, 4M0005 through 4M0605, and 5M0003 through 5M0200.	--	- Enabled, - Disabled [ii, iii, iv]	Enabled [ii, iii] Disabled [iv]	C3-05
Torq Comp Gain [i, ii]	**Torque Compensation Gain:** Sets the gain for the automatic torque (voltage) compensation function and helps to produce better starting torque.	--	0.00 - 2.50 [i, ii]	1.00 [i, ii]	C4-01
Torq Comp Time [i, ii]	**Torque Compensation Delay Time:** Sets the torque compensation filter time.	ms [i, ii]	0 - 60000 [i, ii]	200 [i] 50 [ii]	C4-02

i Parameter accessible in V/f control mode
ii Parameter accessible in Open Loop Vector control mode
iii Parameter accessible in Closed Loop Vector control mode
iv Parameter accessible in PM Closed Loop Vector control mode
v Default / Range is dependent on drive voltage class: either 200V, 400V, or 500V
vi Default is dependent on drive model number
vii Range depends on drive setting. Maximum setting = DC Brk TimeStart - Gain2 Reduce T. Maximum setting = DC Brk TimeStart - Gain2 Dec Time.

A1 Parameter Name	Description	Units	Range	Default	Standard Parameter Numbers
StallP Accel Lvl [i, ii]	**Stall Prevention Acceleration Level:** Sets the output current level (percent of rated drive current) at which the Stall Prevention during acceleration is activated.	% [i, ii]	0 - 150 [i, ii]	150 [i, ii]	L3-02
StallP Decel Sel [iii]	**Stall Prevention Selection Deceleration Level:** Function that will begin the Overexcitation Deceleration based on the DC bus voltage and prevent an overvoltage fault from high inertia or rapid deceleration.	--	- Disabled - High Flux Brake [iii]	Disabled [iii]	L3-04
StallP Run Level [i]	**Stall Prevention Level during Run:** Sets the output current level (100% is equal to the drive rated current) at which the Stall Prevention is activated during a run.	% [i]	30 - 150 [i]	150 [i]	L3-06
Spd Agree Level	**Speed Agree Level:** Sets the speed detection level for digital outputs SpdRef / Set Agr (C3), Spd Detection 1 (C3), and Spd Detection 2 (C3).	%	0.0 - 100.0	80.0	L4-01
Spd Agree Width	**Speed Agree Width:** Sets the range of the speed detection for digital outputs SpdRef / Set Agr (C3), Spd Detection 1 (C3), and Spd Detection 2 (C3).	%	0.0 - 40.0	4.0	L4-02
SpdAgreeLvl +/-	**Speed Agree Level +/-:** Sets the speed detection level for digital output functions SpdRef /Out Agr (C3), SpdRef /Set Agr (C3), Spd Detection 3 (C3), and Spd Detection 4 (C3).	%	-100.0 - 100.0	0.0	L4-03
SpdAgreeWdth +/-	**Speed Agree Width +/-:** Sets the range of the speed detection for digital outputs SpdRef /Out Agr (C3), SpdRef /Set Agr (C3), Spd Detection 3 (C3), and Spd Detection 4 (C3).	%	0.0 - 40.0	4.0	L4-04
Run Delay Time	**Run Delay Timer:** Sets the time that must pass after the run command is entered to when the drive internal RUN command is set and the motor is started.	Sec	0.00 - 1.00	0.00	S1-10
Cont Fault Time	**Contactor Fault Time:** Determines the time the drive should expect the motor contactor confirmation signal to be made before an SE1 fault is declared.	Sec	0.00 - 10.00	0.10	S6-20

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iv Parameter accessible in PM Closed Loop Vector control mode
v Default / Range is dependent on drive voltage class: either 200V, 400V, or 500V
vi Default is dependent on drive model number
vii Range depends on drive setting. Maximum setting = DC Brk TimeStart - Gain2 Reduce T. Maximum setting = DC Brk TimeStart - Gain2 Dec Time.

A1 Parameter Name	Description	Units	Range	Default	Standard Parameter Numbers
Cont Open Delay	**Contactor Open Delay:** Determines the delay time between shutting off the output of the drive and resetting the contactor control command in order to release the motor contactor after a ride has finished.	Sec	0.00 - 1.00	0.10	S1-11
Torq Ramp@Stp iii, iv	Torque Ramp at Stop: Determines the reduction rate used to bring the internal torque reference value down to zero after Position Lock at Stop has finished. For more details, refer to ***Torque Ramp Down on page 40***. $\text{Rate} = \frac{300\%\ torque}{Torq\ Ramp@Stp}$	ms iii, iv	0 - 10000 iii, iv	100 iii, iv	S3-16
LightLd SrchTime	**Light Load Search Time:** Sets the time to perform Light Load Direction Search.	Sec	0.0 - 5.0	1.0	S4-03
LightLd Srch Spd	**Light Load Search Speed:** Sets the speed reference (percent of contract car speed) to use during Light Load Direction Search.	%	0.00 - 20.00	5.00 i, ii, iii 10.00 iv	S4-04
Rescue Trq Limit	**Rescue Torque Limit:** Sets the maximum motor torque when the drive is in Rescue Operation Mode.	%	0 - 300	100	S4-05
UPS Power Rating	**Un-interruptible Power Supply Power Rating:** Sets the capacity of the UPS used when the drive is in Rescue Operation Mode	--	0.0 - 100.0	0.0	S4-07
DCVoltLvl@Rescue	**DC Voltage Level at Rescue Operation:** Sets the DC bus voltage the drive should expect when the drive is in Rescue Operation Mode.	V	0 - 1150	0	S4-12
PS ReductnDetLvl	**Power Supply Reduction Detection Level:** Determines at which level of backup power supply deterioration a PF5 fault is triggered in Rescue Operation.	%	10 - 100	80	S4-13
FieldForce Limit ii, iii	**Field Forcing Limit:** Sets the maximum limit of the excitation current command during magnetic field forcing. A setting of 100% is equal to motor no-load current. Disabled only during DC injection Braking.	% ii, iii	100 - 400 ii, iii	400 ii, iii	d6-06

i Parameter accessible in V/f control mode
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iv Parameter accessible in PM Closed Loop Vector control mode
v Default / Range is dependent on drive voltage class: either 200V, 400V, or 500V
vi Default is dependent on drive model number
vii Range depends on drive setting. Maximum setting = DC Brk TimeStart - Gain2 Reduce T. Maximum setting = DC Brk TimeStart - Gain2 Dec Time.

A1 Parameter Name	Description	Units	Range	Default	Standard Parameter Numbers
NTSD Speed	**Normal Terminal Stopping Device Speed:** Maximum speed command the drive can run at when NTSD mode is active. For more details, refer to *Normal Terminal Stopping Device Mode on page 61*.	fpm	0.0 - 955.8	0.0	P3-01
NTSD Threshold 1	**Normal Terminal Stopping Device Threshold 1:** Sets the maximum allowable speed at the NTSD checkpoint 1. For more details, refer to *Normal Terminal Stopping Device Mode on page 61*.	fpm	0.0 - 955.8	0.0	P3-06
NTSD Threshold 2	**Normal Terminal Stopping Device Threshold 2:** Sets maximum allowable speed at the NTSD checkpoint 2. For more details, refer to *Normal Terminal Stopping Device Mode on page 61*.	fpm	0.00 - 955.8	0.0	P3-07
NTSD Threshold 3	**Normal Terminal Stopping Device Threshold 3:** Sets maximum allowable speed at the NTSD checkpoint 3. For more details, refer to *Normal Terminal Stopping Device Mode on page 61*.	fpm	0.00 - 955.8	0.0	P3-08
SE2 Delay Time [i, ii, iii]	**Sequencing Error 2 Delay Time:** Sets a delay time to let the drive produce no-load current in the induction motors before the SE2 fault is declared.	ms [i, ii, iii]	0 - 10000 [i, ii, iii]	200 [i, ii, iii]	S6-02

i Parameter accessible in V/f control mode
ii Parameter accessible in Open Loop Vector control mode
iii Parameter accessible in Closed Loop Vector control mode
iv Parameter accessible in PM Closed Loop Vector control mode
v Default / Range is dependent on drive voltage class: either 200V, 400V, or 500V
vi Default is dependent on drive model number
vii Range depends on drive setting. Maximum setting = DC Brk TimeStart - Gain2 Reduce T. Maximum setting = DC Brk TimeStart - Gain2 Dec Time.

■ A1 Sub-menu Detailed Descriptions

High / Low Gain Switch

Note: This parameter is only accessible when the drive is set for Closed Loop Operation.

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 M1000 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 high / low gain switch is controlled internally ONLY.

the gain change level parameter (GAIN CHNG LEVEL(A1)), which defines a percentage of contract speed

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 high / low gain control is shown below.

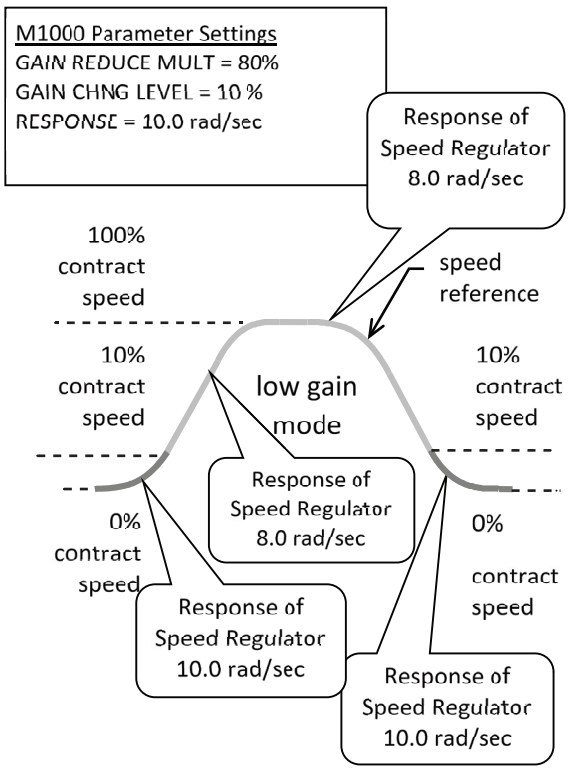


Figure 9 High/Low Example

Notch Filter

This parameter determines the notch filter center frequency.

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 would not be an issue if the notch frequency were set at or above 10 Hz.

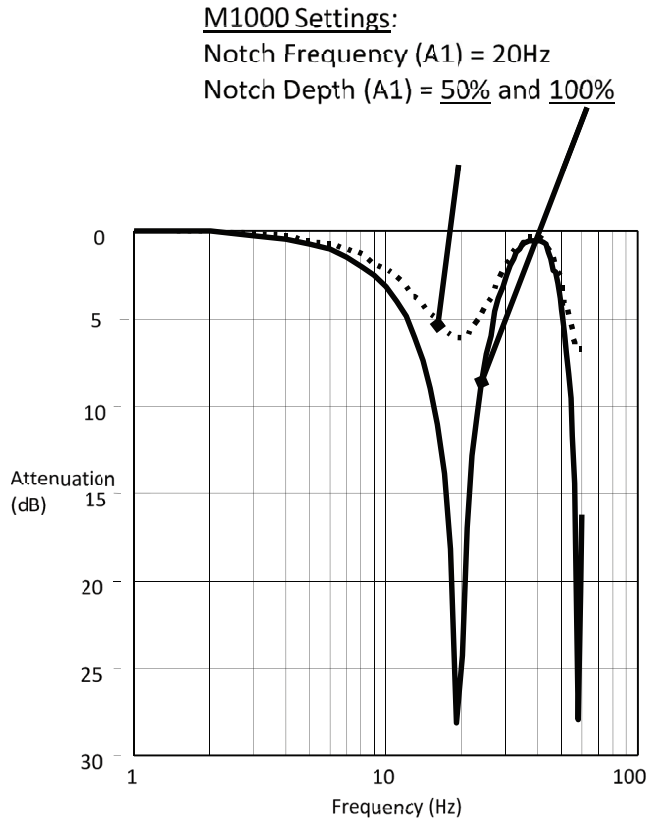


Figure 10 Notch Filter Example

Torque Ramp Down

This is a feature in the drive that will linearly ramp the torque down to zero. This feature will help eliminate the "bump" when the elevator is at door zone and the brake is being applied or is already applied. More likely to happen in gearless machines (and at full load), the "bump" is a symptom of a mechanical brake slippage when transferring the elevator weight from the motor to the mechanical brake. To eliminate the "bump", it is recommend to gradually ramp the motor torque down rather than quickly removing the torque so the weight of the elevator is gently transferred from motor over to the mechanical brake.

WARNING! *It is recommended that this parameter be enabled gradually because the output contactor/motor contactor should NEVER be opened while the drive is outputting power to the motor.*

Table 21 Torque Ramp Down Parameter Starting Values

Parameters	Default	Recommended Starting Values
Stopping Method (C1)	Coast to Stop	Ramp to Stop
TrqLmtRedTim@Stp (A1)	100 ms	100 ms
DC Brk Time Stop (A1)	0.60 Sec	0.20 Sec

1. Gradually increase TrqLmtRedTim@Stp (A1) by increments of 100 until the “bump” is gone.
2. Always watch that the drive green RUN LED turns off before the motor contactor drops out. If the green RUN LED turns off after the motor contactor drops out, start lowering the TrqLmtRedTim@Stp (A1).

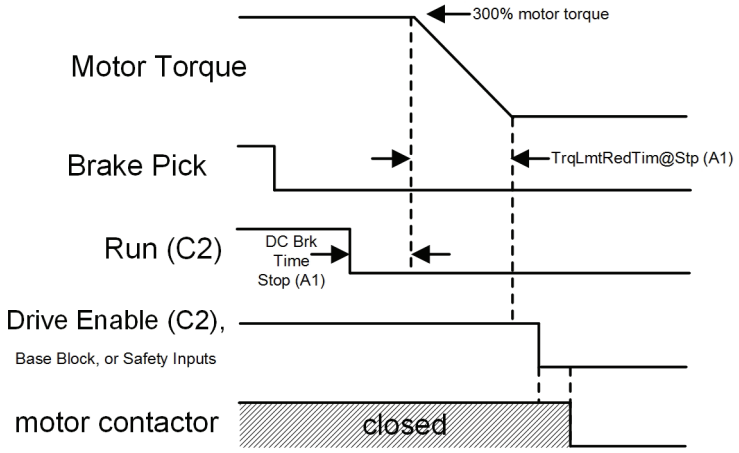


Figure 11 Torque Ramp Down Timing Diagram

Speed Deviation

The M1000 has four methods to detect that the motor speed is tracking the output speed.

- Speed deviation alarm
- Speed deviation fault
- Speed deviation low
- Speed agreement level

The speed deviation alarm is a function that will let the user set a speed range in the drive that will trigger an alarm. The drive will only declare an alarm and will not shut down. The alarm will be triggered when the Motor Speed (D1) is outside the range of the Output Speed (D1) for more than a set time. The range is defined as the Alarm Level (A1) and the set time is Alarm Time (A1).

The speed deviation fault is a function that will let the user set a speed range in the drive that will trigger a fault. The fault will be triggered when the Motor Speed (D1) is outside the range of the Output Speed (D1) for more than a set time. The range is defined as the Fault Level (A1) and the set time is Fault Time (A1).

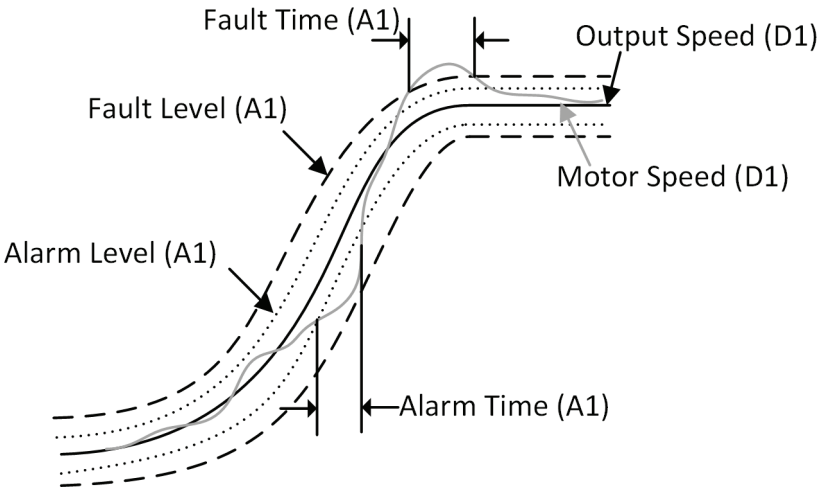


Figure 12 Speed Deviation Alarm and Fault

The speed deviation low feature in the drive that allows the user to configure a logic output of the drive to give the controller an indication that the speed is outside a defined range. 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 time. This feature is similar to the speed deviation alarm and fault but it will not cause the drive to declare an alarm or fault.

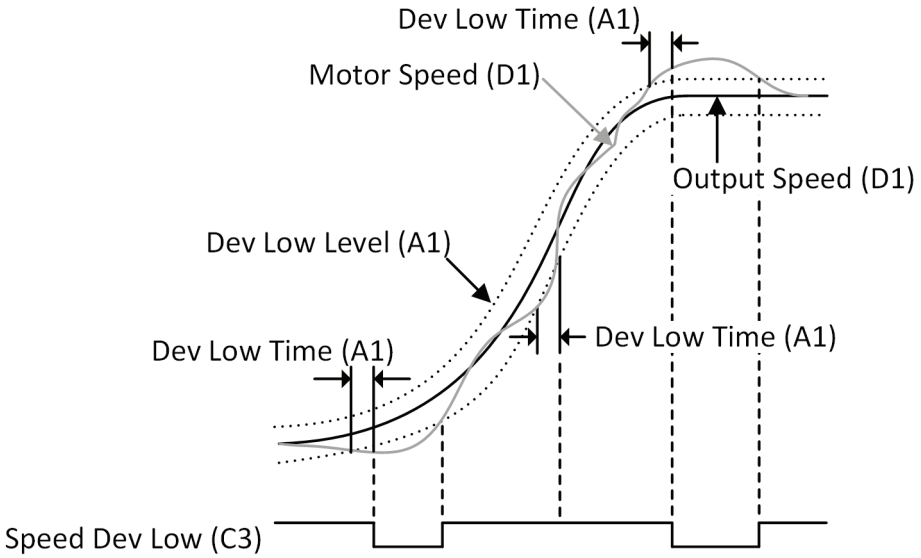


Figure 13 Speed Deviation Low Timing Diagram

The speed agreement level is a feature in the drive that allows the user to program an output of the drive to give the controller status of the drive speed regulation. This feature will not cause the drive to declare an alarm or fault.

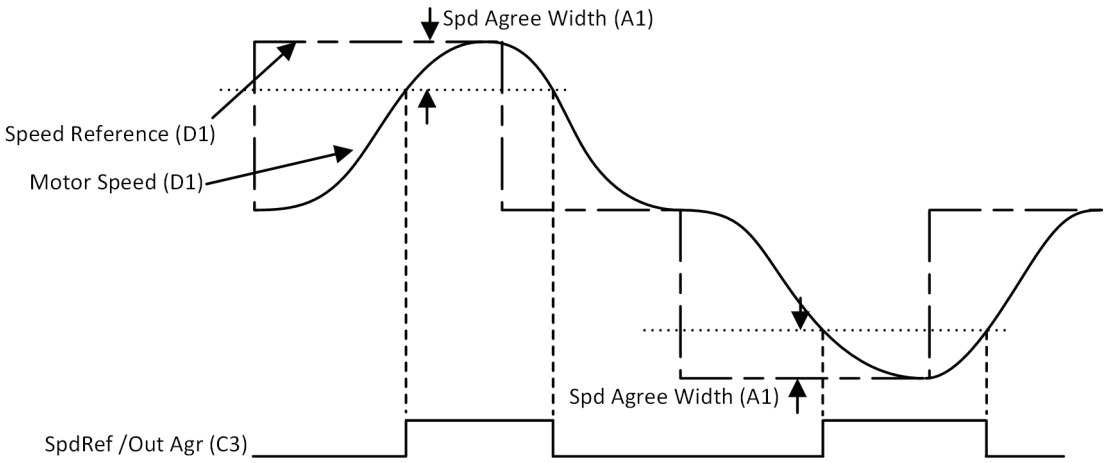


Figure 14 Speed Agree 1 Timing Diagram

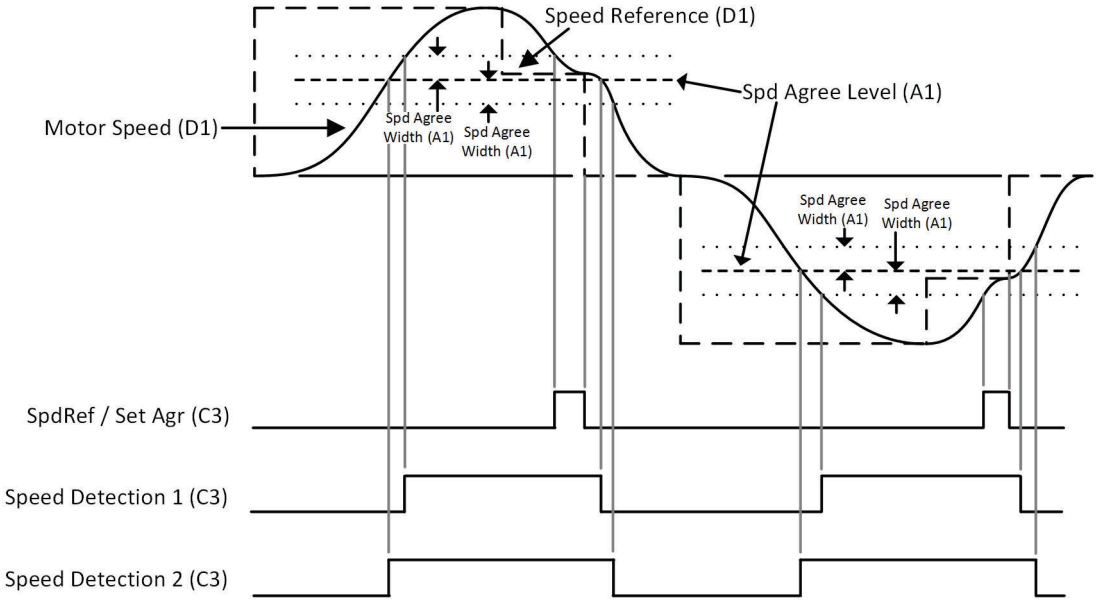


Figure 15 User-set Speed Agree 1, Speed Detection 1, and Speed Detection 2 Timing Diagram

Position Lock

The position lock is a function that will eliminate rollback in an elevator that does NOT have a load weighing device. This function is only applicable to PM motors.

Note: If pre-torque is used, position lock will be disabled.

1. Run the elevator toward the middle of the hoistway so the elevator does not go past the final limits while the position lock parameters are adjusted.
2. Set the elevator on inspection if it is not already on inspection.
3. Set the inspection speed of the elevator to 0 so the rollback can be seen easily.
4. Verify that the following drive parameters are set to the recommended starting values.

Table 22 Position Lock Parameter Starting Values

Sub-menu	Parameter Name	Default	Recommended Starting Value
C1	Pre-Torq Cmd Src	Disable	Disable
C5	Term A1 FuncSel	Speed Command	Neither of these parameters should be set to Pre-Torque. If it is, position lock will be disabled.
C5	Term A2 FuncSel	Pre-Torque	
A1	DC Brk TimeStart	0.40 sec	0.40 sec
A1	Gain2 Dec Time	0.00	0.00
A1	Gain2 Reduce T	0.10 sec	0.10
A1	SpCtrlGn@PosLck	10.00	Default
A1	SpCtrlTim@PosLck	0.100	Default
A1	StrPosLckGain 1	5	5
A1	StrPosLckGain 2	0.00	0.01
A1	Gain2 Redc Fact	0.50	0.30

5. Run the elevator on inspection at 0 speed. Make note of how much rollback is observed and how it rolled back.
6. Increment the DC Brk TimeStart (A1) timer by increments of 0.05 sec until you see an effect on the rollback (either there is less rollback, the motor rolls back then rolls forward, or it rocks back and forth):
   a. If the motor starts to vibrate or oscillate, dampen the speed regulator gains: SpCtrlGn@PosLck (A1) and SpCtrlTim@PosLck (A1)
      i. Lower SpCtrlGn@PosLck (A1) by steps of 5
      ii. Increase SpCtrlTim@PosLck (A1) by increments of 0.5
7. Next, increase StrPosLckGain 2 (A1) by increments of 1 until the rollback is eliminated.
8. Set Gain2 Dec Time (A1) to 0.01.
9. Set Gain2 Reduce T (A1) to the maximum value.

Note: This maximum value is dependent on the values of DC Brk TimeStart (A1) and Gain2 Dec Time (A1).

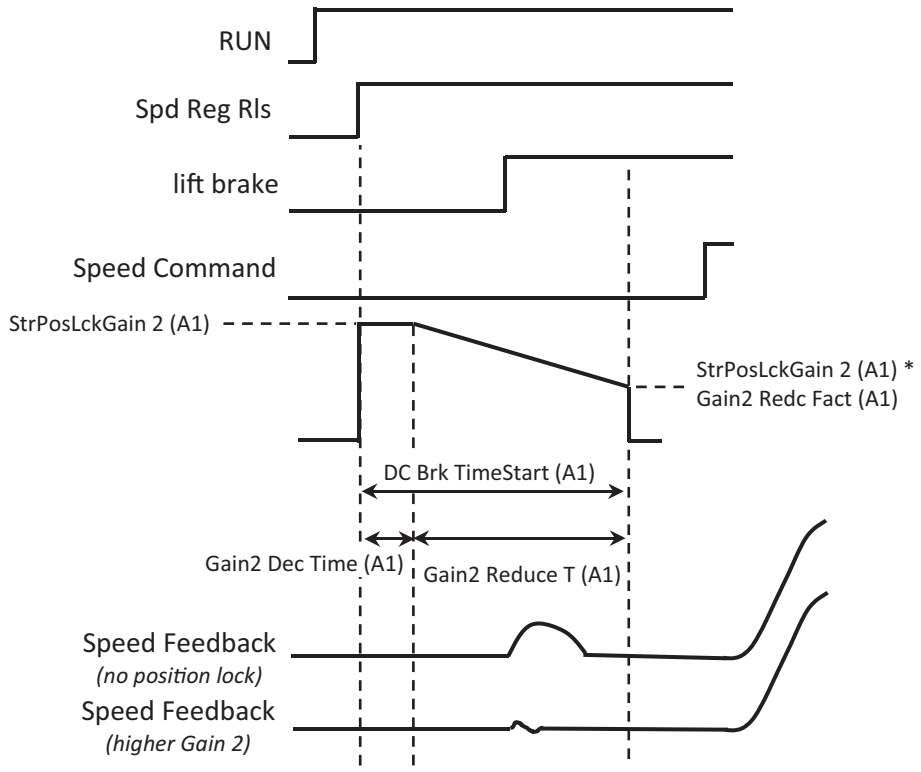


Figure 16 Position Lock Timing Diagram

■ S-CURVES A2 Sub-menu

Table 23 S-CURVES A2 Parameter List

A2 Parameter Name	Description	Units	Range	Default	Standard Parameter Numbers
Accel Rate 0	**Acceleration Rate 0:** Sets the acceleration rate.	fps^2	0.00 - 655.35	3.03 i, ii, iii 0.16 iv	C1-01
Decel Rate 0	**Deceleration Rate 0:** Sets the deceleration rate.	fps^2	0.00 - 655.35	3.03 i, ii, iii 0.16 iv	C1-02
Jerk@Accel Start	**Jerk at Acceleration Start:** Sets the jerk at the beginning of the acceleration.	fps^3	0.00 - 655.35	7.97 i, ii, iii 0.42 iv	C2-01
Jerk@Accel End	**Jerk at Acceleration End:** Sets the jerk at the end of the acceleration.	fps^3	0.00 - 655.35	7.97 i, ii, iii 0.42 iv	C2-02
Jerk@Decel Start	**Jerk at Deceleration Start:** Sets the jerk at the beginning of the deceleration.	fps^3	0.00 - 655.35	7.97 i, ii, iii 0.42 iv	C2-03
Jerk@Decel End	**Jerk at Deceleration End:** Sets the jerk at the end of the deceleration.	fps^3	0.00 - 655.35	7.97 i, ii, iii 0.42 iv	C2-04
Accel Rate 1	**Acceleration Rate 1:** Sets the acceleration rate when the logic input "Multi-Acc/Dec 1" in the C2 sub-menu is triggered.	fps^2	0.00 - 655.35	7.08 i, ii, iii 0.38 iv	C1-03
Decel Rate 1	**Deceleration Rate 1:** Sets the deceleration rate when the logic input "Multi-Acc/Dec 1" in the C2 sub-menu is triggered.	fps^2	0.00 - 655.35	7.08 i, ii, iii 0.38 iv	C1-04
Accel Rate Alt	**Acceleration Rate Alternate:** Sets the acceleration rate for the alternate s-curve.	fps^2	0.00 - 655.35	3.03 i, ii, iii 0.16 iv	P4-01
Decel Rate Alt	**Deceleration Rate Alternate:** Sets the deceleration rate for the alternate s-curve.	fps^2	0.00 - 655.35	3.03 i, ii, iii 0.16 iv	P4-02
Jerk@AccStartAlt	**Jerk at Acceleration Start Alternate:** Sets the jerk at the beginning of the acceleration for the alternate s-curve.	fps^3	0.00 - 655.35	7.97 i, ii, iii 0.42 iv	P4-03
Jerk@Acc End Alt	**Jerk at Acceleration End Alternate:** Sets the jerk at the end of the acceleration for the alternate s-curve.	fps^3	0.00 - 655.35	7.97 i, ii, iii 0.42 iv	P4-04
Jerk@DecStartAlt	**Jerk at Deceleration Start Alternate:** Sets the jerk at the beginning of the deceleration for the alternate s-curve.	fps^3	0.00 - 655.35	7.97 i, ii, iii 0.42 iv	P4-05
Jerk@Dec End Alt	**Jerk at Deceleration End Alternate:** Sets the jerk at the end of the deceleration for the alternate s-curve.	fps^3	0.00 - 655.35	7.97 i, ii, iii 0.42 iv	P4-06

i Parameter accessible in V/f control mode
ii Parameter accessible in Open Loop Vector control mode
iii Parameter accessible in Closed Loop Vector control mode
iv Parameter accessible in PM Closed Loop Vector control mode
v Default / Range is dependent on drive voltage class: either 200V, 400V, or 500V
vi Default is dependent on drive model number

A2 Parameter Name	Description	Units	Range	Default	Standard Parameter Numbers
NTSD Decel Rate	**Normal Terminal Stopping Device Deceleration Rate:** Sets the deceleration rate when the drive is in NTSD mode. For more details, refer to *Normal Terminal Stopping Device Mode on page 61*.	fps^2	0.00 - 655.35	5.06 i, ii, iii 0.27 iv	P3-02
NTSD DecJrkStart	**Normal Terminal Stopping Device Deceleration Jerk at the Start:** Sets the deceleration jerk rate at the start when the drive is in NTSD Mode. **Note:** This is only the case if NTSD Mode was triggered through logic input "NTSD Input 1" and/or "NTSD Input 2". For more details, refer to *Normal Terminal Stopping Device Mode on page 61*.	fps^3	0.00 - 655.35	10.12 i, ii, iii 0.54 iv	P3-04
NTSD DecelJrkEnd	**Normal Terminal Stopping Device Deceleration Jerk at the End:** Sets the deceleration jerk rate at the end when the drive is in NTSD Mode. **Note:** This is only the case if NTSD Mode was triggered through logic input "NTSD Input 1" and/or "NTSD Input 2". For more details, refer to *Normal Terminal Stopping Device Mode on page 61*.	fps^3	0.00 - 655.35	10.12 i, ii, iii 0.54 iv	P3-05
Fast Stop Time	**Fast Stop Time:** Sets the deceleration rate when the drive is in the Fast Stop mode.	fps^2	0.00 - 655.35	7.08 i, ii, iii 0.38 iv	C1-09

i Parameter accessible in V/f control mode
ii Parameter accessible in Open Loop Vector control mode
iii Parameter accessible in Closed Loop Vector control mode
iv Parameter accessible in PM Closed Loop Vector control mode
v Default / Range is dependent on drive voltage class: either 200V, 400V, or 500V
vi Default is dependent on drive model number

A2 Sub-menu Detailed Descriptions

In the M1000, the drive will send the raw Speed Reference (D1) from the elevator controller through an internal s-curve to generate the Output Speed (D1) signal. The s-curve will place a maximum rate of change for the elevator acceleration, deceleration, and jerks. If the car controller is generating its own s-curve, disable the drive internal s-curves. Below is a table that breaks down each portion of the s-curve.

Table 24 S-Curve Descriptions and Adjustments

Parameters	Descriptions	S-Curve Portion	Suggested Adjustments
Accel Rate	Maximum allowed acceleration rate		Reduce if the acceleration is too aggressive. Increase if the acceleration is too gentle. To disable, set it to the maximum.
Decel Rate	Maximum allowed deceleration rate		Reduce if the deceleration is too aggressive. Increase if the deceleration is too gentle. To disable, set it to the maximum.
Jerk@Accel Start	Maximum allowed rate of increase of acceleration, up to ACCEL RATE, when increasing elevator speed		Reduce to give a softer acceleration from standstill into the acceleration segment Increase to give a more aggressive transition into the acceleration segment To disable, set it to the maximum.
Jerk@Accel End	Maximum allowed rate of decrease of acceleration to zero when approaching contract elevator speed		Reduce to give a softer transition to commanded speed from acceleration segment Increase to give a more aggressive transition to commanded speed from acceleration segment To disable, set it to the maximum.
Jerk@Decel Start	Maximum allowed rate of increase of deceleration, up to DECEL RATE, when decreasing elevator speed		Reduce to give a softer transition to the deceleration segment from commanded speed into the deceleration segment. Increase to give a more aggressive transition from commanded speed into the deceleration segment. To disable, set it to the maximum.
Jerk@Decel End	Maximum allowed rate of decrease of deceleration to zero when slowing the elevator to leveling speed		Reduce to give a softer transition to Leveling speed and to stop from the deceleration segment. Increase to give a more aggressive transition to Leveling speed and to stop from the deceleration segment. To disable, set it to the maximum.

■ MULTISTEP REF A3 Sub-menu

Table 25 MULTISTEP REF A3 Parameter List

A3 Parameter Name	Description	Units	Range	Default	Standard Parameter Numbers
Speed Command 1	**Speed Command 1:** Internal multi-step speed command 1.	fpm	0.0 - 955.8 [vii]	0.0	d1-02
Speed Command 2	**Speed Command 2:** Internal multi-step speed command 2.	fpm	0.0 - 955.8 [vii]	0.0	d1-03
Speed Command 3	**Speed Command 3:** Internal multi-step speed command 3.	fpm	0.0 - 955.8 [vii]	0.0	d1-04
Speed Command 4	**Speed Command 4:** Internal multi-step speed command 4.	fpm	0.0 - 955.8 [vii]	0.0	d1-05
Speed Command 5	**Speed Command 5:** Internal multi-step speed command 5.	fpm	0.0 - 955.8 [vii]	0.0	d1-06
Speed Command 6	**Speed Command 6:** Internal multi-step speed command 6.	fpm	0.0 - 955.8 [vii]	0.0	d1-07
Speed Command 7	**Speed Command 7:** Internal multi-step speed command 7.	fpm	0.0 - 955.8 [vii]	0.0	d1-08
Speed Command 8	**Speed Command 8:** Internal multi-step speed command 8.	fpm	0.0 - 955.8 [vii]	0.0	d1-09
Speed Command 9	**Speed Command 9:** Internal multi-step speed command 9.	fpm	0.0 - 955.8 [vii]	0.0	d1-10
Speed Command 10	**Speed Command 10:** Internal multi-step speed command 10.	fpm	0.0 - 955.8 [vii]	0.0	d1-11
Speed Command 11	**Speed Command 11:** Internal multi-step speed command 11.	fpm	0.0 - 955.8 [vii]	0.0	d1-12
Speed Command 12	**Speed Command 12:** Internal multi-step speed command 12.	fpm	0.0 - 955.8 [vii]	0.0	d1-13
Speed Command 13	**Speed Command 13:** Internal multi-step speed command 13.	fpm	0.0 - 955.8 [vii]	0.0	d1-14
Speed Command 14	**Speed Command 14:** Internal multi-step speed command 14.	fpm	0.0 - 955.8 [vii]	0.0	d1-15
Speed Command 15	**Speed Command 15:** Internal multi-step speed command 15.	fpm	0.0 - 955.8 [vii]	0.0	d1-16
Inspect Oper Spd	**Inspection Operating Speed:** Only used when a logic input is set to "Inspection Oper" in the C2 sub-menu. Sets the speed the drive will run at when the logic input "Inspection Oper" is active.	fpm	0.0 - 955.8 [vii]	318.6 [i, ii, iii] 17.0 [iv]	d1-24

i Parameter accessible in V/f control mode
ii Parameter accessible in Open Loop Vector control mode
iii Parameter accessible in Closed Loop Vector control mode
iv Parameter accessible in PM Closed Loop Vector control mode
v Default / Range is dependent on drive voltage class: either 200V, 400V, or 500V
vi Default is dependent on drive model number
vii Range depends on the settings of the drive parameters (such as motor parameters, Contract Car Speed, and Contract Motor Speed).

A3 Parameter Name	Description	Units	Range	Default	Standard Parameter Numbers
Rescue Oper Spd	**Rescue Operation Speed:** Sets the speed that the elevator will run at when it is in Rescue Operation Mode. For more details, refer to *Rescue Operation on page 66*. This setting can be disabled with the setting of Rescue Speed (C1).	fpm	0.0 - 955.8 vii	63.7 i, ii, iii 3.4 iv	d1-25

i Parameter accessible in V/f control mode
ii Parameter accessible in Open Loop Vector control mode
iii Parameter accessible in Closed Loop Vector control mode
iv Parameter accessible in PM Closed Loop Vector control mode
v Default / Range is dependent on drive voltage class: either 200V, 400V, or 500V
vi Default is dependent on drive model number
vii Range depends on the settings of the drive parameters (such as motor parameters, Contract Car Speed, and Contract Motor Speed).

■ A3 Sub-menu Detailed Descriptions

The M1000 can be configured to run the elevator with preset speed with multi-function digital inputs. There are 4 digital inputs that can be configured in the C2 Logic Inputs sub-menu to select the 15 different speed commands. The drive uses binary to decimal conversion to select the speed command as shown below in *Table 26*.

Note: If none of the logic inputs set to Step Reference Bit are active, the drive will run at zero speed.

If any of the Step Reference Bit 0 thru 3 are not set in the C3 Logic Inputs sub-menu, that bit will always be 0.

Table 26 Multi-Step Reference Table

A3 Speed Commands	C2 Logic Input Choices			
	Step Ref B3	Step Ref B2	Step Ref B1	Step Ref B0
Speed Command 1 (A3)	0	0	0	1
Speed Command 2 (A3)	0	0	1	0
Speed Command 3 (A3)	0	0	1	1
Speed Command 4 (A3)	0	1	0	0
Speed Command 5 (A3)	0	1	0	1
Speed Command 6 (A3)	0	1	1	0
Speed Command 7 (A3)	0	1	1	1
Speed Command 8 (A3)	1	0	0	0
Speed Command 9 (A3)	1	0	0	1
Speed Command 10 (A3)	1	0	1	0
Speed Command 11 (A3)	1	0	1	1
Speed Command 12 (A3)	1	1	0	0
Speed Command 13 (A3)	1	1	0	1
Speed Command 14 (A3)	1	1	1	0
Speed Command 15 (A3)	1	1	1	1

■ POWER CONVERT A4 Sub-menu

Table 27 POWER CONVERT A4 Parameter List

A4 Parameter Name	Description	Units	Range	Default	Standard Parameter Numbers
Input Voltage	**Input Voltage:** This parameter must be set to match the power supply voltage.	VAC	155 – 255 [v]	230 [v]	E1-01
			310 – 510 [v]	460 [v]	
			446 – 733 [v]	575 [v]	
UV Detect Level	**Under Voltage Detection Level:** Sets the DC bus undervoltage fault level.	VDC	150 – 210 [v]	190 [v]	L2-05
			300 – 420 [v]	380 [v]	
			431 – 604 [v]	500 [v]	
CarrierFrequency [ii, iii, iv]	**Carrier Frequency:** Sets the drive's transistor switching frequency.	kHz [ii, iii, iv]	1.0 – 15.0 [ii, iii, iv]	[vi]	C6-03
PWM Method	**Pulse Width Modulation Method:** Determines how the drive should perform pulse width modulation. **Note:** The drive rated output current is reduced with a setting of 3 phase modulate.	--	- 2/3 Pha Auto-Mod - 3 Phase Modulate - 2 Phase Modulate	2/3 Pha Auto-Mod	C6-06
OH Pre-Alarm Lvl	**Over Heat Pre-Alarm Level:** Set an OVRLD shutdown alarm that will occur if the drive heatsink temperature exceeds this setting.	C	50 – 150	[vi]	L8-02
Fan Delay Time	**Fan Delay Time:** Sets a delay time to shut off the cooling fan after the run command is removed. **Note:** This operating mode can be disabled.	Sec	0 - 300	20	L8-11
Fc dur OL Fc Red	**Reduce Carrier Frequency:** Sets the reduced carrier frequency used by the Torque Boost function.	kHz	1.0 – 15.0	3.0	L8-39
Hflux Brake Gain [iii]	**High Flux Braking Gain:** Sets the gain applied to the excitation current during Overexcitation Deceleration.	--	1.00 – 3.00 [iii]	1.10 [iii]	n3-13
Hflux Brake Time [iii]	**High Flux Brake Time:** Sets the filter time for the output of the Overexcitation Deceleration function.	ms [iii]	0 – 1000 [iii]	100 [iii]	n3-22

i Parameter accessible in V/f control mode
ii Parameter accessible in Open Loop Vector control mode
iii Parameter accessible in Closed Loop Vector control mode
iv Parameter accessible in PM Closed Loop Vector control mode
v Default / Range is dependent on drive voltage class: either 200V, 400V, or 500V
vi Default is dependent on drive model number

■ MOTOR A5 Sub-menu

Table 28 MOTOR A5 Parameter List

A5 Parameter Name	Description	Units	Range	Default	Standard Parameter Numbers
Mtr Rated Power [i, ii, iii]	**Motor Rated Power:** Sets the induction motor rated power in HP (1 HP = 0.746 kW). Automatically set during autotuning.	HP [i, ii, iii]	0.00 – 650.00 [i, ii, iii]	vi	E2-11
PM Mtr Power [iv]	**PM Motor Rated Power:** Sets the PM motor rated power in HP (1 HP = 0.746 kW). Automatically set during autotuning.	HP [iv]	0.10 – 650.00 [iv]	vi	E5-02
Mtr Rated Voltage	**Motor Rated Voltage:** Sets the motor rated voltage. Automatically set during autotuning.	VAC [v]	0.0 - 255.0 [v]	230 [v]	E1-05
			0.0 - 510.0 [v]	460 [v]	
			0.0 - 733.1 [v]	575 [v]	
Max Frequency [i, ii, iii]	**Maximum Frequency:** Sets the motor rated frequency. Automatically set during autotuning.	Hz [i, ii, iii]	10.0 – 200.0 [i, ii, iii]	60.0 [i, ii, iii]	E1-04
Motor Rated FLA [i, ii, iii]	**Motor Rated Full Load Amps:** Sets the induction motor nameplate current in amps. Automatically set during some autotuning. The decimal accuracy will be 0.01A for models 2M0008-2M0033, 4M0005-4M0018, and 5M0003-5M0013. All other models will have a decimal accuracy of 0.1A.	A [i, ii, iii]	vi	vi	E2-01
PM Mtr Rated FLA [iv]	**PM Motor Rated Full Load Amps:** Sets the PM motor nameplate current in amps. Automatically set during autotuning. The decimal accuracy will be 0.01A for models 2M0008-2M0033, 4M0005-4M0018, and 5M0003-5M0013. All other models will have a decimal accuracy of 0.1A.	A [iv]	vi	vi	E5-03
Number of Poles [i, ii, iii]	**Number of Poles:** Sets the number of poles in the induction motor. Automatically set during autotuning.	--	2 - 48 [i, ii, iii]	4 [i, ii, iii]	E2-04
PM Motor Poles [iv]	**PM Motor Poles:** Sets the number of poles in the PM motor. Automatically set during autotuning. If a PG-E3 is used, the maximum value will be 48.	--	2 – 120 [iv]	12 [iv]	E5-04
Motor Rated Slip [i, ii, iii]	**Motor Rated Slip:** Sets the motor rated slip. Automatically set during autotuning.	Hz [i, ii, iii]	0.00 – 20.00 [i, ii, iii]	vi	E2-02

i Parameter accessible in V/f control mode
ii Parameter accessible in Open Loop Vector control mode
iii Parameter accessible in Closed Loop Vector control mode
iv Parameter accessible in PM Closed Loop Vector control mode
v Default / Range is dependent on drive voltage class: either 200V, 400V, or 500V
vi Default is dependent on drive model number

A5 Parameter Name	Description	Units	Range	Default	Standard Parameter Numbers
Max Motor Speed [iv]	**Maximum Motor Speed:** Sets the maximum speed the motor can rotate.	RPM [iv]	40 – 2000 [iv]	96 [iv]	E1-04
Rated Motor Speed [iv]	**Rated Motor Speed:** Sets the motor rated speed.	RPM [iv]	40 – 2000 [iv]	96 [iv]	E1-06
No-Load Current [i, ii, iii]	**No-Load Current:** Sets the no-load current for the induction motor. Automatically set during autotuning. The decimal accuracy will be 0.01A for models 2M0008-2M0033, 4M0005-4M0018, and 5M0003-5M0013. All other models will have a decimal accuracy of 0.1A.	A [i, ii, iii]	[vi]	[vi]	E2-03
Leak Inductance [i, ii, iii]	**Leakage Inductance:** Sets the voltage drop due to motor leakage inductance as a percentage of motor rated voltage. Automatically set during autotuning	%	0.0 – 40.0 [i, ii, iii]	[vi]	E2-06
Term Resistance [i, ii, iii]	**Terminal Resistance:** Sets the phase-to-phase resistance of the induction motor. Automatically set during autotuning.	Ω	0.000 – 65.000 [i, ii, iii]	[vi]	E2-05
PM Mtr Arm Ohms [iv]	**PM Motor Armature Ohms:** Sets the stator resistance for a single phase of a PM motor.	Ω [iv]	0.000 - 65.000 [iv]	[vi]	E5-05
Saturation Comp1 [ii]	**Saturation Compensation 1:** Sets the iron saturation coefficient at 50% of magnetic flux for the induction motor. Automatically set during autotuning.	--	0.00 - 0.50 [ii]	0.50 [ii]	E5-07
Saturation Comp2 [ii]	**Saturation Compensation 2:** Sets the iron saturation coefficient at 75% of magnetic flux fir the induction motor. Automatically set during autotuning.	--	0.50 - 0.75 [ii]	0.75 [ii]	E2-08
Min Voltage [i, ii]	**Minimum Voltage:** Sets the lowest voltage point on the V/Hz curve.	VAC [i, ii]	0.0 - 255.0 [v] 0.0 - 510.0 [v] 0.0 - 733.1 [v]	[vi]	E1-10
Min Frequency [i, ii]	**Minimum Frequency:** Sets the lowest frequency point on the V/Hz curve.	Hz [i, ii]	0.0 - 200.0 [i, ii]	1.5 [i] 0.5 [ii]	E1-09
Mid Voltage [i, ii]	**Middle Voltage:** Sets the middle voltage on the V/Hz curve.	VAC [i, ii]	0.0 - 255.0 [v] 0.0 - 510.0 [v] 0.0 - 733.1 [v]	[vi]	E1-08
Mid Frequency [i, ii]	**Middle Frequency:** Sets the middle frequency on the V/Hz curve.	Hz [i, ii]	0.0 - 200.0 [i, ii]	3.0 [i, ii]	E1-07

i Parameter accessible in V/f control mode
ii Parameter accessible in Open Loop Vector control mode
iii Parameter accessible in Closed Loop Vector control mode
iv Parameter accessible in PM Closed Loop Vector control mode
v Default / Range is dependent on drive voltage class: either 200V, 400V, or 500V
vi Default is dependent on drive model number

A5 Parameter Name	Description	Units	Range	Default	Standard Parameter Numbers
Base Voltage [i, ii, iii]	**Base Voltage:** Sets the voltage going out to the motor when the drive is running at the Base Frequency (A5). This setting would normally match the Mtr Rated Voltage (A5). Automatically set during autotune.	VAC [i, ii, iii]	0.0 - 255.0 [v] 0.0 - 510.0 [v] 0.0 - 733.1 [v]	0.0 [v]	E1-13
Base Frequency [i, ii]	**Base Frequency:** Sets the motor base frequency.	Hz [i, ii]	0.0 - 200.0 [i, ii]	60.0 [i, ii]	E1-06
V/f Rated Speed [i]	**Volts per Frequency Rated Speed:** Rated motor speed when operating in "V/f Control" in the U8 sub-menu.	RPM [i]	300 - 1800 [i]	1380 [i]	S2-01
Mechanical Loss [ii, iii]	**Mechanical Loss:** Sets the induction motor mechanical loss as a percentage of motor rated power (kW).	% [ii, iii]	0.0 - 10.0 [ii, iii]	0.0 [ii, iii]	E2-09
PM Mtr d Induct [iv]	**PM Motor d-Axis Inductance:** Sets the d-axis inductance of a PM motor.	mH [iv]	0.00 - 600.00 [iv]	vi	E5-06
PM Mtr q Induct [iv]	**PM Motor q-Axis Inductance:** Sets the q-axis inductance of a PM motor.	mH	0.00 - 600.00 [iv]	vi	E5-07
PM Mtr Ind V 1 [iv]	**PM Motor Induction Voltage Constant 1:** Sets the induced phase peak voltage in units of 0.1 mV [electrical angle]. **Note:** If this parameter is set to a non-zero, PM Mtr Ind V 2 (A5) should be set to 0.0.	--	0.0 - 6500.0	473.9	E5-09
PM Mtr Ind V 2 [iv]	**PM Motor Induction Voltage Constant 2:** Sets the induced phase peak voltage in units of 0.1 mV [electrical angle]. **Note:** If this parameter is set to a non-zero, PM Mtr Ind V 1 (A5) should be set to 0.0.	--	0.0 - 6500.0	0.0	E5-24
Mtr OL Charact	**Motor Overload Characteristic:** Sets the type of motor overload to be used to protect the motor from overheating	-- --	- Constant Torque [iv] - CT Motor [i, ii, iii] - OL1 Disabled [i, ii, iii, iv] - Vector Motor [i, ii, iii] - VT Motor [i, ii, iii]	VT Motor [i, ii, iii] Constant Torque [iv]	L1-01

i Parameter accessible in V/f control mode
ii Parameter accessible in Open Loop Vector control mode
iii Parameter accessible in Closed Loop Vector control mode
iv Parameter accessible in PM Closed Loop Vector control mode
v Default / Range is dependent on drive voltage class: either 200V, 400V, or 500V
vi Default is dependent on drive model number

A5 Parameter Name	Description	Units	Range	Default	Standard Parameter Numbers
MOL Time Const	**Motor Overload Time Constant:** Sets the motor overload protection (oL1) time.	Min	0.1 - 5.0	1.0	L1-02
Enc Z-Pulse Offs [iv]	**Encoder Z-Pulse Offset:** Sets the offset between the rotor magnetic axis and the encoder zero position. Set during Encoder Offset Tuning.	Deg [iv]	-180.0 - 180.0 [iv]	0.0 [iv]	E5-11

i Parameter accessible in V/f control mode
ii Parameter accessible in Open Loop Vector control mode
iii Parameter accessible in Closed Loop Vector control mode
iv Parameter accessible in PM Closed Loop Vector control mode
v Default / Range is dependent on drive voltage class: either 200V, 400V, or 500V
vi Default is dependent on drive model number

◆ Configure C0 Menu

■ USER SWITCHES C1 Sub-menu

Table 29 USER SWITCHES C1 Parameter List

C1 Parameter Name	Description	Choices	Default	Standard Parameter Numbers
Spd Command Src	**Speed Command Source:** This parameter designates the source of the drive's speed. There are 5 choices: • Analog Input - speed reference dictated from an analog voltage. • Memobus - speed reference from MEMOBUS or Modbus serial protocol • Multi-step Speed - the drive will be using the internal multi-step speed references. • Option PCB - speed reference from an optional card on the drive • Serial HPV Ref - speed reference from the serial protocol MODE 1 If this parameter is set to Memobus or Serial HPV Ref, a power cycle needs to be done for the parameter to take effect. **Note:** Any speed selected through the logic inputs override the other Speed Command Source (C1).	- Analog Input - Memobus - Multi-step Speed - Option PCB - Serial HPV Ref	Multi-step Speed	b1-01
Run Command Src	**Run Command Source:** This parameter designates the source of the drive run signal. • Digital Inputs - run signal from the digital inputs • Memobus - run signal from MEMOBUS or Modbus protocol • Option PCB - run signal from the from an optional card on the drive • Serial HPV Seq - RUN bit from MODE 1 protocol **Note:** If this parameter is set to Memobus or Serial HPV Seq, a power cycle needs to be done for the parameter to take effect.	- Digital Inputs - Memobus - Operator - Option PCB - Serial HPV Seq	Digital Inputs	b1-02
Serial Run Src	**Serial Run Source:** Run signal ONLY when drive is set up for Serial HPV Seq: • Serial Only - serial RUN bit is only required • Terminal + Serial - serial RUN bit and a run signal from the digital input are required	- Serial Only - Terminal + Serial	Serial Only	P1-01
Motor Rotation	**Motor Rotation:** Sets the phase rotation of the motor	- Forward - Reverse	Forward	b1-14

i Parameter accessible in V/f control mode
ii Parameter accessible in Open Loop Vector control mode
iii Parameter accessible in Closed Loop Vector control mode
iv Parameter accessible in PM Closed Loop Vector control mode
v Default / Range is dependent on drive voltage class: either 200V, 400V, or 500V
vi Default is dependent on drive model number

C1 Parameter Name	Description	Choices	Default	Standard Parameter Numbers
Encoder Select [iv]	**Encoder Selection:** Selects the encoder type that is connected to the PG-F3 option card. • EnDat SerialOnly - Endat 2.2/22 serial protocol • EnDat Sin/Cos - EnDat 2.1/01, 2.2/01 serial protocol with Sin/Cos • Hiperface - Hiperface serial protocol	- EnDat SerialOnly - EnDat Sin/Cos - Hiperface	EnDat Sin/Cos [iv]	F1-50
Ser Enc Comm Spd [iv]	**Serial Encoder Communication Speed:** Selects the communication speed between the PG-F3 card and serial encoder	- 1M/9600bps - 500k/19200bps - 1M/38400bps - 1M/38400bps	1M/9600bps [iv]	F1-52
Encoder Connect	**Encoder Connection:** Selects the phase rotation of the encoder.	- Forward - Reverse	Reverse [i, ii, iii] Forward [iv]	F1-05
PGCardDisconDet [iii, iv]	**PG Card Disconnection Detection:** Disables or enables the PGoH fault that allows the encoder card to detect if an encoder isn't connected to the card.	- Enabled - Disabled	Enabled	F1-20
Stopping Method	**Stopping Method:** Selects the drive operation upon the removal of the run signal. • Coast to Stop - power to the motor will be shut off • ElvEmergercyStp - motor will decelerate using Fast Stop Time (A1) to a stop [iii, iv] • Ramp to stop - motor will decelerate using the current s-curve to a stop	- Coast to Stop - ElvEmergencyStp [iii, iv] - Ramp to Stop	Coast to Stop	b1-03
Serial Comm Mode	**Serial Communication Mode:** Selects the serial protocol for the RS485/RS422 port between the drive and controller.	- HPV Mode 1 - Memobus	HPV Mode 1	P9-01
Pre-Torq Cmd Src [iii, iv]	**Pre-Torque Command Source:** Selects the source for the Pre-Torque command. • Analog - Pre-Torque dictated from an analog voltage • Serial HPV - Pre-Torque dictated from a MODE 1 serial message • Option Card - Pre-Torque dictated from an option card To enable the feature, one of the analog inputs must be set to Pre-Torque in the C5 sub-menu.	- Analog - Disabled - Option Card - Serial HPV	Disabled [iii, iv]	P1-02
Pre-Torq Latch [iii, iv]	**Pre-Torque Latch:** Selects whether the Pre-Torque should latch or not.	- Disabled - Enabled	Disabled [iii, iv]	P1-03
Trq Comp Type [iii, iv]	**Torque Compensation Type:** Selects which Torque Compensation is applied.	- Pre-torque - Feed Forward	Pre-torque [iii, iv]	P1-04
PPT Select [iv]	**Pulse Pre-Torque Select:** Enables the PPT feature. PPT is designed for use with PM motors with splined type brakes to eliminate the bump heard as the brake releases at the start of travel.	- Disabled - Enabled	Disabled [iv]	P5-13
Mtr Overload Act	**Motor Overload Action:** Determines which action the drive takes when a Motor Overload has been detected.	- Alarm Only - Fault	Alarm Only	L1-06

i Parameter accessible in V/f control mode
ii Parameter accessible in Open Loop Vector control mode
iii Parameter accessible in Closed Loop Vector control mode
iv Parameter accessible in PM Closed Loop Vector control mode
v Default / Range is dependent on drive voltage class: either 200V, 400V, or 500V
vi Default is dependent on drive model number

C1 Parameter Name	Description	Choices	Default	Standard Parameter Numbers
Field Force Sel [ii, iii]	**Field Forcing Selection:** Selects whether the forcing field should be active or inactive.	- Disabled - Enabled	Disabled [ii, iii]	d6-03
Restart Sel	**Restart Selection:** Determines if a fault output is triggered when the drive attempts to reset.	- Flt Outp Disabld - Flt Outp Enabled	Flt Outp Disabld	L5-02
Out Ph Loss Det	**Output Phase Loss Detection:** Determines if an output phase loss fault is declared when the current falls below 5% of drive rated current. • Disabled - output phase loss is disabled • 1PH Loss Det - triggered by a single phase loss • 2/3PH Loss - triggered when two phases are lost • DC-PH Loss Det - fault at phase loss at start or when two phases are lost mid-operation [i, ii]	- Disabled - 1PH Loss Det - 2/3PH Loss [i, ii] - DC-PH Loss Det [i, ii]	Disabled	L8-07
DB Tr Protection	**Dynamic Brake Transistor Protection:** Determines if the internal braking transistor protection should be activated or disabled. Should be disabled if a regen or CDBR is used.	- Disabled - Enabled	Enabled	L8-55
Atun Cont ON	**Autotune Contactor On:** Determines the state of the output contactor with the use of Mtr Contact Ctrl (C3) during autotuning. • Disabled - Mtr Contact Ctrl (C3) will never activate during autotune • Enabled at HBB - Mtr Contact Ctrl (C3) will activate regardless of the HBB input. [i, ii] • Enabled - Mtr Contact Ctrl (C3) will only activate if the HBB input is active too	- Disabled - Enable at HBB [i, ii] - Enabled	Disabled	S1-12
LightLoad Search	**Light Load Search:** Feature that will calculate the direction of travel that will require the least amount of work during Rescue Operation. • Disabled - deactivate this feature • Enable-Mtr1 Only - active for only 1 motor • Enable-Mtr1&Mtr2 - active feature up to 2 different motors	- Disabled - Enable-Mtr1 Only - Enable-Mtr1&Mtr2	Disabled	S4-01
LightLdSrchMethd [i, ii]	**Light Load Search Method:** Determines how the drive detects the light load direction. • Regen Direction - direction that requires least work determine with regen. • Output Current - direction that requires least work determine with motor current.	- Regen Direction - Output Current	Regen Direction [i, ii]	S4-02
Power Supply Sel	**Power Supply Selection:** Specifies the type of backup power supply the drive should switch to when the power goes out.	- Battery - Single Phase UPS - Three Phase UPS	Battery	S4-06
UPS Spd Lmt Sel	**Un-interruptible Power Supply Speed Limit Selection:** Determines when the drive should apply a limit to the speed command, which is determined by Rescue Speed (C1), when the drive is in Rescue Operation Mode.	- Disabled - Enabled - Enabled@LLSearch	Enabled	S4-08

i Parameter accessible in V/f control mode
ii Parameter accessible in Open Loop Vector control mode
iii Parameter accessible in Closed Loop Vector control mode
iv Parameter accessible in PM Closed Loop Vector control mode
v Default / Range is dependent on drive voltage class: either 200V, 400V, or 500V
vi Default is dependent on drive model number

C1 Parameter Name	Description	Choices	Default	Standard Parameter Numbers
Rescue Speed	**Rescue Speed:** Selects if the drive should run at the speed set in Rescue Oper Spd (A3) or follow the controller speed command when the drive is in Rescue Operation Mode. • Rescue Oper Spd - the drive will run at the speed set in Rescue Oper Spd (A3) • Selected speed - drive will run at the commanded speed from the controller.	- Rescue Oper Spd - Selected Sped	Rescue Oper Spd	S4-15
StallP Accel Sel [i, ii]	**Stall Prevention Acceleration Selection:** Selection that can help prevent overcurrent fault, motor overload fault, or drive overload fault when lifting a heavy load. • General Purpose - acceleration is paused as long as the current is above StallP Accel Lvl (A1). • Intelligent - accelerate in the shortest possible time without exceeding StallP Accel Lvl (A1). • Disabled - deactivates this feature.	- General Purpose - Intelligent - Disabled	General Purpose [i, ii]	L3-01
StallP Run Sel [i]	**Stall Prevent Run Selection:** Determines how Stall Prevention works during run. To prevent the motor from stalling, the speed is reduced when a transient overload occurs while running. • Decel Time 1 - motor decelerates using Decel Ramp 1 (A2) while Stall Prevention is performed. • Decel Time 2 - motor decelerates using C1-04 while Stall Prevention is performed. • Disabled - drive runs at a set frequency. A heavy load may cause speed loss.	- Decel Time 1 - Decel Time 2 - Disabled	Decel Time 1 [i]	L3-05
Auto Fc Reduce	**Automatic Carrier Frequency Reduction:** Torque Boost increases the output current limit while decreasing the carrier frequency when the output current exceeds a certain value.	- Disabled - Enabled	Disabled	L8-38
Term A1 Level	**Terminal A1 Level:** Sets the analog input A1 as uni-polar or bi-polar.	- -10 ~ +10 VDC - 0 ~ 10 VDC	-10 ~ +10 VDC	H3-01
Term A2 Level	**Terminal A2 Level:** Sets the analog input A2 as uni-polar or bi-polar.	- -10 ~ +10 VDC - 0 ~ 10 VDC	-10 ~ +10 VDC	H3-09
Term FM Lvl Sel	**Terminal FM Selection:** Sets the analog output FM as uni-polar or bi-polar.	- -10 ~ +10 VDC - 0 ~ 10 VDC	-10 ~ +10 VDC	H4-07
Term AM Lvl Sel	**Terminal AM Selection:** Sets the analog output AM as uni-polar or bi-polar.	- -10 ~ +10 VDC - 0 ~ 10 VDC	-10 ~ +10 VDC	H4-08

i Parameter accessible in V/f control mode
ii Parameter accessible in Open Loop Vector control mode
iii Parameter accessible in Closed Loop Vector control mode
iv Parameter accessible in PM Closed Loop Vector control mode
v Default / Range is dependent on drive voltage class: either 200V, 400V, or 500V
vi Default is dependent on drive model number

C1 Parameter Name	Description	Choices	Default	Standard Parameter Numbers
OH Pre-Alarm Sel	**Over Heat Pre Alarm Selection:** Sets the drive operation when an over heat pre-alarm is detected. Alarm Only - an alarm will be triggered that will not shut down the drive Ramp to Stop - an alarm is triggered, the drive decelerates to a stop with the current s-curve, and a fault output is triggered Coast to Stop - a fault is triggered that will shut off power to the motor Fast-Stop - an alarm is triggered, the drive decelerates to a stop using Fast Stop Time (A1), and a fault output is triggered	- Alarm Only - Coast to Stop - Fast-Stop - Ramp to Stop	Alarm Only	L8-03
Inp Ph Loss Prot	**Input Phase Loss Protection:** • Defines when the drive will declare the PF fault. **Note:** 600V class drive model will not accept a setting of "Always Enabled"	- Always Enabled - Disabled - Enbl at ConstSpd - Enbl During Run	Always Enabled	L8-05
NTSD Mode	**Normal Terminal Stopping Device Mode:** Selects the type of NTSD the drive will be performing. For more details, refer to *Normal Terminal Stopping Device Mode on page 61*.	- 1 Threshold - 2 Thresholds - 3 Thresholds - External - Input - Jerk Disabled	External - Input	P3-03
PM Cur Unbal Det [iv]	**Permanent Magnet Current Unbalance Detection:** Enables or Disables output current imbalance detection when running in Closed Loop PM Vector control. Current Imbalance can heat up a PM motor and lead to demagnetization of the magnets.	- Disabled - Enabled	Enabled [iv]	L8-29

i Parameter accessible in V/f control mode
ii Parameter accessible in Open Loop Vector control mode
iii Parameter accessible in Closed Loop Vector control mode
iv Parameter accessible in PM Closed Loop Vector control mode
v Default / Range is dependent on drive voltage class: either 200V, 400V, or 500V
vi Default is dependent on drive model number

■ Pre-Torque

Pre-torque is a feature that will eliminate rollback at the start of a run by producing torque before the mechanical brakes lift. This feature requires the use of an external device like a load weigh device to determine how much motor torque should be applied.

Note: Terminal A1 / A2 Bias and the Term A1 / A2 Gain parameters in the A1 sub-menu have no effect on pre-torque. Pre-torque is limited to 120%.

Note: Pre-Torq Value 1 – 2 and Pre-Torq Input 1 – 2 have no effect when Trq Comp Type (C1) is set to Feed Forward or none of the parameters in the C5 sub-menu is set to Pre-Torque. Pre-Torq Value 1 – 2 and Pre-Torq Input 1 – 2 will have an effect regardless of setting of Pre-Torq Cmd Src (C1).

ONLY if the pre-torque signal will be fed from a serial message or a full scale ±10V analog voltage, use settings below (there is no setup procedure):

Table 30 Parameter Recommendation for Setting Up a Full-Scale Pre-Torque

Parameter Name (sub-menu)	Default	Recommended Starting Values
Trq Com Type (C1)	Pre-Torque	Pre-torque
Pre-Torq Cmd Src (C1)	Disabled	Refer to the car controller documentation to set it as Analog or Serial HPV.
Term A1 FuncSel (C5)	Speed Command	One of these analog inputs has to be set to Pre-Torque to enable pre-torque.
Term A2 FuncSel (C5)	Pre-Torque	
Pre-Torque Ramp T (A1)	500 ms	500 ms
PreTorq Bias@Dwn (A1)	0.0%	0.0%

Parameter Name (sub-menu)	Default	Recommended Starting Values
Pre-Torq Value 1	-100.0%	-100.0%
Pre-Torq Value 2	100.0%	100.0%
Pre-Torq Input 1	-100.0%	-100.0%
Pre-Torq Input 2	100.0%	100.0%

Note: The load weigh device should be calibrated before adjusting the drive parameters.

ONLY if the pre-torque signal will be fed from an ANALOG voltage that is NOT a full scale ±10V, follow the steps below:

Table 31 Parameter Recommendation for Setting Up a NON-Full-Scale Pre-Torque

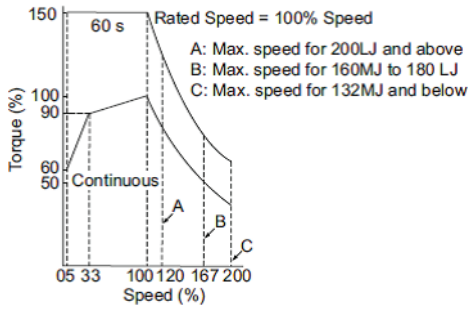
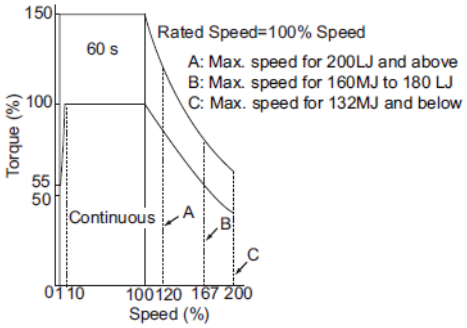
Parameter Name (sub-menu)	Default	Recommended Starting Values
Trq Comp Type (C1)	Pre-Torque	Pre-torque
Pre-Torq Cmd Src (C1)	Disabled	Disabled
Term A1 FuncSel (C5)	Speed Command	NEITHER should be set to Pre-Torque
Term A2 FuncSel (C5)	Pre-Torque	
Pre-Torque Ramp T (A1)	500 ms	500 ms
PreTorq Bias@Dwn (A1)	0.0%	0.0%
Pre-Torq Value 1 (A1)	-100.0%	-100.0%
Pre-Torq Value 2 (A1)	100.0%	100.0%
Pre-Torq Input 1 (A1)	-100.0%	-100.0%
Pre-Torq Input 2 (A1)	100.0%	100.0%

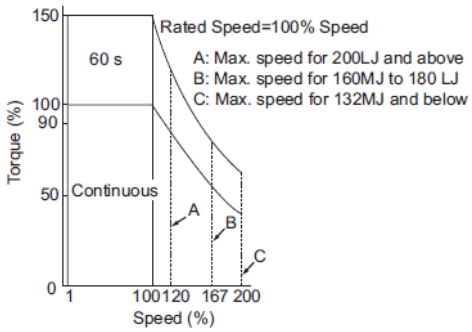
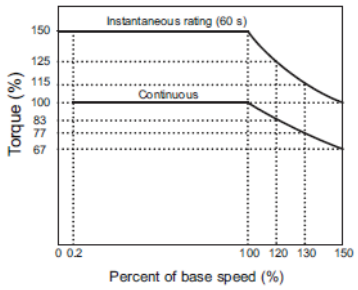
1. With an EMPTY elevator (no test weights), run the elevator toward the middle of the hoistway to stay away from the terminal floor when setting up Pre-torque.
2. Set the controller for inspection operation.

■ Motor Overload

The motor overload is an electronic overload that protects the motor from overheating. This overload depends on time, current output, and speed of the motor. The drive has 4 different overload types.

Table 32 Motor Overload Curves

Mtr OL Charact (A5)	Descriptions	Overload Curve
VT Motor	General-purpose motor This overload should be used on motor designed to operate from line power. The motor cooling is most effective when running at rated base frequency. The overload will more likely be triggered at 100% load at slow speeds.	
CT	Drive dedicated motor Motor is designed to effectively cool itself even at slow speeds. The motor can run with 100% load from 5Hz to 50Hz.	

Mtr OL Charact (A5)	Descriptions	Overload Curve
Vector Motor	Vector motors Motor is designed to effectively cool itself even at slow speeds. The motor can run with 100% load from 0.5Hz to 50Hz.	
Constant Torque	Constant torque PM motors Motor is designed to cool itself at very slow speeds. The motor can run with 100% load from 0.2% speed to 100% speed.	

■ Normal Terminal Stopping Device Mode

This parameter allows the drive to perform pre-programmed NTS slowdowns when the elevator is running too fast for it to make it to the terminal landings. When the drive/controller thinks the elevator is traveling too fast, the drive can be forced to decelerate faster than normal to a slow running speed to safely make it to the terminal landings. There are five methods of NTSD that can be selected:

External - Input:

This should be selected if the drive's NTSD function will not be used, or if it is desired for the drive to go into NTSD mode as soon as the input programmed for NTSD Input 1 in the C2 sub-menu is triggered logic low. The drive will immediately slow down to the NTSD Speed (A1) and clamp the speed there. Once the speed command is below the setting of NTSD Speed (A1), the drive will follow the speed command. While the drive is in NTSD Operation, only the deceleration portion of the s-curve will be changed to use NTSD Decel Rate (A2), NTSD DecJrkStart (A2), and NTSD DecelJrkEnd (A2). The drive will get out of NTSD Operation and back into normal operation when the NTSD input is re-asserted as logic high again.

Table 33 External - Input NTSD Mode Logic Input Table

NTSD Input 1	NTSD Input 2	Result
Not Used	Not Used	Internal NTSD function of drive is not used
1		Normal operation
0		Use NTSD Decel Rate, NTSD DecJrkStart, and NTSD DecelJrkEnd to decelerate the elevator. Clamp speed command so it cannot exceed NTSD Speed

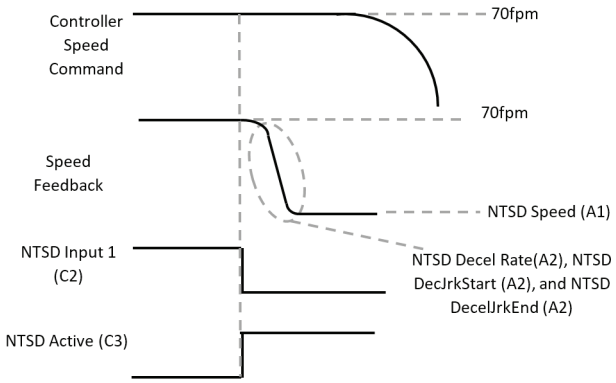


Figure 17 External - Input NTSD Mode Logic Input Table

One Threshold:

This should be selected if the drive uses only one speed check point to determine whether or not it should go into NTSD Operation. When NTSD Input 1 in the C2 sub-menu is triggered logic low, the drive will compare the speed feedback to NTSD Threshold 1 (A1). If the speed feedback is faster than NTSD Threshold 1 (A1), the drive will slow down to the NTSD Speed (A1) and clamp the speed there. Once the speed command is below the setting of NTSD Speed (A1), the drive will follow the speed command. While the drive is in NTSD Operation, only the deceleration portion of the s-curve will be changed to use NTSD Decel Rate (A2), NTSD DecJrkStart (A2), and NTSD DecelJrkEnd (A2). The drive will get out of NTSD Operation and back into normal operation when the NTSD input is re-asserted as logic high and the speed feedback is slower than or running at NTSD Speed (A1).

Table 34 One Threshold NTSD Mode Function Table

NTSD Input 1	NTSD Input 2	Result
1	Not Used	Normal operation
0		If | speed feedback | > NTSD Threshold 1 decelerate elevator using NTSD Decel Rate, NTSD DecJrkStart, and NTSD DecelJrkEnd and clamp the drive speed command to | speed command | ≤ NTSD Speed

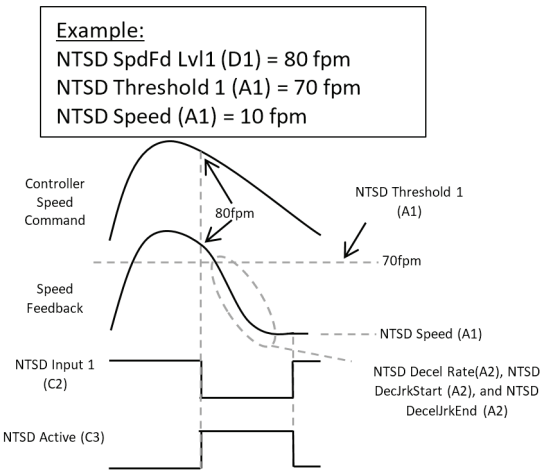


Figure 18 One Threshold NTSD Mode Diagram

Two Thresholds:

This should be selected if the drive uses two speed check points to determine whether or not it should go into NTSD Operation. When NTSD Input 1 or NTSD Input 2 in the C2 sub-menu is triggered logic low, the drive will compare the speed feedback to NTSD Threshold 1 (A1) or NTSD Threshold 2 (A1). If the speed feedback is faster than NTSD Threshold 1 (A1) or NTSD Threshold 2 (A1), the drive will slow down to the NTSD Speed (A1) and clamp the speed there. Once the speed command is below the setting of NTSD Speed (A1), the drive will follow the speed command. While the drive is in NTSD Operation, only the deceleration portion of the s-curve will be changed to use NTSD Decel Rate (A2), NTSD DecJrkStart (A2), and NTSD DecelJrkEnd (A2). The drive will get out of NTSD Operation and back into normal operation when: the NTSD inputs are re-asserted as logic high and the speed feedback is slower than or running at NTSD Speed (A1).

Table 35 Two Thresholds NTSD Mode Function Table

NTSD Input 1	NTSD Input 2	Result
1	1	Normal operation
1	0	if | speed feedback | > NTSD Threshold 2 decelerate elevator using NTSD Decel Rate, NTSD DecJrkStart, and NTSD DecelJrkEnd and clamp the drive speed command to | speed command | ≤ NTSD Speed
0	1	if | speed feedback | > NTSD Threshold 1 decelerate elevator using NTSD Decel Rate, NTSD DecJrkStart, and NTSD DecelJrkEnd and clamp the drive speed command to | speed command | ≤ NTSD Speed
0	0	

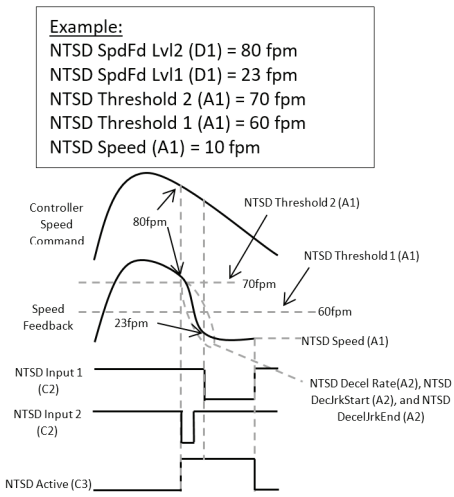


Figure 19 Two Thresholds NTSD Mode Diagram

Three Thresholds:

This should be selected if the drive uses three speed check points to determine whether or not it should go into NTSD Operation. When NTSD Input 1 and/or NTSD Input 2 in the C2 sub-menu is triggered logic low, the drive will compare the speed feedback to NTSD Threshold 1 (A1), NTSD Threshold 2 (A1), or NTSD Threshold 3 (A1). If the

speed feedback is faster than NTSD Threshold 1 (A1), NTSD Threshold 2 (A1), or NTSD Threshold 3 (A1), the drive will slow down to the NTSD Speed (A1) and clamp the speed there. Once the speed command is below the setting of NTSD Speed (A1), the drive will follow the speed command. While the drive is in NTSD Operation, only the deceleration portion of the s-curve will be changed to use NTSD Decel Rate (A2), NTSD DecJrkStart (A2), and NTSD DecelJrkEnd (A2). The drive will get out of NTSD Operation and back into normal operation when the NTSD inputs are re-asserted as logic high and the speed feedback is slower than or running at NTSD Speed (A1).

Table 36 Three Thresholds NTSD Mode Function Table

NTSD Input 1	NTST Input 2	Result
1	1	Normal operation
0	1	if | speed feedback | > NTSD Threshold 3 decelerate elevator using NTSD Decel Rate, NTSD DecJrkStart, and NTSD DecelJrkEnd and clamp the drive speed command to | speed command | ≤ NTSD Target Speed
1	0	if | speed feedback | > NTSD Threshold 2 decelerate elevator using NTSD Decel Rate, NTSD DecJrkStart, and NTSD DecelJrkEnd and clamp the drive speed command to | speed command | ≤ NTSD Speed
0	0	if | speed feedback | > NTSD Threshold 1 decelerate elevator using NTSD Decel Rate, NTSD DecJrkStart, and NTSD DecelJrkEnd and clamp the drive speed command to | speed command | ≤ NTSD Speed

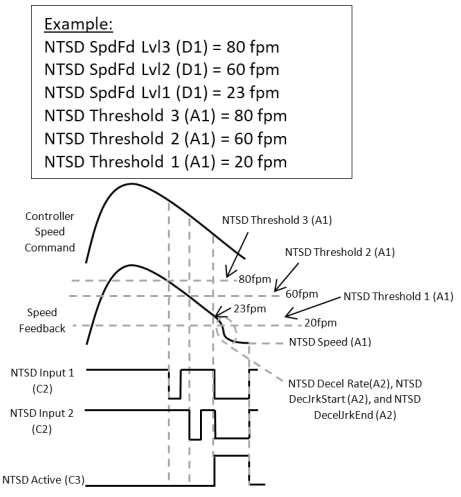


Figure 20 Three Thresholds NTSD Mode Diagram

Jerk Disabled:

This should be selected if it is desired for the drive to go into NTSD mode with the deceleration jerks disabled. The drive will go into NTSD Operation as soon as the input programmed for Not in NTSD in the C2 sub-menu is triggered logic low or if NTSD Active in the C2 sub-menu is triggered logic high. The drive will immediately slow down to the NTSD Speed (A1) and clamp the speed there. Once the speed command is below the setting of NTSD Speed (A1), the drive will follow the speed command. While the drive is in NTSD Operation, only the deceleration portion of the s-curve will be changed to use NTSD Decel Rate (A2) and have no deceleration jerks. The drive will get out of NTSD Operation and back into normal operation when the NTSD logic input is re-asserted as logic low or high again.

Table 37 Jerk Disabled - NTSD Active and Not in NTSD Function Table

NTSD Active	Not in NTSD	Result
0	Not Used	Normal operation
Not Used	1	
1	Not Used	Use NTSD Decel Rate and no deceleration jerks to decelerate the elevator. Clamp speed command so it cannot exceed NTSD Speed.
Not Used	0	

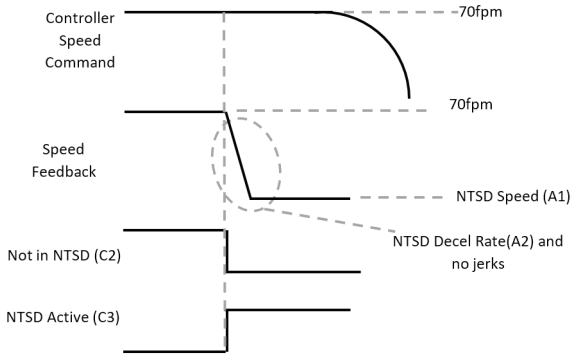


Figure 21 Jerk Disabled NTSD Mode Diagram with Not NTSD Input

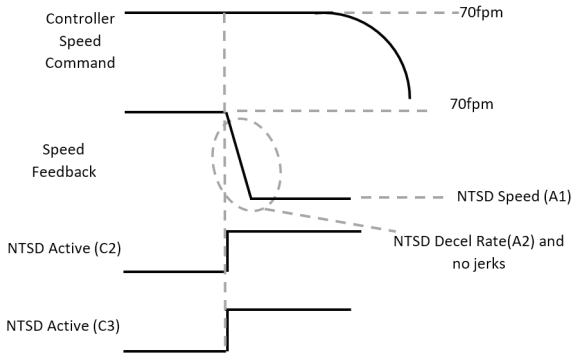


Figure 22 Jerk Disabled NTSD Mode Diagram with NTSD Active Input

■ Pulse Pre-Torque

The pulse pre-torque (PPT) is a function that will eliminate rollback in an elevator that does NOT have a load weighing device AND the PM motor has a SPLINED type brake. The splined type brakes are best-suited for this feature because there is a small amount of mechanical float to determine car loading. The drive will take ~ 1 second to determine the car loading before the speed regulator release signal is active. Traditional pre-torque and position lock should be disabled when PPT is enabled.

■ Rescue Operation

The Rescue Operation is a feature in the drive that will assist the elevator to run to the nearest floor in the event of a power outage when a backup battery or UPS (uninterruptable power supply) is being used.

Parameter Names (sub-menu)	Default
LightLoad Search (C1)	Disabled
LightLdSrchMethod (C1)	Regen Direction
Power Supply Sel (C1)	Battery
UPS Spd Lmt Sel (C1)	Enabled
Rescue Speed (C1)	Rescue Oper Spd
LightLd SrchTime (A1)	1.0 Sec
LightLd Srch Spd (A1)	10.00%
Rescue Trq Limit (A1)	100%
UPS Power Rating (A1)	0.0 kVA
DC VoltLvl@Rescue (A1)	0V
PS ReductnDetLvl (A1)	80%
Rescue Oper Spd (A3)	0 fpm

Torque Limit During Rescue Operation

This function will set a limit on how much peak torque the drive can apply to try to limit the amount of power drawn from the battery or UPS. Once the drive is out of Rescue Operation mode, the drive switches back to using the Motor Torque Limit and the Regen Torque Limit in the A1 sub-menu.

Parameter Names (sub-menu)	Recommended Setting
Rescue Trq Limit (A1)	100%

Light Load Function

If a load weighing device is not being used to determine the direction of least work (direction that the elevator wants to drift when brakes are open), the drive can be used to determine the direction of least work. After the drive determines the direction, it will notify the controller which direction it will be traveling via logic output and force the elevator to run in that direction. Refer to ***Figure 23***.

Parameter Names (sub-menu)	Recommended Setting
LightLoad Search (C1)	Output Current
LightLdSrchMethod (C1)	Enable-Mtr 1 Only
LightLd SrchTime (A1)	0.5
LightLd Srch Spd (A1)	5%

Under Voltage Fault During Rescue Operation

When the drive is in Rescue Operation, it will change the under voltage fault threshold. This will allow the drive to operate a motor with a lower voltage UPS or battery.

Parameter Names (sub-menu)	Recommended Setting
DCVoltLvl@Rescue (A1)	Set to the DC voltage that is expected when the drive is being powered by a UPS or battery.

Rescue Operation Speed Command

When the drive is in Rescue Operation, the drive can be programmed to either use a preset running speed in the A3 sub-menu Rescue Operation Speed or follow the commanded speed from the car controller.

Parameter Names (sub-menu)	Recommended Setting
Rescue Speed (C1)	Refer to the car controller documentation
Rescue Oper Spd (A3)	Refer to the car controller documentation

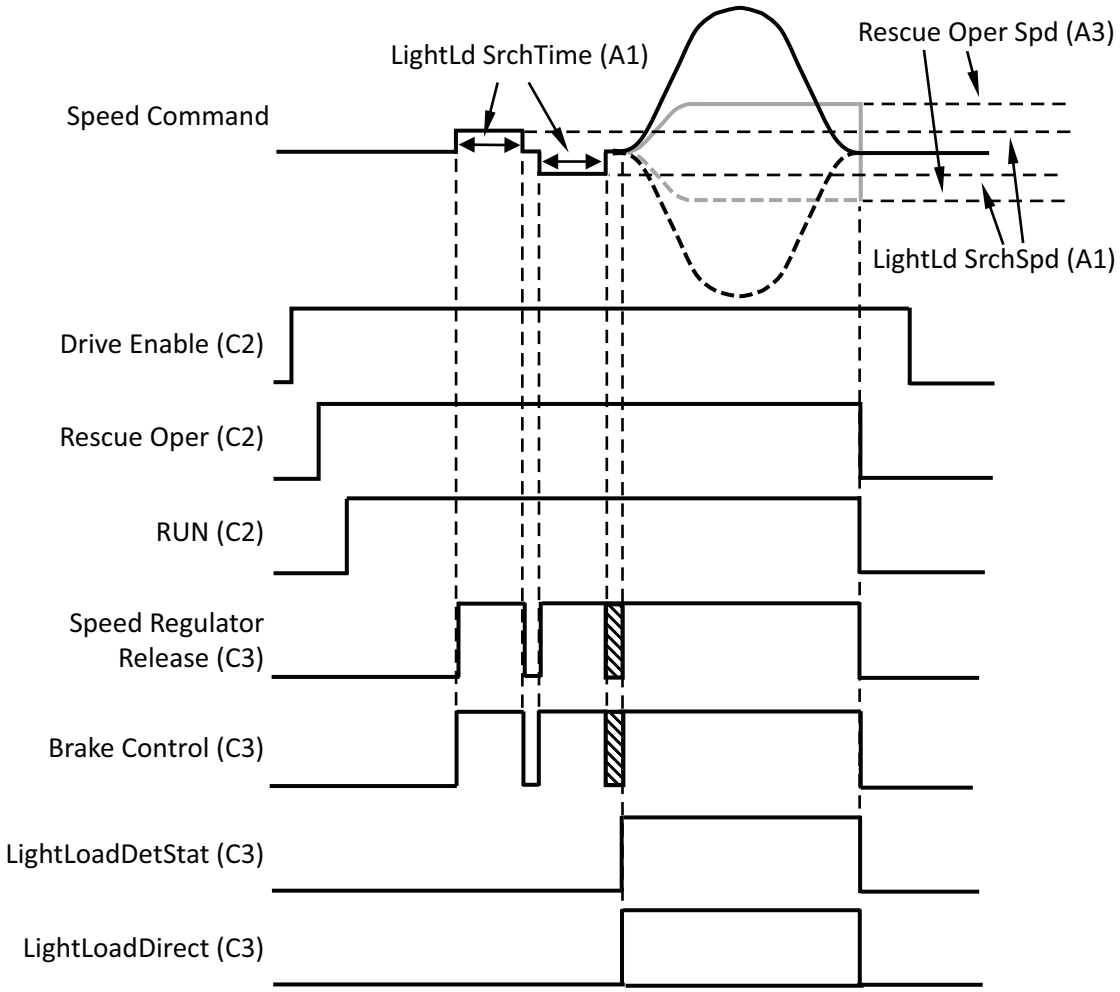


Figure 23 Rescue Operation Timing Diagram

■ LOGIC INPUTS C2 Sub-menu

Table 38 LOGIC INPUTS C2 Parameter List

C2 Parameter Name	Description	Default	Standard Parameter Numbers
Term S1 Func Sel	**Terminal S1 Function Selection:** Logic Input 1 on terminal S1	Drive Enable	H1-01
Term S2 Func Sel	**Terminal S2 Function Selection:** Logic Input 2 on terminal S2	Run	H1-02
Term S3 Func Sel	**Terminal S3 Function Selection:** Logic Input 3 on terminal S3	Up/Dwn	H1-03
Term S4 Func Sel	**Terminal S4 Function Selection:** Logic Input 4 on terminal S4	Fault Reset	H1-04
Term S5 Func Sel	**Terminal S5 Function Selection:** Logic Input 5 on terminal S5	Step Ref B0	H1-05
Term S6 Func Sel	**Terminal S6 Function Selection:** Logic Input 6 on terminal S6	Step Ref B1	H1-06
Term S7 Func Sel	**Terminal S7 Function Selection:** Logic Input 7 on terminal S7	Step Ref B2	H1-07
Term S8 Func Sel	**Terminal S8 Function Selection:** Logic Input 8 on terminal S8	Term Not Used	H1-08

Logic Input Choices

Note: It is recommended that if a logic input terminal is not to be used, the terminal should be programmed to "Term Not Used.' This is more relevant for the Multi-Step Reference inputs because the speed selected through the S1-S8 terminals overrides any speed received from the analog input or serial messages.

Table 39 Logic Input Choices

C2 Parameter Choices	Description	Standard Settings
Alternate Scurve	**Alternate S-Curve:** The drive will switch the S-Curve profile over to the alternate S-Curve in the A2 sub-menu. • Open/Inactive: Drive uses the default S-curve. • Closed/Active: Drive uses the Alternate S-Curve in the A2 sub-menu.	86
Base Block N.C.	**Base Block Normally Closed:** The drive output transistors will not switch/gate on. • Open/Inactive: The output transistors are disabled. • Closed/Active: The output transistors are enabled.	9
Base Block N.O.	**Base Block Normally Open:** The drive output transistors will not switch/gate on. • Open/Inactive: The output transistors are enabled. • Closed/Active: The output transistors are disabled.	8
Brake Feedback	**Brake Feedback:** The drive will monitor this input signal to verify that the switch brake is physically lifting or dropping with a normally open micro switch. • Open/Inactive: Brake is dropped. • Closed/Active: Brake is lifted/picked.	79

i Parameter accessible in V/f control mode
ii Parameter accessible in Open Loop Vector control mode
iii Parameter accessible in Closed Loop Vector control mode
iv Parameter accessible in PM Closed Loop Vector control mode
v Default / Range is dependent on drive voltage class: either 200V, 400V, or 500V
vi Default is dependent on drive model number

C2 Parameter Choices	Description	Standard Settings
Brake Feedback2	**Brake Feedback 2:** The drive will monitor this input signal to verify that the switch brake is physically lifting or dropping with a normally closed micro switch. • Open/Inactive: Brake is lifted/picked. • Closed/Active: Brake is dropped.	5B
Comm Test Mode	**Communication Test Mode:** Built-in function for self-diagnosing serial communications operation. • Open/Inactive: No test will be performed. • Closed/Active: Test will start.	67
DL Dist Correctn [iii, iv]	**Direct Landing Distance Correction:** The drive will stop at the designated floor with greater accuracy if the Direct Landing function is active. **Note:** Functionality is limited to Standard Navigation operation in the U10 sub-menu. • Open/Inactive: Drive will not initiate Direct Landing function. • Closed/Active: Drive will activate Direct Landing function.	5C
Drive Enable	**Drive Enable:** If this is set as a logic input, the drive output can be disabled or enabled. • Open/Inactive: Drive will not output voltage or current to the motor. • Closed/Active: Drive will allow voltage or current to be output to the motor.	80
Fast-Stop N.C.	**Fast Stop Normally Closed:** The drive will decelerate to a stop using the deceleration rate set in Fast Stop Time (A2). The drive can only be restarted after coming to a complete stop, the input is open/inactive, and removing the run signal. • Open/Inactive: Drive will not decelerate to a stop. • Closed/Active: Drive will begin to decelerate to a stop.	17
Fast-Stop N.O.	**Fast Stop Normally Open:** The drive will decelerate to a stop using the deceleration rate set in Fast Stop Time (A2). The drive can only be restarted after coming to a complete stop, the input is closed/active and removing the run signal. • Open/Inactive: Drive will begin to decelerate to a stop. • Closed/Active: Drive will not decelerate to a stop.	15
Fault Reset	**Fault Reset:** Active drive fault will be reset. • Open/Inactive: Drive will not attempt to reset active faults. • Closed/Active: Drive will reset the active fault.	14
Inspection Oper	**Inspection Speed Operation:** The drive will run at a predefined inspection speed. **Note:** Functionality is limited to Standard Navigation operation in the U10 sub-menu. • Open/Inactive: Drive operates normally. • Closed/Active: Drive will run at a predefined inspection speed.	54

i Parameter accessible in V/f control mode
ii Parameter accessible in Open Loop Vector control mode
iii Parameter accessible in Closed Loop Vector control mode
iv Parameter accessible in PM Closed Loop Vector control mode
v Default / Range is dependent on drive voltage class: either 200V, 400V, or 500V
vi Default is dependent on drive model number

C2 Parameter Choices	Description	Standard Settings
Intermed Speed	**Inspection Speed Operation:** The drive will run at a predefined inspection speed. **Note:** Functionality is limited to Standard Navigation operation in the U10 sub-menu. • Open/Inactive: Drive operates normally. • Closed/Active: Drive will run at a predefined speed.	51
Jog Freq Ref	**Jog Frequency Reference:** The drive will run at a predefined jog frequency. **Note:** Functionality is limited to Standard Navigation operation in the U10 sub-menu. • Open/Inactive: Drive operates normally. • Closed/Active: Drive will run at a predefined jog speed.	6
Leveling Speed	**Leveling Speed:** The drive will run at a predefined leveling speed. **Note:** Functionality is limited to Standard Navigation operation in the U10 sub-menu. • Open/Inactive: Drive operates normally. • Closed/Active: Drive will run at a predefined speed.	53
Motor 2 Select	**Motor 2 Selection:** The drive can control two different induction motors independently. **Note:** Functionality is limited to Standard Navigation operation in the U10 sub-menu. • Open/Inactive: Drive is running the default motor (motor 1). • Closed/Active: Drive is running motor 2.	16
Motor Cont Fdbk	**Motor Contactor Feedback:** The drive will monitor this input signal to verify that the motor contactor is physically picking or dropping with a normally open auxiliary relay. • Open/Inactive: Motor contactor is open/dropped. • Closed/Active: Motor contactor is closed/picked.	56
Motor Cont Fdbk2	**Motor Contactor Feedback 2:** The drive will monitor this input signal to verify that the motor contactor is physically picking or dropping with a normally closed auxiliary relay. • Open/Inactive: Motor contactor is closed/picked. • Closed/Active: Motor contactor is open/dropped.	5A
Multi-Acc/Dec 1	**Multi Acceleration or Deceleration 1:** The drive will accelerate or decelerate using different acceleration or deceleration rates.	7
Multi-Acc/Dec 2	**Multi Acceleration or Deceleration 2:** The drive will accelerate or decelerate using different acceleration or deceleration rates. **Note:** Functionality is limited to Standard Navigation operation in the U10 sub-menu.	1A
N.C Extrn Alm 2D	**Normally Closed External Alarm 2D:** The drive will declare an alarm at any time and continue to run. • Open/Inactive: Drive will declare an alarm at any time. • Closed/Active: Drive will operate normally.	2D

i Parameter accessible in V/f control mode
ii Parameter accessible in Open Loop Vector control mode
iii Parameter accessible in Closed Loop Vector control mode
iv Parameter accessible in PM Closed Loop Vector control mode
v Default / Range is dependent on drive voltage class: either 200V, 400V, or 500V
vi Default is dependent on drive model number

C2 Parameter Choices	Description	Standard Settings
N.C Extrn Alm 2F	**Normally Closed External Alarm 2F:** The drive will declare an alarm only during a run and continue to run. • Open/Inactive: Drive will declare an alarm only during a run. • Closed/Active: Drive will operate normally.	2F
N.C Extrn Flt 21	**Normally Closed External Fault 21:** The drive will ramp to a stop, then declare a fault at any time. • Open/Inactive: Drive will ramp to a stop and declare a fault at any time. • Closed/Active: Drive will operate normally.	21
N.C Extrn Flt 23	**Normally Closed External Fault 23:** The drive will ramp to a stop, then declare a fault, but only during a run. • Open/Inactive: Drive will ramp to a stop, then declare a fault, but only during a run. • Closed/Active: Drive will operate normally.	23
N.C Extrn Flt 25	**Normally Closed External Fault 25:** The drive will declare a fault and coast to a stop at any time. • Open/Inactive: Drive will declare a fault and coast to a stop at any time. • Closed/Active: Drive will operate normally.	25
N.C Extrn Flt 27	**Normally Closed External Fault 27:** The drive will declare a fault and coast to a stop, but only during a run. • Open/Inactive: Drive will declare a fault and coast to a stop, but only during a run. • Closed/Active: Drive will operate normally.	27
N.C Extrn Flt 29	**Normally Closed External Fault 29:** The drive will go into a fast stop, then declare a fault at any time. • Open/Inactive: Drive will go into a fast stop, then declare a fault at any time. • Closed/Active: Drive will operate normally.	29
N.C Extrn Flt 2B	**Normally Closed External Fault 2B:** The drive will go into a fast stop, then declare a fault, but only during a run. • Open/Inactive: Drive will go into a fast stop, then declare a fault, but only during a run. • Closed/Active: Drive will operate normally.	2B
N.O Extrn Alm 2C	**Normally Open External Fault 2C:** The drive will declare an alarm at any time and continue to run. • Open/Inactive: Drive will operate normally. • Closed/Active: Drive will declare an alarm at any time.	2C
N.O Extrn Alm 2E	**Normally Open External Alarm 2E:** The drive will declare an alarm only during a run, and continue to run. • Open/Inactive: Drive will operate normally. • Closed/Active: Drive will ramp to a stop and declare a fault at any time.	2E

i Parameter accessible in V/f control mode
ii Parameter accessible in Open Loop Vector control mode
iii Parameter accessible in Closed Loop Vector control mode
iv Parameter accessible in PM Closed Loop Vector control mode
v Default / Range is dependent on drive voltage class: either 200V, 400V, or 500V
vi Default is dependent on drive model number

C2 Parameter Choices	Description	Standard Settings
N.O Extrn Flt 20	**Normally Open External Fault 20:** The drive will ramp to a stop, then declare a fault at any time. • Open/Inactive: Drive will operate normally. • Closed/Active: Drive will ramp to a stop and declare a fault at any time.	20
N.O Extrn Flt 22	**Normally Open External Fault 22:** The drive will ramp to a stop, then declare a fault, but only during a run. • Open/Inactive: Drive will operate normally. • Closed/Active: Drive will ramp to a stop, then declare a fault, but only during a run.	22
N.O Extrn Flt 24	**Normally Open External Fault 24:** The drive will declare a fault and coast to a stop at any time. • Open/Inactive: Drive will operate normally. • Closed/Active: Drive will declare a fault and coast to a stop at any time.	24
N.O Extrn Flt 26	**Normally Open External Fault 26:** The drive will declare a fault and coast to a stop but only during a run. • Open/Inactive: Drive will operate normally. • Closed/Active: Drive will declare a fault and coast to a stop, but only during a run.	26
N.O Extrn Flt 28	**Normally Open External Fault 28:** The drive will go into a fast stop, then declare a fault at any time. • Open/Inactive: Drive will operate normally. • Closed/Active: Drive will go into a fast stop, then declare a fault at any time.	28
N.O Extrn Flt 2A	**Normally Open External Fault 2A:** The drive will go into a fast stop, then declare a fault, but only during a run. • Open/Inactive: Drive will operate normally. • Closed/Active: Drive will go into a fast stop, then declare a fault, but only during a run.	2A
Nominal Speed	**Nominal Speed:** The drive will run at a predefined speed. Functionality is limited to Standard Navigation operation in the U10 sub-menu. • Open/Inactive: Drive will operate normally. • Closed/Active: Drive will run at a predefined speed.	50
Not in NTSD	**Not in Normal Terminal Stopping Device:** The drive will activate NTSD Mode. ***Refer to Normal Terminal Stopping Device Mode on page 61***. • Open/Inactive: Drive will go into NTSD Mode. • Closed/Active: Drive will operate normally.	82
NTSD Active	**Normal Terminal Stopping Device Active:** The drive will activate NTSD Mode. ***Refer to Normal Terminal Stopping Device Mode on page 61***. • Open/Inactive: Drive will operate normally. • Closed/Active: Drive will go into NTSD Mode.	83
NTSD Input 1	**Normal Terminal Stopping Device Input 1:** The drive will activate NTSD Mode. ***Refer to Normal Terminal Stopping Device Mode on page 61***.	84

i Parameter accessible in V/f control mode
ii Parameter accessible in Open Loop Vector control mode
iii Parameter accessible in Closed Loop Vector control mode
iv Parameter accessible in PM Closed Loop Vector control mode
v Default / Range is dependent on drive voltage class: either 200V, 400V, or 500V
vi Default is dependent on drive model number

C2 Parameter Choices	Description	Standard Settings
NTSD Input 2	**Normal Terminal Stopping Device Input 2:** The drive will activate NTSD Mode. *Refer to Normal Terminal Stopping Device Mode on page 61*.	85
Pre-Torque Latch [iii, iv]	**Pre-Torque Latch:** The drive will clamp the pre-torque signal. • Open/Inactive: Pre-torque reference will follow the command from the controller. • Closed/Active: Pre-torque reference will be clamped to the value that was seen when the input was triggered.	81
Releveling Speed	**Releveling Speed:** The drive will run at a predefined speed. **Note:** Functionality is limited to Standard Navigation operation in the U10 sub-menu. • Open/Inactive: Drive will operate normally. • Closed/Active: Drive will run at a predefined speed.	52
Rescue Oper	**Rescue Operation:** The drive will activate Rescue Operation. • Open/Inactive: Drive will operate normally. • Closed/Active: Drive will activate Rescue Operation.	55
Run	**Run:** The drive will run. • Open/Inactive: Drive will not run at all. • Closed/Active: Drive will run.	42
Run Down	**Run Down:** The drive will run in the down direction. • Open/Inactive: Drive will not run at all. • Closed/Active: Drive will run in the down direction.	41
Run Up	**Run Up:** The drive will run in the up direction. • Open/Inactive: Drive will not run at all. • Closed/Active: Drive will run in the up direction.	40
Speed Limit Down	**Speed Limit Down:** The drive will limit speed in the down direction to leveling speed. **Note:** Functionality is limited to Standard Navigation operation in the U10 sub-menu. • Open/Inactive: Drive will operate normally. • Closed/Active: Drive will limit speed in the down direction.	58
Speed Limit Up	**Speed Limit Up:** The drive will limit speed in the up direction to leveling speed. **Note:** Functionality is limited to Standard Navigation operation in the U10 sub-menu. • Open/Inactive: Drive will operate normally. • Closed/Active: Drive will limit speed in the up direction.	57
Step Ref B0	**Step Reference Bit 0 – 3:** The drive will use these 4 bits to select the appropriate speed command in the A3 sub-menu. The sequence can be found in *Table 26 on page 49*.	3
Step Ref B1		4
Step Ref B2		5
Step Ref B3		32

i Parameter accessible in V/f control mode
ii Parameter accessible in Open Loop Vector control mode
iii Parameter accessible in Closed Loop Vector control mode
iv Parameter accessible in PM Closed Loop Vector control mode
v Default / Range is dependent on drive voltage class: either 200V, 400V, or 500V
vi Default is dependent on drive model number

C2 Parameter Choices	Description	Standard Settings
Term Not Used	**Terminal Not Used:** The programmed logic input will not have any functionality.	F
Timer Function	**Timer Function:** The drive digital output can be delayed by a digital input. **Note:** Functionality is limited to Standard Navigation operation in the U10 sub-menu.	18
Up/Dwn	**Up or Down:** The drive will run up or run down, depending on the signal. • Open/Inactive: Drive will run up. • Closed/Active: Drive will run down.	43
i Parameter accessible in V/f control mode ii Parameter accessible in Open Loop Vector control mode iii Parameter accessible in Closed Loop Vector control mode iv Parameter accessible in PM Closed Loop Vector control mode v Default / Range is dependent on drive voltage class: either 200V, 400V, or 500V vi Default is dependent on drive model number		

■ LOGIC OUTPUTS C3 Sub-menu

Table 40 LOGIC OUTPUTS C3 Parameter List

C3 Parameter Name	Description	Default	Standard Parameter Numbers
P1 Func Sel	**P1 - C1 Function Selection:** Photocoupler output 1	During RUN 2	H2-04
P2 Func Sel	**P2 - C2 Function Selection:** Photocoupler output 2	Term Not Used	H2-05
M1-M2 Func Sel	**M1 - M2 Function Selection:** Normally open relay output	Brake Control	H2-01
M3-M4 Func Sel	**M3 - M4 Function Selection:** Normally open relay output	Mtr Contact Ctrl	H2-02
M5-M6 Func Sel	**M5 - M6 Function Selection:** Normally open relay output	Drive Ready	H2-03

Logic Output Choices

The cross reference of the choices in the Logic Outputs (C3) between the Magnetek and Standard Menus are listed below.

Table 41 Logic Output Choices

C3 Parameter Choices	Standard Settings	Standard Choices
BaseBlk 1	8	During Baseblock (N.O.)
BaseBlk 2	1B	During Baseblock 2 (N.C.)
Brake Control	50	Brake Control
Brk Trans Fault	4E	Braking Transistor Fault (rr)
Current Mon Stat	5C	Motor Current Monitor
DC Bus Undervolt	7	DC Bus Undervoltage
Door Zone	52	Door Zone Reached
Drive Ready	6	Drive Ready (READY)
During RUN 1	0	During Run
During RUN 2	37	During Frequency Output
Fan Alrm Det	60	Internal Cooling Fan Alarm
Fault	E	Fault
Fault Reset	1E	Reset Enabled
LightLoadDetStat	55	Light Load Direction Detection Status
LightLoadDirect	54	Light Load Direction
Maintenance	2F	Maintenance Period
Minor Fault	10	Minor Fault
Motor 2 Selected	1C	Motor 2 Selection
Mtr Contact Ctrl	51	Output Contactor Control
NTSD Active	43	NTSD Active
OH Prealarm	20	Drive Overheat Pre-alarm (oH)
Overload (OL1)	1F	Motor Overload Alarm (oL1)
OVRLD Shdwn Alm	42	Motor Overload Shut Down Alarm
PF Detected	47	Input Phase Loss
PoleSearch Stat	61	Motor Pole Search Status
Ref Source	9	Speed Reference Source

i Parameter accessible in V/f control mode
ii Parameter accessible in Open Loop Vector control mode
iii Parameter accessible in Closed Loop Vector control mode
iv Parameter accessible in PM Closed Loop Vector control mode
v Default / Range is dependent on drive voltage class: either 200V, 400V, or 500V
vi Default is dependent on drive model number

C3 Parameter Choices	Standard Settings	Standard Choices
Regenerating [iii, iv]	1D	During Regeneration
Reset Cmd Active	11	Fault Reset Command Active
Reverse Dir	1A	During Down Direction
Run Cmd Source	A	Up/Down Command Source
SafeDisable Stat	58	Safe Disable Status
Spd Detection 1	4	Speed Detection 1
Spd Detection 2	5	Speed Detection 2
Spd Detection 3	15	Speed Detection 3
Spd Detection 4	16	Speed Detection 4
Spd Ref Release	44	Speed Reference Release
Spd Reg Release	41	Speed Regulator Release
SpdRef/Out Agr 1	2	Speed Agree 1
SpdRef/Out Agr 2	13	Speed Agree 2
SpdRef/Set Agr 1	3	User-set Speed Agree 1
SpdRef/Set Agr 2	14	User-set Speed Agree 2
Speed Dev Low [iii, iv]	40	Speed Deviation Low
Term Not Used	F	Not Used (Through Mode)
Timer Output	12	Timer Output
Torque Detect 1	B	Torque Detection 1
Torque Detect 2	18	Torque Detection 2
Torque Limit [ii, iii, iv]	30	During Torque Limit
Zero Servo End [iii, iv]	33	Within Position Lock Bandwidth
Zero Speed	1	Zero Speed
!BaseBlk 1	108	Inverse of Speed Reference Source
!BaseBlk 2	11B	Inverse of During Baseblock 2 (N.C.)
!Brake Control	150	Inverse of Brake Control
!Brk Trans Fault	14E	Inverse of Braking Transistor Fault (rr)
!CurrentMonStat	15C	Inverse of Motor Current Monitor
!DC Bus Undervlt	107	Inverse of During Baseblock (N.O.)
!Door Zone	152	Inverse of Door Zone Reached
!Drive Ready	106	Inverse of DC Bus Undervoltage
!During RUN 1	100	Inverse of During Run
!During RUN 2	137	Inverse of During Frequency Output
!Fan Alrm Det	160	Inverse of Internal Cooling Fan Alarm
!Fault	10E	Inverse of Fault
!Fault Reset	11E	Inverse of Reset Enabled
!LightLoadDetSta	155	Inverse of Light Load Direction Detection Status
!LightLoadDirect	154	Inverse of Light Load Direction
!Maintenance	12F	Inverse of Maintenance Period
!Minor Fault	110	Inverse of Minor Fault
!Motor 2 Select [i, ii, iii]	11C	Inverse of Motor 2 Selection
!MtrContact Ctrl	151	Inverse of Output Contactor Control
!NTSD Active	143	Inverse of NTSD Active
!OH Prealarm	120	Inverse of Drive Overheat Pre-alarm (oH)
!Overload (OL1)	11F	Inverse of Reset Enabled
!OVRLD ShdwnAlm	142	Inverse of Motor Overload Shut Down Alarm

i Parameter accessible in V/f control mode
ii Parameter accessible in Open Loop Vector control mode
iii Parameter accessible in Closed Loop Vector control mode
iv Parameter accessible in PM Closed Loop Vector control mode
v Default / Range is dependent on drive voltage class: either 200V, 400V, or 500V
vi Default is dependent on drive model number

C3 Parameter Choices	Standard Settings	Standard Choices
!PF Detected	147	Inverse of Input Phase Loss
!PoleSearch Stat [iv]	161	Inverse of Motor Pole Search Status
!Reference Src	109	Inverse of Speed Reference Source
!Regenerating	11D	Inverse of Regenerating
!ResetCmd Active	111	Inverse of Fault Reset Command Active
!Reverse Dir	11A	Inverse of During Down Direction
!Run Cmd Source	10A	Inverse of Up/Down Command Source
!SafeDisableStat	158	Inverse of Safe Disable Status
!Spd Detection 1	104	Inverse of Speed Detection 1
!Spd Detection 2	105	Inverse of Speed Detection 2
!Spd Detection 3	115	Inverse of Speed Detection 3
!Spd Detection 4	116	Inverse of Speed Detection 4
!Spd Ref Release	144	Inverse of Safe Reference Release
!Spd Reg Release	141	Inverse of Speed Regulator Release
!SpdRef/Out Agr1	102	Inverse of User-set Speed Agree 1
!SpdRef/Out Agr2	113	Inverse of Speed Agree 2
!SpdRef/Set Agr1	103	Inverse of Speed Detection 1
!SpdRef/Set Agr2	114	Inverse of User-set Speed Agree 2
!Speed Dev Low [iii, iv]	140	Inverse of Speed Deviation Low
!Timer Output	112	Inverse of Timer Output
!Torque Detect 1	10B	Inverse of Torque Detection 1
!Torque Detect 2	118	Inverse of Torque Detection 2
!Torque Limit [ii, iii, iv]	130	Inverse of During Torque Limit
!Zero Servo End [iii, iv]	133	Inverse of Within Position Lock Bandwidth
!Zero Speed	101	Inverse of Zero Speed

i Parameter accessible in V/f control mode
ii Parameter accessible in Open Loop Vector control mode
iii Parameter accessible in Closed Loop Vector control mode
iv Parameter accessible in PM Closed Loop Vector control mode
v Default / Range is dependent on drive voltage class: either 200V, 400V, or 500V
vi Default is dependent on drive model number

■ ANALOG OUTPUTS C4 Sub-menu

Table 42 ANALOG OUTPUTS C4 Parameter List

C4 Parameter Name	Description	Default	Standard Parameter Numbers
Term FM Func Sel	**Terminal FM Selection:** Analog output 1	Speed Reference	H4-01
Term AM Func Sel	**Terminal AM Selection:** Analog output 2	Speed Feedback	H4-04

Analog Output Choices

The cross reference of the choices in the Analog Outputs (C4) between the Magnetek and Standard are listed below.

Table 43 Analog Output Choices

C4 Parameter Choices	Standard Settings	Standard Choices
AI Opt Ch1 Level	121	AI Opt Ch1 Level
AI Opt Ch2 Level	122	AI Opt Ch2 Level
AI Opt Ch3 Level	123	AI Opt Ch3 Level
ASR Out w/o Fil [iii, iv]	625	Feedback Control Output
Car Accel Rate [iv]	431	Car Acceleration Rate
dAxis CtrlOutp [ii, iii, iv]	608	d-Axis Current Controller Output
DC Bus Voltage	107	DC Bus Voltage
Distance-to-go [iv]	442	Remaining Distance
Encoder Speed	192	Encoder Speed
Flux Position [iv]	613	Flux Position
Heatsink Temp	408	Heatsink Temperature
InertiaComp Outp [iii, iv]	626	Inertia Compensation Output
Input Speed	101	Speed Reference
MaxCurrent@Acc	426	Max. Current during Acceleration
MaxCurrent@Dec	427	Max. Current during Deceleration
MaxCurrent@Level	429	Max. Current during Leveling Speed
MaxCurrent@Run	428	Max. Current during Constant Speed
Mot EXC Current [ii, iii, iv]	602	Motor Excitation Current (Id)
Mot SEC Current	601	Motor Secondary Current (Iq)
Motor OL1 Level	416	Motor Overload Estimate (oL1)
Not Used	000	Not Used
Offset Frequency	621	Offset Frequency
Output Current	103	Output Current
Output kWatts	108	Output Power
Output Speed	102	Output Speed
Output Voltage	106	Output Voltage Reference
PG1 CounterValue	618	Speed Detection PG1 Counter
PG2 CounterValue	619	PG2 Counter Value
PID Diff Fdbk	502	PID Diff Fdbk
PID Feedback 1	501	PID Feedback 1
PID Feedback 2	505	PID Feedback 2
PID Input	502	PID Input

i Parameter accessible in V/f control mode
ii Parameter accessible in Open Loop Vector control mode
iii Parameter accessible in Closed Loop Vector control mode
iv Parameter accessible in PM Closed Loop Vector control mode
v Default / Range is dependent on drive voltage class: either 200V, 400V, or 500V
vi Default is dependent on drive model number

C4 Parameter Choices	Standard Settings	Standard Choices
PID Output	503	PID Output
PID Setpoint	504	PID Setpoint
PosLck Dev Count [iii, iv]	622	Position Lock Deviation Counter
Pre-Torque Ref [ii, iii, iv]	190	Torque Compensation
qAxis I CtrlOutp [ii, iii, iv]	607	q-Axis Current Controller Output
Rescue SpdLimLvl	440	Speed Reference Limit at Rescue Operation
Spd Ctrl Input [iii, iv]	603	Speed Control Loop Input
Spd Ctrl Output [iii, iv]	604	Speed Control Loop Output
SpdFbkCmp Output [iv]	656	Speed Feedback Compensation Output
Speed Command	191	Speed Reference
Speed Feedback [ii, iii, iv]	105	Speed Feedback
Speed Reference	116	Output Speed after Soft Start
Term A1 Level	113	Terminal A1 Input Voltage
Term A2 Level	114	Terminal A2 Input Voltage
Term A3 Level	115	Terminal A3 Input Voltage
Term RP Inp Freq	124	Term RP Inp Freq
Term Not Used	31	Not Used
Torque Reference [ii, iii, iv]	109	Torque Reference
Up/Dn 2 Bias Val	620	Up/Dn 2 Bias Val
Voltage Ref (Vd) [ii, iii, iv]	606	Output Voltage Reference (Vd)
Voltage Ref (Vq) [ii, iii, iv]	605	Output Voltage Reference (Vq)

i Parameter accessible in V/f control mode
ii Parameter accessible in Open Loop Vector control mode
iii Parameter accessible in Closed Loop Vector control mode
iv Parameter accessible in PM Closed Loop Vector control mode
v Default / Range is dependent on drive voltage class: either 200V, 400V, or 500V
vi Default is dependent on drive model number

C4 Sub-menu Detailed Descriptions

C4 Analog Outputs

The drive 2 analog outputs can be programed to output an analog voltage on terminals FM and AM. These 2 signals can be altered as shown in the figures below for the FM signal. The examples below show the original signal and the signal after the bias or gain is changed.

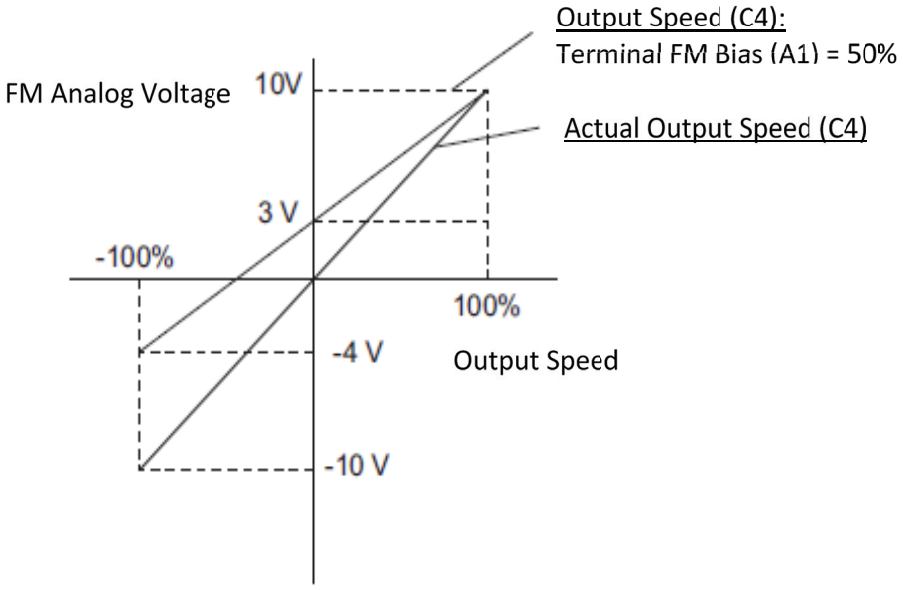


Figure 24 Bias Setting Example

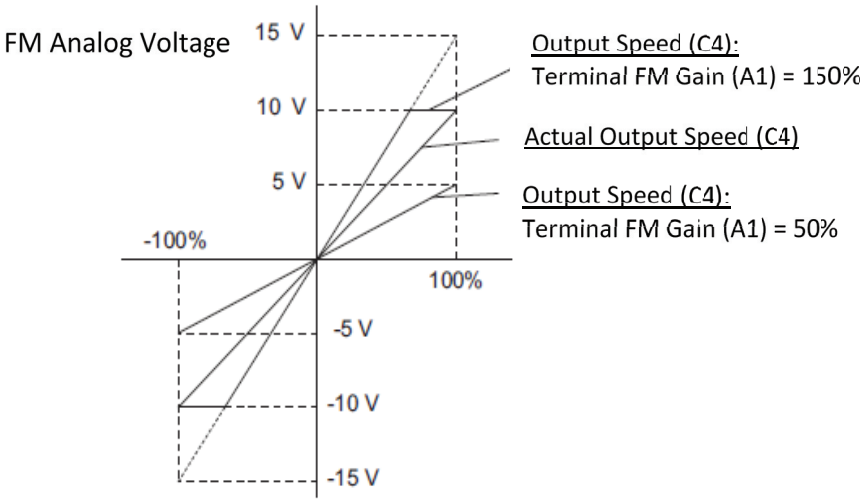


Figure 25 Gain Setting Example

■ ANALOG INPUTS C5 Sub-menu

Table 44 ANALOG INPUTS C5 Parameter List

C5 Parameter Name	Description	Default	Standard Parameter Numbers
Term A1 FuncSel	**Terminal A1 Function Selection:** Analog input 1	Speed Command	H3-02
Term A2 FuncSel	**Terminal A2 Function Selection:** Analog input 2	Pre-Torque	H3-10

Analog Input Choices

The cross reference of the choices in the Analog Inputs (C5) between the Magnetek and Standard are listed below.

Table 45 Analog Input Choices

C5 Parameter Choices	Descriptions	Standard Settings	Standard Choices
Aux Speed Ref 1	Used as a second speed reference. When Speed Command 1 is commanded (Step Reference B0-B3 = 0001), the drive speed will follow the analog input that is set to "Aux Speed Ref 1".	2	Auxiliary Speed Reference 1
Aux Speed Ref 2	Used as a third speed reference. When Speed Command 2 is commanded (Step Reference B0-B3 = 0010), the drive speed will follow the analog input that is set to "Aux Speed Ref 2".	3	Auxiliary Speed Reference 2
Motor PTC	PTC thermistor input Declares the oH3 alarm at 1.18V Declares the oH4 fault at 2.293V	E	Motor Temperature
Pre-Torque	Load cell input when P1-04 = 0 or Torque Feed Forward when P1-04 = 1 For more details, refer to *Pre-Torque on page 59*.	14	Torque Compensation
Speed Command	Value added to input signal when multiple analog terminals supply the speed reference	0	Speed Reference Bias
Term Not Used	The input will be disabled.	1F	Not used (Through Mode)

C5 Sub-menu Detailed Descriptions

C5 Analog Inputs

The drive 2 analog inputs can be programed to read an analog voltage on terminals A1 and A2. These 2 signals can be altered as shown in the figures below for the FM signal. The examples below show the original signal and the signal after the bias or gain is changed.

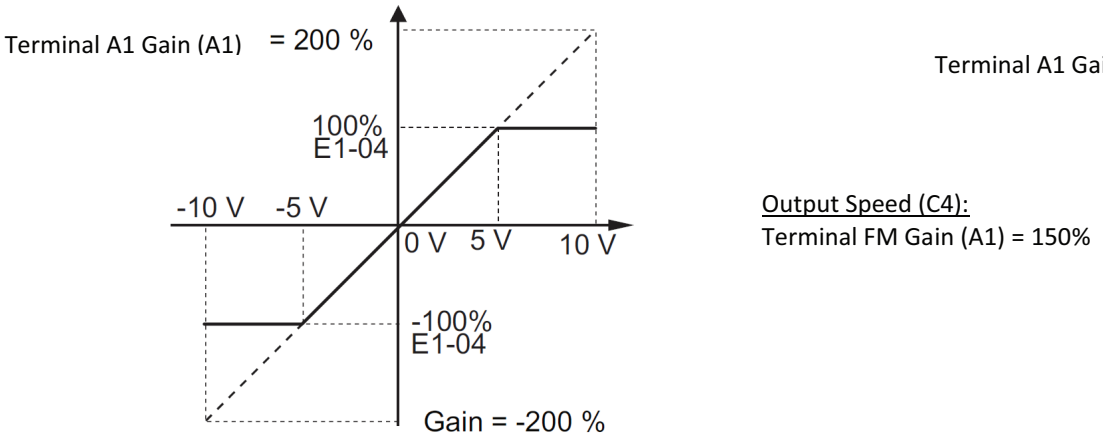


Figure 26 Bias Setting Example

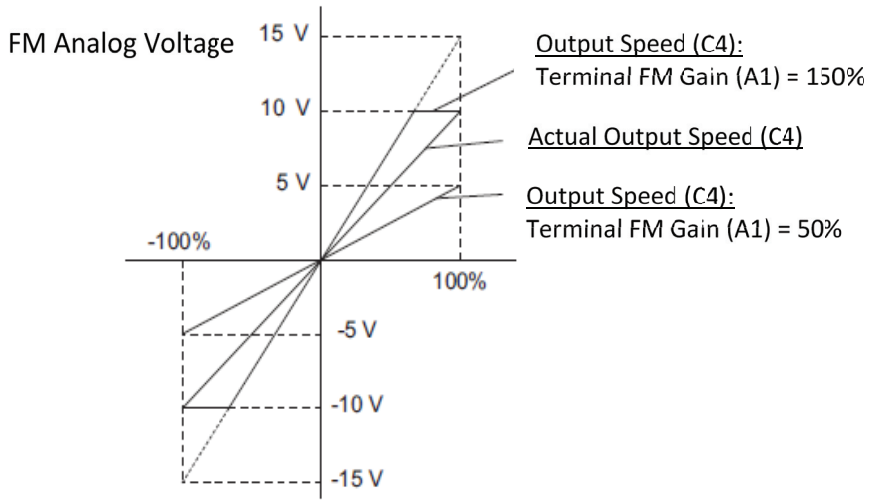


Figure 27 Gain Setting Example

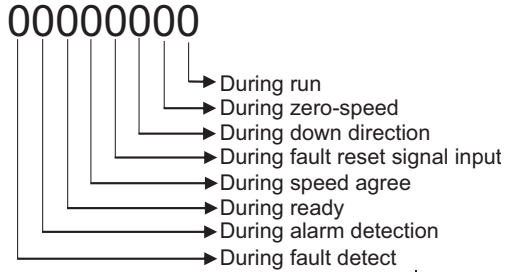
◆ Display D0 Menu

■ ELEVATOR DATA D1 Sub-menu

Table 46 ELEVATOR DATA D1 Parameter List

D1 Parameter Name	Description	Units	Standard Parameter Numbers
Speed Command	**Speed Command:** Displays the commanded speed from the controller.	fpm	U1-91
Speed Reference	**Speed Reference:** Displays the drive speed reference.	fpm	U1-16
Output Speed	**Output Speed:** Displays the speed that the drive is trying to output.	fpm	U1-02
Speed Feedback [ii, iii, iv]	**Speed Feedback:** Displays the speed feedback measured from the encoder.	fpm [ii, iii, iv]	U1-05
Encoder Speed	**Encoder Speed:** Displays the measured speed from the encoder.	RPM	U1-92
Output Term Sts	**Output Terminal Status:** Displays the output terminal status. 00000000 Terminal M1-M2 Terminal M3-M4 Terminal M5-M6 Terminal P1-C1 Terminal P2-C2 N/A Terminal MA-MB-MC	1 = on, 0 = off	U1-11
Input Term Sts	**Input Terminal Status:** Displays the input terminal status. 00000000 Terminal S1 Terminal S2 Terminal S3 Terminal S4 Terminal S5 Terminal S6 Terminal S7 Terminal S8	1 = on, 0 = off	U1-10
SrlBytesReceived	**Serial Bytes Received:** Number of valid HPV Mode 1 Runtime bytes the drive received after a power up. **Note:** The value rolls over after 65535.	number of byte	U7-02
SrlBytesSent	**Serial Bytes Received:** Number of valid HPV Mode 1 response bytes the drive received after a power up. **Note:** The value rolls over after 65535.	number of byte	U7-03

i Parameter accessible in V/f control mode
ii Parameter accessible in Open Loop Vector control mode
iii Parameter accessible in Closed Loop Vector control mode
iv Parameter accessible in PM Closed Loop Vector control mode
v Default / Range is dependent on drive voltage class: either 200V, 400V, or 500V
vi Default is dependent on drive model number

D1 Parameter Name	Description	Units	Standard Parameter Numbers
Drive Status	**Drive Status:** Displays the input terminal status. 	1 = on; 0 = off	U1-12
Term A1 Level	**Terminal A1 Level:** Displays the voltage input to terminal A1.	%	U1-13
Term A2 Level	**Terminal A2 Level:** Displays the voltage input to terminal A2.	%	U1-14
Pre-Torque Ref [iii, iv]	**Pre-Torque Reference:** Displays the amount of torque the drive will apply to the motor during pre-torque. Used for either Pre-Torque or Feed Forward operation, depending on Trq Comp Type (C1).	% of rated torque [iii, iv]	U1-90
Measured PPR	**Measured Pulses Per Revolution:** Only for Axial Flux, this displays the measured encoder pulses for one revolution of the motor (determined by the Z index).	PPR	U1-93
Z-Edge Count	**Z-Edge Count:** Only for Axial Flux, this displays the amount of motor revolution (determined by index pulses from the Z index channel).	--	U1-94
NTSD SpdFb Lvl1	**Normal Terminal Stopping Device Speed Feedback Level 1:** Displays the speed feedback that the drive measured when the NTSD Threshold 1 was triggered.	fpm	U7-04
NTSD SpdFb Lvl2	**Normal Terminal Stopping Device Speed Feedback Level 2:** Displays the speed feedback that the drive measured when the NTSD Threshold 2 was triggered.	fpm	U7-05
NTSD SpdFb Lvl3	**Normal Terminal Stopping Device Speed Feedback Level 3:** Displays the speed feedback that the drive measured when the NTSD Threshold 3 was triggered.	fpm	U7-06

i Parameter accessible in V/f control mode
ii Parameter accessible in Open Loop Vector control mode
iii Parameter accessible in Closed Loop Vector control mode
iv Parameter accessible in PM Closed Loop Vector control mode
v Default / Range is dependent on drive voltage class: either 200V, 400V, or 500V
vi Default is dependent on drive model number

■ POWER DATA D2 Sub-menu

Table 47 POWER DATA D2 Parameter List

D2 Parameter Name	Description	Units	Standard Parameter Numbers
DC Bus Voltage	**DC Bus Voltage:** Displays the measured DC bus voltage.	VDC	U1-07
Output Current	**Output Current:** Displays the measured output current to the motor.	A	U1-03
Output Voltage	**Output Voltage:** Displays the output voltage to the motor.	VAC	U1-06
Torque Reference [ii, iii, iv]	**Torque Reference:** Displays the internal torque reference.	% of rated torque [ii, iii, iv]	U1-09
Output kWatts	**Output Kilowatts:** Displays the output power (this value is calculated internally).	kW	U1-08
Motor OL1 Level	**Motor Overload Level:** Shows the value of the motor overload detection accumulator. 100% is equal to the oL1 detection level.	% of motor amp rating	U4-16
Drive OL2 Level	**Drive Overload Level:** Displays the level of the drive overload detection (oL2). A value of 100% is equal to the oL2 detection level	% drive amp rating	U4-17
Current PeakHold	**Current Peak Hold:** Displays the highest current value that occurred during a ride.	A	U4-13
Heatsink Temp	**Heatsink Temperature:** Displays the heatsink temperature.	C	U4-08
Drv Elapsed Time	**Drive Elapsed Time:** Displays the cumulative operation time of the drive. The value for the cumulative operation time counter can be reset in parameter o4-01. Use parameter o4-02 to determine if the operation time should start as soon as the power is switched on or only while the Up/Down command is present. The maximum number displayed is 99999, after which the value is reset to 0.	Hours	U4-01
Fan Elapsed Time	**Fan Elapsed Time:** Displays the cumulative operation time of the cooling fan. The default value for the fan operation time is reset in parameter o4-03. This value will reset to 0 and start counting again after reaching 99999.	Hours	U4-03
Fan Life Mon	**Fan Life Monitor:** Displays main cooling fan usage time in as a percentage of its expected performance life. Parameter o4-03 can be used to reset this monitor. The fan should be replaced when this monitor reaches 90%.	% of expected operation time	U4-04
Cap Life Mon	**Capacitor Life Monitor:** Displays main circuit capacitor usage time in as a percentage of their expected performance life. The capacitors should be replaced when this monitor reaches 90%. Parameter o4-05 can be used to reset this monitor.	% of expected operation time	U4-05

i Parameter accessible in V/f control mode
ii Parameter accessible in Open Loop Vector control mode
iii Parameter accessible in Closed Loop Vector control mode
iv Parameter accessible in PM Closed Loop Vector control mode
v Default / Range is dependent on drive voltage class: either 200V, 400V, or 500V
vi Default is dependent on drive model number

D2 Parameter Name	Description	Units	Standard Parameter Numbers
IGBT Life Mon	**IGBT Life Monitor:** Displays IGBT usage time as a percentage of the expected performance life. The IGBTs should be replaced when this monitor reaches 90%. Parameter o4-09 can be used to reset this monitor.	% of expected operation time	U4-07
MaxCurrent@Acc	**Maximum Current at Acceleration:** Shows the maximum current that occurred during acceleration.	A	U4-26
MaxCurrent@Dec	**Maximum Current at Deceleration:** Shows the maximum current that occurred during deceleration.	A	U4-27
MaxCurrent@Run	**Maximum Current at Run:** Shows the maximum current that occurred during ride at top speed.	A	U4-28
Slip Comp Value [i, ii]	**Slip Compensation Value:** Shows the slip compensation value.	% [i, ii]	U4-30
Flux Position	**Flux Position:** Displays the angular position of the PM flux position. This number is dependent on the setting of Enc Z-Pulse Offs (A5).	Deg	U6-13
PG Counter	**Pulse Generator Counter:** Displays the number of pulses for speed detection.	PPR	U6-18

i Parameter accessible in V/f control mode
ii Parameter accessible in Open Loop Vector control mode
iii Parameter accessible in Closed Loop Vector control mode
iv Parameter accessible in PM Closed Loop Vector control mode
v Default / Range is dependent on drive voltage class: either 200V, 400V, or 500V
vi Default is dependent on drive model number

◆ Fault F0 Menu

Table 48 FAULTS Sub-menus and Parameter Lists

Sub-menus	Parameter Names	Descriptions	Units	Standard Parameter Numbers
F1	***F1 ACTIVE FAULT Sub-menu***			
F1	Active Fault	Drive fault that is currently being declared.	--	U2-01
F1	Active Alarm	Drive alarm that is currently being declared.	--	--
F1	Active Error	Drive error that is currently being declared.	--	--
F2	***F2 PRE FAULT INFO Sub-menu***			
F2	Last Fault	Most recently cleared fault	--	U2-02
F2	Input Speed	Input Speed when drive faulted on the 'Last Fault'	fpm	U2-03
F2	Speed Reference	Speed Reference when drive faulted on the 'Last Fault'	fpm	U2-15
F2	Output Speed	Output Speed when drive faulted on the 'Last Fault'	fpm	U2-04
F2	Output Current	Output Current when drive faulted on the 'Last Fault'	A	U2-05
F2	Speed Feedback [ii, iii, iv]	Speed Feedback when drive faulted on the 'Last Fault'	fpm [ii, iii, iv]	U2-06
F2	Output Voltage	Output Voltage when drive faulted on the 'Last Fault'	VAC	U2-07
F2	DC Bus Voltage	DC Bus Voltage when drive faulted on the 'Last Fault'	VDC	U2-08
F2	Torque Reference [ii, iii, iv]	Torque Reference when drive faulted on the 'Last Fault'	% of rated torque [ii, iii, iv]	U2-10
F2	Input Term Sts	Input Terminal Status when drive faulted on the 'Last Fault'. Refer to Input Term Sts (D1).	1 = on, 0 = off	U2-11
F2	Output Term Sts	Output Terminal Status when drive faulted on the 'Last Fault'. Refer to Output Term Sts (D1).	1 = on, 0 = off	U2-12
F2	Drive Status	Drive Status when drive faulted on the 'Last Fault'. Refer to Drive Status (D1).	1 = on, 0 = off	U2-13
F2	Drv Elapsed Time	Time when drive faulted on the 'Last Fault'	Hours	U2-14
F2	Heatsink Temp	Heat sink temperature when drive faulted on the 'Last Fault'	C	U2-20
F2	oPE Flt Parameter	Displays the parameter that is causing the oPE02 or oPE08 fault to be declared.	--	U1-18
F3	***F3 FAULT HISTORY Sub-menu***			
F3	Last Fault	Most recently cleared fault	--	U3-01
F3	Fault Message 2	2nd most recently cleared fault	--	U3-02
F3	Fault Message 3	3rd most recently cleared fault	--	U3-03
F3	Fault Message 4	4th most recently cleared fault	--	U3-04
F3	Fault Message 5	5th most recently cleared fault	--	U3-05
F3	Fault Message 6	6th most recently cleared fault	--	U3-06
F3	Fault Message 7	7th most recently cleared fault	--	U3-07
F3	Fault Message 8	8th most recently cleared fault	--	U3-08

Sub-menus	Parameter Names	Descriptions	Units	Standard Parameter Numbers
F3	Fault Message 9	9th most recently cleared fault	--	U3-09
F3	Fault Message 10	10th most recently cleared fault	--	U3-10
F4	***F4 CLR FLT HISTORY Sub-menu***			
F4	Clear Flt Hist	Clears the fault history and traces in the F2 and F3 sub-menus	--	o4-11
F5	***F5 RESET FAULTS Sub-menu***			
F5	Reset Active Fault	Reset the fault that is currently being declared in the F1 sub-menu	--	--

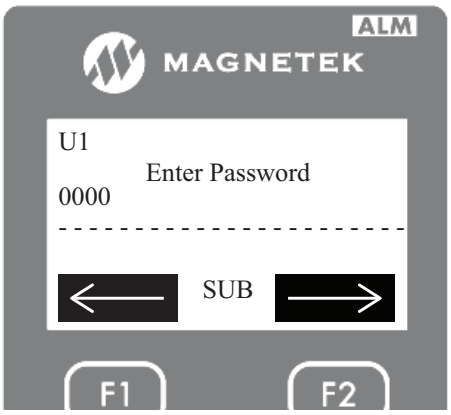
◆ Utility U0 Menu

Table 49 UTILITY Sub-menu Parameter List

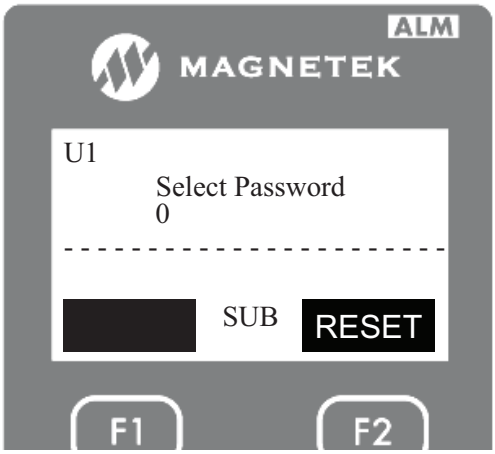
Sub-menu	Parameter Names	Descriptions	Standard Parameter Numbers
U1	***U1 PASSWORD Sub-menu***		
U1	Enter Password	Feature that will restrict the user in viewing or accessing parameters.	A1-04
U2	***U2 MODIFIED CONST Sub-menu***		
U2	Modified Const	Displays up to 150 parameters that have been changed from factory default. For more details, refer to ***U2 MODIFIED CONSTANTS SUB-MENU on page 91***.	--
U3	***U3 UNITS SELECTION Sub-menu***		
U3	Display Units	Change the units that are displayed in the drive.	o1-03
U4	***U4 OVERSPEED TEST Sub-menu***		
U4	Overspeed Test?	Enables the drive to over-speed the elevator for 1 run to perform an overspeed safety test. For more details, refer to ***U4 OVERSPEED TEST SUB-MENU on page 91***.	P1-05
U5	***U5 RESTORE DEFAULTS Sub-menu***		
U5	Initialization	Sets defaults in the drive.	A1-03
U6	***U6 DRIVE INFO Sub-menu***		
U6	SW No. (Flash)	Displays the drive software	U1-25
U6	SW No. (ROM)	Displays the drive gate firing software	U1-26
U6	Drive Firm Ver	Displays the drive software version	U7-01
U6	Inverter Model #	Selects the drive rating	o2-04
U6	Operator Firm	Displays the dual operator software	--
U7	***U7 LANGUAGE SELECT Sub-menu***		
U7	Select Language	Selects different language	A1-00
U8	***U8 BASICS Sub-menu***		
U8	Control Method	Selects the motor control method that will be used.	A1-02
U9	***U9 AUTOTUNE Sub-menu***		
U9	Tuning Mode Sel	Allows the drive to perform autotune on the motor connected to the drive. Refer to ***Autotune on page 103***.	T1-01 or T2-01
U10	***U10 STD Navigation Sub-menu***		
U10	Std Navigation	Allows the user to navigate using the Standard Navigation menu.	--
U13	***U13 PARAM BACKUP Sub-menu***		
U13	Parameter Backup	Allows the user to save the drive parameters as a user-set default.	o2-03
U13	Parameter Restore	Allows the user to load the user-set default parameters into the drive.	A1-03

■ U1 PASSWORD SUB-MENU

The password allows the user to restrict a select few parameters from being viewed and accessed without the correct 4 digit password. The value shown in the “Enter Password” screen as shown below will display the last value that was enter as a possible password.



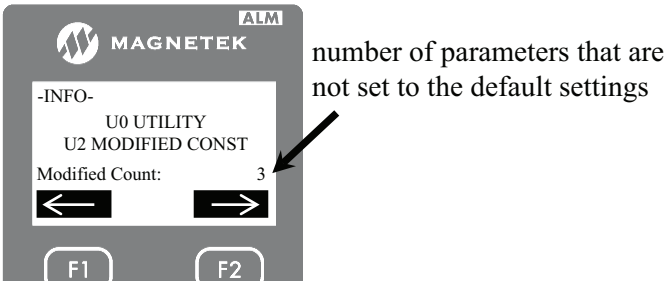
If the displayed password does not match the drive's valid password, the drive will continue to hide and restrict parameters. The currently set password can be reveal if the following is done. While in the sub-menu U1 Password with “Enter Password” on the display, press and hold the “F2” key while hitting the up directional arrow. If done successfully, the following display below will appear with the password.



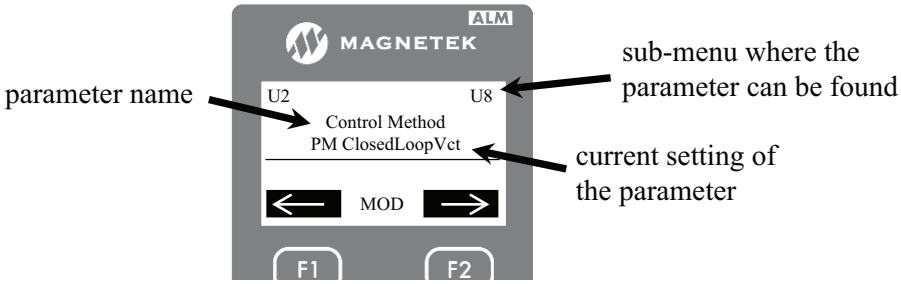
While in the “Select Password” sub-menu, the user can either leave the password the same, change the password by pressing the “ENTER” key, or resetting the password back to default of 0 by pressing the “F2” key for reset. After any of the above is done, press the “ESC” key to go back into the main menu.

■ U2 MODIFIED CONSTANTS SUB-MENU

The Modified Constants sub-menu will display any parameter (up to 150 parameters) that has been edited or changed from factory default settings. At the menu level, the number of parameters that were edited or changed will be displayed. See below.

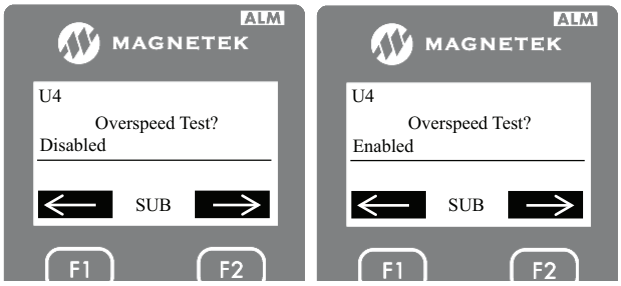


In the sub-menu level, the parameter name, its current setting, and the sub-menu that it can be found in are displayed as shown below. The parameter settings can be changed in the Modified Constants sub-menu by pressing the ENTER key.



■ U4 OVERSPEED TEST SUB-MENU

Normally, the speed command is limited by the overspeed fault as set by Overspeed Detection Level and the Overspeed Detection Time in the A1 sub-menu. But sometimes the elevator is required to be over-sped to test the elevator overspeed safety equipment. The Overspeed Test will allow the drive to overspeed the elevator for 1 run without declaring an overspeed fault.



Parameter Name (sub-menu)	Default		Recommended Setting
	IM	PM	
Overspeed Test? (U4)	Disabled		Enabled
Ovrspd Tst Mult (A1)	125.0%		Set this value to the required percent overspeed $\frac{Required\ Overspeed\ (fpm)}{Contract\ Speed\ (fpm)} * 100$
Speed Command 1 - 15 (A3)	0 fpm		Determine which speed command in the A3 sub-menu is the high speed and set it to the required overspeed. **Note:** Only required if Spd Command Src (C1) is set to 'Multi-Step Speed'
Max Frequency (A5)	60 Hz	-	Make note of the current value. Increase this value by the required overspeed percentage to allow the drive to overspeed the motor. After the test is completed, set the parameter back to the original value.
Max Motor Speed (A5)	-	96 RPM	

When the Overspeed Test is enabled, the drive will over-speed the elevator on the first run after overspeed test was enabled. It will also disable the overspeed fault. After that one run and the run command is removed, the test will automatically disable itself and the overspeed fault will be re-enabled. In order for another overspeed test to be performed, the above steps will need to be repeated.

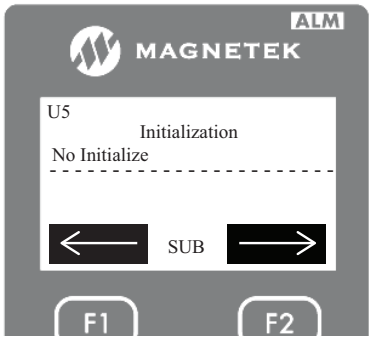
■ U5 Restore Defaults

Initialize all the drive parameters back to default settings. NOTE: the default settings depends on the setting of Control Method (U8) and Inverter Model # (U6).

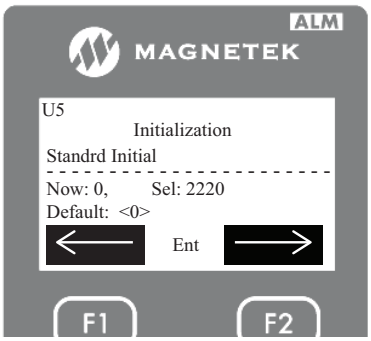
There are four choices:

Choices	Descriptions	Standard Settings
3-Wire Initial	**3-Wire Initialization:** The drive will initialize the drive parameters to factory default settings except for Term S1 Func Sel (C2) and Term S2 Func Sel (C2). These 2 parameters will be set to 'Term Not Used'.	3330
No Initialize	**No Initialization:** The drive will not initialize the drive parameters to the default settings.	0
Standrd Initial	**Standard Initialization:** The drive will initialize the drive parameters to the factory default settings.	2220
Term->Cntrl Int	**Terminal Board to Control Board Initialization:** The drive will transfer all the parameter settings from the terminal board into the control board. **Note:** This should only be done if new control board was installed.	5550

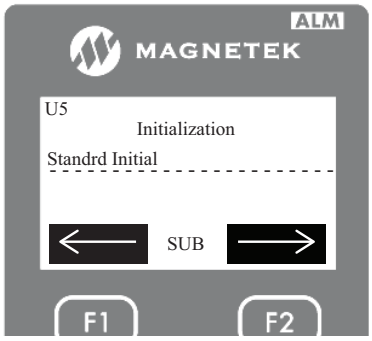
The following shows how to perform an initialization to set the drive back to the factory default.



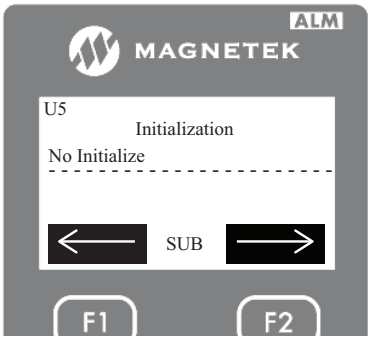
Press the “Enter” key and use the Up or Down arrow key to find “Standrd Initial”



Press the “Enter” key to select the setting



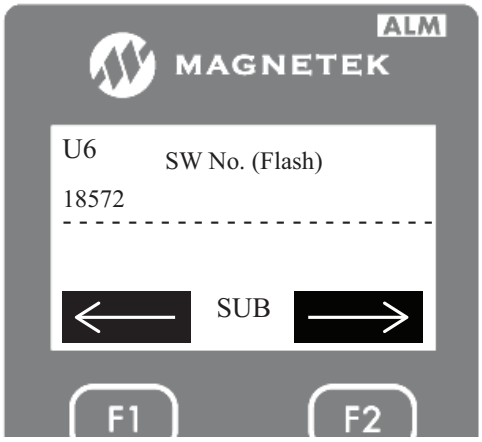
After initializing, the parameter will be set back to “No Initialize”



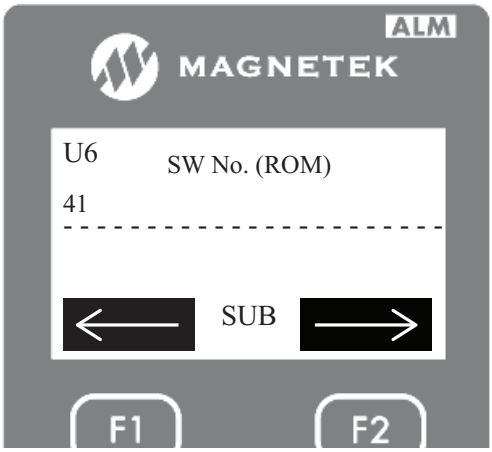
■ U6 Drive Information

This sub-menu contains parameters that identify:

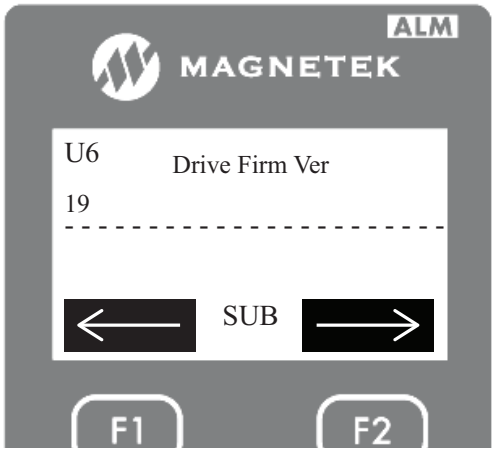
• SW No. (Flash)
Displays the software number that is currently in the drive control board.



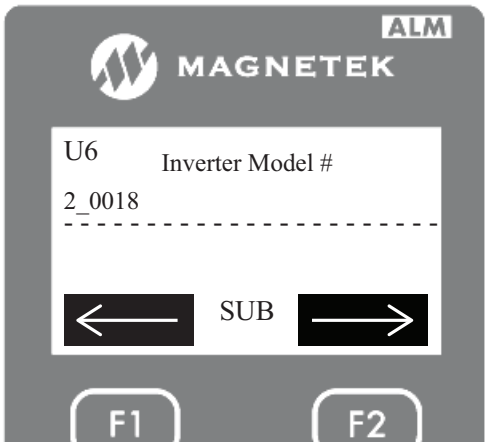
• SW No. (ROM)
Displays the software number that is currently in the drive gate board.



• Drive Firm Ver
Displays the software version that is currently in the drive control board.



• Inverter Model #
Sets up the default values and internal gains of the drive. This should match the drive model printed on the drive nameplate.

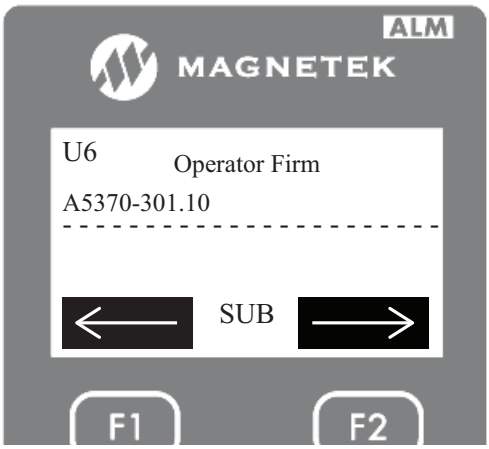


200V - 240V			380V - 480V		
Drive Model Number	**Choices**	**Standard Settings**	**Drive Model Number**	**Choices**	**Standard Settings**
--	2_0008	101	--	4_0005	148
--	2_0011	102	--	4_0006	149
--	2_0014	103	--	4_0007	150
LU2M0018DAC	2_0018	104	LU4M0009DAC	4_0009	151
LU2M0025DAC	2_0025	106	LU4M0015DAC	4_0015	153
LU2M0033DAC	2_0033	107	LU4M0018DAC	4_0018	154
LU2M0047DAC	2_0047	109	LU4M0024DAC	4_0024	156
LU2M0060DAC	2_0060	110	LU4M0031DAC	4_0031	157
LU2M0075DAC	2_0075	111	LU4M0039DAC	4_0039	158
LU2M0085DAC	2_0085	112	LU4M0045DAC	4_0045	159
LU2M0115DAC	2_0115	114	LU4M0060DAC	4_0060	161
LU2M0145DAC	2_0145	115	LU4M0075DAC	4_0075	162
LU2M0180DAC	2_0180	116	LU4M0091DAC	4_0091	163
LU2M0215AAC	2_0215	117	LU4M0112DAC	4_0112	164
LU2M0283AAC	2_0283	118	LU4M0150DAC	4_0150	165
LU2M0346AAC	2_0346	119	LU4M0180AAC	4_0180	166
LU2M0415AAC	2_0415	120	LU4M0216AAC	4_0216	167
--	--	--	--	4_0260	168
--	--	--	--	4_0304	169
--	--	--	--	4_0370	170
--	--	--	--	4_0450	172
--	--	--	--	4_0605	174

500V - 600V		
Drive Model Number	**Choices**	**Standard Settings**
LU5M0003DAC	5_0003	196
LU5M0004DAC	5_0004	197
LU5M0006DAC	5_0006	199
LU5M0010DAC	5_0010	201
LU5M0013DAC	5_0013	202
LU5M0017DAC	5_0017	204
LU5M0022DAC	5_0022	205
LU5M0027DAC	5_0027	206
LU5M0032DAC	5_0032	207
LU5M0041DAC	5_0041	209
LU5M0052DAC	5_0052	210

500V - 600V		
Drive Model Number	**Choices**	**Standard Settings**
LU5M0062DAC	5_0062	211
--	5_0077	212
--	5_0099	213
--	5_0130	214
--	5_0172	215
--	5_0200	217
--	0	255

• Operator Firm
Displays the software currently in the dual operator.



■ U8 Basics

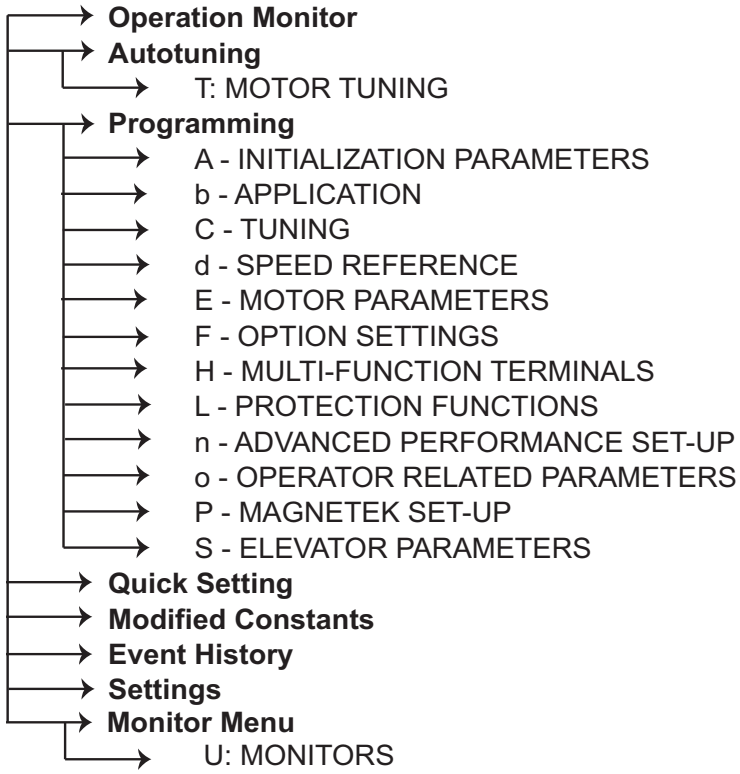
The control method determines the type of AC motor that will be connected to the drive and the type of motor control that will be applied to the attached motor.

There are four choices:

Choices	Descriptions	Standard Settings
Closed Loop Vect	**Closed Loop Vector Control:** The drive will spin an induction motor with vector control using an encoder feedback.	3
Open Loop Vector	**Open Loop Vector Control:** The drive will spin an induction motor with vector control using no feedback.	2
PM ClosedLoopVct	**Permanent Magnet Closed Loop Vector Control:** The drive will spin a permanent magnet motor with closed loop control using an encoder feedback.	7
V/f Control	**Volts per Hertz Control:** The drive will spin an induction motor with no vector control or no feedback.	0

■ U10 Standard Navigation

The Standard Navigation operates on 5 levels: the main menu level, parameter group level, parameter sub-group level, parameter level, and the data entry level. At the menu level, it allows the user to navigate between menus. At the parameter group level, it allows the user to navigate between different parameter groups within that menu: such as A, b, C, d, and etc. At the sub-group level, the user can navigate through a group of parameters: such as C1, C2, C3, and etc. At the parameter level, the user can select a specific parameter in a sub-group: such as C1-01, C1-02, and etc. At the entry level, the user can change values or select different options. Below is the menu tree of the Standard Navigation.



■ U13 Parameter Backup

The parameter backup is a function in the drive that allows the user to save the current drive setting as backup. This can also be used to restore all the drive parameters back to the saved backup parameters.

U13 Parameter Name	Description	Choices	Default	Standard Parameter Number
Parameter Backup	**Parameter Backup:** • Idle – waiting for input • Set User Backup – save the current parameter as the backup parameter • Wipe User Backup – clear the backup parameter	- Idle - Set User Backup - Wipe User Backup	IDLE	o2-03
Parameter Restore	**Parameter Restore:** • Idle – waiting for input • Restore Backup – load backup parameters into the drive	- Idle - Restore Backup	IDLE	A1-03

◆ Drive Defaults

■ Defaults by Drive Control Methods

Table 50 Control Method Dependent Parameters and Default Values

Sub-menu	Parameter Name	Setting Range	Resolution	Control Method (U8)			
				V/f Control	Open Loop Vector	Closed Loop Vector	PM ClosedLoop Vct
A1	Encoder Pulses	1 to 60000	1 ppr	-		1024	2048
A1	ZeroSpeed@Stop	0.0000 to 9.999	0.001%	2.400	1.000	0.200	0.350
A1	SpCtrlGn@PosLck	0.00 to 300.00	0.01	-	-	40.00	10.00
A1	Output V Lim Sel	-	-	-	Enabled	Enabled	Disabled
A1	Torq Comp Time	0 to 60000	1 ms	200 [iii]	50	-	-
A1	LightLd Srch Spd	0.00 to 20.00	0.01%	5.00	5.00	5.00	10.00
A5	Max Frequency / Max Motor Speed	iv	0.1 Hz/1 rpm	60.0 Hz	60.0 Hz	60.0 Hz	96 rpm
A5	Base Frequency / Rated Motor Speed	iv	0.1 Hz/1 rpm	60.0 Hz	60.0 Hz	60.0 Hz	96 rpm
A5	Min Voltage [ii]	0.0 to 255.0	0.1 V	i	2.3 V	-	-
A5	Min Frequency	0.0 to 120.0	0.1 Hz/1 rpm	1.5 Hz	0.5 Hz	0.0 Hz	0 rpm
A5	Mid Voltage [ii]	0.0 to 255.0	0.1 V	i	12.6 V	-	-
A5	Mtr OL Charact	-	-	VT Motor	VT Motor	VT Motor	Constant Torque
C1	Encoder Connect	-	-	Reverse	Reverse	Reverse	Forward

i For models LU2□0008 and 4□0005, the default setting is 17.2 for Mid Voltage (A5), and 10.3 for Min Voltage (A5).
For models LU2□0011 to 2□0180, 4□0006 to 4□0091, the default setting is 16.1 for Mid Voltage (A5), and 8.0 for Min Voltage (A5).
For models LU2□0215 to 2□0415, 4□0112 to 4□0260, the default setting is 13.8 for Mid Voltage (A5) and, 6.9 for Min Voltage (A5).

ii Values shown here are for 200 V class drives. Double the value when using a 400 V class drive. Multiply value by 2.875 for 600 V class drives.

iii Default setting value varies by Inverter Model # (U6).The default setting for models LU2□0115 to 2□0415, LU4□0112 to 4□0260 is 1000 ms when using “V/f control”.

iv Setting range depends on the type of motor being used. An induction motor has a setting range of 10.0 to 200.0 Hz, while a PM motor has a setting range of 40 - 2000 RPM.

■ Defaults by Drive Models

Table 51 200 V Class Drives Default Settings by Drive Model Selection – 2□0008 through 2□0075

Sub-menu	Parameter Name	Unit	Default Settings								
-	Model LU	-	2□0008	2□0011	2□0014	2□0018	2□0025	2□0033	2□0047	2□0060	2□0075
U6	Inverter Model #	-	--	--	--	2_0018	2_0025	2_0033	2_0047	2_0060	2_0075
A5	Mtr Rated Power	HP	2	3	4	5	7.5	10	15	20	25
A5	Motor Rated FLA	A	6.2	8.5	11.4	14	19.6	26.6	39.7	53	65.8
A5	Motor Rated Slip	Hz	2.6	2.9	2.7	2.73	1.5	1.3	1.7	1.6	1.67
A5	No-Load Current	A	2.8	3	3.7	4.5	5.1	8	11.2	15.2	15.7
A5	Term Resistance	Ω	1.997	1.601	1.034	0.771	0.399	0.288	0.23	0.138	0.101
A5	Leak Inductance	%	18.5	18.4	19	19.6	18.2	15.5	19.5	17.2	20.1
A5	PM Mtr Power	HP	1.5	2.2	3	5	7.5	10	15	20	25
A5	PM Mtr Rated FLA	A	8	11	14	14.6	20	29.3	37.9	53.2	65
A5	PM Mtr Arm Ohms	Ω	1.048	0.645	0.645	0.331	0.37	0.223	0.153	0.095	0.069
A5	PM Mtr d Induct	mH	6.96	7.03	7.03	4.78	5.39	3.58	3.46	2.46	1.99
A5	PM Mtr q Induct	mH	10.58	9.71	9.71	6.52	7.36	4.89	4.96	3.7	2.99
A5	PM Mtr Ind V 1	mV/(rad/sec)	220.8	235.3	235.3	239.3	254.3	237	270	254.3	256.7
A4	oH Pre-Alarm Lvl	°C	115	125	110	110	120	125	120	120	125

Table 52 200 V Class Drives Default Settings by Drive Model Selection – 2□0085 through 2□0415

Sub-menu	Parameter Name	Unit	Default Settings							
-	Model LU	-	2□0085	2□0115	2□0145	2□0180	2□0215	2□0283	2□0346	2□0415
U6	Inverter Model #	-	2_0085	2_0115	2_0145	2_0180	2_0215	2_0283	2_0346	2_0415
A5	Mtr Rated Power	HP	30	40	50	60	75	100	125	150
A5	Motor Rated FLA	A	77.2	105	131	160	190	260	260	260
A5	Motor Rated Slip	Hz	1.7	1.8	1.33	1.6	1.43	1.39	1.39	1.39
A5	No-Load Current	A	18.5	21.9	38.2	44	45.6	72	72	72
A5	Term Resistance	Ω	0.079	0.064	0.039	0.03	0.022	0.023	0.023	0.023
A5	Leak Inductance	%	19.5	20.8	18.8	20.2	20.5	20	20	20
A5	PM Mtr Power	HP	30	40	50	60	75	100	125	150
A5	PM Mtr Rated FLA	A	76.4	103.5	133.1	149.4	181.6	181.6	181.6	181.6
A5	PM Mtr Arm Ohms	Ω	0.054	0.041	0.027	0.022	0.016	0.016	0.016	0.016
A5	PM Mtr d Induct	mH	1.7	1.29	0.91	0.9	0.72	0.72	0.72	0.72
A5	PM Mtr q Induct	mH	2.55	2	1.41	1.39	1.11	1.11	1.11	1.11
A5	PM Mtr Ind V 1	mV/(rad/sec)	261.1	260.4	245.1	276	0.317	0.533	0.592	0.646
A4	oH Pre-Alarm Lvl	°C	130	130	130	125	115	120	120	120

Table 53 400 V Class Drives Default Settings by Drive Capacity – 4□0005 through 4□0031

Sub-menu	Parameter Name	Unit	Default Settings							
-	Model LU	-	4□0005	4□0006	4□0007	4□0009	4□0015	4□0018	4□0024	4□0031
U6	Inverter Model #	-	4_0005	4_0006	4_0007	4_0009	4_0015	4_0018	4_0024	4_0031
A5	Mtr Rated Power	HP	2	3	4	5	7.5	10	15	20
A5	Motor Rated FLA	A	3.1	4.2	5.7	7	9.8	13.3	19.9	26.5
A5	Motor Rated Slip	Hz	2.5	3	2.7	2.7	1.5	1.3	1.7	1.6
A5	No-Load Current	A	1.4	1.5	1.9	2.3	2.6	4	5.6	7.6
A5	Term Resistance	Ω	1.01	6.495	4.36	3.333	1.595	1.152	0.922	0.55
A5	Leak Inductance	%	18.3	18.7	19	19.3	18.2	15.5	19.6	17.2
A5	PM Mtr Power	HP	1.5	2.2	3	5	7.5	10	15	20
A5	PM Mtr Rated FLA	A	4.8	5.5	7.2	7.3	10	14.6	19	26.6
A5	PM Mtr Arm Ohms	Ω	4.192	2.658	2.658	1.326	1.479	0.892	0.613	0.378
A5	PM Mtr d Induct	mH	27.83	28.12	28.12	19.11	21.58	14.33	13.84	9.85
A5	PM Mtr q Induct	mH	42.32	38.85	38.85	26.08	29.44	19.56	19.83	14.79
A5	PM Mtr Ind V 1	mV/(rad/sec)	441.7	470.6	470.6	478.6	508.4	473.9	540	508.4
A4	oH Pre-Alarm Lvl	°C	110	110	110	110	110	115	120	120

Table 54 400 V Class Drives Default Settings by Drive Model Selection – 4□0039 through 4□0150

Sub-menu	Parameter Name	Unit	Default Settings						
-	Model LU	-	4□0039	4□0045	4□0060	4□0075	4□0091	4□0112	4□0150
U6	Inverter Model #	-	4_0039	4_0045	4_0060	4_0075	4_0091	4_0112	4_0150
A5	Mtr Rated Power	HP	25	30	40	50	60	75	100
A5	Motor Rated FLA	A	32.9	38.6	52.3	65.6	79.7	95	130
A5	Motor Rated Slip	Hz	1.67	1.7	1.8	1.33	1.6	1.46	1.39
A5	No-Load Current	A	7.8	9.2	10.9	19.1	22	24	36
A5	Term Resistance	Ω	0.403	0.316	0.269	0.155	0.122	0.088	0.092
A5	Leak Inductance	%	20.1	23.5	20.7	18.8	19.9	20	20
A5	PM Mtr Power	HP	25	30	40	50	60	75	75
A5	PM Mtr Rated FLA	A	32.5	38.2	51.8	66.6	74.7	90.8	130.0
A5	PM Mtr Arm Ohms	Ω	0.276	0.217	0.165	0.107	0.087	0.064	0.022
A5	PM Mtr d Induct	mH	7.95	6.8	5.15	3.62	3.59	2.87	1.80
A5	PM Mtr q Induct	mH	11.94	10.22	8	5.63	5.55	4.44	2.80
A5	PM Mtr Ind V 1	mV/(rad/sec)	513.7	522.3	520.8	490.2	552	554.4	1280.0
A4	oH Pre-Alarm Lvl	°C	115	120	120	110	120	130	130

Table 55 400 V Class Drives Default Settings by Drive Capacity – 4□0180 through 4□0605

Sub-menu	Parameter Name	Unit	Default Settings						
-	Model LU	-	4□0180	4□0216	4□0260	4□0304	4□0370	4□0450	4□0605
U6	Inverter Model #	-	4_0180	4_0216	4_0260	4_0304	4_0370	4_0450	4_0605
A5	Mtr Rated Power	HP	125	150	200	250	300	350	400
A5	Motor Rated FLA	A	156	190	223	270	310	370	500
A5	Motor Rated Slip	Hz	1.4	1.4	1.38	1.35	1.3	1.3	1.25
A5	No-Load Current	A	40	49	58	70	81	96	130
A5	Term Resistance	Ω	0.056	0.046	0.035	0.029	0.025	0.020	0.014
A5	Leak Inductance	%	20	20	20	20	20	20	20
A5	PM Mtr Power	HP	75	75	100	100	100	100	100
A5	PM Mtr Rated FLA	A	130	130	130	130	130	130	130
A5	PM Mtr Arm Ohms	Ω	0.022	0.022	0.022	0.022	0.022	0.022	0.022
A5	PM Mtr d Induct	mH	1.80	1.80	1.80	1.80	1.80	1.80	1.80
A5	PM Mtr q Induct	mH	2.80	2.80	2.80	2.80	2.80	2.80	2.80
A5	PM Mtr Ind V 1	mV/(rad/sec)	1280.0	1280.0	1280.0	1280.0	1280.0	1280.0	1280.0
A4	oH Pre-Alarm Lvl	°C	120	120	125	130	140	140	140

Table 56 600 V Class Drives Default Settings by Drive Capacity – 5□0003 through 5□0032

Sub-menu	Parameter Name	Unit	Default Settings								
-	Model LU	-	5□0003	5□0004	5□0006	5□0010	5□0013	5□0017	5□0022	5□0027	5□0032
U6	Inverter Model #	-	5_0003	5_0004	5_0006	5_0010	5_0013	5_0017	5_0022	5_0027	5_0032
A5	Mtr Rated Power	HP	2	3	5	7.5	10	15	20	25	30
A5	Motor Rated FLA	A	2.7	3.9	6.1	9	11	17	22	27	32
A5	Motor Rated Slip	Hz	2.5	3.0	2.7	1.5	1.3	1.7	1.6	1.67	1.7
A5	No-Load Current	A	0.8	1.2	1.8	2.7	3.3	5.1	6.6	8.1	9.6
A5	Term Resistance	Ω	13.72	8.825	4.936	2.601	1.446	1.171	0.896	0.658	0.516
A5	Leak Inductance	%	18.3	18.7	19.3	18.2	15.5	19.6	17.2	20.1	23.5
A5	PM Mtr Power	HP	2	3	5	7.5	10	15	20	25	30
A5	PM Mtr Rated FLA	A	2.6	3.1	4.7	7.4	9.4	12.8	16.5	20.3	24.0
A5	PM Mtr Arm Ohms	Ω	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
A5	PM Mtr d Induct	mH	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
A5	PM Mtr q Induct	mH	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
A5	PM Mtr Ind V 1	mV/(rad/sec)	0	0	0	0	0	0	0	0	0
A4	oH Pre-Alarm Lvl	°C	110	110	110	115	120	120	115	115	110

Table 57 600 V Class Drives Default Settings by Drive Capacity – 5□0041 through 5□0200

Sub-menu	Parameter Name	Unit	Default Settings							
-	Model LU	-	5□0041	5□0052	5□0062	5□0077	5□0099	5□0130	5□0172	5□0200
U6	Inverter Model #	-	5_0041	5_0052	5_0062	5_0077	5_0099	5_0130	5_0172	5_0200
A5	Mtr Rated Power	HP	40	50	60	75	100	125	150	250
A5	Motor Rated FLA	A	41	52	62	77	99	130	172	200
A5	Motor Rated Slip	Hz	1.8	1.33	1.6	1.46	1.39	1.39	1.4	1.35
A5	No-Load Current	A	12.3	15.6	18.8	23.1	29.7	37.5	43.2	57.6
A5	Term Resistance	Ω	0.438	0.267	0.210	0.150	0.099	0.079	0.060	0.037
A5	Leak Inductance	%	20.7	18.8	19.9	20.0	20.0	20.0	20.0	20.0
A5	PM Mtr Power	HP	40	50	60	75	100	125	150	250
A5	PM Mtr Rated FLA	A	30.8	39.0	46.5	57.8	74.3	97.5	129.0	150.0
A5	PM Mtr Arm Ohms	Ω	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
A5	PM Mtr d Induct	mH	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
A5	PM Mtr q Induct	mH	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
A5	PM Mtr Ind V 1	mV/(rad/sec)	0	0	0	0	0	0	0	0
A4	oH Pre-Alarm Lvl	°C	110	110	110	110	110	110	110	110

6 Autotune

◆ Autotune

■ Induction Motor Autotune

The M1000 has four types of autotuning for induction motors. The autotune will allow the drive to calculate motor characteristics for motor control.

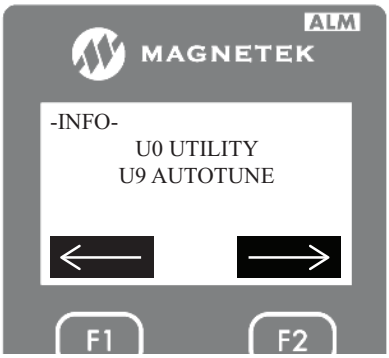
Table 58 Tuning Mode Selection

Tuning Mode Sel (U9)	Control Method (U8)			Description
	V/f Control	Open Loop Vector	Closed Loop Vect	
Standard Tuning	--	X	X	Rotational autotuning.
Term Resistance	X	X	X	Non-rotational autotuning that only measures motor resistance. Not recommended for vector control.
Tune-No Rotate1	--	X	X	Recommended non-rotational autotuning.
Tune-No Rotate2	--	X	X	Non-rotational autotuning that requires knowledge of motor slip.

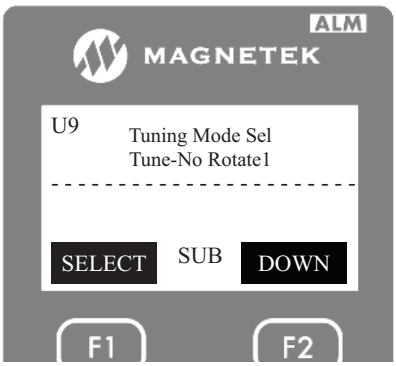
Standard Tuning (Standard Tuning)

This autotune will calculate several motor characteristics and verify proper encoder phasing. This will rotate the motor. For the motor to rotate, the rope must be off the sheave and the brakes have to be lifted during the autotune process.

1. Before the autotune can start, the following needs to be evaluated:
   - **a.** The ropes must be off the sheave.
   - **b.** The brakes should be physically or electrically lifted so the motor can rotate freely during the autotune.
   - **c.** The motor contactor should be bypassed or electrically picked during the autotune.
   - **d.** Verify that the safety disable inputs are enabled.
     - **i.** If the drive's INTERNAL power supply is being used to enable the H1, H2, and HC inputs, place a jumper between all three inputs.
     - **ii.** If an EXTERNAL power supply is being used to enable the H1, H2, and HC inputs, a jumper needs to be placed to enable the H1 and H2. Do NOT put a jumper between H1/H2 to HC.
   - **e.** If any of the logic inputs in the C2 sub-menu are set to "Ext BaseBlk N.O." or "Ext BaseBlk N.C.", they must be set to "Term Not Used" while trying to perform an autotune.
2. To begin the autotune, navigate to the U9 AUTOTUNE menu as shown:



3. Then press the "ENTER" key to access the AUTOTUNE sub-menu screen. The first thing the drive will ask the user is to select a type of autotune as shown below.



4. On this screen, press the “ENTER” key. Then use the UP or DOWN key to select one of four different types of autotune for induction motors. In this case set it for standard tuning.
5. After selecting “Standard Tuning”, press the DOWN key to enter the next data. The next data the drive will ask the user to enter is the motor nameplate power in horsepower.

Note: The UP key can be pressed to go back to the previous parameter.

6. After entering the motor nameplate horsepower, press the DOWN key to enter the motor nameplate voltage.
7. After entering the motor nameplate voltage, press the DOWN key to enter the motor nameplate current.
8. After entering the motor nameplate current, press the DOWN key to enter the motor nameplate frequency.
9. After entering the motor nameplate frequency, press the DOWN key to enter the motor poles.
10. After entering the motor poles, press the DOWN key to enter the motor nameplate speed. This speed should be the rated speed and NOT the synchronous.
11. After entering the motor nameplate speed, press the DOWN key to enter the encoder pulses per revolution (PPR).

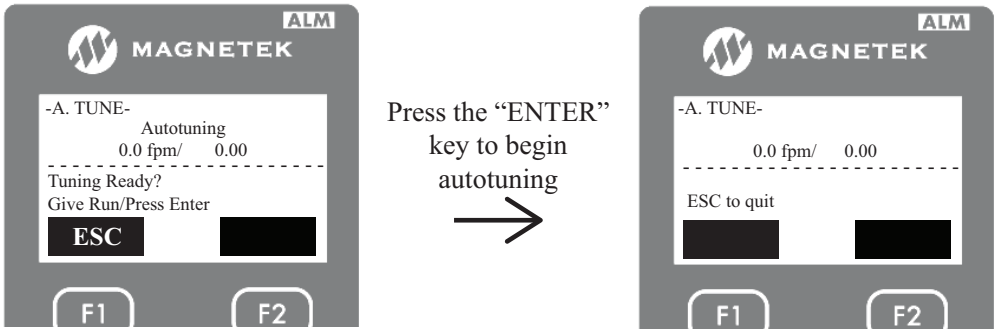
Note: This parameter is skipped when the drive is set up to run in open-loop.

12. After entering the PPR, press the DOWN key to enter the motor no load current. Some motor manufactures will have the no load current printed on the nameplate, and some will not. For those that do not, leave the default setting that shows up on the display.

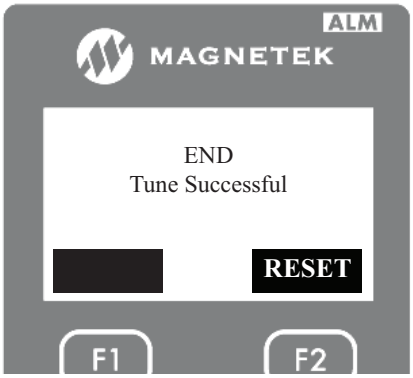
13. After all the data have been entered, the autotune should be initiated by either the “ENTER” key or a RUN signal.

a. If the enter key will be pressed, the motor contactor will need to be bypassed by either wiring or manually pushing the contactor closed. The brake will also need to be picked/lifted during the autotune so the motor can spin.

b. If a RUN sequence will be sent, the controller should be set to inspection operation. Running the elevator on inspection should pick both the motor contactor and brakes.



14. During the autotune, the motor will make audible noise and the display will show speed and motor amps as shown above. The drive will begin to tune the motor without the need to spin the motor. Towards the end of the autotune, the motor will start to spin. After the tuning is done, the drive will announce the following.

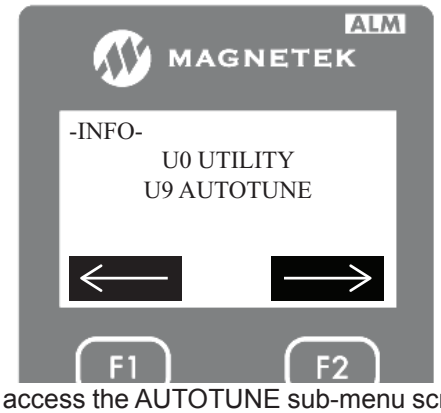


15. After a successful autotune, the drive will populate the following parameters:
    - **a.** Encoder Pulses (A1)
    - **b.** Mtr Rated Power (A5)
    - **c.** Max Frequency (A5)
    - **d.** Motor Rated FLA (A5)
    - **e.** Number of Poles (A5)
    - **f.** Motor Rated Slip (A5) - calculated from autotune
    - **g.** No-Load Current (A5)
    - **h.** Leak Inductance (A5) - calculated from autotune
    - **i.** Term Resistance (A5) - calculated from autotune
16. Set the drive back up for normal operation: inspection speed, brakes, ropes, base block (if used), and safe disable (if used).

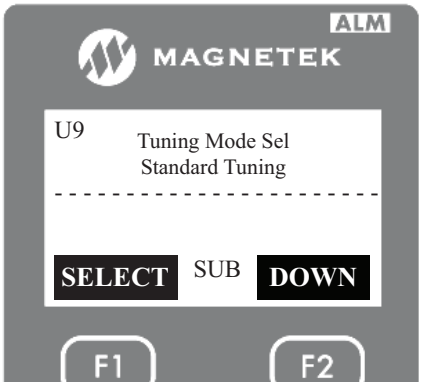
Tune No Rotation 1 (Tune-No Rotate1)

This autotune will calculate several motor characteristics. This is a non-rotational autotune, so this can be performed with the brakes set and the ropes on the sheave. This is the preferred non-rotational autotune for induction motors.

1. Before the autotune can start, the following needs to be evaluated:
   - **a.** The brakes should be disabled so they do not lift during the autotune. This can be performed by disconnecting the brake coils.
   - **b.** The motor contactor should be bypassed or electrically picked during the autotune.
   - **c.** Verify that the safety disable inputs are enabled.
     - **i.** If the drive's INTERNAL power supply is being used to enable H1, H2, and HC inputs, place a jumper between all three inputs.
     - **ii.** If an EXTERNAL power supply is being used to enable the H1, H2, and HC inputs, a jumper needs to be placed to enable the H1 and H2. Do NOT put a jumper between H1/H2 to HC.
   - **d.** If any of the logic inputs in the C2 sub-menu are set to "Ext BaseBlk N.O." or "Ext BaseBlk N.C.", they must be set to "Term Not Used" while trying to perform an autotune.
2. To begin the autotune, navigate to the U9 AUTOTUNE menu as shown:

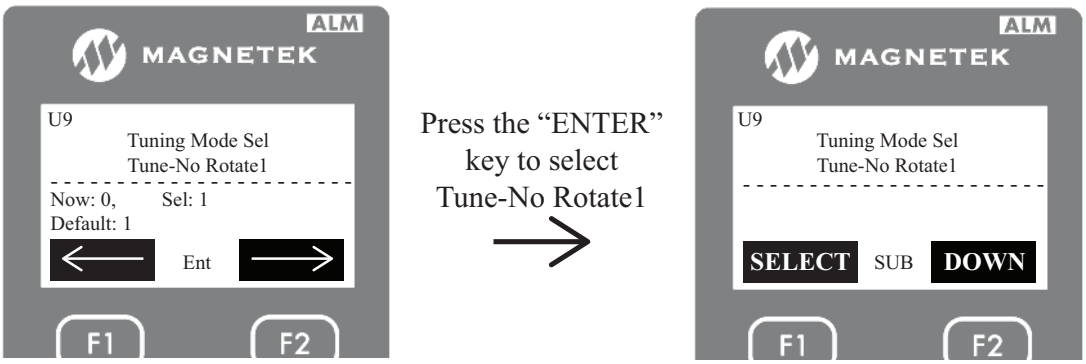


3. Then press the "ENTER" key to access the AUTOTUNE sub-menu screen. The first thing the drive will ask the user is to select a type of autotune as shown below.



4. On this screen, press the “ENTER” key. Then use the UP or DOWN key to select one of four different types of autotune for induction motors. In this case set it for non-rotational tuning 1 as shown below.

Note: The drive will not retain this setting after a power cycle.



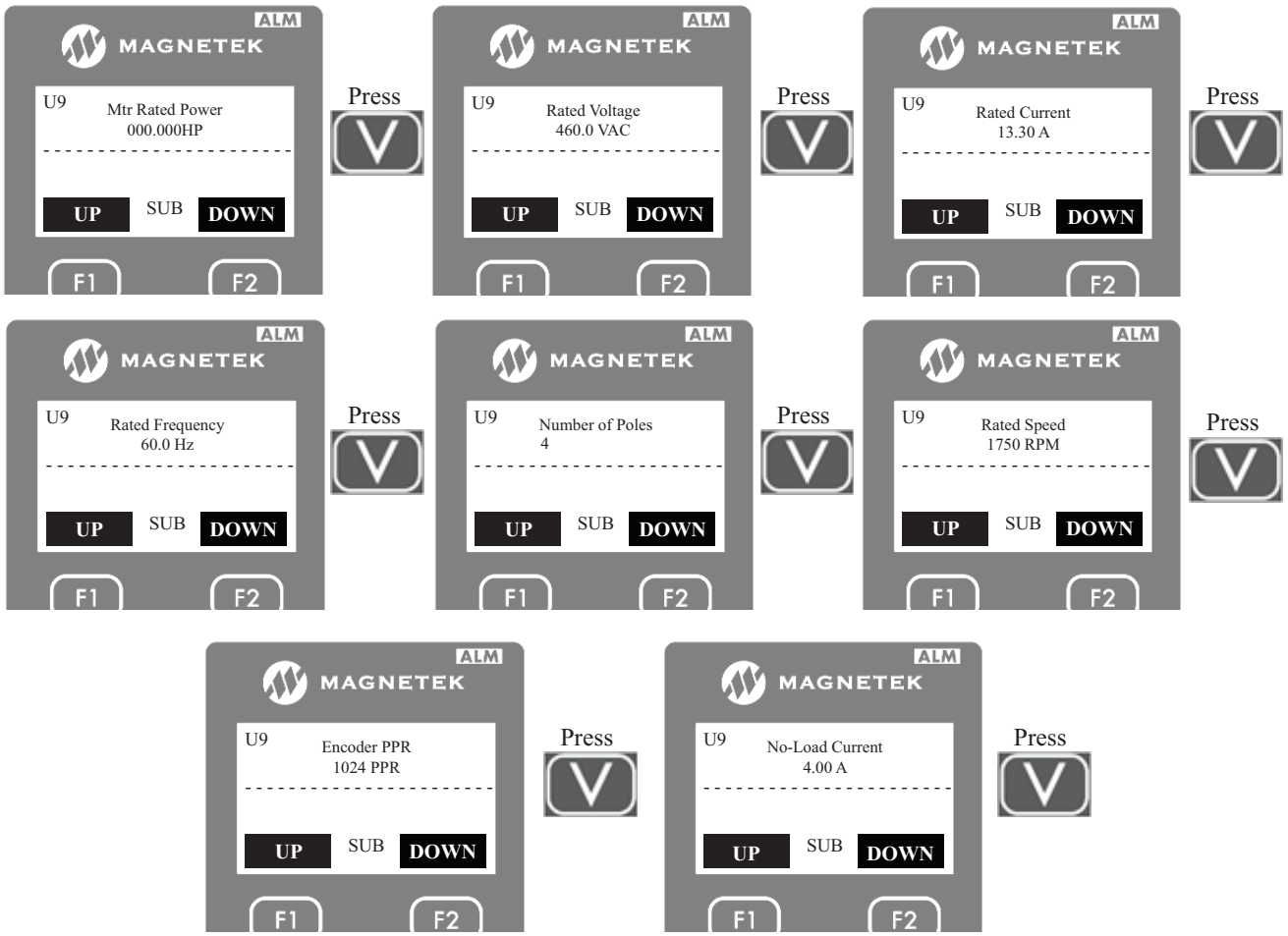
5. After selecting “Tune-No Rotate1”, press the DOWN key to enter the next data. The next data the drive will ask the user to enter is the motor nameplate power in horsepower.

Note: The UP key can be pressed to go back to the previous parameter.

6. After entering the motor nameplate horsepower, press the DOWN key to enter the motor nameplate voltage.
7. After entering the motor nameplate voltage, press the DOWN key to enter the motor nameplate current.
8. After entering the motor nameplate current, press the DOWN key to enter the motor nameplate frequency.
9. After entering the motor nameplate frequency, press the DOWN key to enter the motor poles.
10. After entering the motor poles, press the down key to enter the motor nameplate speed. This speed should be the rated speed and NOT the synchronous.
11. After entering the motor nameplate speed, press the DOWN key to enter the encoder pulses per revolution (PPR).

Note: This parameter is skipped when the drive is set up to run in open-loop.

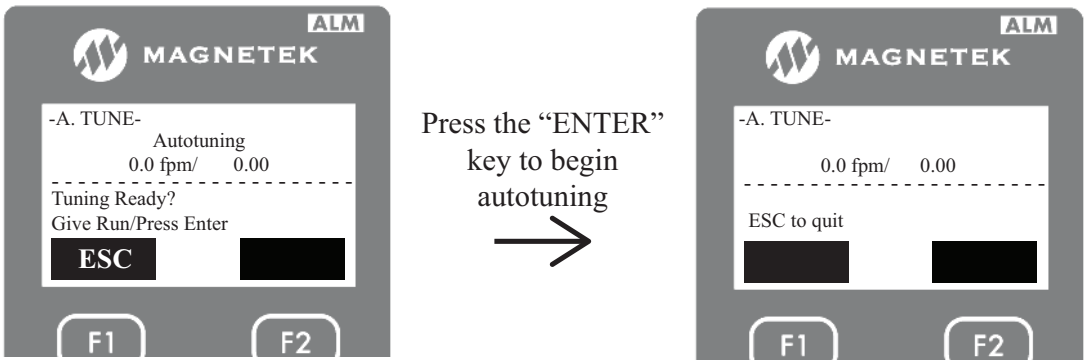
12. After entering the PPR, press the DOWN key to enter the motor no load current. Some motor manufactures will have the no load current printed on the nameplate, and some will not. For those that do not, leave the default setting that shows up on the display.



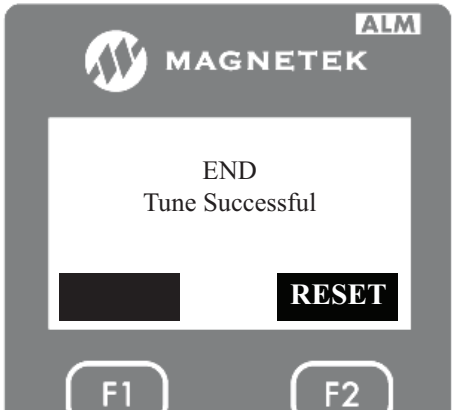
13. After all the data have been entered, the autotune should be initiated by either the “ENTER” key or a RUN signal.

a. If the enter key will be pressed, the motor contactor will need to be bypassed by either wiring or manually pushing the contactor closed. The brake cannot be lifted during the autotune.

b. If a RUN sequence will be sent, the controller should be set to inspection operation. Running the elevator on inspection should pick the motor contactor. The brake cannot be lifted during the autotune.



14. During the autotune, the motor will make audible noise and the display will show speed and motor amps as shown above. After the tuning is done, the drive will announce the following.

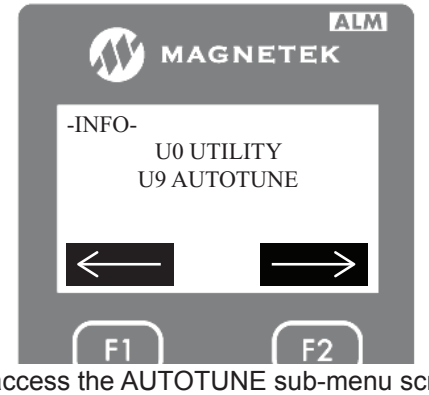


15. After a successful autotune, the drive will populate the following parameters:
    a. Encoder Pulses (A1)
    b. Mtr Rated Power (A5)
    c. Max Frequency (A5)
    d. Motor Rated FLA (A5)
    e. Number of Poles (A5)
    f. Motor Rated Slip (A5) - calculated from autotune
    g. No-Load Current (A5)
    h. Leak Inductance (A5) - calculated from autotune
    i. Term Resistance (A5) - calculated from autotune
16. Set the drive back up for normal operation: inspection speed, brakes, base block (if used), and safe disable (if used).

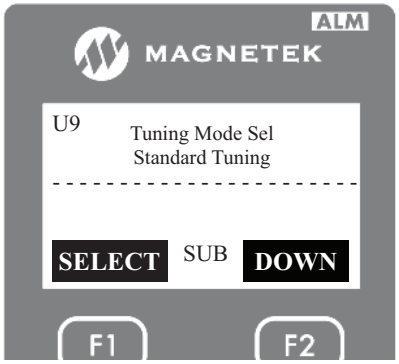
Terminal Resistance (Term Resistance)

This autotune will only calculate the motor resistance. This is a non-rotational autotune, so this can be performed with the brakes set and the ropes on the sheave.

1. Before the autotune can start, the following needs to be evaluated:
   a. The brakes should be disabled so they do not lift during the autotune. This can be performed by disconnecting the brake coils.
   b. The motor contactor should be bypassed or electrically picked during the autotune.
   c. Verify that the safety disable inputs are enabled.
      i. If the drive's INTERNAL power supply is being used to enable H1, H2, and HC inputs, place a jumper between all three inputs.
      ii. If an EXTERNAL power supply is being used to enable the H1, H2, and HC inputs, a jumper needs to be placed to enable the H1 and H2. Do NOT put a jumper between H1/H2 to HC.
   d. If any of the logic inputs in the C2 sub-menu are set to "Ext BaseBlk N.O." or "Ext BaseBlk N.C.", they must be set to "Term Not Used" while trying to perform an autotune.
2. To begin the autotune, navigate to the U9 AUTOTUNE menu as shown:

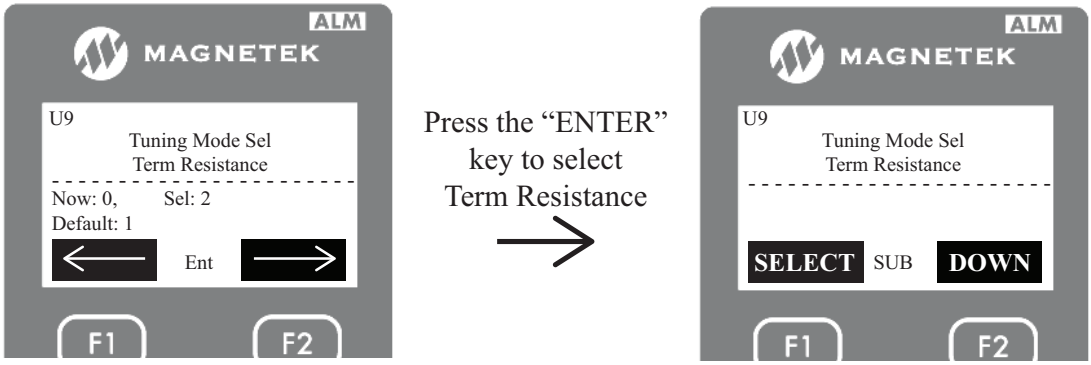


3. Then press the "ENTER" key to access the AUTOTUNE sub-menu screen. The first thing the drive will ask the user is to select a type of autotune as shown below.



4. On this screen, press the “ENTER” key. Then use the UP or DOWN key to select one of four different types of autotune for induction motors. In this case set it for terminal resistance as shown below.

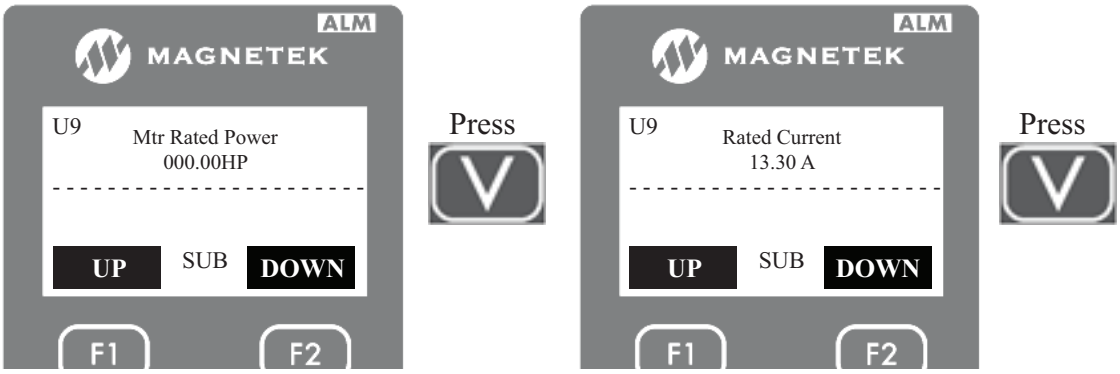
Note: The drive will not retain this setting after a power cycle.



5. After selecting “Term Resistance”, press the down key to enter the next data. The next data the drive will ask the user to enter is the motor nameplate power in horsepower.

Note: The UP key can be pressed to go back to the previous parameter.

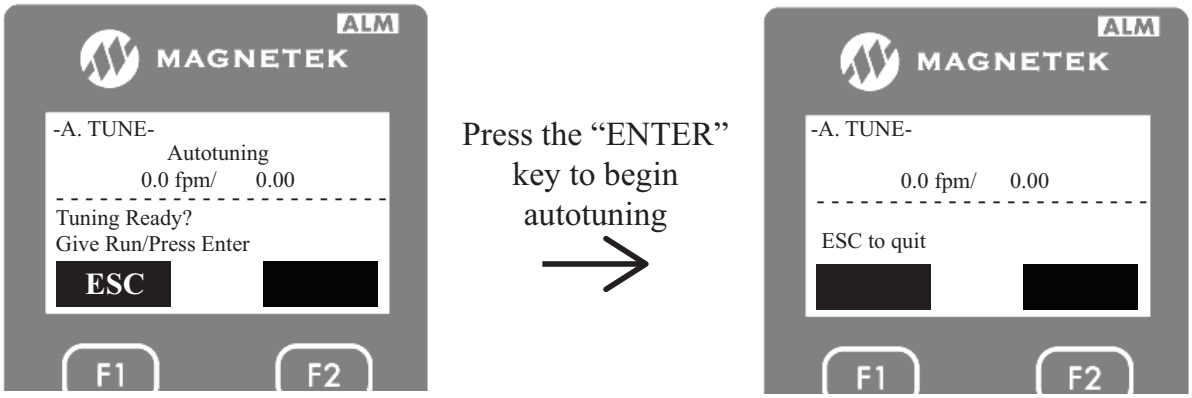
6. After entering the motor nameplate horsepower, press the DOWN key to enter the motor nameplate current.



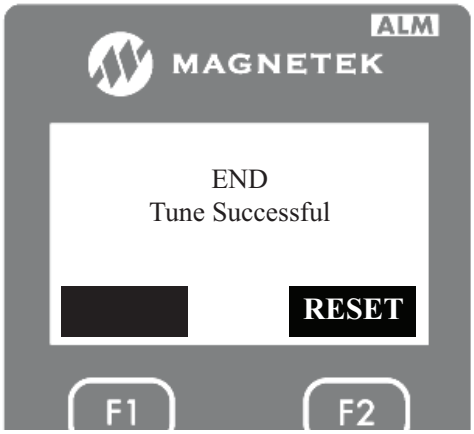
7. After all the data have been entered, the autotune should be initiated by either the “ENTER” key or a RUN signal.

a. If the enter key will be pressed, the motor contactor will need to be bypassed by either wiring or manually pushing the contactor closed. The brake cannot be lifted during the autotune.

b. If a RUN sequence will be sent, the controller should be set to inspection operation. Running the elevator on inspection should pick the motor contactor. The brake cannot be lifted during the autotune.



8. During the autotune, the motor will make audible noise and the display will show speed and motor amps as shown above. After the tuning is done, the drive will announce the following:

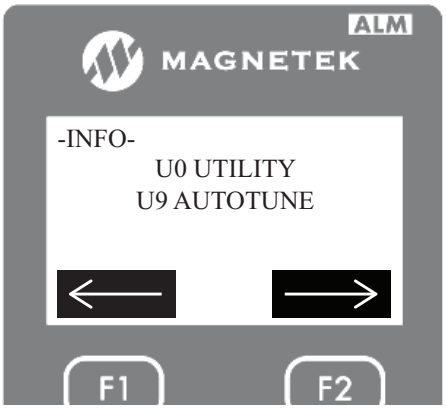


9. After a successful autotune, the drive will populate the following parameters:
   a. Mtr Rated Power (A5)
   b. Motor Rated FLA (A5)
   c. Term Resistance (A5) - calculated from autotune
10. Set the drive back up for normal operation: inspection speed, brakes, base block (if used), and safe disable (if used).

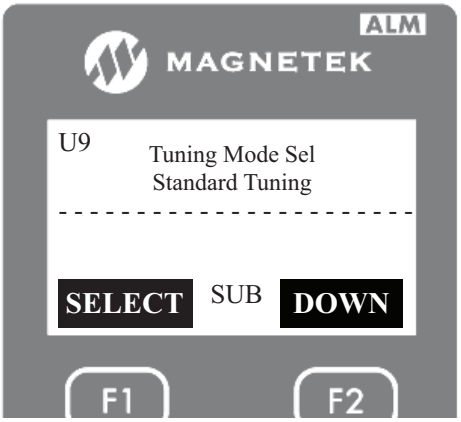
Tune No Rotation 2 (Tune-No Rotate2)

This autotune will calculate several motor characteristics. This is a non-rotational autotune, so this can be performed with the brakes set and the ropes on the sheave.

1. Before the autotune can start, the following needs to be evaluated:
   a. The brakes should be disabled so they do not lift during the autotune. This can be performed by disconnecting the brake coils.
   b. The motor contactor should be bypassed or electrically picked during the autotune.
   c. Verify that the safety disable inputs are enabled.
      i. If the drive's INTERNAL power supply is being used to enable the H1, H2, and HC inputs, place a jumper between all three inputs.
      ii. If an EXTERNAL power supply is being used to enable the H1, H2, and HC inputs, a jumper needs to be placed to enable the H1 and H2. Do NOT put a jumper between H1/H2 to HC.
   d. If any of the logic inputs in the C2 sub-menu are set to "Ext BaseBlk N.O." or "Ext BaseBlk N.C.", they must be set to "Term Not Used" while trying to perform an autotune.
2. To begin the autotune, navigate to the U9 AUTOTUNE menu as shown:

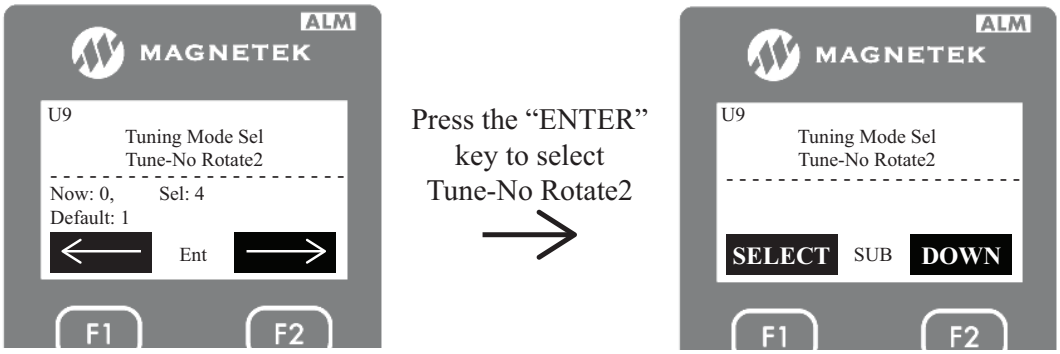


3. Then press the “ENTER” key to access the AUTOTUNE sub-menu screen. The first thing the drive will ask the user is to select a type of autotune as shown below.



4. On this screen, press the “ENTER” key. Then use the UP or DOWN key to select one of four different types of autotune for induction motors. In this case set it for non-rotational tuning 2 as shown below.

Note: The drive will not retain this setting after a power cycle.



5. After selecting “Tune-No Rotate2”, press the DOWN key to enter the next data. The next data the drive will ask the user to enter is the motor nameplate power in horsepower.

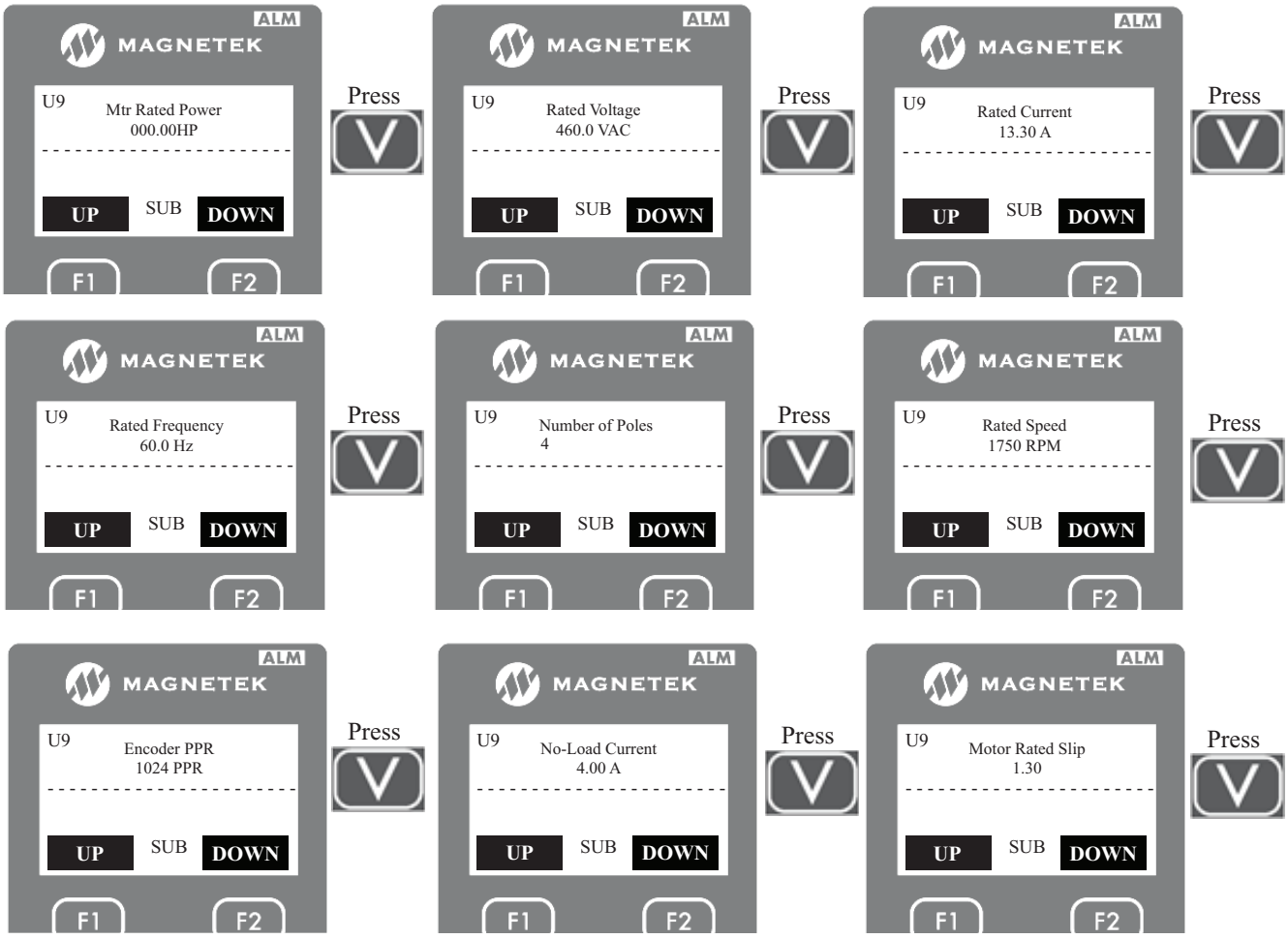
Note: The UP key can be pressed to go back to the previous parameter.

6. After entering the motor nameplate horsepower, press the DOWN key to enter the motor nameplate current.
7. After entering the motor nameplate voltage, press the DOWN key to enter the motor nameplate voltage.
8. After entering the motor nameplate current, press the DOWN key to enter the motor nameplate frequency.
9. After entering the motor nameplate frequency, press the DOWN key to enter the motor poles.
10. After entering the motor poles, press the DOWN key to enter the motor nameplate speed. This speed should be the rated speed and NOT the synchronous.
11. After entering the motor nameplate speed, press the DOWN key to enter the encoder pulses per revolution (PPR).

Note: This parameter is skipped when the drive is set up to run in open-loop.

12. After entering the PPR, press the DOWN key to enter the motor no load current. Some motor manufacturers will have the no load current printed on the nameplate, and some will not. For those that do not, leave the default setting that shows up on the display.

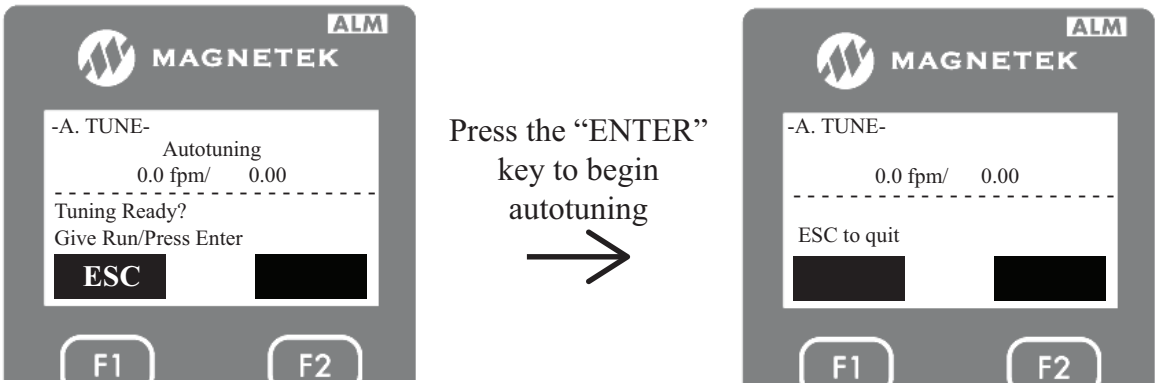
13. After entering the no load current, press the DOWN key to enter the motor rated slip in Hz.



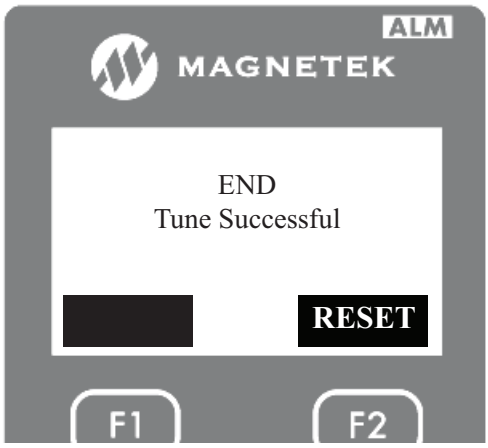
14. After all the data have been entered, the autotune should be initiated by either the “ENTER” key or a RUN signal.

a. If the enter key will be pressed, the motor contactor will need to be bypassed by either wiring or manually pushing the contactor closed. The brake cannot be lifted during the autotune.

b. If a RUN sequence will be sent, the controller should be set to inspection operation. Running the elevator on inspection should pick the motor contactor. The brake cannot be lifted during the autotune.



15. During the autotune, the motor will make audible noise and the display will show speed and motor amps as shown above. After the tuning is done, the drive will announce the following:



16. After a successful autotune, the drive will populate the following parameters:
- **a.** Encoder Pulses (A1)
- **b.** Mtr Rated Power (A5)
- **c.** Max Frequency (A5)
- **d.** Motor Rated FLA (A5)
- **e.** Number of Poles (A5)
- **f.** Motor Rated Slip (A5)
- **g.** No-Load Current (A5)
- **h.** Lead Inductance (A5) - calculated from the autotune
- **i.** Term Resistance (A5) - calculated from the autotune

17. Set the drive back up for normal operation: inspection speed, brakes, base block (if used), and safe disable (if used).

■ PM Motor Autotune

The M1000 has seven autotuning selections for permanent magnet motor using the PG-X3 and PG-F3 cards. The autotune will set up the motor characteristics for motor control.

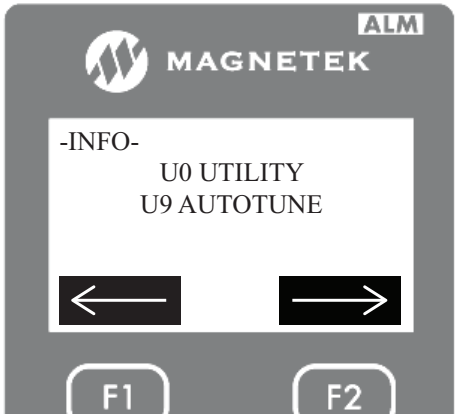
Table 59 PM Tuning Mode (U9)

PM Tuning Mode (U9)	Description
Ind VoltageConst	Rotational autotune that will calculate the motor induction voltage only.
InitPoleEstPrms	It is recommended to perform this non-rotational preliminary check to verify that the non-rotational rotor alignment (PolePos-norotate) can be done without a problem.
PolePos - norotate	Non-rotational rotor alignment that will calculate the position of the magnets in the motor.
PolePos - rotate	Rotational rotor alignment that will calculate the position of the magnets in the motor.
Standard Tuning	This autotune requires all motor parameters to be known during the setup. This autotune will not output any power to the drive, and thus cannot calculate anything.
Term Resistance	Non-rotational autotuning that only measures motor resistance.
Tune-No Rotate	It is recommended to perform this non-rotational autotune first to set up the motor parameters and calculate the motor resistance and inductance.

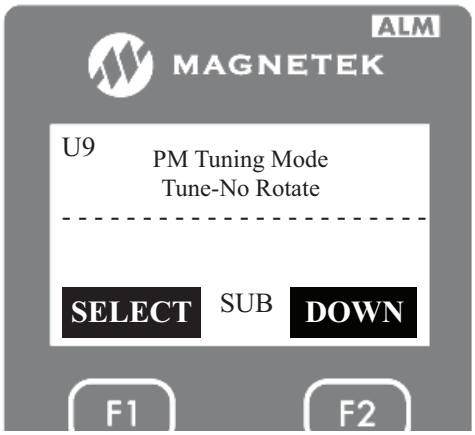
Standard Tuning (Standard Tuning)

This autotune will NOT calculate any motor characteristics. This autotune will not apply any power to the motor and assume that all the relevant motor characteristics are known beforehand.

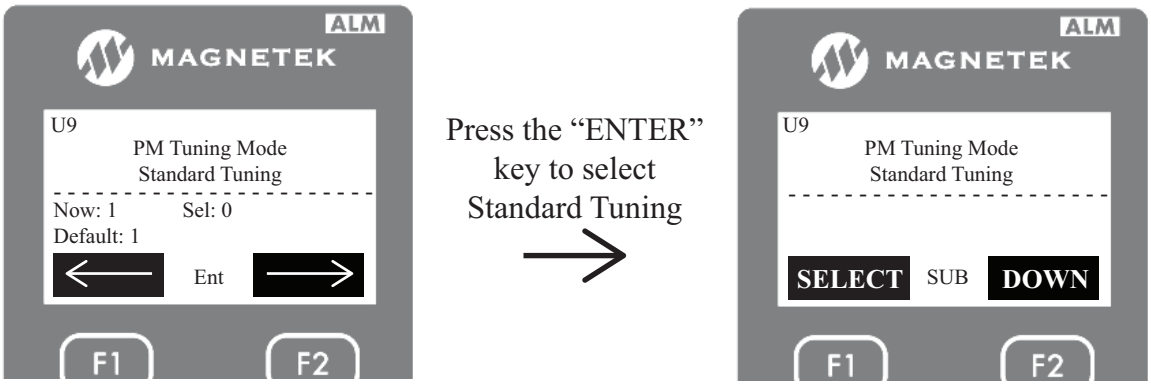
1. Before the autotune can start, the following needs to be evaluated:
   a. The brakes should be disabled so they do not lift during the autotune. This can be performed by disconnecting the brake coils.
   b. Verify that the safety disable inputs are enabled.
      i. If the drive's INTERNAL power supply is being used to enable the H1, H2, and HC inputs, place a jumper between all three inputs.
      ii. If an EXTERNAL power supply is being used to enable the H1, H2, and HC inputs, a jumper needs to be placed to enable the H1 and H2. Do NOT put a jumper between H1/H2 to HC.
   c. If any of the logic inputs in the C2 sub-menu are set to "Ext BaseBlk N.O." or "Ext BaseBlk N.C.", they must be set to "Term Not Used" while trying to perform an autotune.
2. To begin the autotune, navigate to the U9 AUTOTUNE menu as shown:



3. Then press the "ENTER" key to access the AUTOTUNE sub-menu screen. The first thing the drive will ask the user is to select a type of autotune as shown below.



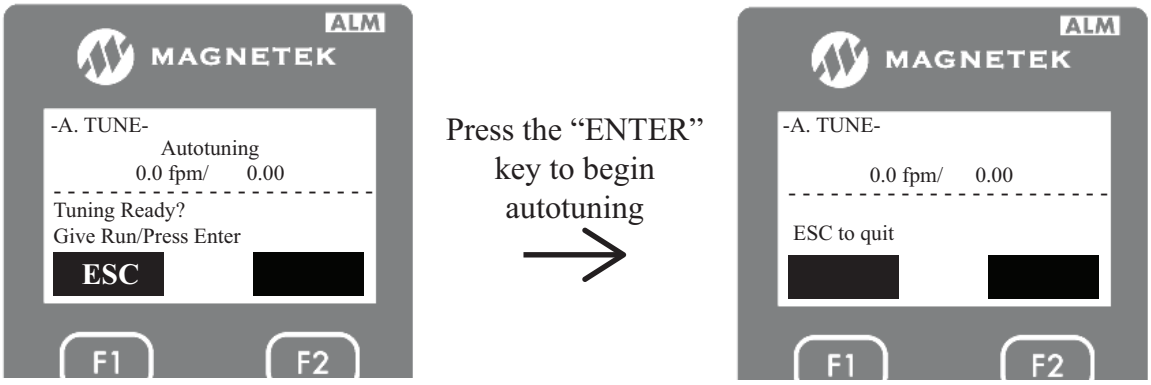
4. On this screen, press the “ENTER” key. Then use the UP or DOWN key to select one of seven different types of autotune for PM motors. In this case set it for standard tuning, as shown below.



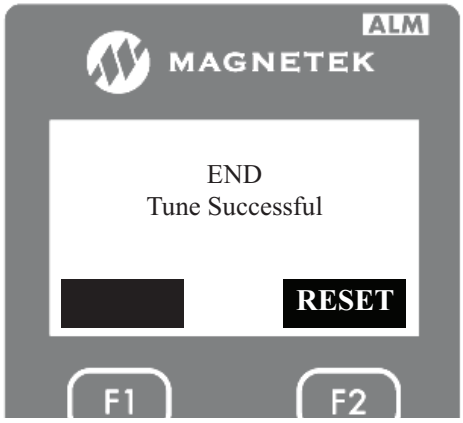
5. After selecting “Standard Tuning”, press the DOWN key to enter the next data. The next data the drive will ask the user to enter is the motor nameplate power in horsepower.

Note: The UP key can be pressed to go back to the previous parameter.

6. After entering the motor nameplate horsepower, press the DOWN key to enter the motor nameplate voltage.
7. After entering the motor nameplate voltage, press the DOWN key to enter the motor nameplate current.
8. After entering the motor nameplate current, press the DOWN key to enter the motor poles.
9. After entering the motor nameplate poles, press the DOWN key to enter the motor nameplate speed.
10. After entering the motor nameplate speed, press the DOWN key to enter the stator resistance.
11. After entering the motor stator resistance, press the DOWN key and enter the d-axis inductance.
12. After entering the motor d-axis inductance, press the DOWN key and enter the q-axis inductance.
13. After entering the motor q-axis inductance, press the DOWN key and select the unit that the induction voltage constant will be entered as.
14. After selecting the unit of the induction voltage constant, press the DOWN key and enter the motor induction voltage constant.
15. After entering the motor induction voltage constant, press the DOWN key and enter the encoder pulses per revolution (PPR).
16. After entering the PPR, press the DOWN key and enter the encoder alignment offset.
17. The drive will ask that the “ENTER” key be pressed to begin the autotune.



18. The drive will not output power to the motor.

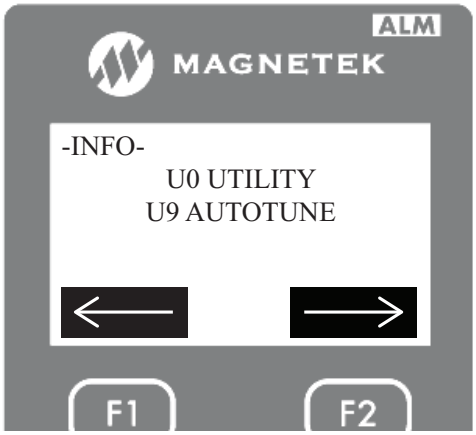


19. After a successful autotune, the drive will populate the following parameters:
    a. PM Mtr Power (A5)
    b. PM Mtr Rated FLA (A5)
    c. PM Motor Poles (A5)
    d. PM Mtr Arm Ohms (A5)
    e. PM Mtr d Induct (A5)
    f. PM Mtr q Induct (A5)
    g. Enc Z-Pulse Offs (A5)
20. Set the drive back up for normal operation: inspection speed, brakes, base block (if used), and safe disable (if used).

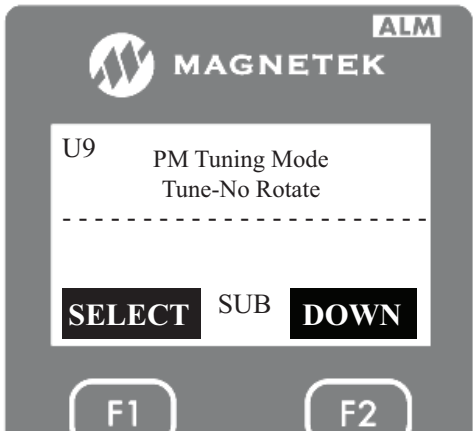
Terminal Resistance (Term Resistance)

This autotune will only calculate the motor resistance. This is a non-rotational autotune, so this can be performed with the brakes set and the ropes on the sheave.

1. Before the autotune can start, the following needs to be evaluated:
   a. The brakes should be disabled so they do not lift during the autotune. This can be performed by disconnecting the brake coils.
   b. The motor contactor should be bypassed or electrically picked during the autotune.
   c. Verify that the safety disable inputs are enabled:
      i. If the drive's INTERNAL power supply is being used to enable the H1, H2, and HC inputs, place a jumper between all three inputs.
      ii. If an EXTERNAL power supply is being used to enable the H1, H2, and HC inputs, a jumper needs to be placed to enable the H1 and H2. Do NOT put a jumper between H1/H2 to HC.
   d. If any of the logic inputs in the C2 sub-menu are set to "Ext BaseBlk N.O." or "Ext BaseBlk N.C.", they must be set to "Term Not Used" while trying to perform an autotune.
2. To begin the autotune, navigate to the U9 AUTOTUNE menu as shown:

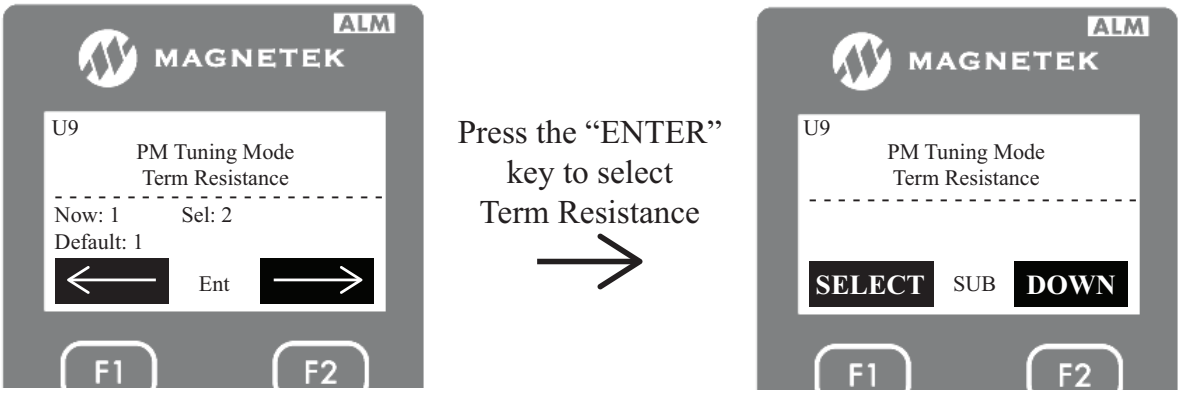


3. Then press the “ENTER” key to access the AUTOTUNE sub-menu screen. The first thing the drive will ask the user is to select a type of autotune as shown below:

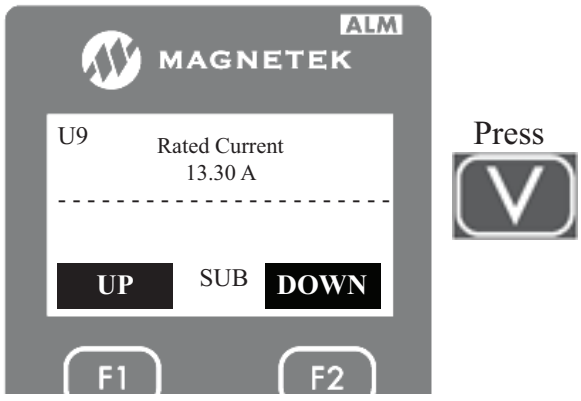


4. On this screen, press the “ENTER” key. Then use the UP or DOWN key to select one of seven different types of autotune for PM motors. In this case set it for terminal resistance as shown below.

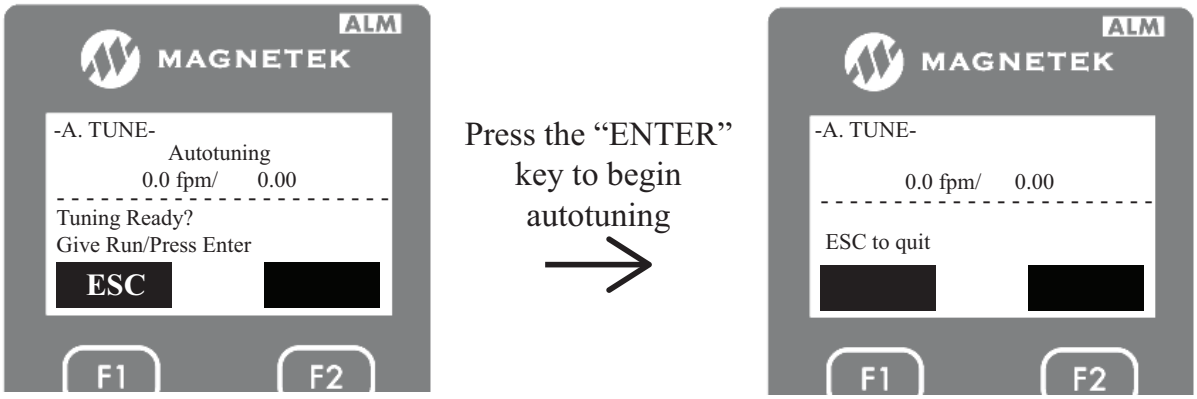
Note: The drive will not retain this setting after a power cycle.



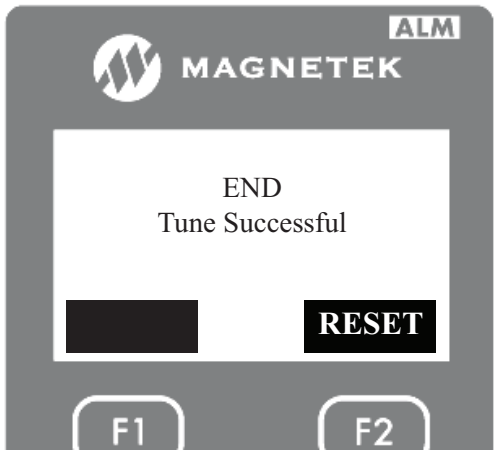
5. After selecting “Term Resistance”, press the DOWN key to enter the next data. The next data the drive will ask the user to enter is the motor nameplate current.
The UP key can be pressed to go back to the previous parameter.



6. After all the data have been entered, the autotune should be initiated by either the “ENTER” key or a RUN signal.
a. If the enter key will be pressed, the motor contactor will need to be bypassed by either wiring or manually pushing the contactor closed. The brake cannot be lifted during the autotune.
b. If a RUN sequence will be sent, the controller should be set to inspection operation. Running the elevator on inspection should pick the motor contactor. The brake cannot be lifted during the autotune.



7. During the autotune, the motor will make audible noise and the display will show speed and motor amps as shown above. After the tuning is done, the drive will announce the following:



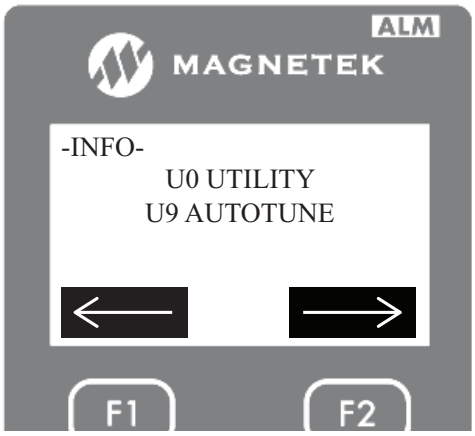
8. After a successful autotune, the drive will populate the following parameters:
   a. PM Mtr Rated FLA (A5)
   b. PM Mtr Arm Ohms (A5) - calculated from the autotune
9. Set the drive back up for normal operation: inspection speed, brakes, base block (if used), and safe disable (if used).

Tune No Rotation (Tune-No Rotate)

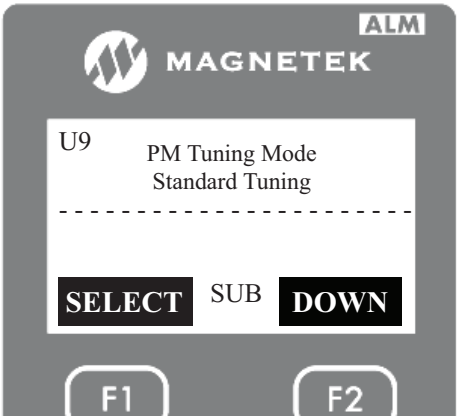
This autotune will calculate several motor characteristic. This is a non-rotational autotune, so this can be performed with the brakes set and the ropes on the sheave. This is the preferred initial non-rotational autotune for permanent magnet motors because it will calculate various motor characteristics.

1. Before the autotune can start, the following needs to be evaluated:
   a. The brakes should be disabled so they do not lift during the autotune. This can be performed by disconnecting the brake coils.
   b. The motor contactor should be bypassed or electrically picked during the autotune.
   c. Verify that the safety disable inputs are enabled:
      i. If the drive's INTERNAL power supply is being used to enable the H1, H2, and HC inputs, place a jumper between all three inputs.
      ii. If an EXTERNAL power supply is being used to enable the H1, H2, and HC inputs, a jumper needs to be placed to enable the H1 and H2. Do NOT put a jumper between H1/H2 to HC.
   d. If any of the logic inputs in the C2 sub-menu are set to "Ext BaseBlk N.O." or "Ext BaseBlk N.C.", they must be set to "Term Not Used" while trying to perform an autotune.

2. To begin the autotune, navigate to the U9 AUTOTUNE menu as shown:

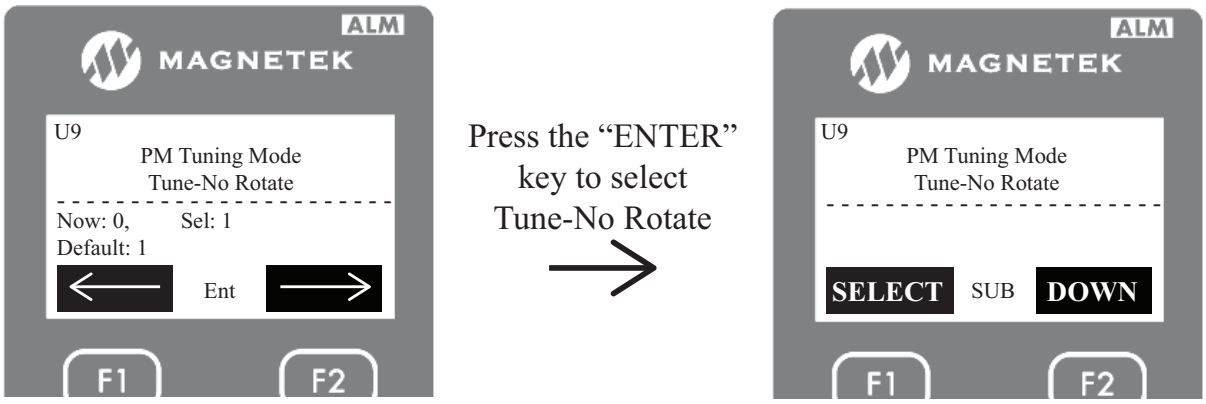


3. Then press the “ENTER” key to access the AUTOTUNE sub-menu screen. The first thing the drive will ask the user is to select a type of autotune as shown below.



4. On this screen, press the “ENTER” key. Then use the UP or DOWN key to select one of seven different types of autotune for PM motors. In this case set it for tuning no rotation as shown below.

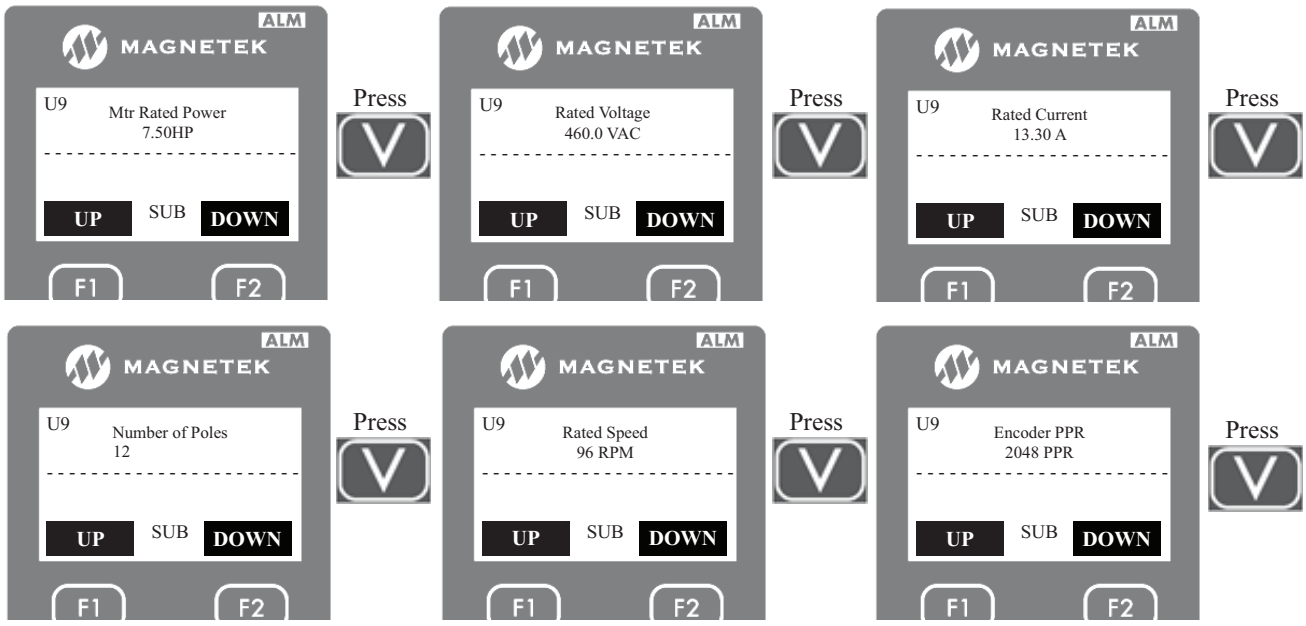
Note: The drive will not retain this setting after a power cycle.



5. After selecting “Tune-No Rotate”, press the DOWN key to enter the next data. The next data the drive will ask the user to enter is the motor nameplate power in horsepower.

Note: The UP key can be pressed to go back to the previous parameter.

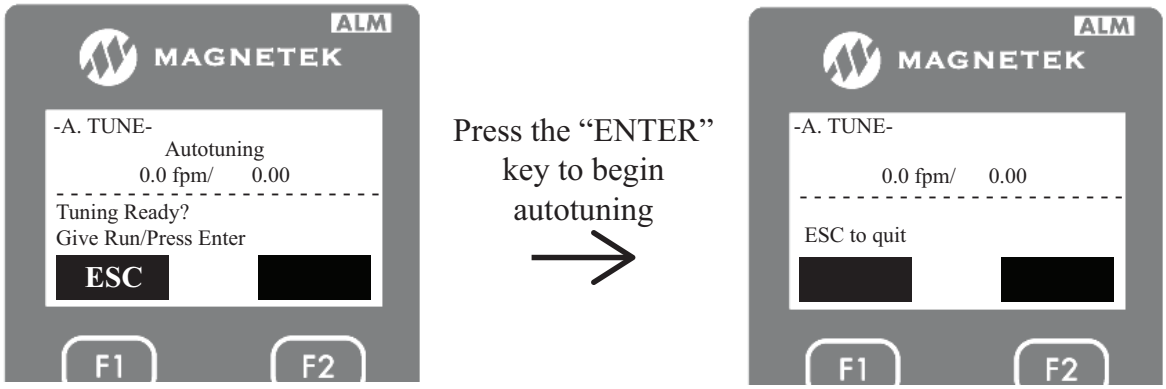
6. After entering the motor nameplate horsepower, press the DOWN key to enter the motor nameplate voltage.
7. After entering the motor nameplate voltage, press the DOWN key to enter the motor nameplate current.
8. After entering the motor nameplate current, press the DOWN key to enter the motor poles.
9. After entering the motor poles, press the DOWN key to enter the motor nameplate speed.
10. After entering the motor nameplate speed, press the DOWN key to enter the encoder pulses per revolution (PPR).



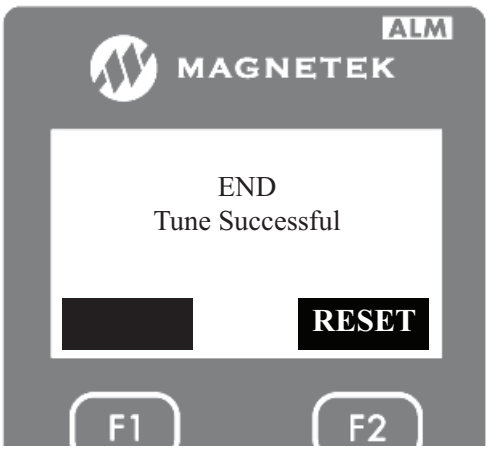
11. After all the data have been entered, the autotune should be initiated by either the “ENTER” key or a RUN signal.

a. If the enter key will be pressed, the motor contactor will need to be bypassed by either wiring or manually pushing the contactor closed. The brake cannot be lifted during the autotune.

b. If a RUN sequence will be sent, the controller should be set to inspection operation. Running the elevator on inspection should pick the motor contactor. The brake cannot be lifted during the autotune.



12. During the autotune, the motor will make audible noise and the display will show speed and motor amps as shown above. After the tuning is done, the drive will announce the following.

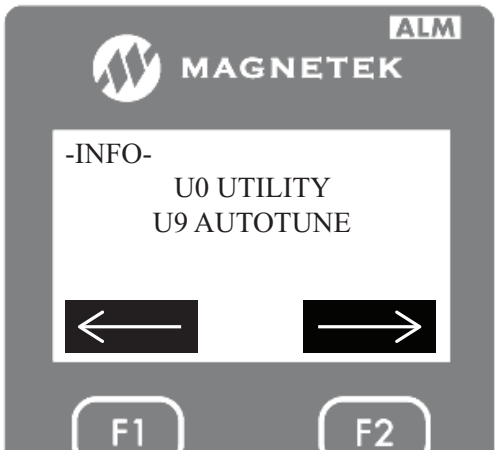


13. After a successful autotune, the drive will populate the following parameters:
    a. Encoder Pulses (A1)
    b. PM Mtr Power (A5)
    c. PM Mtr Rated FLA (A5)
    d. PM Motor Poles (A5)
    e. PM Mtr Arm Ohms (A5) - calculated from the autotune
    f. PM Mtr d Induct (A5) - calculated from the autotune
    g. PM Mtr q Induct (A5) - calculated from the autotune
14. Set the drive back up for normal operation: inspection speed, brakes, base block (if used), and safe disable (if used).

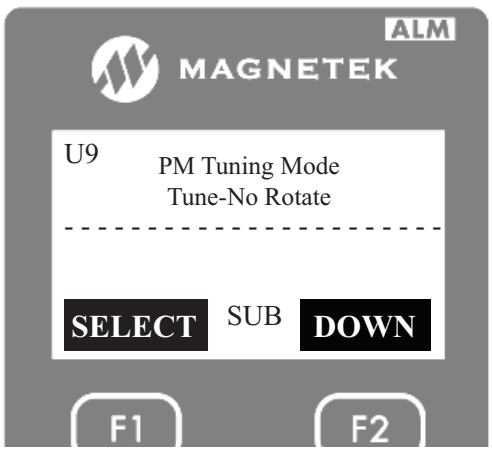
Initial Pole Estimate Parameters (InitPoleEstPrms)

This is only a rotor alignment test that checks if a non-rotational rotor alignment is performed, that the encoder angle offset it measures will have validity in the number that it calculates.

1. Before the alignment test can start, the following needs to be evaluated:
   a. The brakes should be disabled so they do not lift during the alignment test. This can be performed by disconnecting the brake coils.
   b. The motor contactor should be bypassed or electrically picked during the alignment test.
   c. Verify that the safety disable inputs are enabled:
      i. If the drive's INTERNAL power supply is being used to enable the H1, H2, and HC inputs, place a jumper between all three inputs.
      ii. If an EXTERNAL power supply is being used to enable the H1, H2, and HC inputs, a jumper needs to be placed to enable the H1 and H2. Do NOT put a jumper between H1/H2 to HC.
   d. If any of the logic inputs in the C2 sub-menu are set to "Ext BaseBlk N.O." or "Ext BaseBlk N.C.", they must be set to "Term Not Used" while trying to perform an alignment test.
2. To begin the alignment test, navigate to the U9 AUTOTUNE menu as shown:

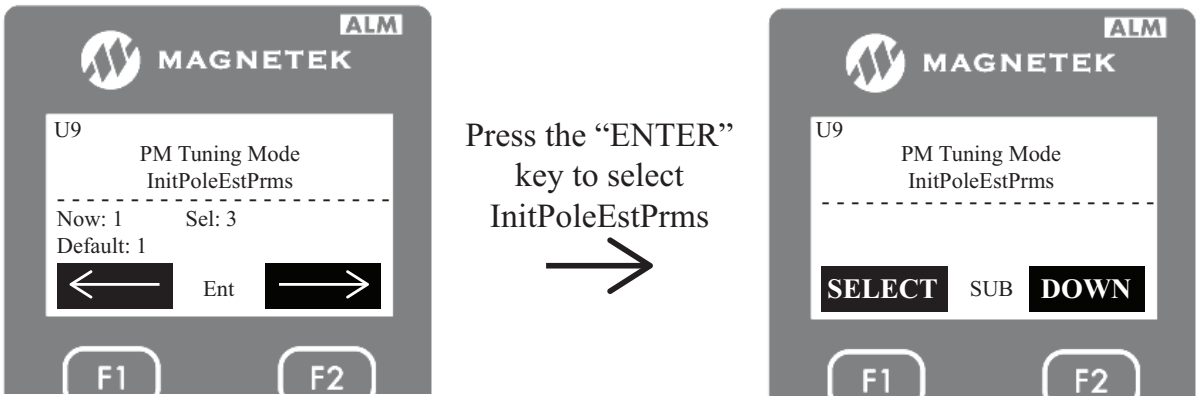


3. Then press the "ENTER" key to access the AUTOTUNE sub-menu screen. The first thing the drive will ask the user is to select a type of autotune as shown below.

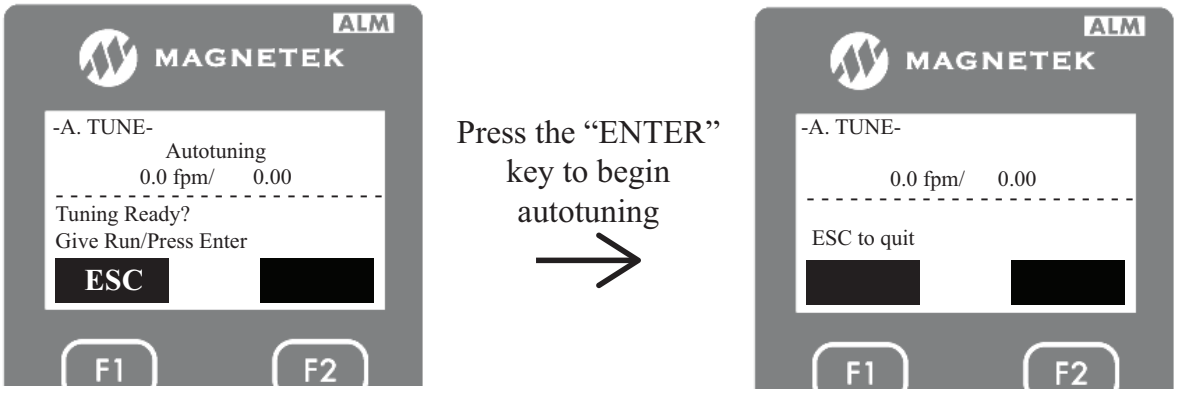


4. On this screen, press the “ENTER” key. Then use the UP or DOWN key to select one of seven different types of autotune for PM motors. In this case set it for the rotor alignment test as shown below.

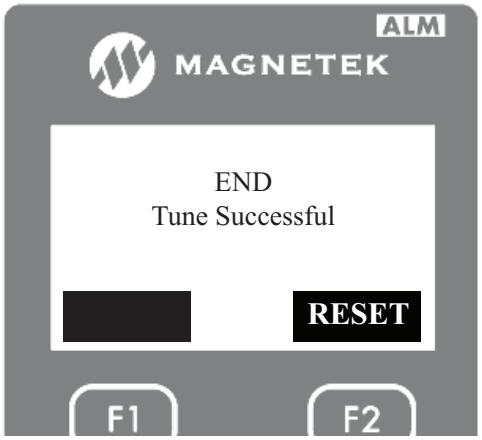
Note: The drive will not retain this setting after a power cycle.



5. After selecting “InitPoleEstPrms”, press the DOWN key to begin the rotor alignment test.
6. The alignment test should be initiated by either the “ENTER” key or a RUN signal.
   a. If the enter key will be pressed, the motor contactor will need to be bypassed by either wiring or manually pushing the contactor closed. The brake cannot be lifted during the alignment test.
   b. If a RUN sequence will be sent, the controller should be set to inspection operation. Running the elevator on inspection should pick the motor contactor. The brake cannot be lifted during the alignment test.



7. During the alignment test, the motor will make audible noise and the display will show speed and motor amps as shown above. After the test is done, the drive will announce the following.

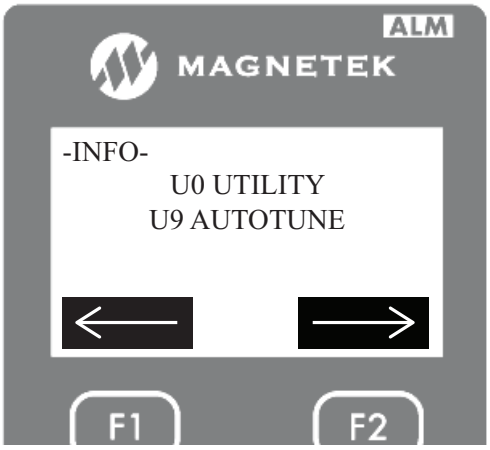


8. After the drive successfully tested alignment, this will indicate that the non-rotational rotor alignment (“PolePos-norotate”) can be done without a problem.

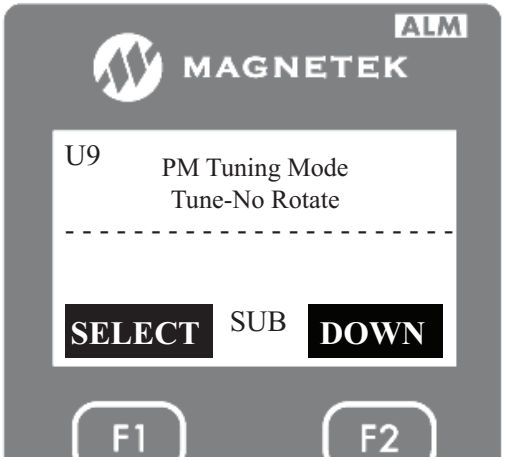
Pole Position No Rotation (PolePos-norotate)

This will perform a rotor alignment that will locate the magnets in the motor. This is a non-rotational alignment. So this can be done with the brakes set and ropes on the sheave. This rotor alignment is only recommended if the drive was able to successfully complete the "InitPoleEstPrms" alignment test.

1. Before the alignment can start, the following needs to be evaluated:
   a. The brakes should be disabled so they do not lift during the alignment. This can be performed by disconnecting the brake coils.
   b. The motor contactor should be bypassed or electrically picked during the alignment.
   c. Verify that the safety disable inputs are enabled:
      i. If the drive's INTERNAL power supply is being used to enable the H1, H2, and HC inputs, place a jumper between all three inputs.
      ii. If an EXTERNAL power supply is being used to enable the H1, H2, and HC inputs, a jumper needs to be placed to enable the H1 and H2. Do NOT put a jumper between H1/H2 to HC.
   d. If any of the logic inputs in the C2 sub-menu are set to "Ext BaseBlk N.O." or "Ext BaseBlk N.C.", they must be set to "Term Not Used" while trying to perform an alignment.
2. To begin the alignment, navigate to the U9 AUTOTUNE menu as shown:

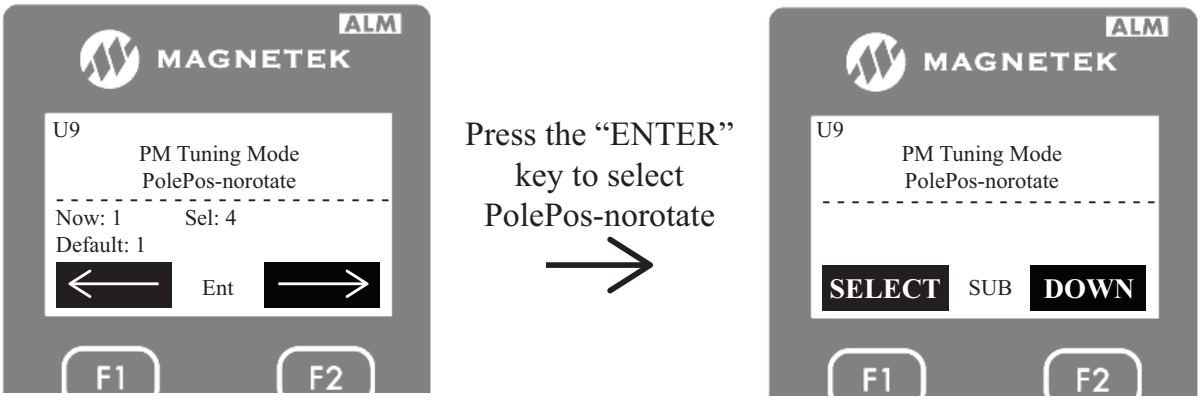


3. Then press the "ENTER" key to access the AUTOTUNE sub-menu screen. The first thing the drive will ask the user is to select a type of autotune as shown below.

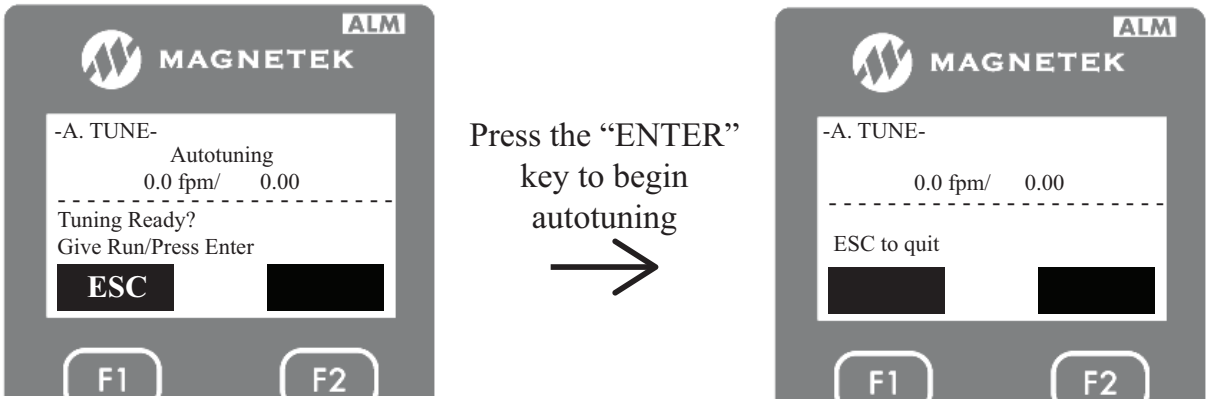


4. On this screen, press the “ENTER” key. Then use the UP or DOWN key to select one of seven different types of autotune for PM motors. In this case set it for non-rotational rotor alignment as show below.

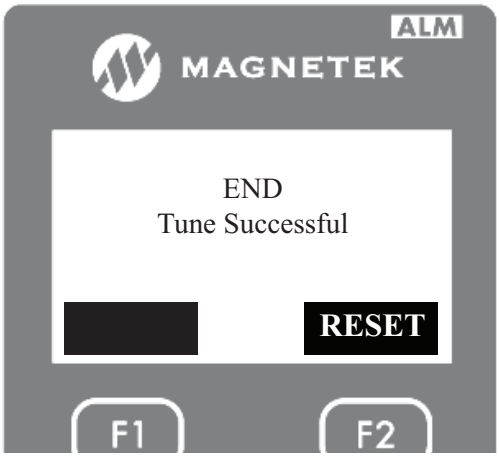
Note: The drive will not retain this setting after a power cycle.



5. After selecting “PolePos-norotate”, press the DOWN key to begin the non-rotational rotor alignment.
6. The alignment should be initiated by either the “ENTER” key or a RUN signal.
   a. If the enter key will be pressed, the motor contactor will need to be bypassed by either wiring or manually pushing the contactor closed. The brake cannot be lifted during the alignment.
   b. If a RUN sequence will be sent, the controller should be set to inspection operation. Running the elevator on inspection should pick the motor contactor. The brake cannot be lifted during the alignment.



7. During the alignment, the motor will make audible noise and the display will show speed and motor amps as shown above. After the alignment is done, the drive will announce the following.



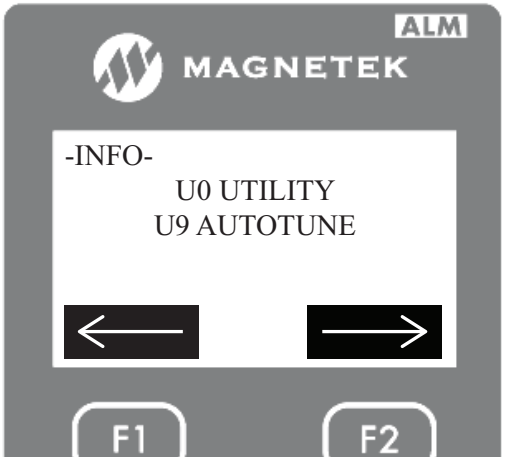
8. After a successful alignment, the drive will populate the following parameters:
   a. Enc Z-Pulse Offs (A5) - calculated from the alignment

9. Set the drive back up for normal operation: inspection speed, brakes, base block (if used), and safe disable (if used).

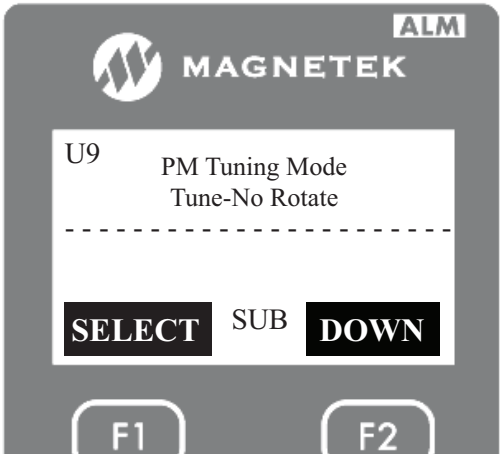
Pole Position Rotation (PolePos-rotate)

This will perform a rotor alignment that will locate the magnets in the motor and verify encoder phasing. This is a rotational alignment so the brakes has to be lifted and ropes be taken off the sheave.

1. Before the alignment can start, the following needs to be evaluated:
   - **a.** The ropes must be off the sheave.
   - **b.** The brakes should be physically or electrically lifted so the motor can rotate freely during the alignment.
   - **c.** The motor contactor should be bypassed or electrically picked during the alignment.
   - **d.** Verify that the safety disable inputs are enabled.
     - **i.** If the drive's INTERNAL power supply is being used to enable the H1, H2, and HC inputs, place a jumper between all three inputs.
     - **ii.** If an EXTERNAL power supply is being used to enable the H1, H2, and HC inputs, a jumper needs to be placed to enable the H1 and H2. Do NOT put a jumper between H1/H2 to HC.
   - **e.** If any of the logic inputs in the C2 sub-menu are set to "Ext BaseBlk N.O." or "Ext BaseBlk N.C.", they must be set to "Term Not Used" while trying to perform an alignment.
2. To begin the alignment, navigate to the U9 AUTOTUNE menu as shown:

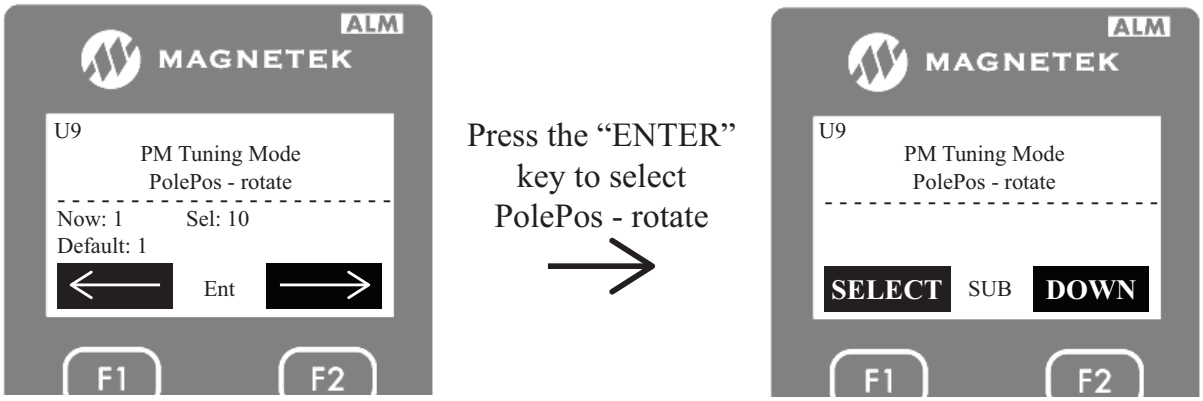


3. Then press the “ENTER” key to access the AUTOTUNE sub-menu screen. The first thing the drive will ask the user is to select a type of autotune as shown below.

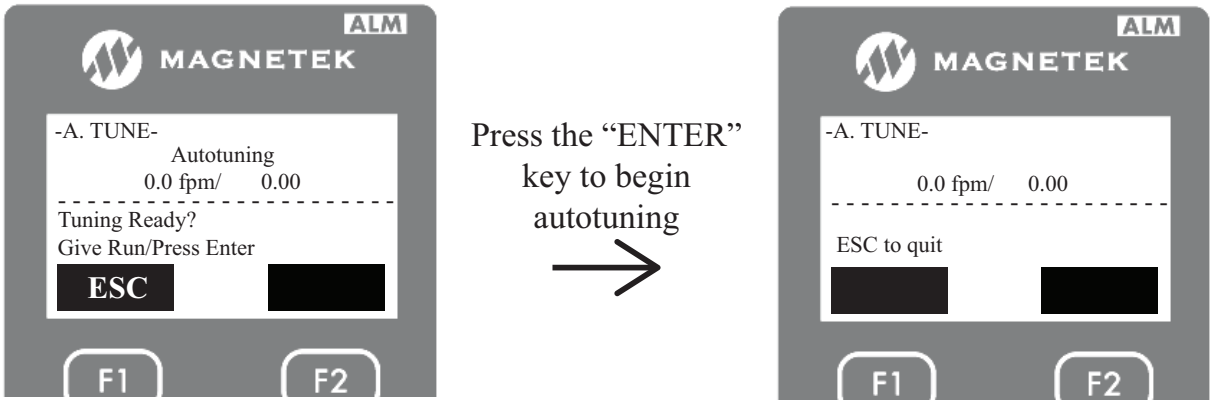


4. On this screen, press the “ENTER” key. Then use the UP or DOWN key to select one of seven different types of autotune for PM motors. In this case set it for rotational rotor alignment as show below.

Note: The drive will not retain this setting after a power cycle.



5. After selecting “PolePos - rotate”, press the DOWN key to begin the rotational rotor alignment.
6. The alignment should be initiated by either the "ENTER" key or a RUN signal.
   a. If the enter key will be pressed, the motor contactor will need to be bypassed by either wiring or manually pushing the contactor closed. The brake will also need to be picked / lifted during the alignment so the motor can spin.
   b. If a RUN sequence will be sent, the controller should be set to inspection operation. Running the elevator on inspection should pick both the motor contactor and brakes.



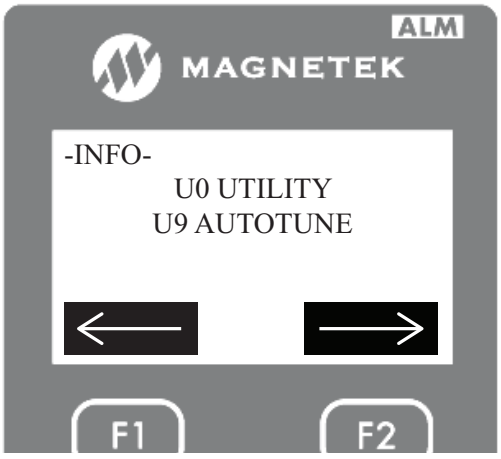
7. During the alignment, the motor will make a noise and jerk. Then it will stop and jerk again in the opposite direction. After the alignment is done, the drive will announce the following.

8. After a successful alignment, the drive will populate the following parameters:
   a. Enc Z-Pulse Offs (A5) - calculated from the alignment

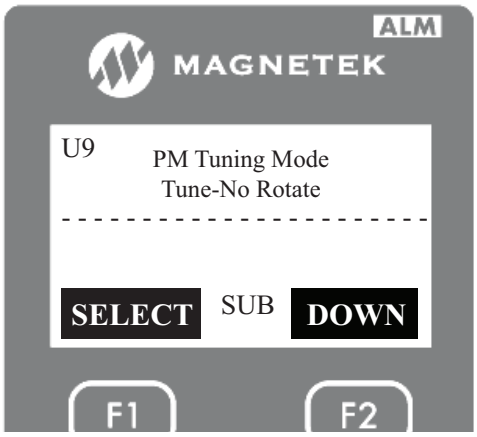
Inductance Voltage Constant (Ind VoltageConst)

This autotune will only calculate the motor inductance voltage. This is a rotational autotune so the brakes has to be lifted and ropes be taken off the sheave.

1. Before the autotune can start, the following needs to be evaluated:
   - **a.** The ropes must be off the sheave.
   - **b.** The brakes should be physically or electrically lifted so the motor can rotate freely during the autotune.
   - **c.** The motor contactor should be bypassed or electrically picked during the autotune.
   - **d.** Verify that the safety disable inputs are enabled.
     - **i.** If the drive's INTERNAL power supply is being used to enable the H1, H2, and HC inputs, place a jumper between all three inputs.
     - **ii.** If an EXTERNAL power supply is being used to enable the H1, H2, and HC inputs, a jumper needs to be placed to enable the H1 and H2. Do NOT put a jumper between H1/H2 to HC.
   - **e.** If any of the logic inputs in the C2 sub-menu are set to "Ext BaseBlk N.O." or "Ext BaseBlk N.C.", they must be set to "Term Not Used" while trying to perform an autotune.
2. To begin the autotune, navigate to the U9 AUTOTUNE menu as shown:

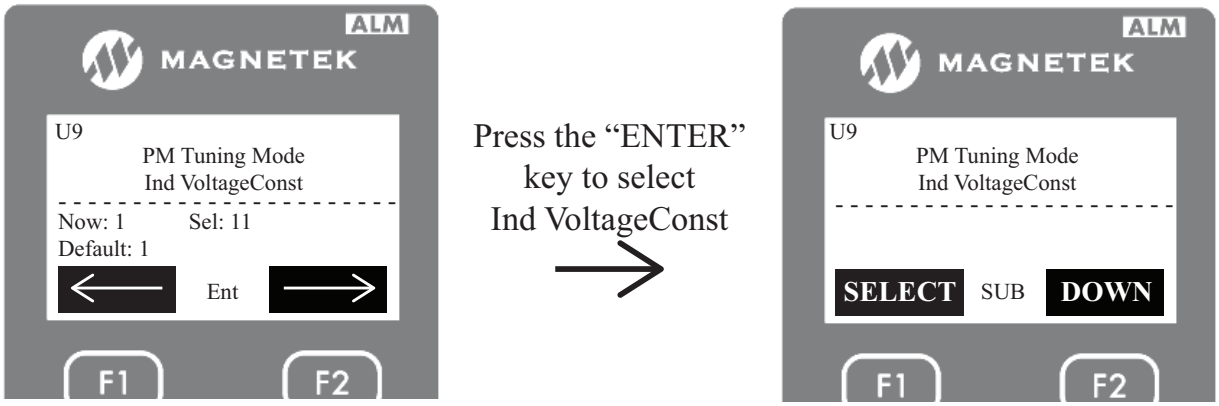


3. Then press the “ENTER” key to access the AUTOTUNE sub-menu screen. The first thing the drive will ask the user is to select a type of autotune as shown below.

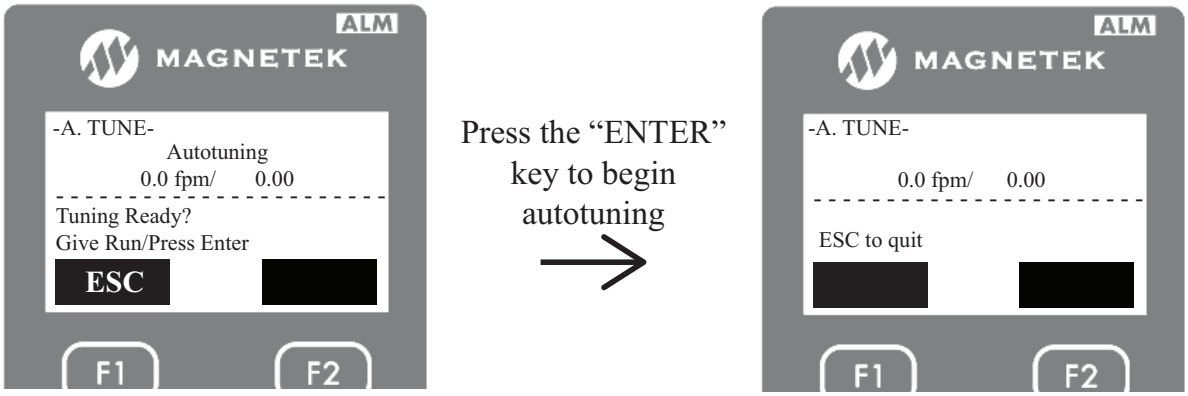


4. On this screen, press the “ENTER” key. Then use the UP or DOWN key to select one of seven different types of autotune for PM motors. In this case set it for inductance voltage constant as show below.

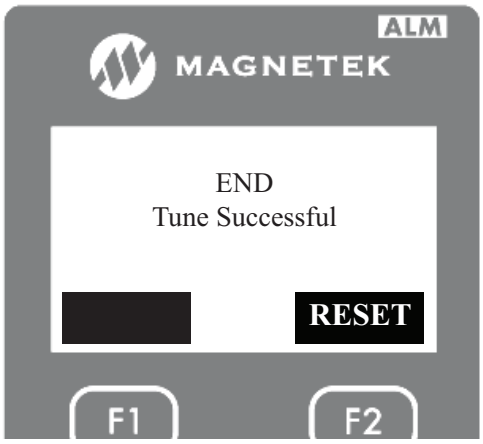
Note: The drive will not retain this setting after a power cycle.



5. After selecting “Ind VoltageConst”, press the DOWN key to begin the autotune.
6. The autotune should be initiated by either the "ENTER" key or a RUN signal.
   a. If the enter key will be pressed, the motor contactor will need to be bypassed by either wiring or manually pushing the contactor closed. The brake will also need to be picked / lifted during the autotune so the motor can spin.
   b. If a RUN sequence will be sent, the controller should be set to inspection operation. Running the elevator on inspection should pick both the motor contactor and brakes.



7. During the autotune, the motor will make a noise and start making several turns. After the tuning is done, the drive will announce the following.



8. After a successful autotune, the drive will populate the following parameters:
   a. PM Mtr Ind V 1 - calculated from the autotune
9. Set the drive back up for normal operation: inspection speed, brakes, ropes, base block (if used), and safe disable (if used).

7 Troubleshooting

◆ Faults, Alarms, Operating Programming Errors, Autotune Faults, and Copy Errors

■ Fault Displays, Causes, and Possible Solutions

Faults are detected for drive protection, and cause the drive to stop while triggering the fault output terminal MA-MB-MC. Remove the cause of the fault and manually clear the fault before attempting to run the drive again.

■ Alarm Codes, Causes, and Possible Solutions (alarm)

Alarms are drive protection functions that do not necessarily cause the drive to stop. Once the cause of an alarm is removed, the drive will return to the same status as before the alarm occurred.

When an alarm has been triggered, the ALM light on the digital operator display blinks and the alarm code display flashes. If a multi-function output is set for an alarm (H2-☐☐ = 10), that output terminal will be triggered for certain alarms.

Note: If a multi-function output is set to close when an alarm occurs (H2-☐☐ = 10), it will also close when maintenance periods are reached, triggering alarms LT-1 through LT-4 (triggered only if H2-☐☐ = 2F).

■ oPE Codes, Causes, and Possible Solutions (programming error)

An Operator Programming Error (oPE) occurs when a contradictory parameter is set or an individual parameter is set to an inappropriate value.

The drive will not operate until the parameter or parameters causing the problem are set correctly. An oPE, however, does not trigger an alarm or fault output. If an oPE occurs, investigate the cause and refer to *Table 60* for the appropriate action. When an oPE appears on the operator display, go to oPE Flt Parameter (F2) to see which parameter is causing the oPE.

■ Autotuning Codes, Causes, and Possible Solutions (autotune)

Autotuning faults in this section are displayed on the digital operator and will cause the motor to coast to a stop. Autotuning faults do not trigger a multi-function digital output set for fault or alarm output.

An End☐ error on the digital operator display indicates autotuning has successfully completed with discrepancies in the calculations. Check the cause of the End☐ error using the tables in this section and perform autotuning again after fixing the cause.

The drive may be used in the application if no cause can be identified despite the existence of an End☐ error.

An Er☐ error indicates that autotuning has not completed successfully. Check for the cause of the error using the tables in this section, and perform autotuning again after fixing the cause.

■ Copy Function Tasks, Errors, and Troubleshooting (copy)

The table below lists the messages and errors that may appear when using the Copy function.

When executing the tasks offered by the Copy function, the operator will indicate the task being performed. When an error occurs, a code appears on the operator to indicate the error. Note that errors related to the Copy function do not trigger a multi-function output terminal that has been set up to close when a fault or alarm occurs. To clear an error, simply press any key on the operator and the error display will disappear.

Table 60 lists the corrective action that can be taken when an error occurs.

Note:
1. Whenever using the copy function, the drive should be fully stopped.
2. The drive will not accept an Up/Down command while the Copy function is being executed.
3. Parameters can only be saved to a drive when the voltage class, capacity, control mode, and software version match.

Table 60 Detailed Fault Displays, Causes, and Possible Solutions

Fault Code/ Name	Description	Causes and Solutions
AEr CAN Setup Alm *(alarm)*	**Communication Option Node ID Setting Error (CANopen):** Option card node address is outside the acceptable setting range.	Station number is set outside the possible setting range. • Set parameter F6-35 to the proper value if a CANopen option card is used.
bb Base Block Alarm *(alarm)*	**Baseblock:** Drive output interrupted as indicated by an external baseblock signal.	External baseblock signal was entered via one of the multi-function input terminals (S1 to S8). • Check external sequence and baseblock signal input timing. • Verify that one of the logic input terminals in the C2 sub-menu is not programmed incorrectly to “Ext BaseBlk N.O.” or “Ext BaseBlk N.C.”. • Verify that the logic input is being triggered correctly when the drive is running.
boL DB Overload Alm / DB Overload Flt	**Braking Transistor Overload:** The braking transistor has reached its overload level.	The wrong braking resistor is installed. • Make sure the rating of the braking resistor fits drive and application. Use an external braking transistor if necessary.
bUS Option COM Alm / Option COM Flt	**Option Communication Error:** The connection was lost after establishing initial communication; Only detected when the Up/Down command speed reference is assigned to an option card.	No signal was received from the PLC, or faulty communications wiring or an existing short circuit. • Check for fault wiring. • Correct the wiring. • Check for disconnected cables and short circuits and repair as needed. A communications data error occurred due to noise. • Check the various options available to minimize the effects of noise. • Counteract noise in the control circuit, main circuit, and ground wiring. • Ensure that other equipment such as switches or relays do not cause noise. Use surge absorbers if necessary. • Use only recommended cables or other shielded line. Ground the shield on the controller side or on the drive input power side. • Separate all communication wiring from drive power lines. Install an EMC noise filter to the drive power supply input. The option card is damaged. • Replace the option card if there are no problems with the wiring and the error continues to occur. The option card is not properly connected to the drive. • The connector pins on the option card do not line up properly with the connector pins on the drive. • Reinstall the option card.
CALL No COM Alm *(alarm)*	**Serial Communication Stand By:** Communication has not yet been established.	Communications wiring is faulty, there is a short circuit, or something is not connected properly. • Check for wiring errors. • Correct the wiring. • Check for disconnected cables and short circuits. Repair as needed. Programming error on the master side. • Check communications at start-up and correct programming errors. Communications circuitry is damaged. • Perform a self-diagnostics check. • If the problem continues, replace either the control board or the entire drive. For instructions on replacing the control board, contact Magnetek. Termination resistor setting is incorrect. • A termination resistor must be installed at both ends of a communication line. Slave drives must have the internal termination resistor switch set correctly. Place DIP switch S2 to the ON position.

Fault Code/ Name	Description	Causes and Solutions
CE ModBus COM Alm / ModBus COM Flt	**MEMOBUS/Modbus Communication Error:** Communication data was not received for the amount of time set in parameter Communication Fault Detection Time.	Faulty communications wiring or an existing short circuit. • Check for faulty wiring. • Correct the wiring. • Check for disconnected cables and short circuits and repair as needed. Communication data error occurred due to noise. • Check the various options available to minimize the effects of noise. • Counteract noise in the control circuit, main circuit, and ground wiring. • Use only recommended cables or other shielded line. Ground the shield on the controller side or on the drive input power side. • Ensure that other equipment such as switches or relays do not cause noise. Use surge absorbers if required. • Separated all communication wiring from drive power lines. Install an EMC noise filter to the drive power supply input.
CF OL Ovrtorq Flt	**Control Fault:** The torque limit was reached continuously for three seconds or longer while ramping to stop in OLV Control.	Motor parameters are improperly set. • Check the motor parameter settings and repeat autotuning. Torque limit is too low. Set the torque limit to the most appropriate setting for Mtr Torque Limit (A1) and Regen Torque Limit (A1). Load inertia is too big. • Lower the deceleration ramp rates in A2. • Set the speed reference to the minimum value and interrupt the Up/Down command when the drive finishes decelerating.
CoF Current Offset	**Current Offset Fault:** The current sensor is damaged or there was residual induction current in the motor (e.g., during sudden deceleration or when coasting) when the drive attempted to start the motor.	Due to residual induction current in the motor when the drive attempted to start the motor, the drive attempted to adjust the current offset value beyond the allowable range. • Create a motor restart sequence that allows enough time for the residual induction voltage to dissipate. • Enable Speed Search at start (b3-01 = 1). Use the multi-function terminals to execute External Speed Search 1 and 2 (H1-xx = 61 or 62). **Note:** When using a PM motor, both External Speed Search 1 and 2 perform the same operation. Hardware is damaged. Replace the drive.
COMM Serial Comms Alm / Serial Comms Flt	**Serial Communication Alarm / Fault:** With MODE 1 serial communication protocol, the drive has not received a Runtime message for more than 40ms while the drive is running. or The drive has received 2 or more consecutive checksum errors.	Parameters are set incorrectly • Check that the Serial Comm Mode (C1) is set to the correct communication protocol. Communication wiring • Check that the communication wires are connected into the correct terminal • Check for faulty wiring or poor connection on the terminals • Check for breaks in the wires • Replace the communication cable / wire Hardware issue • Check if the drive is receiving messages from the controller in SrlBytesReceieved (D1). • Perform a communication self-diagnostics check • Replace the drive terminal board or the control board • Replace the controller serial communication board Electrical noise • Check that the communication cable is not in close proximity to power conductors. • Check that the communication cable has a shield and that the shield is properly grounded. • Place DIP switch S2 to the ON position
CoPy *(copy)*	**Writing Parameter Settings (flashing)**	Parameters are being written to the drive. • Not an error.

Fault Code/ Name	Description	Causes and Solutions
CPEr *(copy)*	**Control Mode Mismatch**	Control mode of the parameters to be loaded onto the drive an the control mode already set to the drive don't match. • Check the control mode for the parameters that are to be loaded onto the drive and the control mode set to the drive those parameters will be written to. Set the same control mode using parameter Control Method (U8) and try again.
CPF00 or CPF01 Ctrl Circuit Flt	**Control Circuit Error**	There is a self diagnostic error in control circuit. • Cycle power to the drive. • Set the frequency to the minimum value and interrupt the Run command when the drive finishes decelerating. Connector on the operator is damaged. • Replace the operator.
CPF02 Internal A/D Flt	**A/D Conversion Error:** An A/D conversion error or control circuit error occurred.	Control circuit is damaged. • Cycle power to the drive. • If the problem continues, replace the control board or the entire drive. Contact Magnetek for instructions on replacing the control board.
CPF03 CPU Conn Flt	**Control Board Connection Error:** Connection error between the control board and the drive.	There is a connection error. • Turn off the power and check the connection between the control board and the drive. • If the program continues, replace the control board or the entire drive. Contact Magnetek for instructions on replacing the control board. Drive fails to operate properly due to noise interference. • Check the various options available to minimize the effects of noise. • Counteract noise in the control circuit, main circuit, and ground wiring. • Use only recommended cables or other shielded line. Ground the shield on the controller side or on the drive input power side. • Ensure that other equipment such as switches or relays do not cause noise and use surge absorbers if required. • Separate all communication wiring from drive power lines. Install an EMC noise filter to the drive power supply input.
CPF06 CPU EEPROM Flt	**EEPROM Memory Data Error:** An error in the data saved to EEPROM.	There is an error in EEPROM control circuit. • Turn off the power and check the connection between the control board and the drive. • If the problem continues, replace the control board or the entire drive. Contact Magnetek for instructions on replacing the control board. The power supply was switched off while parameters were being saved to the drive. • Restore defaults in the drive with Initialization (U5). Power to the control board was lost while writing parameter settings during Rescue Operation. • Restore defaults in the drive with Initialization (U5).
CPF07 Term Comm Flt	**Terminal Board Connection Error**	There is a fault connection between the terminal board and control board. • Turn off the power and check the connection between the control board and the drive. • If the problem continues, replace the control board or the entire drive. Contact Magnetek for instructions on replacing the control board.
CPF08 Term EEPROM Flt		
CPF11 to CPF14, CPF16 to CPF21 Ctrl RAM Fault	**Control Circuit Error**	Hardware is damaged. • Cycle power to the drive. • If the problem continues, replace the control board or the entire drive. Contact Magnetek for instructions on replacing the control board.
CPF22 Hybrid IC Fault	**Hybrid IC Failure**	Hybrid IC failure on the power board. • Cycle power to the drive. • If the problem continues, replace the control board or the entire drive. Contact Magnetek for instructions on replacing the control board.

Fault Code/ Name	Description	Causes and Solutions
CPF23 PWM Fdbk Flt	**Control Board Connection Error:** Connection error between the control board and the drive.	Hardware is damaged. • Turn the power off and check the connection between the control board and the drive. • If the problem continues, replace the control board or the entire drive. Contact Magnetek for instructions on replacing the control board.
CPF24 Drive Model Flt	**Drive Unit Signal Fault:** The drive capacity cannot be detected correctly (drive capacity is checked when the drive is powered up)	Hardware is damaged. • If the problem continues, replace the control board or the entire drive. Contact Magnetek for instructions on replacing the control board.
CPF25 No Term Brd Flt	**Terminal Board not Connected**	Terminal board is not connected correctly. • Reconnect the terminal board to the connector on the drive, then cycle power to the drive.
CPF26 to CPF34	**Control Circuit Error:** CPU Error	Hardware is damaged. • If the problem continues, replace the control board or the entire drive. Contact Magnetek for instructions on replacing the control board.
CPF35 External A/D Flt	**A/D Conversion Error:** An A/D conversion error or control circuit error occurred.	A/D conversion is damaged; control circuit is damaged. • Cycle power to the drive. • If the problem continues, replace the control board or the entire drive. Contact Magnetek for instructions on replacing the control board.
CPyE *(copy)*	**Error Writing Data**	Failed writing parameters. • Try writing parameters again.
CrST *(alarm)*	**Cannot Reset**	A fault reset command was entered while the Run command was still present. • Ensure that a Run command cannot be entered from the external terminals or option card during fault reset. • Turn off the Run command.
CSEr *(copy)*	**Copy Unit Error**	Hardware fault. • Replace the operator or the USB Copy Unit.
dEv Speed Dev Alarm / Speed Dev Fault	**Speed Deviation with Control Method (U8) set to Closed Loop Vect or PM ClosedLoopVct:** The deviation between the speed reference and speed feedback is greater than the setting in Spd Dev Flt Lvl (A1)and Spd Dev Flt Time (A1).	Load is too heavy. • Reduce the load. Accel/decel ramp is too short. • Lower the acceleration and deceleration rates in the A2 menu. The load is locked up. • Check the machine and hoistway. Parameters are not set appropriately. • Check the settings of parameters Spd Dev Flt Lvl (A1) and Spd Dev Flt Time (A1). The motor brake is not applied. • Ensure the motor brake picks when the drive is running. During Rescue Operation, either the DC bus voltage dropped below DCVoltLvl@Rescue (A1) x (PS ReductnDetLvl (A1) - 10%), or 100 ms after triggering Rescue Operation, the DC bus voltage did not reach DCVoltLvl@Rescue (A1) x PS ReductnDetLvl (A1) before the motor started. • Check the DC bus voltage setting in DCVoltLvl@Rescue (A1). • Lower the speed reference, which is determined by Rescue Speed (C1). • Check the backup power supply. It may need to be replaced with another UPS if it has become worn and can no longer provide enough power.
dFPS *(copy)*	**Drive Model Mismatch**	The drives used in the copy and write process are not the same model; the drive from which the parameters were copied is a different model; or the drive to be written to is a different model. • Check the model number of the drive from which the parameters were copied and the model of the drive to which you are attempting to write the parameters. Make sure the two drives are the same model and have the same software version.
dv1 Z-Pulse Miss Flt	**Encoder Z Pulse Fault:** The motor turned one full rotation without the Z Pulse being detected.	Encoder is not connected, not wired properly, or is damaged. • Make sure the encoder is properly connected and all shielded lines are properly grounded. • If the problem continues after cycling power, then replace either the PG option card or the encoder itself.

Fault Code/ Name	Description	Causes and Solutions
dv2 Z-Pulse Dev Flt	**Z Pulse Noise Fault Detection:** The Z pulse is out of phase by more than 5 degrees for the number of times specified in parameter F1-17.	Noise interference along the encoder cable. • Separate the encoder cable lines from the source of the noise. Encoder cable is not wired properly. • Rewire the encoder and make sure all shielded lines are properly grounded. PG option card or the encoder is damaged. • If the problem continues after cycling power, replace the PG option card or the encoder.
dv3 Reverse Tach Flt	**Inversion Detection:** The torque reference and acceleration are in opposite directions and the speed reference and actual motor speed differ by over 30% for the number of times set to F1-18.	The encoder offset is not set properly. • Set the Enc Z-Pulse Offs (A5) as specified on the motor nameplate. Replacing the encoder or changing the motor/encoder rotation direction requires readjustment of the encoder offset. Perform an alignment in U9 sub-menu. An external force on the load side has caused the motor to move. • Make sure the motor is rotating in the right direction. • Look for any problems on the load side that might cause the motor to rotate in the opposite direction. Noise interference along the encoder cable is disturbing the encoder signals. • Properly rewire the encoder and connect all lines including shielded line. Encoder is disconnected, not wired properly, or the PG option card or the encoder itself is damaged. • Properly rewire the encoder and connect all lines including shielded line. Rotational direction for the encoder is the opposite of the order of the motor lines. • Properly connect the motor lines for each phase (U/T1, V/T2, W/T3). Swap the Motor Rotation (C1), and then perform an alignment in the U9 menu. • Swap the Encoder Connect (C1), and then perform an alignment in the U9 sub-menu.
dv4 Enc Direct Flt	**Inversion Prevention Detection:** Pulses indicate that the motor is rotating in the opposite direction of the speed reference. Set the number of pulses to trigger inverse detection to F1-19. **Note:** Set F1-19 to 0 to disable inverses detection in applications where the motor may rotate in the opposite direction of the speed reference.	The encoder offset is not set properly. • Set the Enc Z-Pulse Offs (A5) as specified on the motor nameplate. • Perform an encoder alignment in the U9 sub-menu. • If the problem continues after cycling power, then replace either the PG option card or the encoder itself. Replacing the encoder or changing the motor/encoder rotation direction requires readjustment of the encoder offset or an encoder alignment in the U9 sub-menu. Noise interference along the encoder cable is disturbing the encoder signals. • Make sure the motor is rotating in the correct direction. • Look for any problems on the load side that might be causing the motor to rotate in the opposite direction. Encoder is disconnected, not wired properly, or the PG option card or the encoder itself is damaged. • Rewire the encoder and make sure all lines including shielded line are properly connected. • If the problem continues after cycling power, replace the PG option card or the encoder.

Fault Code/ Name	Description	Causes and Solutions
dv6 Over Accel Flt	**Overacceleration Detection:** The acceleration/deceleration of the elevator car exceeds the overacceleration detection level	The encoder offset is incorrect. • Perform an encoder alignment in the U9 sub-menu for PM motors. Noise along the encoder cable. • Check the encoder wiring for any loose connections. Make sure that the shielded line is properly grounded. Cables for the motor encoder are not wired properly, or the PG option card (or the encoder itself) is damaged. • Check the encoder wiring for any loose connections. Make sure that the shielded line is properly grounded. Incorrect motor data has been set. • Check the parameters in the A5 sub-menu to make sure they match the information on the motor nameplate. The acceleration is too fast. • Check and adjust the acceleration rate and the jerk at acceleration start set in the A2 sub-menu. Incorrect setting for overacceleration • Check and adjust the setting of Over Accel Lvl (A1) and Over Accel Time (A1) so the fault is not too sensitive.
dv7 Rtr Pole Timeout	**Rotor Polarity Detection Timeover:** Unable to detect the magnetic poles within the designated time.	Battery voltage is too low. • Charge the battery. The output cable is disconnected. • Check for wiring errors and ensure the output cable is connected properly. • Correct the wiring. The motor winding is damaged. • Check the resistance between the motor lines. • Replace the motor if the winding is damaged. The output terminal is loose. • Apply the tightening torque specified in this manual to fasten the terminals. Incorrect motor data has been sent. • Check the parameters in the A5 sub-menu to make sure they match the information on the motor nameplate. Non-rotational alignment failure. • A non-rotational alignment cannot be performed; perform a rotational alignment instead.
dv8 Rtr Pos Det Flt	**PM Rotor Position Estimation Error:** An invalid value resulted from Initial Pole Search. **Note:** Reset the fault and try Initial Pole Search again.	Brake was released during Initial Pole Search or during power loss. • Check the brake sequence. • The brake must remain applied during Initial Pole Search and whenever the power supply is interrupted. Initial Pole Search cannot be performed on the monitor being used. • Use a PG option card that is compatible with both the drive and an absolute encoder. Initial Pole Search cannot be performed. • A non-rotational alignment cannot be performed; perform a rotational alignment instead.
ECE *(copy)*	**Copy Error**	Attempted to read data from the encoder during undervoltage. • Make sure there is no undervoltage fault or alarm, then try reading the data again.
ECS *(copy)*	**Checksum Error**	Checksum error occurred when attempting to read data from the encoder. • Try copying the data again.
EdE *(copy)*	**Write Impossible**	Drive settings do not permit writing to the encoder (F1-51 = 0), or there was a CPF24 while attempting to write to the encoder. • Set the drive to allow encoder to be written to (F1-51 = 1) and try writing the data again.
EEP SI-S EEPROM Alm *(alarm)*	**CANopen EEPROM Checksum Alarm:**	If these errors occur, the object dictionary will be reset to its default values. • After the object dictionary has been changed and object dictionary contents are then changed, execute a Store Parameter command. • If the object dictionary has not been changed, execute a Restore Parameter command.

Fault Code/ Name	Description	Causes and Solutions
EF Run UP / Dwn Alm *(alarm)*	**Up/Down Command Error:** Both RUN UP and RUN DOWN closed simultaneously for over 0.5 s.	Sequence error. • Check the forward and reverse command sequence and correct the problem. **Note:** When minor fault EF detected, motor ramps to stop.
EF0 Option Ext Alm / Option Ext Flt	**Option Card External Fault:** An external fault condition is present.	An external fault was received from the PLC with other than F6-03 = 3 "alarm only" (the drive continued to run after external fault). • Remove the cause of the external fault. • Remove the external fault from the PLC. Problem with the PLC program. • Check the PLC program and correct problems.
EF1 External Alm S1 / External Flt S1	**External Fault (input terminal S1):** External fault at Logic Input 1 on terminal S1.	An external device has tripped an alarm function. • Remove the cause of the external fault and reset the fault. Wiring is incorrect. • Ensure the signal lines have been connected properly to the terminals assigned for external fault detection. • Reconnect the signal line. Incorrect Logic Input settings. • Check for incorrect setting of Logic Inputs in the C2 sub-menu for external faults.
EF2 External Alm S2 / External Flt S2	**External Fault (input terminal S2):** External fault at Logic Input 2 on terminal S2.	
EF3 External Alm S3 / External Flt S3	**External Fault (input terminal S3):** External fault at Logic Input 3 on terminal S3.	
EF4 External Alm S4 / External Flt S4	**External Fault (input terminal S4):** External fault at Logic Input 4 on terminal S4.	
EF5 External Alm S5 / External Flt S5	**External Fault (input terminal S5):** External fault at Logic Input 5 on terminal S5.	
EF6 External Alm S6 / External Flt S6	**External Fault (input terminal S6):** External fault at Logic Input 6 on terminal S6.	
EF7 External Alm S7 / External Flt S7	**External Fault (input terminal S7):** External fault at Logic Input 7 on terminal S7.	
EF8 External Alm S8 / External Flt S8	**External Fault (input terminal S8):** External fault at Logic Input 8 on terminal S8.	
EiF *(copy)*	**Write Data Error**	Communication error occurred while attempting to write to the encoder. • Make sure communications are normal and try writing to the encoder again.
End Tune Successful *(copy)*	**Task Complete**	Finished reading, writing, for verifying parameters. • Not an error.
End1 High V/f Setting *(autotune)*	**Excessive V/f Setting (detected only during Rotational autotuning, and displayed after autotuning is complete).**	The torque reference exceeded 20% during autotuning, or the results from autotuning the no-load current exceeded 80%. • Before autotuning the drive, verify the information written on the motor nameplate and enter the data into the correct parameters in the U9 AUTOTUNE sub-menu. • Enter proper information into the parameters in the U9 AUTOTUNE sub-menu and repeat autotuning.
End2 Iron Core Sat *(autotune)*	**Motor Iron-Core Saturation Coefficient (detected only during Rotational autotuning and displayed after autotuning is complete).**	Motor data entered during autotuning was incorrect. • Make sure the data entered for the parameters in the U9 AUTOTUNE sub-menu match the information written on the motor nameplate. • Restart autotuning and enter the correct information. Results from autotuning are outside the parameter setting range, assigning the iron-core saturation coefficient (E2-07, E2-08) a temporary value. • Check and correct faulty motor wiring.
End3 Motor FLA Err *(autotune)*	**Rated Current Setting Alarm (displayed after Autotuning is complete)**	The correct current rating printed on the nameplate was not entered into Rated Current in the U9 sub-menu during autotune. • Check the setting of parameter Rated Current in the U9 sub-menu. • Check the motor data and repeat autotuning.

Fault Code/ Name	Description	Causes and Solutions
End4 Rated Slip Alarm *(autotune)*	**Adjusted Slip Calculation Error**	The slip that was calculated is outside the allowable range. • Make sure the data entered for autotuning in the U9 sub-menu is correct. • Execute the "Standard Tuning" in the U9 sub-menu for a rotational autotune. If a rotational autotune cannot be done, try "Tune-No Rotate2."
End5 TermResistAlarm *(autotune)*	**Resistance Tuning Error**	The resistance value that was calculated is outside the allowable range. • Double-check the data that was entered for the autotuning process. • Check the motor and motor cable connection for faults.
End6 Leakage L Alarm *(autotune)*	**Leakage Inductance Alarm**	Control Method (U8) setting error. • Check the setting of Control Method (U8). • Check the control mode and repeat autotuning. The leakage inductance value that was calculated is outside the allowable range. • Double-check the data that was entered for the autotune process in Leak Inductance (A5).
End7 No-Load I Alarm *(autotune)*	**No-Load Current Alarm**	The entered no-load current value was outside the allowable range. • Check and correct the faulty motor wiring. Autotuning results were less than 5% of the motor rated current. • Double-check the data that was entered for the autotuning process in No-Load Current (A5).
End8 OmegaInj Alm *(autotune)*	**Rescue Operation Speed Warning**	High frequency injection calculations for the battery power supply were below 10 Hz. • For Rescue Operation, either switch to a larger battery (at least 280 VDC for a 200 V class drive, 560 VDC for a 400 V class drive, or 700 VDC for a 600 V class drive) or switch to an absolute encoder and the PG-F3 option card.
End9 PoleEst Alm *(autotune)*	**Rescue Operation Rotor Pole Position Search Warning**	While operating from the backup battery, pole diversion exceeded 40 degrees. • For Rescue Operation, either switch to a larger battery (at least 280 VDC for a 200 V class drive, 560 VDC for a 400 V class drive, or 700 VDC for a 600 V class drive) or switch to an absolute encoder and the PG-F3 option card.
End10 PoleDis Alm *(autotune)*	**Rescue Operation Rotor Polarity Detection Warning**	While operating from the backup battery, the Id value between poles was less than 5%. • For Rescue Operation, either switch to a larger battery (at least 280 VDC for a 200 V class drive, 560 VDC for a 400 class drive, or 700 VDC for a 600 class drive) or switch to an absolute encoder and the PG-F3 option card.
EPE *(copy)*	**ID Mismatch**	Attempted to acquire machine data from an encoder that does not have any machine data written to it yet. • Try again after writing machine data to the encoder.
Er-01 Data Invalid *(autotune)*	**Motor Data Error**	Motor data or data entered during autotuning was incorrect. • Check that the motor data entered in the parameters for U9 AUTOTUNE sub-menu matches motor nameplate input before autotuning. • Start autotuning over again and enter the correct information. Motor rated power and motor-rated current settings in the U9 AUTOTUNE sub-menu do not match. • Check the drive and motor capacities. • Correct the settings of parameters "Mtr Rated Power" and "Rated Current" in the U9 AUTOTUNE sub-menu. Motor rated current and detected no-load current are not consistent with another. • Check the motor rated current and no-load current. • Correct the settings of parameters No-Load Current (A5) and the "Rated Current" in the U9 AUTOTUNE sub-menu. Rated frequency and motor rated speed in the U9 AUTOTUNE sub-menu do not match. • Set "Rated Frequency" and "Rated Speed" in the U9 AUTOTUNE sub-menu to the correct value. • Check if the correct pole number was entered for the U9 AUTOTUNE sub-menu.

Fault Code/ Name	Description	Causes and Solutions
Er-02 Minor Fault *(autotune)*	**Alarm**	An alarm was triggered during autotuning. • Exit the autotuning menu, check the alarm code, remove the alarm cause, and repeat autotuning.
Er-03 STOP Key *(autotune)*	**Escape Key Input**	Autotuning canceled by pressing ESC key. • Autotuning did not complete properly and will have to be performed again.
Er-04 Resistance *(autotune)*	**Line-to-Line Resistance Error**	Motor data entered during autotuning was incorrect. • Make sure the data entered in the U9 sub-menu for autotune match the information written on the motor nameplate. • Reset autotuning and enter the correct information. Results from autotuning are outside the parameter setting range or the tuning process took too long, or the motor cable or cable connection is faulty. • Check and correct faulty motor wiring.
Er-05 No-Load Current *(autotune)*	**No-Load Current Error**	Motor data entered during autotuning was incorrect. • Make sure the data entered in the U9 sub-menu for autotune match the information written on the motor nameplate. • Restart autotuning and enter the correct information. Results from autotuning are outside the parameter setting range or the tuning process took too long. • Check and correct faulty motor wiring. • Perform a “standard tuning” in the U9 sub-menu for a rotational autotuning. Remember that the rope must be off the sheave and the brake must be released to perform a rotational autotuning. The load during rotational auto-turning was too high. • Disconnect the motor from machine and restart autotuning. If motor and load cannot be uncoupled, make sure the load is lower than 30%. • If a mechanical brake is installed, make sure it is fully lifted during tuning.
Er-08 Rated Slip *(autotune)*	**Rated Slip Error**	Motor data entered during autotuning was incorrect. • Make sure the data entered in the U9 sub-menu for autotune match the information written on the motor nameplate. • Restart auto-turning and enter the correct information. Drive-calculated values outside parameter setting range or the tuning process took too long. • Check and correct faulty motor wiring. • Perform a “standard tuning” in the U9 sub-menu for a rotational autotuning. Remember that the rope must be off the sheave and the brake must be released to perform a rotational autotuning. The load during rotational autotuning was too high. • Disconnect the motor from machine and restart autotuning. If motor and load cannot be uncoupled make sure that the load is lower than 30%. • If a mechanical brake is installed, make sure it is fully lifted during tuning.
Er-09 Acceleration *(autotune)*	**Acceleration Error**	The motor did not accelerate for the specified acceleration ramp. • Lower the acceleration rates in the A2 sub-menu. Torque limit when motoring is too low. • Check the settings of Mtr Torque Limit (A1) and Regen Torq Limit (A1). • Increase the setting of Mtr Torque Limit (A1) and Regen Torq Limit (A1). The load during rotational autotuning was too high. • Disconnect the motor from machine and restart autotuning. If motor and load cannot be uncoupled make sure the load is lower than 30%. • If a mechanical brake is installed, make sure it is fully lifted during tuning.

Fault Code/ Name	Description	Causes and Solutions
Er-10 PG Direction *(autotune)*	**Motor Direction Error**	The encoder signal lines are not properly connected to the drive. • Check and correct wiring to the PG encoder. Motor and encoder direction are opposite. • Check the Speed Feedback (D1) while turning the motor manually in forward direction. If the sign displayed is negative, change the setting of Encoder Connect (C1). The load pulled the motor in the opposite direction of the speed reference and the torque exceeded 100%. • Uncouple the motor from the load and repeat autotuning.
Er-11 Motor Speed *(autotune)*	**Motor Speed Fault**	Torque reference is too high. • Lower the acceleration rate in the A2 sub-menu. • Disconnect the machine from the motor, if possible.
Er-12 I-det. Circuit *(autotune)*	**Current Detection Error**	One of the motor phases is missing: (U/T1, V/T2, W/T3). • Check motor wiring and correct any problems. Current exceeded the current rating of the drive, or the current is too low. • Check the motor wiring for a short between motor lines. • Make sure the motor contactor is closed during tunning. • Replace either the control board or the entire drive. For instructions on replacing the control board, contact Magnetek. Attempted autotuning without motor connected to the drive. • Manually push the motor contactor close while performing the autotune. • Connect the motor and perform auto-turning. Current detection signal error. • Replace either the control board or the entire drive. For instructions on replacing the control board, contact Magnetek.
Er-13 Leakage L ERR *(autotune)*	**Leakage Inductance Error**	Drive was unable to complete tuning for leakage inductance within 300 seconds. • Check all wiring and correct any mistakes. • Double-check the motor current value that was entered for Rated Current in the U9 sub-menu for autotuning. • Check the motor rated current value written on the motor nameplate and enter the correct value.
Er-18 Induced V ERR *(autotune)*	**Induction Voltage Error**	The result of Back EMF Constant Tuning (induced voltage) exceeds the allowable setting range. • Double-check the data entered in the PM autotune in the U9 sub-menu and perform autotuning again. • Check the values set for the PM Mtr Ind V 1 (A5) and / or PM Mtr Ind V 2.
Er-19 PM InductanceERR *(autotune)*	**Inductance Error**	The induced voltage constant attempted to set a value to PM motor d inductance and PM motor q inductance in the A5 sub-menu that exceeds the allowable setting range. • Double-check the data entered in the PM autotune in the U9 sub-menu and perform autotuning again. • Check the values set for the PM Mtr d Induct (A5) and PM Mtr q Induct (A5).
Er-20 StatorResistERR *(autotune)*	**Stator Resistance Error**	Stator resistance tuning attempted to set a value to PM Motor Armature Ohms in the A5 sub-menu that is outside the allowable range. • Double-check the data entered in the PM autotune in the U9 sub-menu and perform autotuning again. • Check the value set for the PM Mtr Arm Ohms (A5).

Fault Code/ Name	Description	Causes and Solutions
Er-21 Z-Pulse Comp ERR *(autotune)*	**Z Pulse Correction Error**	Motor is coasting when autotuning is initiated. • Make sure the motor has stopped completely. Repeat autotuning. Either the motor or the encoder on the motor is not properly wired. • Check the wiring for the motor and the encoder. Repeat autotuning. The direction for the encoder on the motor is not properly wired. • Check the direction of the motor with Motor Rotation (C1) or encoder with Encoder Connect (C1). Encoder is damaged. • Check the signal output from the encoder attached to the motor. Replace the encoder if damaged. PG-E3 option detected excess position error with the ERN1387 encoder. • If other possible solutions are not successful, perform autotuning of PG-E3 encoder characteristics.
Er-22 PoleEst Err *(autotune)*	**Initial Rotor Pole Search Error**	Parameters set by Initial Rotor Pole Search Tuning were outside the acceptable range, or during normal operation, pole diversion exceeded 20 degrees. • Switch to an absolute encoder and to the PG-F3 option card.
Er-23 StandZPlsCmpErr *(autotune)*	**Non-rotating Encoder Offset Tuning Warning**	Pole diversion exceeded 15 degrees three times, or parameters set by Encoder Offset Tuning were outside the acceptable range. • Remove the ropes and conduct a “PolePos-rotate” for PM Tuning Mode (U9) for a rotational autotuning for encoder offset.
Er-24 *(autotune)*	**Autotuning Error for PG-E3 Encoder Characteristics**	The signal lines between the PG-E3 option card and encoder are disconnected at the R+ and R- terminals, or there is excessive electrical interference at the PG-E3 option card. • Refer to the installation manual for the PG-E3 option card for information on correct connection of signal lines. The software for the PG-E3 option card does not support the autotuning of PG-E3 encoder characteristics. • Check the software version (PRG) for the PG-E3 option card. The software version PRG: 1102 or later support autotuning of PG-E3 encoder characteristics.
Er-25 RUN Cmd Removed *(autotune)*	**Run Command Removed:** The drive run signals were removed while the drive was in the process of autotuning the motor. ONLY if the autotune was initiated via the run signals.	Autotune was stopped Fingers were removed off the inspection button while the drive was in the middle of autotune. Intermittent wiring connection issue Check for loose connection on the drive terminals for drive enable, run, run up, run down, and motor contactor feedback inputs. Nuisance error • Perform the autotune with the ENTER key on the operator. Make sure that the motor contactor is bypassed in some fashion during the autotune with the ENTER key.
Er-73 Cycle Pwr To Reset *(autotune)*	**Cycle Power to Reset Error:** Autotune was initiated while the drive was still in a RUN state.	Autotune should only be performed when the drive is idle and NOT running. • Power cycle on the drive will be required to reset the fault.
Er-99 Invalid Tune *(autotune)*	**Invalid Autotune Error**: Operator has received an autotune error that does not exist in the database.	Software for the operator does not support autotune error. • Check Operator Firm (U6) and verify that it is the most recent version. • Contact Magnetek for instruction to update software.
ErE	**Data Error**	Attempted to write data to the encoder during undervoltage. • Make sure there is no undervoltage fault or alarm and try again.
Err EEPROM Write Flt	**EEPROM Write Error:** Data cannot be written to the EEPROM.	Noise has corrupted data while writing to the EEPROM. • Press the ENTER button. • Correct the parameter setting. • Cycle power to the drive. • If the problem continues, replace the control board or the entire drive. Contact Magnetek for instructions on replacing the control board. Hardware problem. • If the problem continues, replace the control board or the entire drive. Contact Magnetek for instructions on replacing the control board.

Fault Code/ Name	Description	Causes and Solutions
EvE *(copy)*	**Verify Error**	Drive parameters and the data saved to the encoder do not match. • Use the Verify Menu to check parameter settings and try again.
FrL No Spd Ref Flt	**Speed Reference Missing:** Parameter d1-18 is set to 3, leveling speed detection is not assigned to a digital input (H1-xx ≠ 53) and no speed was selected while an Up or Down command was entered.	Parameter d1-18 is set to 1, H1-xx is not set to 53 and no speed was selected at start. • Make sure the selected speed selection method matches the elevator controller sequence. Check parameter d1-18 and H1-xx settings. • Make sure the elevator controller is connected properly. • Make sure the elevator controller selects the speed properly.
GF Ground Fault	**Ground Fault:** A current short to ground exceeded 50% of rated current on the output side of the drive.	Motor insulation is damaged. • Check the insulation resistance of the motor. • Replace the motor. A damaged motor cable is creating a short circuit. • Check the motor cable; remove the short circuit and turn the power back on. • Check the resistance between the cable and the ground terminal; replace the cable. The leakage current at the drive output is too high. • Reduce the Carrier Frequency (A4). • Reduce the amount of stray capacitance. • The drive started to run during a current offset fault or while coasting to a stop. • The value set exceeds the allowable setting range while the drive automatically adjusts the current offset (this happens only when attempting to restart a PM motor that is coasting to stop). Hardware problem. • If the problem continues, replace the control board or the entire drive. Contact Magnetek for instructions on replacing the control board.
Hbb SafeDisable Open *(alarm)*	**Safe Disable Circuit Fault Signal (H1-HC, H2-HC) Release:** <I> Both Safe Disable Input channels are open.	Both Safe Disable Inputs H1 and H2 are open. • Check signal status at the input terminals H1 and H2. • Check the Sink/Source Selection for the digital inputs. • If the Safe Disable function is not utilized, check if the terminals H1-HC, and H2-HC are linked. Internally, both Safe Disable channels are broken. • Replace either the control board or the entire drive. For instructions on replacing the control board, contact Magnetek.
HbbF SafeDisable Ckt *(alarm)*	**Safe Disable Circuit Fault Signal (H1-HC, H2-HC) Release:** <I> One Safe Disable channel is open while the other one is closed.	The signals to the Safe Disable inputs are wrong or the wiring is incorrect. • Check signal status at the input terminals H1 and H2. if the Safe Disable function is not utilized, the terminals H1-HC, and H2-HC must be linked. One of the Safe Disable channels is faulty. • Replace either the control board or the entire drive. For instructions on replacing the control board, contact Magnetek.
HCA HighCurrentAlarm *(alarm)*	**High Current Alarm:** Drive current exceeded overcurrent warning level (150% of the rated current).	Load is too heavy. • Either reduce the load for applications with repetitive operation (repetitive stops and starts, etc.) or replace the drive. Acceleration/deceleration is too fast. • Calculate the amount of torque required for the desired acceleration and/or deceleration ramp relative to the inertia moment of the load. • If the torque level is not right for the load, take the following steps: • Lower the acceleration and deceleration times in the A2 sub-menu. • Increase the capacity of the drive. A special-purpose motor is being used, or the drive is attempting to run a motor greater than the maximum allowable capacity. • Check the motor capacity. • Use a motor appropriate for the drive. Ensure the motor is within allowable capacity range. The current level increased due to a momentary power loss or while attempting to perform a fault reset. • The alarm will appear only briefly. There is no need to take action to prevent the alarm from occurring in such instances.

Fault Code/ Name	Description	Causes and Solutions
iFEr *(copy)*	**Communication Error**	A communication error occurred between the drive and the operator or the USB copy unit. • Check the cable connection. A non-compatible cable is being used to connect the USB Copy unit and the drive. • Use the cable originally packaged with the USB Copy Unit.
InvFW Unknown Drv SW	**Unknown Drive Software Version:** The Dual Operator does not recognize the drive software as a compatible drive software.	Drive software verification • Dual Operator is only compatible with the M1000 drive (NOT the L1000). • Check the software version of the drive on the initial loading screen of the Dual Operator when it powers up.
LF Output Pha Loss	**Output Phase Loss:** Phase Loss on the output side of the drive was detected.	The output cable is disconnected. • Check for wiring errors and properly connect the output cable on U, V, and W. • Correct the wiring. • Verify that the motor contactor is closing when running. • Verify that wen the motor contactor is picked, the drive and motor are electrically connected. The motor winding is damaged. • Check the resistance between motor lines. • Replace the motor if the winding is damaged. The output terminal is loose. • Check for loose wires on the motor contactor. • Check for loose wires on the drive's U, V, and W. • Apply the tightening torque specified in this manual to fasten the terminals. The rated current of the motor being used is less than 5% of the drive rated current. • Check the drive and motor capacities. An output transistor is damaged. • If the problem continues, replace the control board or the entire drive. Contact Magnetek for instructions on replacing the control board. A single-phase motor is being used. • The drive cannot operate a single phase motor. Check the setting of Out Ph Loss Det (C1). • Check that the correct output phase loss detection is being selected. • If it is a nuisance fault, disable the function.
LF2 Curr Imbalance	**Output Current Imbalance:** One or more of the phases in the output current is lost.	Phase loss has occurred on the output side of the drive. • Check for faulty wiring or poor connections on the output side of the drive. • Correct the wiring. Wires on the output side of the drive are loose. • Check for loose wires on the drive's U, V, and W. • Check for loose wires on the motor contactor. • Apply the tightening torque specified in this manual to fasten the terminals. The output circuit is damaged. • If the problem continues, replace the control board or the entire drive. Contact Magnetek for instructions on replacing the control board. Motor impedance or motor phases are uneven. • Measure the line-to-line resistance for each motor phase. Ensure all values are the same. • Replace the motor. Nuisance Fault • If the drive is declaring a Current Imbalance fault falsely, disable the fault in PM Cur Unbal Det (C1).

Fault Code/ Name	Description	Causes and Solutions
LT-1 Check Fan Alarm *(alarm)*	**Cooling Fan Maintenance Time:** The cooling fan has reached its expected maintenance period and may need to be replaced. **Note:** An alarm output (H2-xx = 10) will only be triggered if H2-xx = 2F.	The cooling fan has reached 90% of its expected performance life. • Replace the cooling fan and reset the Maintenance Monitor by setting o4-03 to 0.
LT-2 Check Caps Alarm *(alarm)*	**Capacitor Maintenance Time:** The main circuit and control circuit capacitors are nearing the end of their expected performance life. **Note:** An alarm output (H2-xx = 10) will only be triggered if H2-xx = 2F.	The main circuit and control circuit capacitors have reached 90% of their expected performance life. • Replace either the control board or the entire drive. For instructions on replacing the control board, contact Magnetek.
LT-3 Check Pre-Charge *(alarm)*	**Soft Charge Bypass Relay Maintenance Time:** The DC bus soft charge relay is nearing the end of its expected performance life. **Note:** An alarm output (H2-xx = 10) will only be triggered if H2-xx = 2F.	The DC bus soft charge relay has reached 90% of expected performance life. • Replace either the control board or the entire drive. For instructions on replacing the control board, contact Magnetek.
LT-4 Check IGBT Alarm *(alarm)*	**IGBT Maintenance Time (90%):** IGBTs have reached 90% of their expected performance life. An alarm output (H2-xx = 10) will only be triggered if H2-xx = 2F.	IGBTs have reached 90% of their expected performance life. • Check the load, carrier frequency, and output speed. **NOTICE:** *Optimize Performance Life. To maximize drive performance life, make sure the drive output current does not exceed 150% of the drive rated current. Expected performance life estimates the number of drive starts at three million times if output does not exceed 150%. This assumes the carrier frequency is at its default setting (8 kHz for models CIRM-LU2M0008 to 2M0115, 4M0005 to 4M0091, 5M0003 to 5M0062, 5 kHz for models CIRM-LU2M0145 to 2M0283, 4M0112 to 4M0216, 5M0077 and 2 kHz for models LU2M0316, 2M0415, 5M0099 to 5M0200) and a peak current of less than 150% of the drive rated current.*
ndAT *(copy)*	**Model, Voltage Class, Capacity Mismatch**	The drive from which the parameters were copied and the drive to which you are attempting to write have different electrical specifications, capacities, are set to different control modes, or are different models. • Make sure model numbers and specifications are the same for both drives. The device being used to write the parameters is blank and does not have any parameters saved on it. • Make sure all connections are correct, and copy the parameter settings onto the USB Copy Unit or the operator.

Fault Code/ Name	Description	Causes and Solutions
oC Over Current Flt	**Overcurrent:** Drive sensors have detected an output current greater than the specified overcurrent level.	The motor has been damaged due to overheating or the motor insulation is damaged. • Check the insulation resistance. • Replace the motor. One of the motor cables has shorted out or there is a grounding problem. • Check the motor cables; remove the short circuit and reapply the power to the drive. • Check the resistance between the motor cables and the ground terminal; replace damaged cables. The drive is damaged. • Check the drive output side short circuit for broken output transistor: B1 or +3 and U/V/W; - (negative) and U/V/W • Contact Magnetek for assistance. The load is too heavy. • Measure the current flowing into the motor. • Replace the drive with a larger capacity if the current value exceeds the rated current. • Determine if there is sudden fluctuation in the current level. • Reduce the load to avoid sudden changes in the current level or switch to a larger drive. Acceleration/Deceleration is too fast. • Lower the acceleration and/or deceleration rate in the A2 sub-menu. • Use a larger capacity drive. The drive is attempting to operate a specialized motor or a motor larger than the maximum size allowed. • Check the motor capacity. • Ensure that the rated capacity of the drive is greater than or equal to the capacity rating found on the motor nameplate. Magnetic contactor (MC) on the output side of the drive has turned on or off. • Set up the operation sequence so that the MC is not tripped while the drive is outputting current. Incorrect parameter settings. • Lower the Carrier Frequency (A4) parameter. • Change PWM Method (A4) to “2 Phase Modulate”. • Check all the motor parameters in the A5 sub-menu for proper settings. V/f setting is not operating as expected. • Check the V/Hz ratio between the middle voltage/frequency and add the minimum voltage/frequency. • Lower the voltage if it is too high relative to the frequency. Excessive torque compensation. • Reduce the Torq Comp Gain (A1) until there is no speed loss and less current. Drive fails to operate properly due to noise interference. • Review the possible solutions provided for handling noise interference. • Review the section on handling noise interference and check the control circuit lines, main circuit lines, and ground wiring. The overcurrent level has exceeded the value set to L8-27 (PM control modes). • Correct the value set to overcurrent detection gain (L8-27). The motor control method and motor do not match. • Check that the drive is set to the correct motor control in Control Method (U8).
oFA00 CN5-A Invald Flt	**Option Card Connection Error at Option Connection CN5-A, Option Card Fault at Option Connector CN5-A:** Option compatibility error.	The option card installed into port CN5-A is incompatible with the drive. • Check if the drive supports the option card to be installed. Contact Magnetek for assistance. A PG option card is connected to option port CN5-A. • PG option cards are supported by option port CN5-C. Place the PG option card into the correct option port.

Fault Code/ Name	Description	Causes and Solutions
oFA01 CN5-A Conn Flt	**Option Card Fault at Option Connector CN5-A:** Option not properly connected.	The option board connection to port CN5-A is faulty. • Turn off the power and reconnect the option card. • Check if the option card is properly plugged into the option port. Make sure the card is fixed properly. • If the option is not a communication option card, try to use the card in another option port. If the option card works properly in a different option port, replace the drive because port CN5-A is damaged. If the error persists (oFb01 or oFC01 occur), replace the option card.
oFA02 CN5-A Duplicate *(alarm)*	**Duplicate Option Card at Port CN5-A:** There is already the same type of option card connected on a different port.	An option card of the same type is already installed in option port CN5-B. • Except for PG options, each option card type can only be installed once. Make sure only one type of option card is connected. An input option card is already installed in option port CN5-B. • Install a comm. option, a digital input option, or an analog input option. The same type of card cannot be installed twice.
oFA05, oFA06 oFA10, oFA11 oFA12 to oFA17 oFA30 to oFA43	Option card error occurred at option port CN5-A.	Option card or hardware is damaged. • Cycle power to the drive. • If the problem continues, replace the control board or the entire drive. Contact Magnetek for instructions on replacing the control board.
oFb00 CN5-B Invald Flt	**Option Card Fault at Option Port CN5-B:** Option compatibility error.	The option card installed into port CN5-B is incompatible with the drive. • Make sure the drive supports the option card to be installed. Contact Magnetek for assistance. A communication option card has been installed in option port CN5-B. • Communication option cards are only supported by option port CN5-A. It is not possible to install more than one comm. option. PG-F3 is connected to option port CN5-B. • PG-F3 is only supported by option port CN5-C. Place PG-F3 on the top option port.
oFb01 CN5-B Conn Flt	**Option Card Fault at Option Port CN5-B:** Option not properly connected.	The option board connection to port CN5-B is faulty. • Turn off the power and reconnect the option card. • Check if the option card is properly plugged into the option port. Make sure the card is fixed properly. • Try to use the card in another option port (in case of a PG option use CN5-C). If the option cards work in the other port, replace the drive because port CN5-B is damaged. If the error persists (oFA01 or oFC01 occur), replace the option board.
oFb02 CN5-B Duplicate	**Option Card Fault at Option Port CN5-B:** Same type of option card already connected.	An option card of the same type is already installed in option port CN5-A. • Except for PG options, each option card type can only be installed once. Make sure only one type of option card is connected. An input option card is already installed in option port CN5-A. • Install a comm. option, a digital input option, or an analog input option. The same type of card cannot be installed twice.
oFb03 to oFb11 oFb12 to oFb17	Option card error occurred at Option Port CN5-B.	Option card or hardware is damaged. • Cycle power to the drive. • If the problem continues, replace the control board or the entire drive. Contact Magnetek for instructions on replacing the control board.
oFC00 CN5-C Invald Flt	**Option Card Connection Error at Option Port CN5-C:** Option compatibility error.	The option card is installed into port CN5-C is incompatible with the drive. • Confirm that the drive supports the option card to be installed. Contact Magnetek for assistance. A communication option card has been installed in option port CN5-C. • Communication option cards are only supported by option port CN5-A. It is not possible to install more than one comm. option.

Fault Code/ Name	Description	Causes and Solutions
oFC01 CN5-C Conn Flt	**Option Card Fault at Option Port CN5-C:** Option not properly connected.	The option board connection to port CN5-C is faulty. • Turn the power off and reconnect the option card. • Check if the option card is properly plugged into the option port. Make sure the card is fixed properly. • Try to use the card in another option port (in case of a PG option card use CN5-B). If the option card works in a different port, replace the drive because port CN5-C is damaged. If the error persists (oFA01 or oFb01 occur), replace the option board.
oFC02 CN5-C Duplicate	**Option Card Fault at Option Port CN5-C:** A maximum of two PG option boards can be used simultaneously. Remove the PG option board installed into option port CN5-A.	An option card of the same type is already installed in option port CN5-A or CN5-B. • Except for PG options, each option card type can only be installed once. Make sure only one type of option card is connected. An input option card is already installed in option port CN5-A or CN5-B. • Make sure that a comm. option, a digital input option, or an analog output option is installed. The same type of card cannot be installed twice. Three PG option boards are installed. • A maximum of two PG option boards can be used simultaneously. Remove the PG option board installed into option port CN5-A.
oFC03 to oFC11 oFC12 to oFC17	Option card error occurred at option port CN5-C.	Option card or hardware is damaged. • Cycle power to the drive. • Re-seat the option card with the power off. • If the problem continues, replace the control board or the entire drive. Contact Magnetek for instructions on replacing the control board.
oFC50 CN5-C En A/D Flt	**Encoder Option AD Conversion Error:** Error with the A/D conversion level (VCC level), or A/D conversion timed out.	The PG option card is damaged. • Replace the PG option card.
oFC51 CN5-C En Ana Flt	**Encoder Option Analog Circuit Error:** Incorrect signal level (+2.5 V signal)	The PG option card is damaged. • Replace the PG option card.
oFC52 CN5-C Enc Timout	**Encoder Communication Timeout:** Signal encoder timed out waiting to receive data.	Encoder cable wiring is wrong. • Correct the wiring. Encoder cable does not seem to be connected. • Verify that the encoder card is securely connected. • Verify that there is no break in the encoder cable. • Verify that the encoder cable isn't too long. Parameters for Encoder Select (C1) are set to the wrong values. • Set Encoder Select (C1) to the proper setting.
oFC53 CN5-C En COM Flt	**Encoder Communication Data Error:** Serial encoder CRC checksum error.	Encoder cable wiring is wrong. • Correct the wiring. Encoder cable does not seem to be connected. • Verify that the encoder card is securely connected. • Verify that there is no break in the encoder cable. • Verify that the encoder cable isn't too long.
oFC54 CN5-C Encoder Er	**Encoder Error:** Alarm reading EnDat absolute position data from encoder (OR flag from EnDat error for overvoltage, undervoltage, etc.)	Power supply to encoder is wired incorrectly. • Correct the wiring. The power supply circuit of the PG option card is damaged. • Replace the PG option card.
oFC55 CN5-C Resolvr Er	**Resolver Error:** PG-RT3 senses that the resolver is disconnected or damaged.	Resolver wiring is incorrect. • Correct the wiring. Resolver cable is disconnected. • Reconnect the cable. Resolver or cable is damaged. • Replace the resolver. • Replace the cable. The option card is damaged. • Replace the option card.

Fault Code/ Name	Description	Causes and Solutions
oH User Ovrtemp Alm / User Ovrtemp Flt	**Heatsink Overheat:** The temperature of the heatsink exceeded the OH Pre-Alarm Lvl (A4).	Parameters are set incorrectly. • Verify that OH Pre-Alarm Lvl (A4) is not set too low. Surrounding temperature is too high. • Check the temperature surrounding the drive. Verify temperature is within drive specifications. • Improve the air circulation within the enclosed panel. • Install a fan or air conditioner to cool the surrounding area. • Remove anything near the drive that might be producing excessive heat. Load is too heavy. • Measure the output current. • Decrease the load. • Lower the Carrier Frequency (A4). Internal cooling fan is stopped. • Replace the cooling fan. • After replacing the drive, reset the cooling fan maintenance parameter (o4-03 = 0).
oH1 Overtemp Fault	**Heatsink Overheat:** The temperature of the heatsink exceeded the drive overheat level.	Surrounding temperature is too high. • Check the temperature surrounding the drive. • Improve the air circulation within the enclosure panel. • Install a fan or air conditioner to cool the surrounding area. • Remove anything near the drive that might be producing excessive heat. Load is too heavy. • Measure the output current. • Lower the Carrier Frequency (A4). • Reduce the load.
oH3 Mtr Overheat Alm	**Motor Overheat Alarm (PTC thermistor input):** • The motor overheat signal to analog input terminal A1 or A2 has exceeded the alarm detection level.	Parameter settings are incorrect. • Verify that the C5 sub-menu analog input of "Motor PTC" is set correctly. • Verify that the analog input gain setting and bias offset in the A1 sub-menu are set correctly: Term A1 Gain (A1), Terminal A1 Bias (A1), Ana In A1 Offset (A1), Term A2 Gain (A2), Terminal A2 Bias (A1), and Ana In A2 Offset (A1). Motor thermostat wiring is fault (PTC thermistor input). • Repair the PTC thermistor input wiring. Motor has overheated. • Check the size of the load, the accel/decel times, and the cycle times. • Decrease the load. • Lower the acceleration and deceleration in the A2 sub-menu. • Adjust the preset V/f pattern in the A5 sub-menu. • Be careful not to lower E1-08 and E1-10 too much, as this reduces load tolerance at low speeds. • Check the motor rated current. • Enter the motor rated current as indicated on the motor nameplate (E2-01) in Motor Rated FLA (A5) or PM Mtr Rated FLA (A5). Ensure the motor cooling system is operating normally. • Repair or replace the motor cooling system.

Fault Code/ Name	Description	Causes and Solutions
oH4	**Motor Overheat Fault (PTC thermistor input):** • The motor overheat signal to analog input terminal A1 or A2 exceeded the fault detection level.	Parameter settings are incorrect. • Verify that the C5 sub-menu analog input of "Motor PTC" is set correctly. • Verify that the analog input gain setting and bias offset in the A1 sub-menu are set correctly: Term A1 Gain (A1), Terminal A1 Bias (A1), Ana In A1 Offset (A1), Term A2 Gain (A2), Terminal A2 Bias (A1), and Ana In A2 Offset (A1). Motor thermostat wiring is fault (PTC thermistor input). • Repair the PTC thermistor input wiring. Motor has overheated. • Check the size of the load, the accel/decel times, and the cycle times. • Decrease the load. • Lower the acceleration and deceleration in the A2 sub-menu. • Adjust the preset V/f pattern in the A5 sub-menu. • Be careful not to lower E1-08 and E1-10 too much, as this reduces load tolerance at low speeds. • Check the motor rated current. • Enter the motor rated current as indicated on the motor nameplate (E2-01) in Motor Rated FLA (A5) or PM Mtr Rated FLA (A5). Ensure the motor cooling system is operating normally. • Repair or replace the motor cooling system.
oL1 Mtr Overload Alm / Mtr Overload Flt	**Motor Overload:** The electronic motor overload protection tripped.	Load is too heavy. • Reduce the load. **Note:** After the value of Motor OL1 Level (D2) has decreased to one less than 100, reset oL1. The value of Motor OL1 Level (D2) must be less than 100 before oL1 can be reset. Cycle times are too short during acceleration and deceleration. • Lower the acceleration and deceleration times in the A2 sub-menu. A general purpose motor is driven below the rated speed with too high load. • Reduce the load. • Increase the speed. • If the motor is supposed to operate at low speeds, either increase the motor capacity or use a motor specifically designed to operate in the desired speed range. The output voltage is too high. • Adjust the user-set V/f pattern by reducing Mid Frequency A (A5) and Min Frequency (A5). **Note:** Do not reduce either parameter too low because this reduces load tolerance at low speeds. The wrong motor rated current has been set. • Check the Motor Rated FLA (A5) or PM Mtr Rated FLA (A5). • Perform autotune in U9 sub-menu. The Base Frequency is set incorrectly. • Enter the rated frequency on nameplate to Base Frequency (A5). Multiple motors are running off the same drive. • Disable the motor protection function in Mtr OL Charact (A5) and install a thermal relay to each motor. The electrical thermal protection characteristics and motor overload characteristics do not match. • Check the motor characteristics. • Correct the type of motor protection that has been selected in Mtr OL Charact (A5). • Install an external thermal relay. The electrical thermal relay is operating at the wrong level. • Check the current rating listed on the motor nameplate. • Check the value set for the current in Motor Rated FLA (A5) or PM Mtr Rated FLA (A5). Output current fluctuation due to power supply loss. • Check the power supply for phase loss.

Fault Code/ Name	Description	Causes and Solutions
oL2 Drv Overload Alm / Drv Overload Flt	**Drive Overload:** The thermal sensor of the drive triggered overload protection.	Load is too heavy. • Reduce the load. Accel/decel ramp is too short. • Lower the settings for the acceleration and deceleration in the A2 sub-menu. The output voltage is too high. • Adjust the preset V/f pattern by reducing Mid Frequency A (A5) and Min Frequency (A5). **Note:** Do not lower this parameter excessively, as this will reduce load tolerances at low speeds. Drive capacity is too small. • Replace the drive with a larger model. Overload occurred when operating at low speeds. • Reduce the load when operating at low speeds. • Replace the drive with a model that is one frame size larger. • Lower the Carrier Frequency. Excessive torque compensation. • Reduce the Torq Comp Gain (A1) until there is no speed loss but less current. Output current fluctuation due to input phase loss. • Check the power supply for phase loss.
oL3 Overtorque Alm 3 / Overtorque Flt 3	**Overtorque Detection 1:** The current has exceeded the value set for torque detection (L6-02) for longer than the allowable time (L6-03).	Parameter settings are not appropriate for the load. • Check the settings of parameters L6-02 and L6-03). Fault on the machine side (e.g., machine is locked up). • Check the status of the load. Remove the cause of the fault.
oL4 Overtorque Alm 4 / Overtorque Flt 4	**Overtorque Detection 2:** The current has exceeded the value set for Overtorque Detection 2 (L6-05) for longer than the allowable time (L6-06).	Parameter settings are not appropriate for the load. • Check the settings of parameters L6-05 and L6-06.
oPE01 Model Mismatch *(programming error)*	**Drive Capacity Setting Fault:** Drive capacity and the value set in Inverter Model # (A4) do not match.	The Inverter Model # (A4) and the actual capacity of the drive are not the same. Correct the value set in Inverter Model # (A4). Refer to ***Drive Defaults on page 98***.
oPE02 Paramtr Rang Alm *(programming error)*	**Parameter Range Setting Error:** There are parameters set outside the drive range.	Parameters were set outside of the possible setting range. • Power cycle the drive. • Set parameters to the proper values. Input Phase Loss Detection for 600V class drives. • Inp Ph Loss Prot (C1) parameter cannot be set to “Always Enabled” for 600V drive models. • Set Inp Ph Loss Prot (C1) to any other setting. **Note:** Use oPE Flt Parameter (F2) to find which parameter is causing the oPE02 to be declared. When multiple errors occur at the same time, other errors are given precedence over oPE02.
oPE03 Input Setup Alm *(programming error)*	**Multi-Function Digital Input Selection Error:** A contradictory setting is assigned to multi-function contact inputs in the C2 LOGIC INPUTS sub-menu.	The same function is assigned to two multi-function inputs (excludes “Brake Feedback”, “Brake Feedback2”, “Term Not Used”, and any External Alarm/ Fault) **Note:** “Brake Feedback” and “Brake Feedback2” cannot be assigned to more than 3 inputs. Ensure all multi-function inputs are assigned to different functions. • Re-enter the multi-function settings to ensure this does not occur. Motor contactor feedback and Motor contactor feedback 2 (56 vs 5A) are selected simultaneously. • Check for contradictory settings assigned to the multi-function input terminals simultaneously. Correct setting errors.

Fault Code/ Name	Description	Causes and Solutions
oPE04 Board Change Alm *(programming error)*	**Terminal Board Mismatch Error**	The drive, control board, or terminal board has been replaced and the parameter settings between the control board and the terminal board no longer match. • To load the parameter settings into the drive control board that are stored in the terminal board, set Initialization (U5) to “Term->Cntrl Int”. • To initialize the drive parameters to factory default, set Initialization (U5) to “Standrd Initial”.
oPE05 Run/Spd Src Alm *(programming error)*	**Reference Source Selection Error**	Speed reference is assigned to an option card (b1-01 = 3) but an input option card is not connected to the drive; the Up/Down command is assigned to an option card (b1-02 = 3) but an input option card is not connected to the drive. • Reconnect the input option card to the drive. Although the digital card input is set for BCD special for a 5 digit input (F3-01 = 6), the data length is set for 8 bit or 12 bit (F3-03 = 0, 1). • Set the input data for 16 bit (F3-03 = 2).
oPE06 No Encdr Brd Alm *(programming error)*	**Control Mode Selection Error:** Correct the setting for the control method.	A control method has been selected that requires a PG Encoder card to be installed, but no option card is installed. • Connect a PG Encoder card. • Correct the setting of Control Method (U8).
oPE07 Analog Setup Alm *(programming error)*	**Multi-Function Analog Input Selection Error:** A contradictory setting is assigned to multi-function analog inputs in the C5 ANALOG INPUT sub-menu.	At least two analog input terminals are set to the same function (excludes “Speed Command” and “Term Not Used”). • Change the settings of Term A1 FuncSel (C5) and Term A2 FuncSel (C5) so that functions no longer conflict.
oPE08 Mode Setting Alm *(programming error)*	**Parameter Selection Error:** A function has been set that cannot be used in the motor control method selected.	Attempted to use a function that is not valid for the selected control mode. • Check the motor control method and the functions available. In Open Loop Vector Control, n2-02 is greater than n2-03. • Correct parameter settings so that n2-02 is less than n2-03. Incorrect selection for Control Method (U8) • Check the selected control mode in the U8 sub-menu. **Note:** Use oPE Flt Parameter (F2) to find which parameter is causing the oPE08 to be declared. Other errors are given precedence over oPE08 when multiple errors occur simultaneously.
oPE10 V/F Setup Alm *(programming error)*	**V/f Pattern Setting Error:** The drive V/F curve parameter is not set correctly.	Parameters settings are incorrect. • Max Frequency (A5) / Max Motor Speed (A5) has to be greater than or equal to Base Frequency (A5) / Rated Motor Speed (A5). • Base Frequency (A5) has to be greater than or equal to Mid Frequency (A5). • Mid Frequency (A5) has to be greater than or equal to Min Frequency (A5). • Min Frequency (A5) has to be greater than or equal to E1-11.
oPE12 NTSD Setup Alm *(programming error)*	**Normal Terminal Stopping Device Parameter Setup Alarm:** The settings of NTSD Threshold 1 - 3 does not meet the below requirement: NTSD Threshold 1 ≤ NTSD Threshold 2 ≤ NTSD Threshold 3 **The above requirement is conditional depending on the setting of NTSD Mode (C1)**	Parameter settings are incorrect • Verify that NTSD Threshold 1 (A1), NTSD Threshold 2 (A1), and NTSD Threshold 3 (A1) are set to values that meets the condition. • If it is a nuisance fault, set NTSD Mode (C1) to "External - Input"
oPE16 Enrg Sav Adj Alm *(programming error)*	**Energy Savings Constants Error**	Energy saving coefficients are out of the allowable range. • Check and correct the motor data in E5 parameters.

Fault Code/ Name	Description	Causes and Solutions
oPE18 ParamSetting Alm *(programming error)*	**Parameter Setting Error, Online Tuning Parameter Setting Error:** • The input from load cell with pre-torque input 1 is set to the same value as pre-torque input 2. • DWELL 2 related parameters are not set correctly. • Parameters that control Online Turning are not set correctly.	Pre-Torq Input 1 (A1) and Pre-Torq Input 2 (A1) cannot be set to the same value. • Correct the values set in Pre-Torq Input 1 (A1) and Pre-Torq Input 2 (A1). The Dwell 2 speed reference in S3-20 is greater than 0.00 but is still less than the Dwell 2 End Speed in S3-21. • Correct the values set to S3-20 and S3-21. Open Loop Vector Control is selected, Online Turning is enabled (n6-01 = 2), and one of the following contradictory settings exists: Motor Rated Slip (A5) is set to 30% or less of its factory default; Leak Inductance (A5) is set to 50% or less of its factory default; No-Load Current (A5) is set to 0. • Correct the values set in Motor Rated Slip (A5), Leak Inductance (A5), and/or No-Load Current (A5).
oPE20 PPR Setting Alm *(programming error)*	**PG-F3 Setting Error:** The encoder signal frequency is too high.	With the entered Encoder Pulses (A1), Max Motor Speed (A5), and PM Motor Poles (A5), the calculation encoder signal frequency exceeds 50 kHz (with PG-F3 option) or 20 kHz (with PG-E3 option). • Set Encoder Pulses (A1) to the correct encoder resolution. • Reduce the Max Motor Speed (A5) so the encoder signal frequency at maximum speed is lower than 50 kHz.
oPE21 Start Setup Alm *(programming error)*	**Elevator Parameter Setting Fault:** Elevator parameters are not set correctly.	The DC Brk Time Stop (A1) is set to a value lower than the Brake CloseDelay (A1). • Correct parameter settings so that DC Brk Time Stop (A1) > Brake CloseDelay (A1). The deceleration distance (S5-11) is set to value lower than the minimum deceleration distance (U4-43), or the stop distance (S5-12) is set to a value lower than the minimum stop distance (U4-44). • Correct parameter settings so that S5-11 > U4-43. • Correct parameter settings so that S5-12 > U4-44. Both S5-10 and S5-01 are enabled at the same time. • Correct the setting in parameters S5-01 and S5-10.
oPr Opr Disconct Alm / Opr Disconct Flt	**External Digital Operator Connection Fault:** The external operator has been disconnected from the drive. **Note:** An oPr fault will occur when all of the following conditions are true: • The Up/Down command is assigned to the operator (Run Command Src (C1) set to "Operator" and LOCAL has been selected). • The operator is disconnected when the drive is programmed to fault if the operator is disconnected (o2-06 = 1).	External operator is not properly connected to the drive. • Check the connection between the operator and the drive. • Replace the cable if damaged. • Turn off the drive input power and disconnect the operator. Then reconnect the operator and turn the drive input power back on.
oS Overspeed Alm / Overspeed Flt	**Overspeed:** The motor speed feedback exceeded the Overspd Det Lvl (A1).	Overshoot is occurring. • If using a closed loop vector mode, increase Inertia (A1). Inappropriate parameter settings. • Check the setting for the Oversp Det Lvl (A1) and Overspd Det Time (A1).

Fault Code/ Name	Description	Causes and Solutions
ov Bus Overvolt Alm / Bus Overvolt Flt	**DC Bus Overvoltage:** Voltage in the DC bus has exceeded the overvoltage detection level. For 200V Class: approx. 410 V For 400V Class: approx. 820 V For 600V Class: approx. 1040 V **Note:** For drive models with internal DBR transistor, the turn-on voltage is 394V for 200V class, 788V for 400V class, and 990V for 600V class.	Deceleration ramp is too short and regenerative energy is flowing from the motor into the drive. • Lower the deceleration in the A2 sub-menu. Fast acceleration ramp causes the motor to overshoot the speed reference. • Check if sudden drive acceleration triggers an overvoltage alarm. • Lower the acceleration ramp in the A2 sub-menu. • Lower the jerk setting in the A2 sub-menu. Surge voltage entering from the drive input power. • Install a DC link choke. **Note:** Voltage surge can result from a thyristor converter and phase advancing capacitor using the same input power supply. Ground fault in the output circuit causes the DC bus capacitor to overcharge. • Check the motor wiring for ground faults. • Correct grounding shorts and turn the power back on. Drive input power voltage is too high. • Check the voltage. • Lower drive input power voltage within the limits listed in the specifications. The external braking transistor or regen drive does not seem to be wired correctly. • Check the braking transistor wiring for errors. • Check that the external CDBR or regen drive is operating. Dynamic Braking Resistors Verify that the resistors are connected correctly to the drive. • Verify that the correct resistance is read on a meter. • Verify that the resistance is low enough to dissipate the regenerative energy quickly enough for the application. Encoder cable is disconnected. • Reconnect the cable. Encoder cable wiring is wrong. • Correct the wiring. Noise interference along the encoder wiring. • Separate the wiring from the source of the noise (often the output lines from the drive). Drive fails to operate properly due to noise interference. • Review the list of possible solutions provided for controlling noise. • Review the section on handling noise interference and check the control circuit lines, main circuit lines, and ground wiring. Motor hunting occurs. • Adjust the parameters that control hunting. • Adjust the AFR time constant (n2-02 and n2-03). Drive hardware is damaged. • Verify that the measured DC bus voltage (with meter) and the DC Bus Voltage (D2) are reading the same voltage.

Fault Code/ Name	Description	Causes and Solutions
OVRLD ALARM! Overload *(alarm)*	**ALARM! Overload Shutdown:** There are 3 mechanisms that can cause this alarm to declare: The electronic motor overload protection tripped while the Mtr Overload Act (C1) was set to "Alarm Only". or The drive has reached 90% of the drive overload oL2 trip level. or The temperature of the heatsink exceeded the overheat pre-alarm level set in OH Pre-Alarm Lvl (A4) while OH Pre-Alarm Sel (C1) was set to "Alarm Only".	Parameter settings • Increase Mtr Torque Limit (A1) and Regen Torq Limit (A1) • Check that all the motor parameters in the A5 sub-menu is set correctly according to the motor nameplate Acceleration / deceleration is too fast • Lower the S-curve parameters in the A2 sub-menu Encoder Issue • Check that the motor and encoder are phased in the same direction • Change the direction of Encoder Connect (C1). Motor Brake is Not Released • Ensure the brakes picks properly • Check that the brakes are not dragging Load is too heavy • Reduce the load • Check for proper counter balance Output Voltage is too high for OL or V/f • Adjust the user-set V/f pattern by reducing Mid Voltage (A5) and Min Voltage (A5). • Do not set Mid Voltage (A5) and Min Voltage (A5) too low. This reduces load tolerance at low speeds. Internal drive fan • Check that the fans in the drive are spinning • Replace fan Airflow Around the Drive is Restricted • Provide proper installation space around the drive as shown in the manual • Check for dust or foreign material clogging the cooling fan / air flow / heat sink. Surrounding temperature is too high • Check the ambient temperature of the room and/or cabinet. • Install fan or air conditioner to cool ambient temperature Drive capacity is too small • Replace the drive with a higher capacity model Nuisance alarm • Disable the motor overload protection in Mtr OL Charact (A4) • Increase the OH Pre-Alarm Lvl (A4)
PASS *(alarm)*	**MEMOBUS/Modbus Communication Test Mode Complete**	MEMOBUS/Modbus test has finished normally. • This verifies that the test was successful.
PF In Phas Loss Flt	**Input Phase Loss:** Drive input power has an open phase or has a large imbalance of voltage between phases. Detected when Inp Ph Loss Prot (C1) is enabled.	There is phase loss in the drive input power. • Check for wiring errors in the main circuit drive input power. • Correct the wiring. There is loose wiring in the drive input power terminals. • Ensure the terminals are tightened properly. • Apply the tightening torque as specified in this manual. There is excessive fluctuation in the drive input power voltage. • Check the voltage from the drive input power. • Review the possible solutions for stabilizing the drive input power. There is poor balance between voltage phases. • Stabilize drive input power or disable phase loss detection. Parameter Setting • If the drive is being fed single phase power, set Inp Ph Loss Prot (C1) to “Disabled”. The main circuit capacitors are worn. • Check the maintenance time for the capacitors in Cap Life Mon (D2). • Replace the capacitor if Cap Life Mon (D2) is greater than 90%. For instructions on replacing the capacitor, contact Magnetek. • Check for problems with the drive input power. If drive input power appears normal but the alarm continues to occur, replace either the control board or the entire drive. For instructions on replacing the control board, contact Magnetek.

Fault Code/ Name	Description	Causes and Solutions
PF5 Resc Power Flt	**Rescue Operation Power Supply Deterioration Error**	During Rescue Operation, either the DC bus voltage dropped below DCVoltLvl@Rescue (A1) x (PS ReductnDetLvl (A1) - 10%), or 100 ms after triggering Rescue Operation, the DC bus voltage did not reach DCVoltLvl@Rescue (A1) x PS ReductnDetLvl (A1) before the motor started. • Check the DC bus voltage setting in DCVoltLvl@Rescue (A1). • Lower the speed reference, which is determined by Rescue Speed (C1). • Check the backup power supply. It may need to be replaced with another UPS if it has become worn and can no longer provide enough power.
PGo Encoder Alarm / Encoder Fault	**Encoder Disconnected (for Control Mode with Encoder):** No encoder pulses are received for longer than the time set to F1-14.	Encoder cable is disconnected. • Reconnect the cable. Encoder cable wiring is wrong. • Correct the wiring. Encoder has no power. • Check the power line to the encoder. • Replace the encoder cable. Motor brake is not released. • Ensure the motor brake released properly. Encoder hardware issue • Verify encoder is operating, or replace the encoder. During Rescue Operation, either the DC bus voltage dropped below DCVoltLvl@Rescue (A1) x (PS ReductnDetLvl (A1) - 10%), or 100 ms after triggering Rescue Operation, the DC bus voltage did not reach DCVoltLvl@Rescue (A1) x PS ReductnDetLvl (A1) before the motor started. • Check the DC bus voltage setting in DCVoltLvl@Rescue (A1). • Lower the speed reference, which is determined by Rescue Speed (C1). • Check the backup power supply. It may need to be replaced with another UPS if it has become worn and can no longer provide enough power.
PGoH Enc Disconct Alm / Enc Disconct Flt	**Encoder Disconnected (detected when using an encoder):** Encoder cable is not connected properly.	Wiring is incorrect. • Check that the encoder wires are wired correctly. • Check that the encoder wires are landed on the capital A+, A-, B+, and B- terminals, NOT on the lower case a+, a-, b+, and b- terminals. Encoder cable is disconnected. • Reconnect the cable. • Check for breaks in the cable. • Replace the encoder cable. Encoder hardware issues • Verify the encoder is operating or replace the encoder. PG option card is having issues. • Verify that the correct PG encoder card is connected and it is in the CN5-C slot. • Check that the power supply pin jumper is on the PG encoder card and in the correct voltage range for your specific encoder. • Replace the PG encoder card.
rdEr *(copy)*	**Error Reading Data**	Failed while attempting to read parameter settings from the drive. • Press and hold the READ key on the USB Copy Unit for at least one second to have the unit read parameters from the drive.
rEAd *(copy)*	**Reading Parameter Settings (flashing)**	Displayed while the parameter settings are being read onto the USB Copy Unit. • Not an error.
rF DBR Overcurr Flt	**Brake Resistor Fault:** The resistance of the braking resistor being used is too low.	The proper braking resistor option has not been installed. • Select the braking resistor option so that fits to the drives braking transistor specification. A regenerative converter, regenerative unit or braking unit is being used and the +1 or +3 terminal is connected to - terminal. • Disable the DB Tr Protection (C1).
rr DB Transistr Flt	**Dynamic Braking Transistor Fault:** The built-in dynamic braking transistor failed.	The braking transistor is damaged, or the control circuit is damaged. • Cycle power to the drive and check if the fault reoccurs. • Replace either the control board or the entire drive. For instructions on replacing the control board, contact Magnetek.

Fault Code/ Name	Description	Causes and Solutions
rUn Mtr 2 Switch Alm *(alarm)*	**Motor 2 Switch Alarm:** A command to switch from motor 1 to motor 2 was given during run	Motor switch command • Change the operation pattern so that the motor switch command is entered while the drive is stopped. • Check the C2 sub-menu to verify if the correct input is set for "Motor 2 Select" • If it is a nuisance fault, remove the setting of "Motor 2 Select"
SC Short Circuit	**IGBT Short Circuit:** Short Circuit or Ground Fault is detected.	IGBT Fault, or IGBT short circuit detection circuit fault. • Check the wiring to the motor. • Turn the power supply off and then on again to check operation. • If the problem continues, contact Magnetek. The drive is damaged. • Check the drive output side short circuit for broken output transistor from: B1 and U/V/W and - (negative) and U/V/W.
SE Self Test Fail *(alarm)*	**MEMOBUS/Modbus Self Test Failed**	A digital input set to “Comm Test Mode” in the C2 sub-menu was closed while the drive was running. • Stop the drive and run the test again.
SE1 Contactor Fault	**Motor Contactor Response Error:** Motor contactor does not respond within the time set in Run Delay Time (A1) and Cont Fault Time (A1).	There is a problem with the motor contactor or auxiliary switch. • Check the motor contactor, auxiliary switches and the wiring of the contactor feedback signal. Inappropriate parameter setting • Check the setting of Cont Fault Time (A1).
SE2 Start Curr Fault	**Starting Current Error:** The output current was lower than 25% of the motor no-load current at start.	The motor contactor is open. • Check the contactor for any problems. • Check for any sequencing problems between contact picking and the drive being told to run.
SE3 Current Fault	**Output Current Error:** The output current was lower than 25% of the motor no-load current during operation.	The motor contactor is open. • Check the contactor for any problems. • Check for any sequencing problems between contact picking and the drive being told to run. Parameter setting The fluxing current takes too long to build up, increase SE2 Delay Time (A1)
SE4 Brake Fdbk Fault	**Brake Feedback Error:** The C2 sub-menu input terminal set for “Brake Feedback” or “Brake Feedback2” did not respond within the error time set in SE4 Delay Time (A1) after an output terminal set for “Brake Control” closed.	The feedback contact on the brake is defective or the wiring is incorrect. • Check the brake feedback contact and the wiring. The brake control circuit does not work properly. • Ensure the motor brake operates properly with a brake control command from the drive.
STo PM Stall Flt	**Motor Pull Out or Step Out Detection:** Motor pull out or step out has occurred. Motor has exceeded its pull out torque.	The wrong motor code has been set (only used for motor by drive manufacturer). • Enter the correct motor code for the PM being used into the A5 sub-menu. • For special-purpose motors, enter the correct data to all parameters in the A5 sub-menu according to the Test Report provided for the motor. Load is too heavy. • Reduce the load. • Increase the motor or drive capacity. Accel/decel ramp is too short. • Lower the acceleration and deceleration in the A2 sub-menu. • Lower the jerk setting in the A2 sub-menu.
SvE Posit Lock Fault	**Position Lock Error:** Position deviation during Position Lock.	Torque Limit is set too low. • Set the torque limit to an appropriate value using Mtr Torque Limit (A1) and Regen Torq Limit (A1). Excessive load torque. • Reduce the amount of load torque. Noise interference along encoder wiring. • Check the encoder signal for noise reference.

Fault Code/ Name	Description	Causes and Solutions
TQLIM Torque Limit Alm *(alarm)*	**Torque Limit Alarm:** The drive has reached the torque limit.	Parameter settings • Increase Mtr Torque Limit (A1) and Regen Torq Limit (A1). • Check that all the motor parameters in the A5 sub-menu are set correctly according to the motor nameplate. • Check that Encoder Pulses (A1) are set correctly according to the encoder. Acceleration / deceleration is too fast • Lower the S-curve parameters in the A2 sub-menu. Check that the motor and encoder are phased in the same direction • Change the direction of Encoder Connect (C1). • Spin the encoder by hand and monitor Encoder Speed (D1). Motor brake is not released • Ensure the brakes pick properly. • Check that the brakes are not dragging. Load is too heavy. • Reduce the load. • Check for proper counter balance.
TrPC IGBT Replace Alm *(alarm)*	**IGBT Maintenance Time (90%):** IGBTs have reached 90% of their expected performance life. This alarm will not trigger a multi-function output terminal that is set for "Minor Fault" in the C3 sub-menu.	IGBTs have reached 90% of their expected performance life. • Replace the drive.
UL3 Undertorq Alm 3 / Undertorq Flt 3	**Undertorque Detection 1:** The current has fallen below the minimum value set for torque detection (L6-02) for longer than the allowable time (L6-03).	Parameter settings are not appropriate for the load. • Check the settings of parameters L6-02 and L6-03. There is a fault on the machine side. • Check the load for any problems.
UL4 Undertorq Alm 4 / Undertorq Flt 4	**Undertorque Detection 2:** The current has fallen below the minimum value set for torque detection (L6-05) for longer than the allowable time (L6-06).	Parameter settings are not appropriate for the load. • Check the settings of parameters L6-05 and L6-06. There is a fault on the machine side. • Check the load for any problems.
Uv Undervolt Alarm *(alarm)*	**Undervoltage:** One of the following conditions was true when the drive was stopped and an Up/ Down command was entered: • DC bus voltage dropped below the level specified in UV Detct Level (A4). • Contactor to suppress inrush current in the drive was opened. • Low voltage in the control drive input power. This alarm outputs only if L2-01 is not 0 and DC bus voltage is under UV Detect Level (A4).	Phase loss in the drive input power terminals. • Check for wiring errors in the main circuit drive input power. Correct the wiring. Loose wiring in the drive input power terminals. • Ensure the terminals have been properly tightened. • Apply the tightening torque to the terminals as specified. There is a problem with the drive input power voltage. • Check the voltage. • Lower the voltage of the drive input power so that it is within the limits listed in the specifications. Drive internal circuitry is worn. • Check the maintenance time for the capacitors in Cap Life Mon (D2). • Replace either the control board or the entire drive if Cap Life Mon (D2) exceeds 90%. For instructions on replacing the control board, contact Magnetek. The drive input power transformer is too small and the voltage drops when the power is switched on. • Check for an alarm when the magnetic contactor, line breaker, and leakage breaker are closed. • Check the capacity of the drive input power transformer. Air inside the drive is too hot. • Check the temperature inside the drive. The CHARGE light is broken or disconnected. • Replace either the control board or the entire drive. For instructions on replacing the control board, contact Magnetek.

Fault Code/ Name	Description	Causes and Solutions
Uv1 Undervolt Fault	**DC Bus Undervoltage:** One of the following conditions occurred while the drive was running: • Voltage in the DC bus fell below the UV Detect Level (A4) • For 200V Class: approx. 190V • For 400V Class: approx. 380V (350V when Input Voltage (A4) is less than 400) • For 600V Class: approx. 500V	Input power phase loss. • The main circuit drive input power is wired incorrectly. • Correct the wiring. One of the drive input power wiring terminals is loose. • Ensure there are no loose terminals. • Apply the tightening torque specified in this manual to fasten the terminals. There is a problem with the voltage from the drive input power. • Check the voltage. • Correct the voltage to be within the range listed in drive input power specifications. • If there is no problem with the power supply to the main circuit, check for problems with the main circuit magnetic contactor. The power has been interrupted. • Correct the drive input power. The main circuit capacitors are worn. • Check the maintenance time for the capacitors in Cap Life Mon (D2). • Replace either the control board or the entire drive if Cap Life Mon (D2) exceeds 90%. For instructions on replacing the control board, contact Magnetek. The relay or contactor on the soft-charge bypass circuit is damaged. • Check power to the drive and see if the fault reoccurs. • If the problem continues, replace either the control board or the entire drive. For instructions on replacing the entire drive, contact Magnetek. • Check monitor U4-06 for the performance life of the soft-charge bypass. • Replace either the control board or the entire drive if U4-06 exceeds 90%. For instructions on replacing the control board, contact Magnetek.
Uv2 Control Volt Flt	**Control Power Supply Voltage Fault:** Voltage is too low for the control drive input power.	Control power supply wiring is damaged. • Cycle power to the drive. Check if the fault reoccurs. • If the problem continues, replace the control board, the entire drive, or the control power supply. For instructions on replacing the control board, contact Magnetek. Internal circuitry is damaged. • Cycle power to the drive. Check if the fault reoccurs. • If the problem continues, replace either the control board or the entire drive. For instructions on replacing the control board, contact Magnetek.
Uv3 Pre-Charge Fault	**Soft-Charge Bypass Circuit Fault:** The soft-charge bypass circuit failed.	The relay or contactor on the soft-charge bypass circuit is damaged. • Cycle power to the drive and see if the fault reoccurs. • If the problem continues, replace either the control board or the entire drive. For instructions on replacing the control board, contact Magnetek. • Check monitor U4-06 for the performance life of the soft-charge bypass. • Replace either the control board or the entire drive if U4-06 exceeds 90%. For instructions on replacing the control board, contact Magnetek.
vAEr *(copy)*	**Voltage Class, Capacity Mismatch**	The drive the parameters were copied from and the drive you are performing the Verify mode on have different electrical specifications or are a different capacity. • Make sure electrical specifications and capacities are the same for both drives.
vFyE *(copy)*	**Parameter settings in the drive and those saved to the copy function are not the same**	Indicates that parameter settings that have been Read and loaded onto the Copy Unit or Digital Operator are different. • To synchronize parameters, either write the parameters saved on the USB Copy Unit or LCD digital operator onto the drive, or Read the parameter settings on the drive onto the USB Copy Unit.
voF Output Volt Alm / Output Volt Flt	**Output Voltage Detection Error:** Problem detected with the voltage on the output side of the drive.	Hardware is damaged. • Replace either the control board or the entire drive. For instructions on replacing the control board, contact Magnetek.
vrFy *(copy)*	**Comparing Parameter Settings (flashing)**	The Verify mode has confirmed that parameters settings on the drive and parameters read to the copy device are identical. • Not an error.

<1> Terminals H1, H2, DM+, and DM- on 600 V class models are designed to the functionality, but are not certified to IEC/EN 61800-5-1, ISO/EN 13849 Cat. 3, IEC/EN 61508 SIL2, Insulation coordination: class 1.

8 Appendix

◆ Drive Sizing

This section outlines the information required to select the drive model for the application.

■ Required Data

- Motor Rated Voltage
- Motor Rated Current
- Peak Accelerating Current or Overload % (in amps or % of rated current)
- Motor Rated Frequency (in Hz)
- Input Voltage to Drive
- Elevator Contract Speed (in fpm)
- Machine Type (geared or gearless)
- Elevator Usage: Normal (<500 starts per day) or High (≥500 starts per day)
- Normal Terminal Stop (NTS)
- Regenerative or Resistor Bank

■ Drive Model

1. Select proper drive voltage class based on input voltage to drive and motor rated voltage:

a. 200V Class: $240V_{AC}$ – $200V_{AC}$
b. 400V Class: $480V_{AC}$ – $380V_{AC}$
c. 600V Class: $600V_{AC}$ – $500V_{AC}$

2. Select proper drive ampacity:

a. Calculate Required Peak Current

Required Peak Current = NTS * Overload * Motor Rated Current
or
NTS * Peak Accelerating Current

i. Determine if NTS overload is required:

- If NTS is required, **NTS** = 1.25
- If NTS is not required, **NTS** = 1

ii. Determine Overload requirements:

- If the overload requirement is known, **Overload** = known percentage
- If the overload requirement is not known, **Overload** = refer to table below

Contract Speed (fpm)	Overload
<150	2.0
150-299	2.2
300-350	2.4
>350	2.5

b. Calculate Required Continuous Current

Required Continuous Current = NTS * Motor Rated Current

c. Select the correct drive model

The drive model must meet BOTH the following requirements:

- **Actual Drive Peak Current** ≥ **Required Peak Current**
- **Actual Drive Continuous Current** ≥ **Required Continuous Current**

d. Calculate Actual Drive Peak Current

Actual Drive Peak Current = Usage Peak Current * Gearless Low Speed Derate

i. Determine to use either the Normal or High Usage Peak Current

- If the number of elevator starts per day < 500 starts per day, **Usage Peak Current** = "Normal Usage Peak Current" in ***Table 61 on page 161***
- If the number of elevator starts per day ≥ 500 starts per day, **Usage Peak Current** = "High Usage Peak Current" in ***Table 61 on page 161***

ii. Calculate Low Speed Derate

- If the machine is gearless AND contract speed (FPM) > 8.33 * rated motor frequency (Hz),

$$\textbf{Gearless Low Speed Derate} = \frac{416.7 * \frac{\textit{rated motor freq (Hz)}}{\textit{contract speed (fpm)}} + 50}{100}$$

- For everything else, **Gearless Low Speed Derate** = 1

e. Calculate Actual Drive Continuous Current

Actual Drive Continuous Current = Continuous Rated Current * Gearless Low Speed Derate

Continuous Rated Current = "Continuous Rated Current" in ***Table 61 on page 161***

■ Internal Dynamic Braking, External CDBR, and Dynamic Brake Resistor Selection

Selecting external CDBR and/or Dynamic Braking Resistors (DBR)

Note: If a Regen drive will be used, this whole Internal Dynamic Braking, External CDBR, and Dynamic Brake Resistor Selection section can be replaced with sizing a Regen drive, which can be found in the Regen drive manual.

1. Calculate required Dynamic Braking Amperes (DBA)

DBA = Motor Rated Current * **min DBA %**

min DBA % = percentage selected from ***Table 62 on page 162*** or ***Table 63 on page 162*** based on overload %, motor rated voltage, geared/gearless, and NTS

2. Determine which dynamic braking will be used: either internal DB or CDBR

a. Internal DB can be used if the selected drive model has internal DB and it meets the following requirement:

Internal DB Rating ≥ **DBA**

Internal DB Rating = "Internal DB Rating" amperes in ***Table 61 on page 161***

b. CDBR will be used if the selected drive model does NOT have internal DB or the above is not true

To select a CDBR, the CDBR must meet the following requirement:

CDBR DB Rating ≥ **DBA**

CDBR DB Rating = "CDBR DB Rating" ampere in ***Table 64 on page 163***

3. Calculate DBR resistance

Maximum DBR resistance:

DBR Resistance (ohm) = **DBR Volt/DBA**

DBR Volt = 400V for 200V drives
800V for 400V drives
1000V for 600V drives

Note: DBR Resistance should ALWAYS be larger than or equal to the minimum resistance rating of the internal DB or the CDBR.

4. Calculate the DBR wattage

DBR kW = motor rated current * **power factor**

power factor = select from ***Table 65 on page 163***

Table 61 M1000 Ratings Table

Rated Input Voltage	Drive Models <1>	Continuous Rated Current (Amps)	Normal Usage Peak Current (Amps) <2>	High Usage Peak Current (Amps) <2>	Internal DB Rating (Amps [min. ohms])
240V_{AC} – 200V_{AC}	LU2M0018DAC-D01	17.5	31.5	26.5	25 [16.0Ω]
	LU2M0025DAC-D01	25	45.5	39.5	25 [16.0Ω]
	LU2M0033DAC-D01	33	62	54.5	42 [9.6Ω]
	LU2M0047DAC-D01	47	85.5	74	42 [9.6Ω]
	LU2M0060DAC-D01	60	113	99	42 [9.6Ω]
	LU2M0075DAC-D01	75	150	134.5	42 [9.6Ω]
	LU2M0085DAC-D01	85	170	155.5	62.5 [6.4Ω]
	LU2M0115DAC-D01	115	222	186	62.5 [6.4Ω]
	LU2M0145DAC-D01	128	284	233	n/a
	LU2M0180DAC-D01	158.5	349	289.5	n/a
	LU2M0215AAC-D01	189	315	315	n/a
	LU2M0283AAC-D01	249	387	387	n/a
	LU2M0346AAC-D01	304	556	556	n/a
	LU2M0415AAC-D01	365	651.5	651.5	n/a
480V_{AC} – 380V_{AC}	LU4M0009DAC-D01	9	16	14	25 [32.0Ω]
	LU4M0015DAC-D01	15	26	23	25 [32.0Ω]
	LU4M0018DAC-D01	18	34	31	25 [32.0Ω]
	LU4M0024DAC-D01	24	48	43	40 [20.0Ω]
	LU4M0031DAC-D01	31	62	55	40 [20.0Ω]
	LU4M0039DAC-D01	39	78	63	42 [19.2Ω]
	LU4M0045DAC-D01	45	90	82	42 [19.2Ω]
	LU4M0060DAC-D01	60	120	106	42 [19.2Ω]
	LU4M0075DAC-D01	75	150	114.5	n/a
	LU4M0091DAC-D01	91	182	127	n/a
	LU4M0112DAC-D01	92	202	141	n/a
	LU4M0150DAC-D01	123	270	185	n/a
	LU4M0180AAC-D01	148	349	250.5	n/a
	LU4M0216AAC-D01	177	412.5	269	n/a
600V_{AC} – 500V_{AC}	LU5M0003DAC-D01	3.5	6.5	6.5	7 [150.0Ω]
	LU5M0004DAC-D01	4	7.5	7.5	7 [150.0Ω]
	LU5M0006DAC-D01	6	11.5	11.5	8 [130.0Ω]
	LU5M0010DAC-D01	10	18	18	11 [90.0Ω]
	LU5M0013DAC-D01	12.5	22.5	22.5	15 [65.0Ω]
	LU5M0017DAC-D01	17	31	31	23 [44.0Ω]
	LU5M0022DAC-D01	22	40	40	31 [32.0Ω]
	LU5M0027DAC-D01	27	49	49	35.5 [29.0Ω]
	LU5M0032DAC-D01	32	58	58	67 [15.0Ω]
	LU5M0041DAC-D01	41	74.5	74.5	67 [15.0Ω]
	LU5M0052DAC-D01	52	92.5	92.5	n/a
	LU5M0062DAC-D01	62	92.5	92.5	n/a
	LU5M0077DAC-D01	54	92.5	92.5	n/a
	LU5M0099DAC-D01	39.5	72.5	72.5	n/a
	LU5M0130AAC-D01	52	95	95	n/a
	LU5M0172AAC-D01	115	210.5	210.5	n/a

Note: All the current ratings listed in this table are based on 8 kHz carrier frequency.

<1> Model numbers listed here are those that include the Dual Operator. Other model numbers are available for the other operator options.

<2> Normal Usage will be selected if the number of starts and stops is less than 500 per day. High Usage will be selected if the number of starts and stops is greater than or equal to 500 per day.

Table 62 Geared Machine Minimum Dynamic Braking Ampere (DBA) Percentage Selection Table

	Motor Rated Volt (V)	200% Overload		220% Overload		240% Overload		250% Overload		275% Overload		300% Overload	
		min. DBA	NTS min. DBA	min. DBA	NTS min. DBA	min. DBA	NTS min. DBA	min. DBA	NTS min. DBA	min. DBA	NTS min. DBA	min. DBA	NTS min. DBA
200V	200	0.93	1.25	1.02	1.38	1.11	1.50	1.16	1.57	1.28	1.72	1.39	1.88
	208	0.97	1.30	1.06	1.43	1.16	1.56	1.21	1.63	1.33	1.79	1.45	1.95
	220	1.02	1.38	1.12	1.52	1.23	1.65	1.28	1.72	1.40	1.90	1.53	2.07
	230	1.07	1.44	1.17	1.59	1.28	1.73	1.33	1.80	1.47	1.98	1.60	2.16
	240	1.11	1.50	1.23	1.65	1.34	1.80	1.39	1.88	1.53	2.07	1.67	2.26
400V	250	0.58	0.78	0.64	0.86	0.70	0.94	0.73	0.98	0.80	1.08	0.87	1.17
	380	0.88	1.19	0.97	1.31	1.06	1.43	1.10	1.49	1.21	1.64	1.32	1.79
	400	0.93	1.25	1.02	1.38	1.11	1.50	1.16	1.57	1.28	1.72	1.39	1.88
	415	0.96	1.30	1.06	1.43	1.16	1.56	1.20	1.63	1.32	1.79	1.44	1.95
	440	1.02	1.38	1.12	1.52	1.23	1.65	1.28	1.72	1.40	1.90	1.53	2.07
	460	1.07	1.44	1.17	1.59	1.28	1.73	1.33	1.80	1.47	1.98	1.60	2.16
	480	1.11	1.50	1.23	1.65	1.34	1.80	1.39	1.88	1.53	2.07	1.67	2.26
600V	500	0.77	1.04	0.85	1.15	0.93	1.25	0.97	1.31	1.06	1.44	1.16	1.57
	550	0.85	1.15	0.94	1.26	1.02	1.38	1.06	1.44	1.17	1.58	1.28	1.72
	575	0.89	1.20	0.98	1.32	1.07	1.44	1.11	1.50	1.22	1.65	1.33	1.80
	600	0.93	1.25	1.02	1.38	1.11	1.50	1.16	1.57	1.28	1.72	1.39	1.88

Table 63 Gearless Machine Minimum Dynamic Braking Ampere (DBA) Percentage Selection Table

	Motor Rated Volt (V)	200% Overload		220% Overload		240% Overload		250% Overload		275% Overload		300% Overload	
		min. DBA	NTS min. DBA	min. DBA	NTS min. DBA	min. DBA	NTS min. DBA	min. DBA	NTS min. DBA	min. DBA	NTS min. DBA	min. DBA	NTS min. DBA
200V	200	1.31	1.77	1.44	1.95	1.57	2.12	1.64	2.21	1.80	2.43	1.97	2.65
	208	1.36	1.84	1.50	2.02	1.64	2.21	1.70	2.30	1.87	2.53	2.04	2.76
	220	1.44	1.95	1.59	2.14	1.73	2.33	1.80	2.43	1.98	2.68	2.16	2.92
	230	1.51	2.03	1.66	2.24	1.81	2.44	1.88	2.54	2.07	2.80	2.26	3.05
	240	1.57	2.12	1.73	2.33	1.89	2.55	1.97	2.65	2.16	2.92	2.36	3.18
400V	250	0.82	1.11	0.90	1.22	0.98	1.33	1.02	1.38	1.13	1.52	1.23	1.66
	380	1.24	1.68	1.37	1.85	1.49	2.02	1.56	2.10	1.71	2.31	1.87	2.52
	400	1.31	1.77	1.44	1.95	1.57	2.12	1.64	2.21	1.80	2.43	1.97	2.65
	415	1.36	1.84	1.50	2.02	1.63	2.20	1.70	2.29	1.87	2.52	2.04	2.75
	440	1.44	1.95	1.59	2.14	1.73	2.33	1.80	2.43	1.98	2.68	2.16	2.92
	460	1.51	2.03	1.66	2.24	1.81	2.44	1.88	2.54	2.07	2.80	2.26	3.05
	480	1.57	2.12	1.73	2.33	1.89	2.55	1.97	2.65	2.16	2.92	2.36	3.18
600V	500	1.09	1.47	1.20	1.62	1.31	1.77	1.36	1.84	1.50	2.03	1.64	2.21
	550	1.20	1.62	1.32	1.78	1.44	1.95	1.50	2.03	1.65	2.23	1.80	2.43
	575	1.26	1.69	1.38	1.86	1.51	2.03	1.57	2.12	1.73	2.33	1.88	2.54
	600	1.31	1.77	1.44	1.95	1.57	2.12	1.64	2.21	1.80	2.43	1.97	2.65

Table 64 CDBR Dynamic Braking Module Ratings Table

Voltage Class	CDBR Part Number	CDBR DB Rating (Amps [min. ohms])
200V	05P00671-1603 (2022D)	60 [6.7Ω]
	05P00671-0105 (2037D)	80 [5.0Ω]
	05P00671-1612 (2055D)	121 [3.3Ω]
	05P00671-1604 (2110D)	250 [1.6Ω]
400V	05P00671-1605 (4030D)	40 [20.0Ω]
	05P00671-0103 (4045D)	60 [13.4Ω]
	05P00671-1607 (4090D)	100 [8.0Ω]
	05P00671-0159 (4220D)	250 [3.2Ω]
600V	05P00671-0106 (5037D)	42 [23.8Ω]
	05P00671-0161 (5110D)	105 [9.5Ω]
	05P00671-0162 (5300D)	263 [3.8Ω]

Table 65 DBR Wattage Power Factor

	200V	400V	600V
Geared	0.0625	0.125	0.16
Gearless	0.125	0.25	0.33

◆ Timing Diagram for M1000

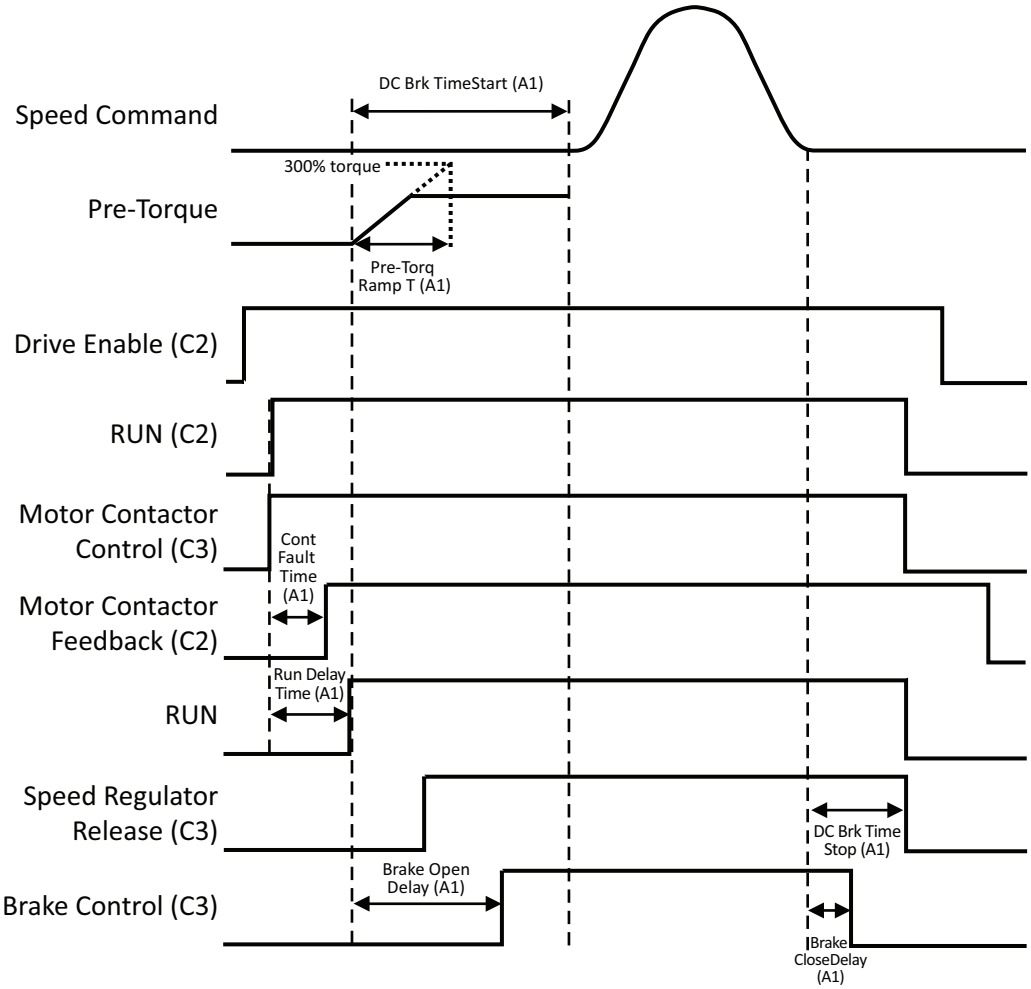


Figure 28 Timing Diagram for Drive Ramp to Stop

◆ Dimensions and Weights

■ Exterior and Mounting Dimensions

IP00 Enclosure Drive with Top Protective Cover

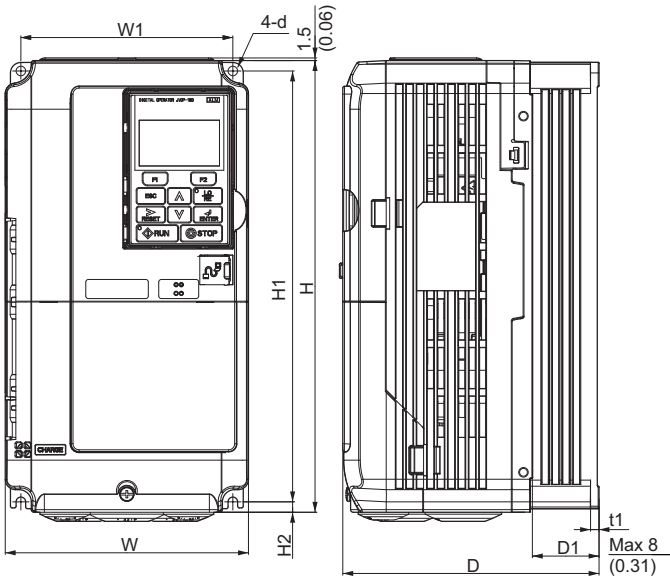


Figure 1

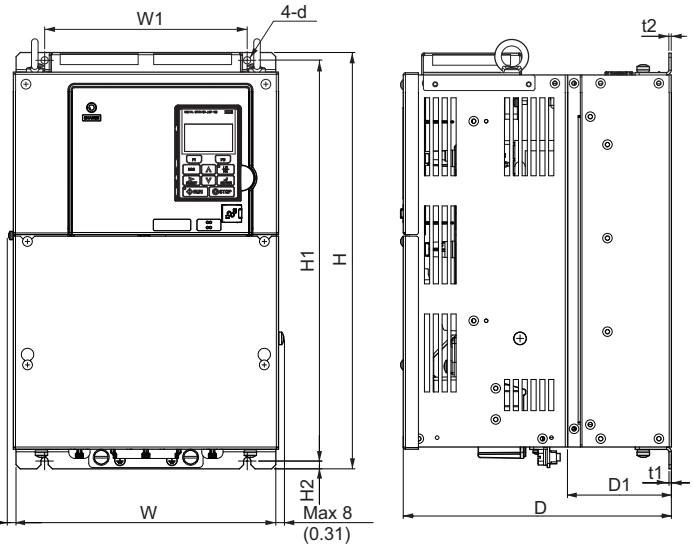


Figure 2

Table 66 Dimensions: 200 V Class

Drive Model LU2M	Figure	Dimensions mm (in)										Wt. kg (lb)
		W	H	D	W1	H1	H2	D1	t1	t2	d	
0018	1	140 (5.51)	260 (10.24)	164 (6.46)	122 (4.80)	248 (9.76)	6 (0.24)	55 (2.17)	5 (0.20)	–	M5	3.5 (7.7)
0025		140 (5.51)	260 (10.24)	167 (6.57)	122 (4.80)	248 (9.76)	6 (0.24)	55 (2.17)	5 (0.20)	–	M5	4 (8.8)
0033		140 (5.51)	260 (10.24)	167 (6.57)	122 (4.80)	248 (9.76)	6 (0.24)	55 (2.17)	5 (0.20)	–	M5	4 (8.8)
0047		180 (7.09)	300 (11.81)	187 (7.36)	160 (6.30)	284 (11.18)	8 (0.31)	75 (2.95)	5 (0.20)	–	M5	5.6 (12.3)
0060		220 (8.66)	350 (13.78)	197 (7.76)	192 (7.56)	335 (13.19)	8 (0.31)	78 (3.07)	5 (0.20)	–	M6	8.7 (19.2)
0075		220 (8.66)	365 (14.37)	197 (7.76)	192 (7.56)	335 (13.19)	8 (0.31)	78 (3.07)	5 (0.20)	–	M6	9.7 (21.4)
0085	2	250 (9.84)	400 (15.75)	258 (10.16)	195 (7.68)	385 (15.16)	7.5 (0.30)	100 (3.94)	2.3 (0.09)	2.3 (0.09)	M6	21 (46.3)
0115		275 (10.83)	450 (17.72)	258 (10.16)	220 (8.66)	435 (17.13)	7.5 (0.30)	100 (3.94)	2.3 (0.09)	2.3 (0.09)	M6	25 (55.1)
0145		325 (12.80)	550 (21.65)	283 (11.14)	260 (10.24)	535 (21.06)	7.5 (0.30)	110 (4.33)	2.3 (0.09)	2.3 (0.09)	M6	37 (81.6)
0180		325 (12.80)	550 (21.65)	283 (11.14)	260 (10.24)	535 (21.06)	7.5 (0.30)	110 (4.33)	2.3 (0.09)	2.3 (0.09)	M6	38 (83.8)

Table 67 Dimensions: 400 V Class

Drive Model LU4M	Figure	Dimensions mm (in)										Wt. kg (lb)
		W	H	D	W1	H1	H2	D1	t1	t2	d	
0009	1	140 (5.51)	260 (10.24)	164 (6.46)	122 (4.80)	248 (9.76)	6 (0.24)	55 (2.17)	5 (0.20)	–	M5	3.5 (7.7)
0015		140 (5.51)	260 (10.24)	167 (6.57)	122 (4.80)	248 (9.76)	6 (0.24)	55 (2.17)	5 (0.20)	–	M5	3.9 (8.6)
0018		140 (5.51)	260 (10.24)	167 (6.57)	122 (4.80)	248 (9.76)	6 (0.24)	55 (2.17)	5 (0.20)	–	M5	3.9 (8.6)
0024		180 (7.09)	300 (11.81)	167 (6.57)	160 (6.30)	284 (11.18)	8 (0.31)	55 (2.17)	5 (0.20)	–	M5	5.4 (11.9)
0031		180 (7.09)	300 (11.81)	187 (7.36)	160 (6.30)	284 (11.18)	8 (0.31)	75 (2.95)	5 (0.20)	–	M5	5.7 (12.6)
0039		220 (8.66)	350 (13.78)	197 (7.76)	192 (7.56)	335 (13.19)	8 (0.31)	78 (3.07)	5 (0.20)	–	M6	8.3 (18.3)
0045	2	250 (9.84)	400 (15.75)	258 (10.16)	195 (7.68)	385 (15.16)	7.5 (0.30)	100 (3.94)	2.3 (0.09)	2.3 (0.09)	M6	21 (46.3)
0060		275 (10.83)	450 (17.72)	258 (10.16)	220 (8.66)	435 (17.13)	7.5 (0.30)	100 (3.94)	2.3 (0.09)	2.3 (0.09)	M6	25 (55.1)
0075		325 (12.80)	510 (20.08)	258 (10.16)	260 (10.24)	495 (19.49)	7.5 (0.30)	105 (4.13)	2.3 (0.09)	3.2 (0.13)	M6	36 (79.4)
0091		325 (12.80)	510 (20.08)	258 (10.16)	260 (10.24)	495 (19.49)	7.5 (0.30)	105 (4.13)	2.3 (0.09)	3.2 (0.13)	M6	36 (79.4)
0112		325 (12.80)	550 (21.65)	283 (11.14)	260 (10.24)	535 (21.06)	7.5 (0.30)	110 (4.33)	2.3 (0.09)	2.3 (0.09)	M6	41 (90.4)
0150		325 (12.80)	550 (21.65)	283 (11.14)	260 (10.24)	535 (21.06)	7.5 (0.30)	110 (4.33)	2.3 (0.09)	2.3 (0.09)	M6	42 (92.6)

Table 68 Dimensions: 600 V Class

Drive Model LU5M	Figure	Dimensions mm (in)										Wt. kg (lb)
		W	H	D	W1	H1	H2	D1	t1	t2	d	
0003	1	140 (5.51)	260 (10.24)	147 (5.79)	122 (4.80)	248 (9.76)	6 (0.24)	38 (1.50)	5 (0.20)	–	M5	3.2 (7.1)
0004		140 (5.51)	260 (10.24)	164 (6.46)	122 (4.80)	248 (9.76)	6 (0.24)	55 (2.17)	5 (0.20)	–	M5	3.5 (7.7)
0006		140 (5.51)	260 (10.24)	164 (6.46)	122 (4.80)	248 (9.76)	6 (0.24)	55 (2.17)	5 (0.20)	–	M5	3.5 (7.7)
0010		140 (5.51)	260 (10.24)	167 (6.57)	122 (4.80)	248 (9.76)	6 (0.24)	55 (2.17)	5 (0.20)	–	M5	3.9 (8.6)
0013		180 (7.09)	300 (11.81)	187 (7.36)	160 (6.30)	284 (11.18)	8 (0.31)	75 (2.95)	5 (0.20)	–	M5	5.7 (12.6)
0017		180 (7.09)	300 (11.81)	187 (7.36)	160 (6.30)	284 (11.18)	8 (0.31)	75 (2.95)	5 (0.20)	–	M5	5.7 (12.6)
0022		220 (8.66)	350 (13.78)	197 (7.76)	192 (7.56)	335 (13.19)	8 (0.31)	78 (3.07)	5 (0.20)	–	M6	8.3 (18.3)
0027		220 (8.66)	350 (13.78)	197 (7.76)	192 (7.56)	335 (13.19)	8 (0.31)	78 (3.07)	5 (0.20)	–	M6	8.3 (18.3)
0032	2	275 (10.83)	450 (17.72)	258 (10.16)	220 (8.66)	435 (17.13)	7.5 (0.30)	100 (3.94)	2.3 (0.09)	2.3 (0.09)	M6	25 (55.1)
0041		275 (10.83)	450 (17.72)	258 (10.16)	220 (8.66)	435 (17.13)	7.5 (0.30)	100 (3.94)	2.3 (0.09)	2.3 (0.09)	M6	25 (55.1)
0052		325 (12.80)	550 (21.65)	283 (11.14)	260 (10.24)	535 (21.06)	7.5 (0.30)	110 (4.33)	2.3 (0.09)	2.3 (0.09)	M6	41 (90.4)
0062		325 (12.80)	550 (21.65)	283 (11.14)	260 (10.24)	535 (21.06)	7.5 (0.30)	110 (4.33)	2.3 (0.09)	2.3 (0.09)	M6	41 (90.4)

IP00 Enclosure Drive

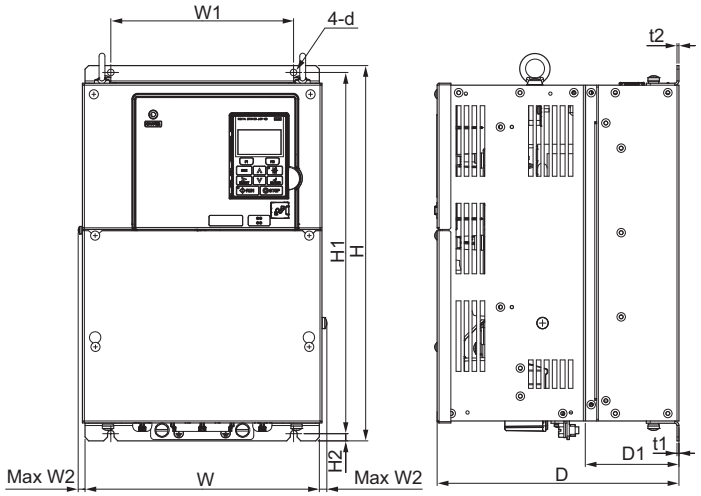


Figure 1

Table 69 Dimensions: 200 V Class

Drive Model LU2M	Figure	Dimensions mm (in)												Wt. kg (lb)
		W	H	D	W1	W2	W3	H1	H2	D1	t1	t2	d	
0215	1	450 (17.72)	705 (27.76)	330 (12.99)	325 (12.80)	10 (0.39)	–	680 (26.77)	12.5 (0.49)	130 (5.12)	3.2 (0.13)	3.2 (0.13)	M10	76 (167.6)
0283		450 (17.72)	705 (27.76)	330 (12.99)	325 (12.80)	10 (0.39)	–	680 (26.77)	12.5 (0.49)	130 (5.12)	3.2 (0.13)	3.2 (0.13)	M10	80 (176.4)
0346		500 (19.69)	800 (31.50)	350 (13.78)	370 (14.57)	10 (0.39)	–	773 (30.43)	13 (0.51)	130 (5.12)	4.5 (0.18)	4.5 (0.18)	M12	98 (216.1)
0415		500 (19.69)	800 (31.50)	350 (13.78)	370 (14.57)	10 (0.39)	–	773 (30.43)	13 (0.51)	130 (5.12)	4.5 (0.18)	4.5 (0.18)	M12	99 (218.3)

Table 70 Dimensions: 400 V Class

Drive Model LU4M	Figure	Dimensions mm (in)												Wt. kg (lb)
		W	H	D	W1	W2	W3	H1	H2	D1	t1	t2	d	
0180	1	450 (17.72)	705 (27.76)	330 (12.99)	325 (12.80)	10 (0.39)	–	680 (26.77)	12.5 (0.49)	130 (5.12)	3.2 (0.13)	3.2 (0.13)	M10	79 (174.2)
0216		500 (19.69)	800 (31.50)	350 (13.78)	370 (14.57)	10 (0.39)	–	773 (30.43)	13 (0.51)	130 (5.12)	4.5 (0.18)	4.5 (0.18)	M12	96 (211.6)

◆ CE Guidelines

■ European Standards

Figure 29 CE Mark

The CE mark indicates compliance with European safety and environmental regulations. It is required for engaging in business and commerce in Europe.

European standards include the Machinery Directive for machine manufacturers, the Low Voltage Directive for electronics manufacturers, and the EMC guidelines for controlling noise.

This drive displays the CE mark based on the EMC guidelines and the Low Voltage Directive.

- **Low Voltage Directive:** 2006/95/EC
- **EMC Guidelines:** 2004/108/EC

Devices used in combination with this drive must also be CE certified and display the CE mark. When using drives displaying the CE mark in combination with other devices, it is ultimately the responsibility of the user to ensure compliance with CE standards. After setting up the device, verify that conditions meet European standards.

Note: 600 V class drives (models 5□□□□□□) are not compliant with European Standards.

■ CE Low Voltage Directive Compliance

This drive has been tested according to European standard IEC/EN 61800-5-1, and it fully complies with the Low Voltage Directive.

To comply with the Low Voltage Directive, be sure to meet the following conditions when combining this drive with other devices:

Area of Use

Do not use drives in areas with pollution higher than severity 2 and overvoltage category 3 in accordance with IEC/EN 664.

Factory Recommended Branch Circuit Protection

Table 71 Recommended Input Fuse Selection

Drive Model LU	M1000					
	Nominal Output Power HP	AC Drive Input Amps	MCCB Rating Amps <1>	Time Delay Fuse Rating Amps <2>	Non-time Delay Fuse Rating Amps <3>	Bussmann Semi-conductor Fuse Rating (Fuse Ampere) <4>
Three-Phase 200 V Class						
2M0018	5	18.9	35	30	50	FWH-90B (90)
2M0025	7.5	28	50	40	75	FWH-100B (100)
2M0033	10	37	60	60	100	FWH-200B (200)
2M0047	15	52	100	90	150	FWH-200B (200)
2M0060	20	68	125	110	200	FWH-200B (200)
2M0075	25	80	150	125	225	FWH-300A (300)
2M0085	30	82	150	125	225	FWH-300A (300)
2M0115	40	111	200	175	250	FWH-350A (350)
2M0145	50	136	250	225	350	FWH-400A (400)
2M0180	60	164	300	250	450	FWH-400A (400)
2M0215	75	200	400	350	600	FWH-600A (600)
2M0283	100	271	500	450	800	FWH-700A (700)
2M0346	125	324	600	500	900 <5>	FWH-800A (800)
2M0415	150	394	700	600	1100 <5>	FWH-1000A (1000)
Three-Phase 400 V Class						
4M0009	5	10.4	20	17.5	30	FWH-90B (90)
4M0015	7.5	15	30	25	40	FWH-80B (80)
4M0018	10	20	40	35	60	FWH-100B (100)
4M0024	15	29	50	50	80	FWH-125B (125)
4M0031	20	39	75	60	110	FWH-200B (200)
4M0039	25	47	75	75	125	FWH-250A (250)
4M0045	30	43	75	75	125	FWH-250A (250)
4M0060	40	58	100	100	150	FWH-250A (250)
4M0075	60	71	125	110	200	FWH-250A (250)
4M0091	60	86	150	150	250	FWH-250A (250)
4M0112	75	105	175	175	300	FWH-350A (350)
4M0150	100	142	225	225	400	FWH-400A (400)
4M0180	125	170	250	250	500	FWH-500A (500)
4M0216	150	207	350	350	600	FWH-600A (600)
Three-Phase 600 V Class						
5M0003 <6>	2	3.6	15	6.25	10	FWP-50B (50)
5M0004 <6>	3	5.1	15	8	15	FWP-60B (60)
5M0006 <6>	5	8.3	15	12	20	FWP-60B (60)
5M0010 <6>	7.5	12	20	20	35	FWP-70B (70)
5M0013 <6>	10	16	30	25	45	FWP-100B (100)
5M0017 <6>	15	23	40	40	60	FWP-100B (100)
5M0022 <6>	20	31	60	50	90	FWP-125A (125)
5M0027 <6>	25	38	75	60	100	FWP-125A (125)
5M0032 <6>	25-30	33	60	50	90	FWP-175A (175)
5M0041 <6>	40	44	75	75	125	FWP-175A (175)
5M0052 <6>	50-60	54	100	90	150	FWP-250A (250)
5M0062 <6>	50-60	66	125	110	175	FWP-250A (250)

<1> Maximum MCCB Rating is 15 A, or 200% of drive input current rating, whichever is larger. MCCB voltage rating must be 600 VAC or greater.
<2> Maximum Time Delay fuse is 175% of drive input current rating. This covers any Class CC, J or T class fuse.

<3> Maximum Non-time Delay fuse is 300% of drive input current rating. This covers any CC, J or T class fuse.
<4> When using semiconductor fuses, Bussmann FWH and FWP are required for UL compliance. Select FWH for 240 V and 480 V models and FWP fuses for 600 V models.
<5> Class L fuse is also approved for this rating.
<6> 600 V class drives are not compliant with European Standards.

Grounding

The drive is designed to be used in T-N (grounded neutral point) networks. If installing the drive in other types of grounded systems, contact your Magnetek representative for instructions.

CE Standards Compliance for DC Power Supply Input

To meet CE standards, the following fuses should be installed. For details, refer to *Figure 30*.

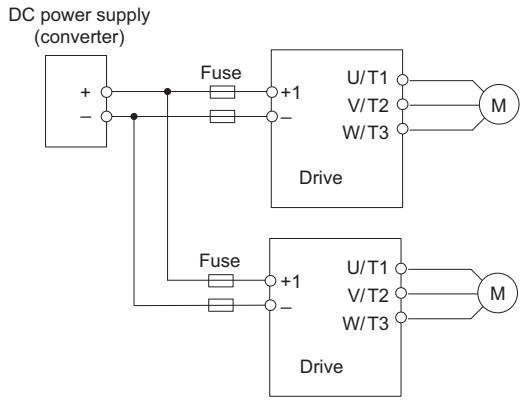


Figure 30 Example of DC Power Supply Input (two M1000 drives connected in series)

Note: When connecting multiple drives together, make sure that each drive has its own fuse. If any one fuse blows, all fuses should be replaced.
Note: For an AC power supply, refer to *Standard Connection Diagram on page 15*.
Note: The recommended fuses and fuse holders are made by Fuji Electric.

Table 72 Fuses and Fuse Holders

Drive Model LU	DC Power Supply Input <1>				
	Fuse			Fuse Holder	
	Type	Rated Short-circuit Breaking Current (kA)	Qty.	Type	Qty.
200 V Class					
2M0018	CR2LS-100	100	2	CM-1A	1
2M0025	CR2L-125		2	CM-2A	1
2M0033	CR2L-150				
2M0047	CR2L-175				
2M0060	CR2L-225		2	<2>	
2M0075	CR2L-260				
2M0085	CR2L-300				
2M0115	CR2L-350				
2M0145	CR2L-400				
2M0180	CR2L-450				
2M0215	CR2L-600				
2M0283					
2M0346	CS5F-800	200			
2M0415	CS5F-1200				

Drive Model LU	DC Power Supply Input <1>				
	Fuse			Fuse Holder	
	Type	Rated Short-circuit Breaking Current (kA)	Qty.	Type	Qty.
400 V Class					
4M0009	CR6L-50	100	2	CMS-4	2
4M0015	CR6L-75		2	CMS-5	2
4M0018					
4M0024	CR6L-100				
4M0031	CR6L-150				
4M0039					
4M0045	CR6L-200		2	<2>	
4M0060	CR6L-250				
4M0075					
4M0091	CR6L-300				
4M0112	CR6L-350				
4M0150	CR6L-400				
4M0180	CS5F-600	200			
4M0216					

<1> DC is not available for UL standards.
<2> Manufacturer does not recommend a specific fuse holder for this fuse. Contact Magnetek or your nearest sales representative on fuse dimensions.

Guarding Against Harmful Materials

When installing IP00 enclosure drives, use an enclosure that prevents foreign material from entering the drive from above or below.

■ EMC Guidelines Compliance

This drive is tested according to European standards IEC/EN 61800-3: 2004, and complies with the European standards IEC/EN 12015 (requires an optional AC reactor) and IEC/EN 12016.

Note: Make sure the protective earthing conductor complies with technical standards and local safety regulations. Because the leakage current exceeds 3.5 mA when an EMC filter is installed, IEC/EN 61800-5-1 states that either the power supply must be automatically disconnected in case of discontinuity of the protective earthing conductor or a protective earthing conductor with a cross-section of at least 10 mm^2 (Cu) or 16 mm^2 (Al) must be used.

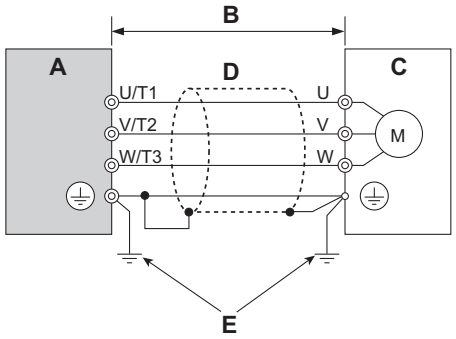
EMC Filter Installation

The following conditions must be met to ensure continued compliance with European standards IEC/EN 12015 and IEC/EN 12016. *Refer to EMC Filters on page 172* for EMC filter selection.

Installation Method

Verify the following installation conditions to ensure that other devices and machinery used in combination with this drive also comply with EMC guidelines.

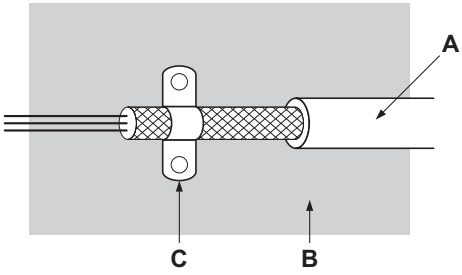
1. Install an EMC noise filter to the input side specified by Magnetek for compliance with European standards.
2. Place the drive and EMC noise filter in the same enclosure.
3. Use braided shield cable for the drive and motor wiring, or run the wiring through a metal conduit.
4. Keep wiring as short as possible. Ground the shield on both the drive side and the motor side.



A – Drive
B – 10 m max cable length between drive and motor
C – Motor
D – Metal conduit
E – Ground wire should be as short as possible.

Figure 31 Installation Method

5. Make sure the ground conductor complies with technical standards and local safety rules. When an EMC filter is installed, the leakage current exceeds 3.5 mA. Therefore according to IEC/EN 61800-5-1, at least one of the conditions below must be satisfied:
   The cross-section of the protective earthing conductor must be at least 10 mm^2 (Cu) or 16 mm^2 (Al).
   a. The power supply must be disconnected automatically in case of discontinuity of the protective earthing conductor.



A – Braided shield cable **C – Cable clamp (conductive)**
B – Metal panel

Figure 32 Ground Area

6. Connect an AC reactor or a DC link choke to minimize harmonic distortion.

Three-Phase 200 V / 400 V Class

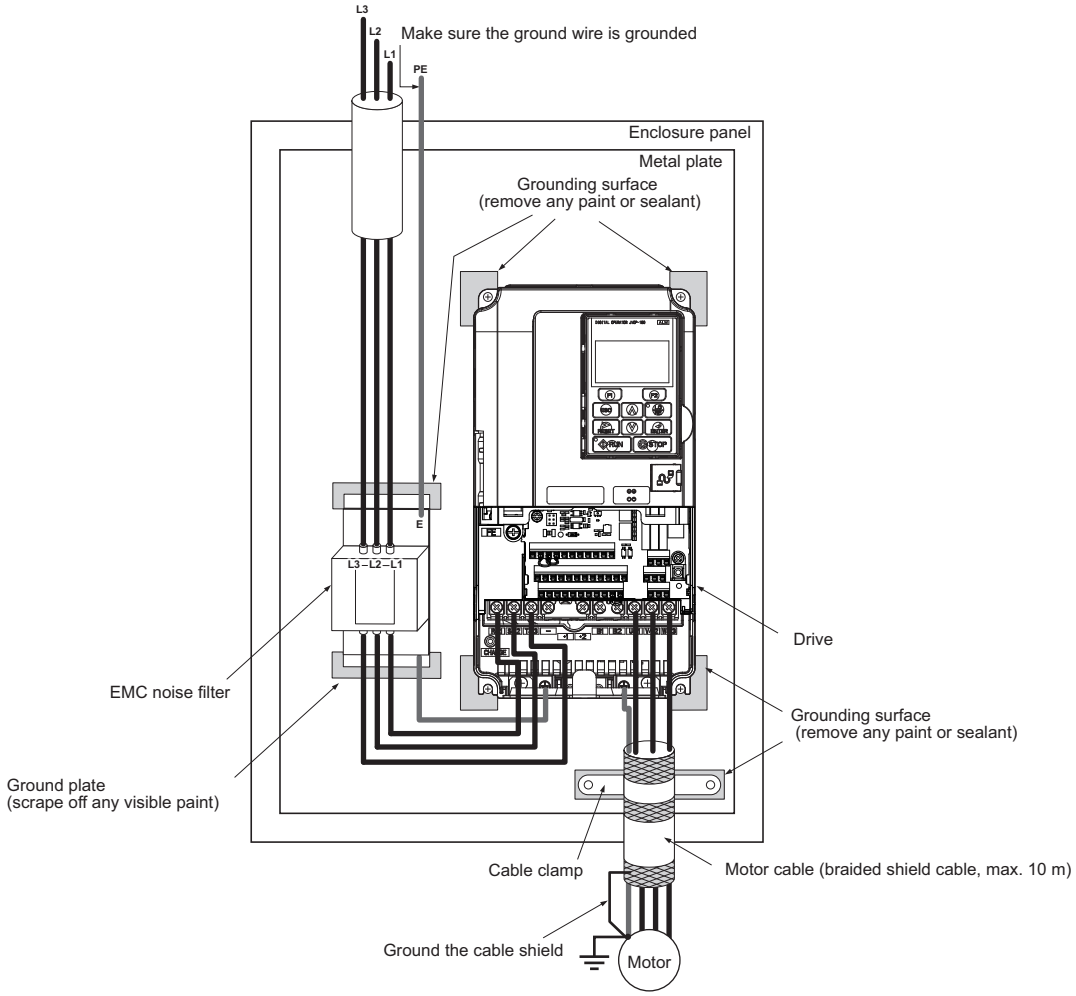


Figure 33 EMC Filter and Drive Installation for CE Compliance (Three-Phase 200 V / 400 V Class)

EMC Filters

Install the drive with the EMC filters to comply with the IEC/EN 61800-3 and IEC/EN 12015 requirements.

Note: If the Safe Disable function of the drive is part of the safety concept of a machine or installation and used for a safe stop according to EN 60204-1, stop category 0, use these filters recommended by Magnetek. For all other EMC filters, additional measurements must be performed to prove EMC compatibility. This also applies when using the safe disable function in one motor contactor installations.

Table 73 IEC/EN 61800-3 Filters

Model LU	Filter Data (Manufacturer: Schaffner)						
	Schaffner P/N	Magnetek P/N	Rated Current (A)	Weight (lb)	Dimensions [W x D x H] (in)	Y x X (in)	Figure
Three-Phase 200 V Class							
2M0018	FS5972-35-07	05P00010-0704	35	4.6	8.1 × 2.0 × 14.0	6.9 × 13.2	1
2M0025							
2M0033	FS5972-60-07	05P00010-0752	60	8.8	9.3 × 2.6 × 16.1	8.1 × 15.4	
2M0047							
2M0060	FS5972-100-35	05P00010-0716	100	7.5	3.5 × 5.9 × 13.0	2.6 × 10.0	2
2M0075							
2M0185	FS5972-170-40	05P00010-0733	170	13.2	4.7 × 6.7 × 17.8	4.0 × 14.4	
2M0115							
2M0145	FS5972-250-37	05P00010-0744	250	25.8	5.1 × 9.5 × 24.0	3.5 × 19.6	
2M0180							
2M0215	FS5972-410-99	05P00010-0745	410	23.1	10.2 × 4.5 × 15.2	9.3 × 4.7	3
2M0283							
2M0346	FS5972-600-99	05P00010-0746	600	24.3	10.2 × 5.3 × 15.2	9.3 × 4.7	
2M0415							
Three-Phase 400 V Class							
4M0009	FS5972-18-07	05P00010-0707	18	2.9	5.6 × 1.8 × 13.0	4.5 × 12.3	1
4M0015	FS5972-35-07	05P00010-0704	35	4.6	8.1 × 2.0 × 14.0	6.9 × 13.2	
4M0018							
4M0024							
4M0031	FS5972-60-07	05P00010-0752	60	8.8	9.3 × 2.6 × 16.1	8.0 × 15.4	
4M0039							
4M0045							
4M0060	FS5972-100-35	05P00010-0716	100	16.5	3.5 × 5.9 × 13.0	2.6 × 10.0	2
4M0075							
4M0091	FS5972-170-35	05P00010-0748	170	10.4	4.7 × 6.7 × 17.8	4.0 × 14.4	
4M0112							
4M0150							
4M0180	FS5972-250-37	05P00010-0744	250	25.8	5.1 × 9.5 × 24.0	3.5 × 19.6	
4M0216	FS5972-410-99	05P00010-0745	410	23.1	10.2 × 4.5 × 15.2	9.3 × 4.7	3

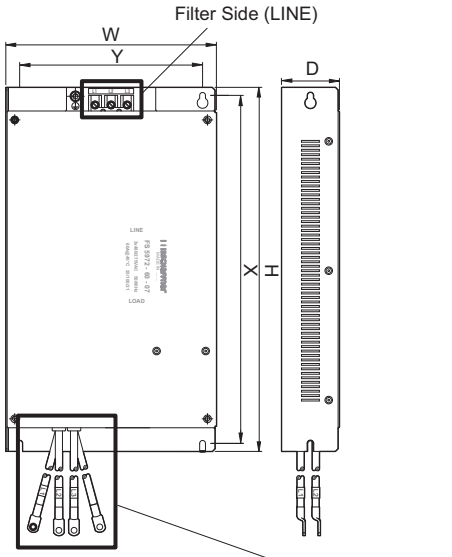


Figure 1

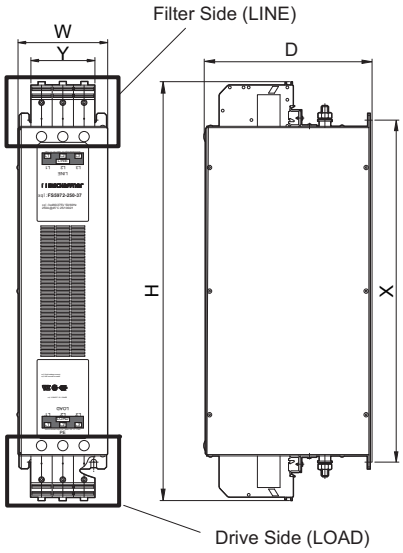


Figure 2

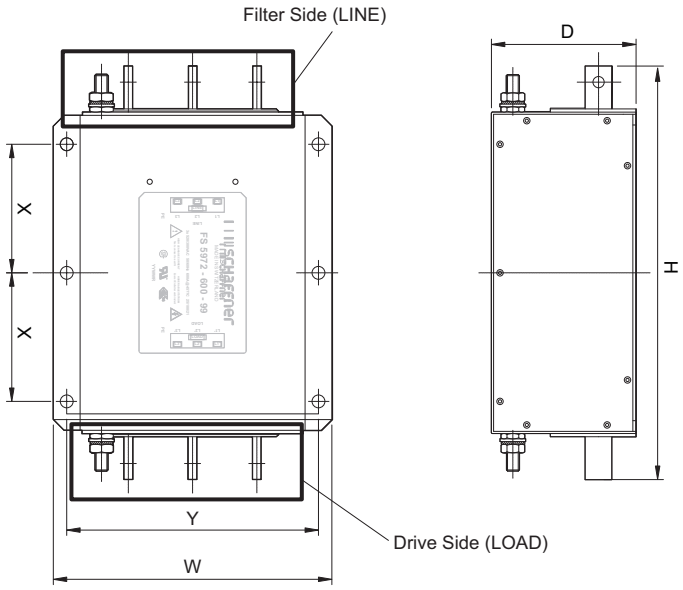


Figure 3

Figure 34 EMC Filter Dimensions

AC Reactors for IEC/EN 12015 Compliance

Contact Magnetek for information about reactors.

◆ Power Ratings

■ Three-Phase 200 V Class Drives

Table 74 Power Ratings (Three-Phase 200 V Class)

Item		Specification													
LU2M		0018	0025	0033	0047	0060	0075	0085	0115	0145	0180	0215	0283	0346	0415
Maximum Applicable Motor Capacity (HP) <1>		3.7 (5)	7.5	10	15	20	25	30	40	50	60	75	100	125	150
Input	Input Current (A) <2>	18.9	28	37	52	68	80	82	111	136	164	200	271	324	394
	Rated Voltage Rated Frequency	Three-phase 200 to 240 Vac 50/60 Hz/270 to 340 Vdc <3>													
	Allowable Voltage Fluctuation	-15 to 10%													
	Allowable Frequency Fluctuation	±5%													
	Input Power (kVA)	9.5	14	18	27	36	44	37	51	62	75	91	124	148	180
Output	Rated Output Capacity (kVA) <4>	6.7 <5>	9.5 <5>	12.6 <5>	17.9 <5>	23 <5>	29 <5>	32 <5>	44 <5>	55 <6>	69 <6>	82 <6>	108 <6>	132 <6>	158 <6>
	Rated Output Current (A)	17.5 <5>	25 <5>	33 <5>	47 <5>	60 <5>	75 <5>	85 <5>	115 <5>	145 <6>	180 <6>	215 <6>	283 <6>	346 <6>	415 <6>
	Overload Tolerance	150% of rated output current for 60 s													
	Carrier Frequency	User adjustable between 2 and 15 kHz								User adjustable between 2 and 10 kHz					
	Maximum Output Voltage (V)	Three-phase 200 to 240 V (proportional to input voltage)													
	Maximum Output Speed (Hz)	200 Hz (user-set)													

<1> The motor capacity (HP) refers to a NEC rated 4-pole motor. The rated output current of the drive output amps should be equal to or greater than the motor current. Select the appropriate capacity drive if operating the motor continuously above motor nameplate current.
<2> Assumes operation at the rated output current. Input current rating varies depending on the power supply transformer, input reactor, wiring connections, and power supply impedance.
<3> DC is not available for UL standards.
<4> Rated motor capacity is calculated with a rated output voltage of 220 V.
<5> Carrier frequency can be set up to 8 kHz while keeping this current rating. Higher carrier frequency settings require derating.
<6> Carrier frequency can be set up to 5 kHz while keeping this current rating. Higher carrier frequency settings require derating.

For elevator application ratings, please see *Table 61 on page 161*.

■ Three-Phase 400 V Class Drives

Table 75 Power Ratings (Three-Phase 400 V Class)

Item		Specification							
LU4M		0009	0015	0018	0024	0031	0039	0045	0060
Maximum Applicable Motor Capacity (HP) <1>		7.5	10	15	20	25	23-30	23-30	40
Input	Input Current (A) <2>	12	16	23	31	38	44	43	58
	Rated Voltage Rated Frequency	Three-phase 380 to 480 Vac 50/60 Hz 510 to 680 Vdc <3>							
	Allowable Voltage Fluctuation	-15 to 10%							
	Allowable Frequency Fluctuation	±5%							
	Input Power (kVA)	14	18	26	35	43	46.6	39.3	53.0

Item		Specification							
LU4M		0009	0015	0018	0024	0031	0039	0045	0060
Output	Rated Output Capacity (kVA) <4>	9.8 <5>	12 <5>	17 <5>	22 <5>	27 <5>	30 <5>	34 <5>	48 <5>
	Rated Output Current (A)	9.8 <5>	12 <5>	17 <5>	22 <5>	27 <5>	39 <5>	45 <5>	60 <5>
	Overload Tolerance	150% of rated output current for 60 s							
	Carrier Frequency	User adjustable between 2 and 15 kHz							
	Maximum Output Voltage (V)	Three-phase 380 to 480 V (proportional to input voltage)							
	Maximum Output Speed (Hz)	200 Hz (user-adjustable)							

Item		Specification					
LU4M		0075	0091	0112	0150	0180	0216
Maximum Applicable Motor Capacity (HP) <1>		50-60	50-60	75	100	125-150	150
Input	Input Current (A) <2>	71	86	105	142	170	207
	Rated Voltage Rated Frequency	Three-phase 380 to 480 Vac 50/60 Hz 510 to 680 Vdc <3>					
	Allowable Voltage Fluctuation	-15 to 10%					
	Allowable Frequency Fluctuation	±5%					
	Input Power (kVA)	64.9	78.6	96.0	129.9	155	189
Output	Rated Output Capacity (kVA) <4>	57 <5>	69 <5>	85 <6>	114 <6>	137 <6>	165 <6>
	Rated Output Current (A)	75 <5>	91 <5>	112 <6>	150 <6>	180 <6>	216 <6>
	Overload Tolerance	150% of rated output current for 60 s					
	Carrier Frequency	User adjustable between 2 and 15 kHz		User adjustable between 2 and 10 kHz			
	Maximum Output Voltage (V)	Three-phase 380 to 480 V (proportional to input voltage)					
	Maximum Output Speed (Hz)	200 Hz (user-adjustable)					

<1> The motor capacity (HP) refers to a NEC rated 4-pole motor. The rated output current of the drive output amps should be equal to or greater than the motor current. Select the appropriate capacity drive if operating the motor continuously above motor nameplate current.
<2> Assumes operation at the rated output current. Input current rating varies depending on the power supply transformer, input reactor, wiring conditions, and power supply impedance.
<3> DC is not available for UL standards.
<4> Rated motor capacity is calculated with a rated output voltage of 440 V.
<5> Carrier frequency can be set up to 8 kHz while keeping this current rating. Higher carrier frequency settings require derating.
<6> Carrier frequency can be set up to 5 kHz while keeping this current rating. Higher carrier frequency settings require derating.
<7> Carrier frequency can be set up to 2 kHz while keeping this current derating. Higher carrier frequency settings require derating.

For elevator application ratings, please see *Table 61 on page 161*.

■ Three-Phase 600 V Class Drives

Table 76 Power Ratings (Three-Phase 600 V Class)

Item		Specification										
LU5M		0003	0004	0006	0010	0013	0017	0022	0027	0032	0041	0052
Maximum Applicable Motor Capacity (HP) <1>		2	3	5	7.5	10	15	20	25	25-30	40	50-60
Input	Input Current (A) <2>	3.6	5.1	8.3	12	16	23	31	38	33	44	54
	Rated Voltage Rated Frequency	Three-phase 500 to 600 Vac 50/60 Hz										
	Allowable Voltage Fluctuation	-10 (-15) to 10%										
	Allowable Frequency Fluctuation	±5%										
	Input Power (kVA)	4.1	5.8	9.5	14	18	26	35	43	38	50	62
Output	Rated Output Capacity (kVA) <3>	3.5 <5>	4.1 <5>	6.3 <5>	9.8 <5>	12 <5>	17 <5>	22 <5>	27 <5>	32 <5>	41 <5>	52 <5>
	Rated Output Current (A)	3.5 <5>	4.1 <5>	6.3 <5>	9.8 <5>	12.5 <5>	17 <5>	22 <5>	27 <6>	32 <5>	41 <5>	52 <5>
	Overload Tolerance	150% of rated output current for 60 s										
	Carrier Frequency	User adjustable between 2 and 15 kHz				User adjustable between 2 and 10 kHz						
	Maximum Output Voltage (V)	Three-phase 500 to 600 Vac (proportional to input voltage)										
	Maximum Output Speed (Hz)	200 Hz (user-adjustable)										

<1> The motor capacity (HP) refers to a NEC rated 4-pole motor. The rated output current of the drive output amps should be equal to or greater than the motor current. Select the appropriate capacity drive if operating the motor continuously above motor nameplate current.
<2> Assumes operation at the rated output current. Input current rating varies depending on the power supply transformer, input reactor, wiring connections, and power supply impedance.
<3> Rated motor capacity is calculated with a rated output voltage of 575 V.
<4> Carrier frequency can be set up to 3 kHz while keeping this current derating. Higher carrier frequency settings require derating.
<5> Carrier frequency can be set up to 8 kHz while keeping this current derating. Higher carrier frequency settings require derating.
<6> Carrier frequency can be set up to 5 kHz while keeping this current derating. Higher carrier frequency settings require derating.

◆ Drive Specifications

Note: Perform rotational autotuning to obtain the performance specifications given below.
Note: For optimum performance life of the drive, install the drive in an environment that meets the required specifications.

Item		Specification
Control Characteristics	Control Method	The following control methods can be set using drive parameters: • V/f Control (V/f) • Open Loop Vector Control (OLV) • Closed Loop Vector Control (CLV) • Closed Loop Vector Control for PM (CLV/PM)
	Frequency Control Range	0.01 to 200 Hz
	Frequency Accuracy (Temperature Fluctuation)	Digital input: within ±0.01% of the max output speed [-10 to 40°C (14 to 104°F)] Analog input: within ±0.1% of the max output speed [25 ±10°C (77 ±18°F)]
	Frequency Setting Resolution	Digital inputs: 0.01 Hz Analog inputs: 1/2048 of the maximum output speed setting (11 bit plus sign)
	Output Speed Resolution	0.001 Hz
	Frequency Setting Signal	Main speed frequency reference: DC -10 to +10 V (20 kΩ), DC 0 to +10 V (20 kΩ), 4 to 20 mA (250 Ω), 0 to 20 mA (250 Ω)
	Starting Torque <1>	V/f: 150% at 3 Hz OLV: 200% at 0.3 Hz CLV, CLV/PM: 200% at 0 r/min
	Speed Control Range <1>	V/f: 1:40 OLV: 1:200 CLV, CLV/PM: 1:1500
	Speed Control Accuracy <1>	OLV: ±0.2% [25 ±10°C (77 ±18°F)] CLV: ±0.02% [25 ±10°C (77 ±18°F)]
	Speed Response <1>	OLV: 10 Hz [25 ±10°C (77 ±18°F)] CLV: 100 Hz <2> CLV/PM: 100 Hz <2>
	Torque Limit	Parameters setting allow separate limits in four quadrants (available in OLV, CLV, CLV/PM)
	Accel/Decel Ramp	0.0 to 6000.0 s (4 selectable combinations of independent acceleration and deceleration settings, unit changeable to m/s2 or ft/s2)
	Braking Transistor	Models LU2M0008 to 2M0115, 4M0005 to 4M0060, and 5M0003 to 5M0041 have a built-in braking transistor.
	V/f Characteristics	Freely programmable
	Main Control Functions	Inertia Compensation, Position Lock at Start and Stop/Anti-Rollback Function, Overtorque/ Undertorque Detection, Torque Limit, Speed Reference, Accel/decel Switch, 5 Zone Jerk Settings, Autotuning (Stationary and Rotational Motor/Encoder Offset Tuning), Dwell, Cooling Fan on/off Switch, Slip Compensation, Torque Compensation, DC Injection Braking at Start and Stop, MEMOBUS/Modbus Comm. (RS-422/485 max, 115.2 kbps), Fault Reset, Removable Terminal Block with Parameter Backup Function, Online Tuning, High Frequency Injection, Short Floor, Rescue Operation (Light Load Direction Search Function), Inspection Run, Brake Sequence, Speed related parameters with elevator units display, etc.
Protection Functions	Motor Protection	Electronic thermal overload relay
	Momentary Overcurrent Protection	Drive stops when output current exceeds 200% of rated output current
	Overload Protection	Drive stops after 60 s at 150% of rated output current <3>
	Overvoltage Protection	200 V class: Stops when DC bus voltage exceeds approx. 410 V 400 V class: Stops when DC bus voltage exceeds approx. 820 V 600 V class: Stops when DC bus voltage exceeds approx. 1040 V
	Undervoltage Protection	200 V class: Stops when DC bus voltage falls below approx. 190 V 400 V class: Stops when DC bus voltage falls below approx. 380 V 600 V class: Stops when DC bus voltage falls below approx. 500 V
	Heatsink Overheat Protection	Thermistor
	Stall Prevention	Stall Prevention is available during acceleration, and during run.
	Ground Protection	Electronic circuit protection <4>
	DC Bus Charge LED	Remains lit until DC bus voltage falls below 50 V

Item		Specification
Environment	Area of Use	Indoors
	Ambient Temperature	IP00 enclosure with top protective cover: [-10 to 40°C (14 to 104°F)] IP00 enclosure: [-10 to 50°C (14 to 122°F)]
	Humidity	95 RH% or less (no condensation)
	Storage Temperature	[-20 to 60°C (-4 to 140°F)] (short-term temperature during transportation)
	Altitude	Up to 1000 meters (3280 ft.) without derating, up to 3000 meters (9842 ft.) with output current and voltage derating
	Vibration/Shock	10 to 20 Hz: 9.8 m/s^2 20 to 55 Hz: 5.9 m/s^2 (LU2M0008 to 2M0180, 4M0005 to 4M0150, and 5M0003 to 5M0077) or 2.0 m/s^2 (LU2M0215 to 2M0415, 4M0180 to 4M0260, and 5M0099 to 5M0200)
Standards		• UL Underwriters Laboratories Inc: UL508C Power Conversion Equipment • IEC/EN 61800-3, IEC/EN 61800-5-1 • ISO International Organization for Standardization: ISO/EN 13849-1 Cat. 3 PLd Safety of machinery - Safety-related parts of control systems • IEC International Electrotechnical Commission: IEC/EN 61508 SIL2 Functional safety of electrical/electronic/programmable electronic safety-related systems safety integrity level 2 • CSA Canadian Standards Association International <5>: 2411-02 Elevator Equipment - Enclosed Elevator-and Escalator Electrical Equipment 3211-06 Industrial Control Equipment - Motor Controllers - Miscellaneous C22.2 No.04-04 Bonding and Grounding of Electrical Equipment C22.2 No.14-05 Industrial Control Equipment B44.1/ASME-A17.5-2004 Safety Code for Elevators and Escalator Electrical Equipment used by CSA to evaluate the L1000 to Class 2411 (Elevator Equipment) • ANSI/ASME American Society of Mechanical Engineers/American National Standards Institute: ANSI/ASME A17.1-2007/B44-04 Safety Code for Elevators and Escalators, Dumbwaiters, Moving Walks, Material Lifts, and Dumbwaiters with Automatic Transfer Devices using IEC/EN 12016:2004 immunity requirements. ANSI/ASME-A17.5-2004/CSA B44.1 - Elevator and Escalator Electrical Equipment, used by CSA to evaluate the L1000 to Class 2411 (Elevator Equipment)
Protection Design		IP00 enclosure with top protective cover, IP00

<1> The accuracy of these values depends on motor characteristics, ambient conditions, and drive settings. Specifications may vary with different motors and with changing motor temperature. Contact Magnetek for consultation.
<2> For drives with B or earlier as the design revision order, 50 Hz is required. The design revision order and software version are printed on the nameplate affixed to the side of the drive. *Refer to Model Number on page 10* for details.
<3> Overload protection may be triggered when operating with 150% of the rated output current if the output speed is less than 6 Hz.
<4> Ground protection cannot be provided when the impedance of the ground fault path is too low, or when the drive is powered up while a ground fault is present at the output.
<5> Terminals H1, H2, DM+, and DM- on 600 V class models are designed to the functionality, but are not certified to IEC/EN 61800-5-1, ISO/EN 13849 Cat. 3, IEC/EN 61508 SIL2, Insulation coordination: class 1.

■ Altitude Derating

The drive standard ratings are valid for an installation altitude up to 3000 m (9842 ft.). If the altitude exceeds 1000 m (3280 ft.). both the drive rated voltage and the rated output current must be derated for 1% per 100 m (328 ft.). The maximum altitude is 3000 m (9842 ft.).

◆ Wire Gauges and Tightening Torque

Use the tables in this section to select the appropriate wires and crimp terminals.

Gauges listed in the tables are for use in the United States.

Note: **1.** Wire gauge recommendations based on drive continuous current ratings using 75°C (167°F) 600 Vac vinyl-sheathed wire assuming ambient temperature within 40°C (104°F) and wiring distance less than 100 m (328 ft.).
2. Terminals B1, B2, -, +1, +2, and +3, are for connecting a DC link choke, braking resistor or DC power supply. Do not connect other nonspecific devices to these terminals.

- Consider the amount of voltage drop when selecting wire gauges. Increase the wire gauge when the voltage drop is greater than 2% of motor rated voltage. Ensure the wire gauge is suitable for the terminal block. Use the following formula to calculate the amount of voltage drop:
  Line drop voltage (V) = $\sqrt{3}$ × wire resistance (Ω/km) × wire length (m) × current (A) × 10^{-3}
- Refer to the instruction manual for braking transistor option or braking resistor option wire gauges.
- Use terminal +1 and the negative terminal when connecting a regenerative converter or a regen unit.
- Use terminal B1 and - terminals when installing the braking unit to the drives with built-in braking transistor (2M0008 to 2M0115, 4M0005 to 4M0060, and 5M0003 to 5M0041).

Magnetek recommends using closed-loop crimp terminals on all drive models. UL/cUL approval requires the use of closed-loop crimp terminals when wiring the drive main circuit terminals on models LU2M0085 to 2M0415 and 4M0045 to 4M0260. Use only the tools recommended by the terminal manufacturer for crimping.

The wire gauges listed in the following tables are Magnetek recommendations. Refer to local codes for proper wire gauge selections.

■ Three-Phase 200 V Class

Table 77 Wire Gauge and Torque Specifications (Three-Phase 200 V Class)

Model LU	Terminal	Recomm. Gauge AWG, kcmil	Wire Range AWG, kcmil	Screw Size	Tightening Torque N·m (lb.in.)
2M0018	R/L1, S/L2, T/L3	10	18 to 10	M4	1.2 to 1.5 (10.6 to 13.3)
	U/T1, V/T2, W/T3	10	18 to 10		
	–, +1, +2	–	12 to 10		
	B1, B2	–	14 to 10		
	⏚	10 <1>	12 to 10		
2M0025	R/L1, S/L2, T/L3	8	12 to 6	M4	2.1 to 2.3 (18.6 to 20.4)
	U/T1, V/T2, W/T3	8	12 to 6		
	–, +1, +2	–	10 to 6		
	B1, B2	–	12 to 10		
	⏚	8 <2>	10 to 8	M5	2.0 to 2.5 (17.7 to 22.1)
2M0033	R/L1, S/L2, T/L3	6	12 to 6	M4	2.1 to 2.3 (18.6 to 20.4)
	U/T1, V/T2, W/T3	8	12 to 6		
	–, +1, +2	–	6		
	B1, B2	–	12 to 10		
	⏚	8	10 to 8	M5	2.0 to 2.5 (17.7 to 22.1)
2M0047	R/L1, S/L2, T/L3	4	6 to 4	M6	5.4 to 6.0 (47.8 to 53.1)
	U/T1, V/T2, W/T3	4	6 to 4		
	–, +1, +2	–	6 to 4		
	B1, B2	–	10 to 6	M5	2.7 to 3.0 (23.9 to 26.6)
	⏚	6	8 to 6	M6	5.4 to 6.0 (47.8 to 53.1)
2M0060	R/L1, S/L2, T/L3	3	10 to 2	M8	9.9 to 11.0 (87.6 to 97.4)
	U/T1, V/T2, W/T3	3	10 to 2		
	–, +1, +2	–	4 to 3		
	B1, B2	–	8 to 6	M5	2.7 to 3.0 (23.9 to 26.6)
	⏚	6	6 to 4	M6	5.4 to 6.0 (47.8 to 53.1)

Model LU	Terminal	Recomm. Gauge AWG, kcmil	Wire Range AWG, kcmil	Screw Size	Tightening Torque N·m (lb.in.)
2M0075	R/L1, S/L2, T/L3	2	10 to 2	M8	9.9 to 11.0 (87.6to 97.4)
	U/T1, V/T2, W/T3	2	10 to 2		
	–, +1, +2	–	3 to 2		
	B1, B2	–	6	M5	2.7 to 3.0 (23.9 to 26.6)
	⏚	6	6 to 4	M6	5.4 to 6.0 (47.8 to 53.1)
2M0085	R/L1, S/L2, T/L3	1/0	10 to 1/0	M8	9 to 11 (79.7 to 97.4)
	U/T1, V/T2, W/T3	1/0	10 to 1/0		
	–, +1	–	2 to 1/0		
	B1, B2	–	6 to 1/0		
	⏚	6	6 to 4		
2M0115	R/L1, S/L2, T/L3	2/0	10 to 3/0	M10	18 to 23 (159 to 204)
	U/T1, V/T2, W/T3	2/0	10 to 3/0		
	–, +1	–	1/0 to 3/0		
	B1, B2	–	4 to 2/0		
	⏚	4	4	M8	9 to 11 (79.7 to 97.4)
2M0145	R/L1, S/L2, T/L3	4/0	1/0 to 4/0	M10	18 to 23 (159 to 204)
	U/T1, V/T2, W/T3	4/0	1/0 to 4/0		
	–, +1	–	1 to 4/0		
	+3	–	1/0 to 4/0		
	⏚	4	4 to 2		9 to 11 (79.7 to 97.4)
2M0180	R/L1, S/L2, T/L3	1/0 × 2P	1/0 to 4/0	M10	18 to 23 (159 to 204)
	U/T1, V/T2, W/T3	1/0 × 2P	1/0 to 4/0		
	–, +1	–	1 to 4/0		
	+3	–	1/0 to 4/0		
	⏚	4	4 to 1/0		9 to 11 (79.7 to 97.4)
2M0215	R/L1, S/L2, T/L3	2/0 × 2P	3/0 to 300	M12	32 to 40 (283 to 354)
	U/T1, V/T2, W/T3	2/0 × 2P	3/0 to 300		
	–, +1	–	3/0 to 300		
	+3	–	2 to 300	M10	18 to 23 (159 to 204)
	⏚	3	3 to 300	M12	32 to 40 (283 to 354)
2M0283	R/L1, S/L2, T/L3	3/0 × 2P	3/0 to 300	M12	32 to 40 (283 to 354)
	U/T1, V/T2, W/T3	3/0 × 2P	3/0 to 300		
	–, +1	–	3/0 to 300		
	+3	–	3/0 to 300	M10	18 to 23 (159 to 204)
	⏚	2	2 to 300	M12	32 to 40 (283 to 354)
2M0346	R/L1, S/L2, T/L3	250 × 2P	4/0 to 600	M12	32 to 40 (283 to 354)
	U/T1, V/T2, W/T3	4/0 × 2P	4/0 to 600		
	–, +1	–	250 to 600		
	+3	–	3/0 to 600	M10	18 to 23 (159 to 204)
	⏚	1	1 to 350	M12	32 to 40 (283 to 354)

Model LU	Terminal	Recomm. Gauge AWG, kcmil	Wire Range AWG, kcmil	Screw Size	Tightening Torque N·m (lb.in.)
2M0415	R/L1, S/L2, T/L3	350 × 2P	250 to 600	M12	32 to 40 (283 to 354)
	U/T1, V/T2, W/T3	300 × 2P	300 to 600		
	–, +1	–	300 to 600		
	+3	–	3/0 to 600	M10	18 to 23 (159 to 204)
	⏚	1	1 to 350	M12	32 to 40 (283 to 354)

<1> When using the wire of this gauge in accordance with IEC/EN 61800-5-1, install an ELCB.
<2> When using the wire of this gauge in accordance with IEC/EN 61800-5-1, install an ELCB, or use copper wire of 10 mm^2 (AWG 8).

Note: When connecting peripheral devices and options to the terminals –, +1, +3, B1, and B2, refer to the instruction manuals for each device. For more information, contact Magnetek or your nearest sales representative.

■ Three-Phase 400 V Class

Table 78 Wire Gauge and Torque Specifications (Three-Phase 400 V Class)

Model LU	Terminal	Recomm. Gauge AWG, kcmil	Wire Range AWG, kcmil	Screw Size	Tightening Torque N·m (lb.in.)
4M0009	R/L1, S/L2, T/L3	12	18 to 10	M4	1.2 to 1.5 (10.6 to 13.3)
	U/T1, V/T2, W/T3	14	18 to 10		
	–, +1, +2	–	14 to 10		
	B1, B2	–	14 to 10		
	⏚	10 <1>	14 to 10		
4M0015	R/L1, S/L2, T/L3	10	12 to 6	M4	2.1 to 2.3 (18.6 to 20.4)
	U/T1, V/T2, W/T3	10	12 to 6		
	–, +1, +2	–	12 to 6		
	B1, B2	–	12 to 10		
	⏚	10 <1>	14 to 10	M5	2.0 to 2.5 (17.7 to 22.1)
4M0018	R/L1, S/L2, T/L3	10	12 to 6	M4	2.1 to 2.3 (18.6 to 20.4)
	U/T1, V/T2, W/T3	10	12 to 6		
	–, +1, +2	–	12 to 6		
	B1, B2	–	12 to 10		
	⏚	10 <1>	12 to 10	M5	2.0 to 2.5 (17.7 to 22.1)
4M0024	R/L1, S/L2, T/L3	8	10 to 6	M5	3.6 to 4.0 (31.8 to 35.4)
	U/T1, V/T2, W/T3	8	10 to 6		
	–, +1, +2	–	10 to 6		
	B1, B2	–	10 to 8	M5	2.7 to 3.0 (23.9 to 26.6)
	⏚	8 <2>	10 to 8	M6	5.4 to 6.0 (47.8 to 53.1)
4M0031	R/L1, S/L2, T/L3	6	10 to 6	M5	3.6 to 4.0 (31.8 to 35.4)
	U/T1, V/T2, W/T3	8	10 to 6		
	–, +1, +2	–	6		
	B1, B2	–	10 to 8	M5	2.7 to 3.0 (23.9 to 26.6)
	⏚	6	10 to 6	M6	5.4 to 6.0 (47.8 to 53.1)

Model LU	Terminal	Recomm. Gauge AWG, kcmil	Wire Range AWG, kcmil	Screw Size	Tightening Torque N·m (lb.in.)
4M0039	R/L1, S/L2, T/L3	6	6 to 4	M6	5.4 to 6.0 (47.8 to 53.1)
	U/T1, V/T2, W/T3	6	6 to 4		
	–, +1, +2	–	6 to 4		
	B1, B2	–	10 to 8	M5	2.7 to 3.0 (23.9 to 26.6)
	⏚	6	8 to 6	M6	5.4 to 6.0 (47.8 to 53.1)
4M0045	R/L1, S/L2, T/L3	4	10 to 1/0	M8	9 to 11 (79.7 to 97.4)
	U/T1, V/T2, W/T3	4	10 to 1/0		
	–, +1	–	6 to 1		
	B1, B2	–	8 to 4		
	⏚	6	8 to 6		
4M0060	R/L1, S/L2, T/L3	3	10 to 3/0	M8	9 to 11 (79.7 to 97.4)
	U/T1, V/T2, W/T3	3	10 to 3/0		
	–, +1	–	4 to 1		
	B1, B2	–	6 to 3		
	⏚	6	6		
4M0075	R/L1, S/L2, T/L3	2	6 to 250	M8	9 to 11 (79.7 to 97.4)
	U/T1, V/T2, W/T3	2	6 to 250		
	–, +1	–	3 to 1/0		
	+3	–	6 to 1/0		
	⏚	4	6 to 4		
4M0091	R/L1, S/L2, T/L3	1/0	6 to 250	M8	9 to 11 (79.7 to 97.4)
	U/T1, V/T2, W/T3	1	6 to 250		
	–, +1	–	3 to 1/0		
	+3	–	4 to 1/0		
	⏚	4	6 to 4		
4M0112	R/L1, S/L2, T/L3	3/0	1/0 to 4/0	M10	18 to 23 (159 to 204)
	U/T1, V/T2, W/T3	2/0	1/0 to 4/0		
	–, +1	–	1/0 to 4/0		
	+3	–	3 to 4/0		
	⏚	4	4		
4M0150	R/L1, S/L2, T/L3	4/0	1/0 to 4/0	M10	18 to 23 (159 to 204)
	U/T1, V/T2, W/T3	4/0	1/0 to 4/0		
	–, +1	–	1 to 4/0		
	+3	–	1/0 to 4/0		
	⏚	4	4 to 2		
4M0180	R/L1, S/L2, T/L3	1 × 2P	2 to 300	M10	18 to 23 (159 to 204)
	U/T1, V/T2, W/T3	1 × 2P	2 to 300		
	–, +1	–	1 to 250		
	+3	–	3 to 3/0		
	⏚	4	4 to 300		
4M0216	R/L1, S/L2, T/L3	2/0 × 2P	1 to 600	M10	18 to 23 (159 to 204)
	U/T1, V/T2, W/T3	2/0 × 2P	1/0 to 600		
	–, +1	–	3/0 to 600		
	+3	–	1 to 325		
	⏚	2	2 to 350		

<1> When using the wire of this gauge in accordance with IEC/EN 61800-5-1, install an ELCB.
<2> When using the wire of this gauge in accordance with IEC/EN 61800-5-1, install an ELCB, or use copper wire of 10 mm^2 (AWG 8).

Note: When connecting peripheral devices and options to the terminals –, +1, +3, B1, and B2, refer to the instruction manuals for each device. For more information, contact Magnetek or your nearest sales representative.

Table 79 Wire Gauge and Torque Specifications (Three-Phase 600 V Class)

Model LU	Terminal	Recomm. Gauge AWG, kcmil	Wire Range AWG, kcmil	Screw Size	Tightening Torque N·m (lb.in.)
5M0003 5M0004	R/L1, S/L2, T/L3	14	14 to 10	M4	1.2 to 1.5 (10.6 to 13.3)
	U/T1, V/T2, W/T3	14	14 to 10		
	–, +1, +2	–	14 to 10		
	B1, B2	–	14 to 10		
	⏚	10	14 to 10		
5M0006	R/L1, S/L2, T/L3	14	14 to 10	M4	1.2 to 1.5 (10.6 to 13.3)
	U/T1, V/T2, W/T3	14	14 to 10		
	–, +1, +2	–	14 to 10		
	B1, B2	–	14 to 10		
	⏚	10	12 to 10		
5M0010	R/L1, S/L2, T/L3	10	14 to 6	M4	2.1 to 2.3 (18.6 to 20.4)
	U/T1, V/T2, W/T3	14	14 to 6		
	–, +1, +2	–	14 to 6		
	B1, B2	–	14 to 10		
	⏚	8	12 to 8	M5	2.0 to 2.5 (17.7 to 22.1)
5M0013	R/L1, S/L2, T/L3	10	10 to 6	M5	3.6 to 4.0 (31.8 to 35.4)
	U/T1, V/T2, W/T3	10	10 to 6		
	–, +1, +2	–	10 to 6		
	B1, B2	–	10 to 8		2.7 to 3.0 (23.9 to 26.6)
	⏚	8	12 to 8	M6	5.4 to 6.0 (47.8 to 53.1)
5M0017	R/L1, S/L2, T/L3	8	10 to 6	M5	3.6 to 4.0 (31.8 to 35.4)
	U/T1, V/T2, W/T3	10	10 to 6		
	–, +1, +2	–	10 to 6		
	B1, B2	–	10 to 8		2.7 to 3.0 (23.9 to 26.6)
	⏚	8	10 to 8	M6	5.4 to 6.0 (47.8 to 53.1)
5M0022 5M0027	R/L1, S/L2, T/L3	6	6 to 4	M6	5.4 to 6.0 (47.8 to 53.1)
	U/T1, V/T2, W/T3	6	6 to 4		
	–, +1, +2	–	6 to 4		
	B1, B2	–	10 to 8	M5	2.7 to 3.0 (23.9 to 26.6)
	⏚	6	10 to 6	M6	5.4 to 6.0 (47.8 to 53.1)
5M0032	R/L1, S/L2, T/L3	6	10 to 3	M8	9 to 11 (79.7 to 97.4)
	U/T1, V/T2, W/T3	6	10 to 3		
	–, +1	–	6 to 1		
	B1, B2	–	12 to 3		
	⏚	6	6		
5M0041	R/L1, S/L2, T/L3	4	10 to 3	M8	9 to 11 (79.7 to 97.4)
	U/T1, V/T2, W/T3	6	10 to 3		
	–, +1	–	6 to 1		
	B1, B2	–	8 to 3		
	⏚	6	6		

Model LU	Terminal	Recomm. Gauge AWG, kcmil	Wire Range AWG, kcmil	Screw Size	Tightening Torque N·m (lb.in.)
5M0052	R/L1, S/L2, T/L3	4	10 to 4/0	M10	18 to 23 (159 to 204)
	U/T1, V/T2, W/T3	4	10 to 4/0		
	–, +1	–	4 to 4/0		
	+3	–	6 to 4/0		
	⏚	4	4		
5M0062	R/L1, S/L2, T/L3	3	10 to 4/0	M10	18 to 23 (159 to 204)
	U/T1, V/T2, W/T3	3	10 to 4/0		
	–, +1	–	3 to 4/0		
	+3	–	6 to 4/0		
	⏚	4	4		

◆ Drive Watt Loss Data

Table 80 Watt Loss 200 V Class Three-Phase Models

Model Number LU	Carrier Frequency 8 kHz			
	Rated Amps (A)	Heatsink Loss (W)	Interior Unit Loss (W)	Total Loss (W)
2M0018	17.5 <1>	100.7	67.4	168.1
2M0025	25.0 <1>	194.4	92.3	286.6
2M0033	33.0 <1>	213.8	104.8	318.7
2M0047	47.0 <1>	280.2	129.9	410.2
2M0060	60.0 <1>	394.9	162.8	557.7
2M0075	75.0 <1>	459.8	220.9	680.7
2M0085	85.0 <1>	510.3	210.9	721.2
2M0115	115.0 <1>	662.4	250.0	912.4
2M0145	145.0 <2>	815.9	306.3	1122.2
2M0180	180.0 <2>	976.0	378.1	1354.1
2M0215	215.0 <2>	1514.0	466.1	1980.2
2M0283	283.0 <2>	1936.2	587.8	2523.9
2M0346	346.0 <2>	2563.9	782.9	3346.8
2M0415	415.0 <2>	2672.1	954.1	3626.2

<1> These values assume the carrier frequency is set to 8 kHz or less.
<2> These values assume the carrier frequency is set to 5 kHz or less.

Table 81 Watt Loss 400 V Class Three-Phase Models

Model Number LU	Carrier Frequency 8 kHz			
	Rated Amps (A)	Heatsink Loss (W)	Interior Unit Loss (W)	Total Loss (W)
4M0009	9.2 <1>	68.5	61.0	129.5
4M0015	14.8 <1>	135.4	85.7	221.1
4M0018	18.0 <1>	149.9	97.0	246.9
4M0024	24.0 <1>	208.0	115.1	323.2
4M0031	31.0 <1>	262.6	140.8	403.4
4M0039	39.0 <1>	329.8	179.4	509.2
4M0045	45.0 <1>	348.5	169.6	518.1
4M0060	60.0 <1>	484.1	217.2	701.3
4M0075	75.0 <1>	563.4	254.0	817.4
4M0091	91.0 <1>	722.6	299.0	1021.7
4M0112	112.0 <2>	908.2	416.4	1324.6
4M0150	150.0 <2>	1340.3	580.1	1920.3
4M0180	180.0 <2>	1771.4	541.0	2312.5
4M0216	216.0 <2>	2360.2	715.1	3075.3

<1> These values assume the carrier frequency is set to 8 kHz or less.
<2> These values assume the carrier frequency is set to 5 kHz or less.

◆ PG-X3 Option Card

■ About the PG-X3 Option Card

The PG-X3 Option allows the user to connect an incremental line driver encoder (PG) for motor speed feedback to the drive and take advantage of the V/f with PG, Closed Loop Vector, and Closed Loop Vector for PM motors control modes. The option helps increase the control accuracy and performance.

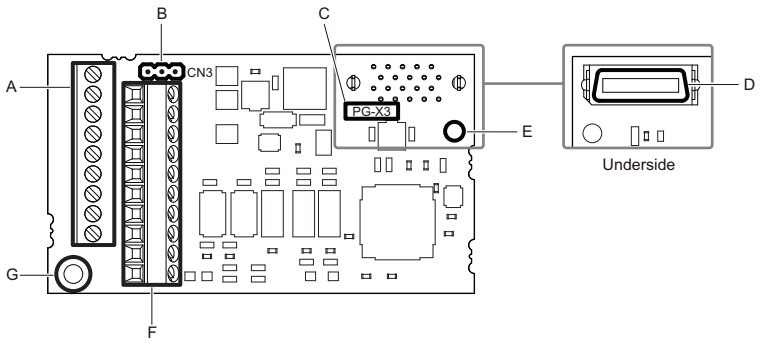
This PG signal allows the drive to compensate for subtle variations in the load, while providing the drive with the necessary data to control the output frequency and maintain an accurate constant speed.

The PG-X3 Option reads a maximum input frequency from the PG of 300 kHz. Be sure to select a PG with an output of maximum 300 kHz when operating at maximum speed.

Note: This option cannot be used with an open collector encoder. Use option PG-B3 with open collector encoders.

■ Option Components

PG-X3 Option

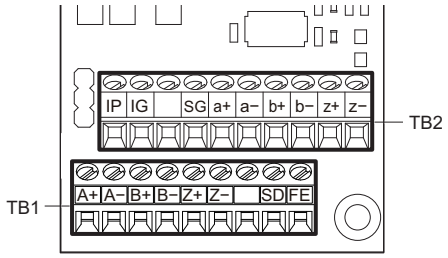


A – Terminal block TB1
B – Jumper for PG power supply voltage (CN3) <1>
C – Model number
D – Connector (CN5)
E – Installation hole
F – Terminal block TB2
G – Ground terminal (installation hole) <2>

<1> Refer to *Table 82 on page 189* for detail.
<2> Terminal for ground wire packaged with the option card

Figure 35 PG-X3 Option Components

Terminal Blocks TB1 and TB2



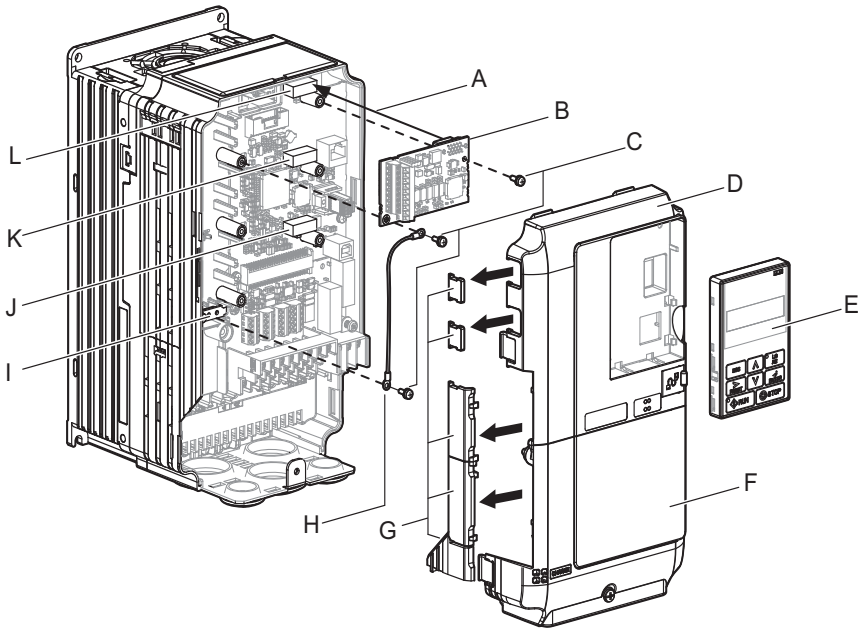
Refer to *Table 85 on page 191* for details on TB1 and TB2 terminal functions and signal levels.

■ Installation Procedure

Prior to Installing the Option

Prior to installing the option, wire the drive, make the necessary connections to the drive terminals, and verify that the drive functions normally. Refer to the Quick Start Guide packaged with the drive for information on wiring and connecting the drive.

Figure 36 shows an exploded view of the drive with the option and related components for reference.



A – Insertion point for CN5
B – Option card
C – Included screws
D – Front cover
E – Digital operator
F – Terminal cover
G – Removable tabs for wire routing
H – Ground wire
I – Drive grounding terminal (FE)
J – Connector CN5-A
K – Connector CN5-B
L – Connector CN5-C

Figure 36 Drive Components with Option

Installing the Option

Remove the front covers of the drive before installing the option. Refer to the drive manual for directions on removing the front covers. Cover removal varies depending on drive size.

1. Shut off power to the drive, wait the appropriate amount of time specified on the drive for voltage to dissipate, then remove the digital operator (E) and front covers (D, F).

DANGER! *Electrical Shock Hazard. Do not connect or disconnect wiring while the power is on. Before wiring terminals, disconnect all power to the equipment. The internal capacitor remains charged even after the power supply is turned off. After shutting off the power, wait at least the amount of time specified on the drive before touching any components.*

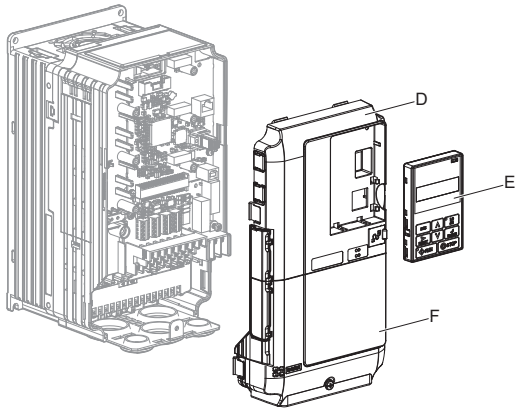


Figure 37 Remove the Front Covers and Digital Operator

2. Insert the option (B) into the CN5-B (K) or CN5-C (L) connectors located on the drive and fasten it into place using one of the included screws (C).
   Use the CN5-C connector (L) when connecting only one option to the drive; use both CN5-B and CN5-C when connecting two options.
   Connect one of the ground wires (H) to the ground terminal (I) using one of the remaining screws (C).
   Connect the other end of the ground wire (H) to the remaining ground terminal and installation hole on the option using the last remaining provided screw (C).

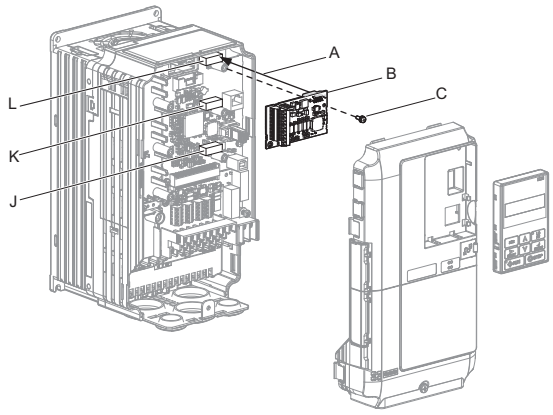
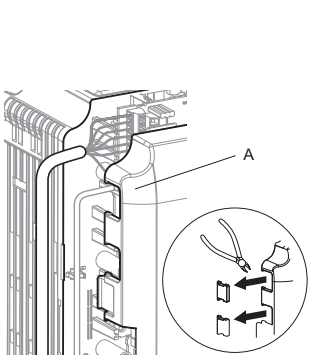


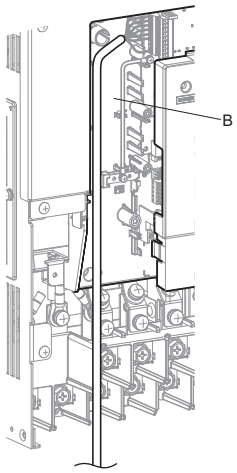
Figure 38 Insert the Option and Connect the Ground Wire

Note: 1. The option package includes two ground wires. Use the longer wire when plugging the option into connector CN5-C on the drive side. Use the shorter wire when plugging the option into connector CN5-B.
2. There are two screw holes on the drive for use as ground terminals. When connecting three options, two ground wires will need to share the same drive ground terminal.

3. Route the option wiring.
   Depending on the drive model, some drives may require routing the wiring through the side of the front cover to the outside. In these cases, cut out the perforated openings on the left side of the drive front cover as shown in ***Figure 39*** (A) and leave no sharp edges to damage wiring.
   Route the wiring inside the enclosure as shown in ***Figure 39*** (B) for drives that do not require routing through the front cover.



A – Route wires through the openings provided on the left side of the front cover. *<1>*



B – Use the open space provided inside the drive to route option wiring.

<1> The drive will not meet NEMA Type 1 requirements if wiring is exposed outside the enclosure.

Figure 39 Wire Routing Examples

4. Prepare wire ends as shown in ***Figure 40***. ***Refer to Table 83 on page 190*** to confirm that the proper tightening torque is applied to each terminal. Take particular precaution to ensure that each wire is properly connected and wire insulation is not accidentally pinched into electrical terminals.

WARNING! *Fire Hazard. Tighten terminal screws to the specified tightening torque. Loose electrical connections could result in death or serious injury by fire due to overheating. Tightening screws beyond the specified tightening torque may cause erroneous operation, damage the terminal block, or cause a fire.*

NOTICE: *Heat shrink tubing or electrical tape may be required to ensure that cable shielding does not contact other wiring. Insufficient insulation may cause a short circuit that can damage the option or drive.*

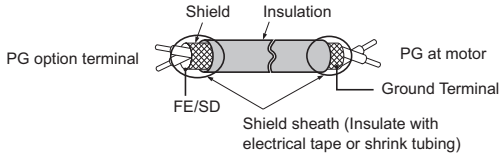


Figure 40 Preparing Ends of Shielded Cable

5. Wire the motor PG encoder to the terminal block on the option. Refer to ***Figure 41*** for wiring instructions. ***Refer to Table 85 on page 191*** for a detailed description of the option board terminal functions.

Parameter Settings and Connections for Different Encoder Types

- Connecting a Single-Channel Encoder

  When using a single-channel encoder in V/f with PG control mode, connect the pulse output from the PG to the option and set drive parameter F1-21 to 0.

- Connecting a Two-Channel Encoder

  When using a two-channel encoder, connect the A and B pulse outputs on the PG to the option and set F1-21 to 1. When using a two-channel encoder in Closed Loop Vector control mode, connect pulse outputs A and B from the encoder to the corresponding terminals on the option.

- Connecting a Two-Channel Encoder with Z Marker Pulse

  When using a two-channel encoder with Z marker pulse, connect the A channel, B channel, and Z pulse outputs to the corresponding terminals on the option.

Control Method	V/f with PG		Closed Loop Vector	
No. of Encoders	1 CN5-C	2 CN5-B	1 CN5-C	2 CN5-B
Single Channel (A)	F1-21 = 0	F1-37 = 0	N/A	N/A
Two Channel (AB Quadrature)	F1-21 = 1	F1-37 = 1	No setting required	No setting required
Two Channel with Marker (ABZ)	F1-21 = 1	F1-37 = 1	No setting required	No setting required

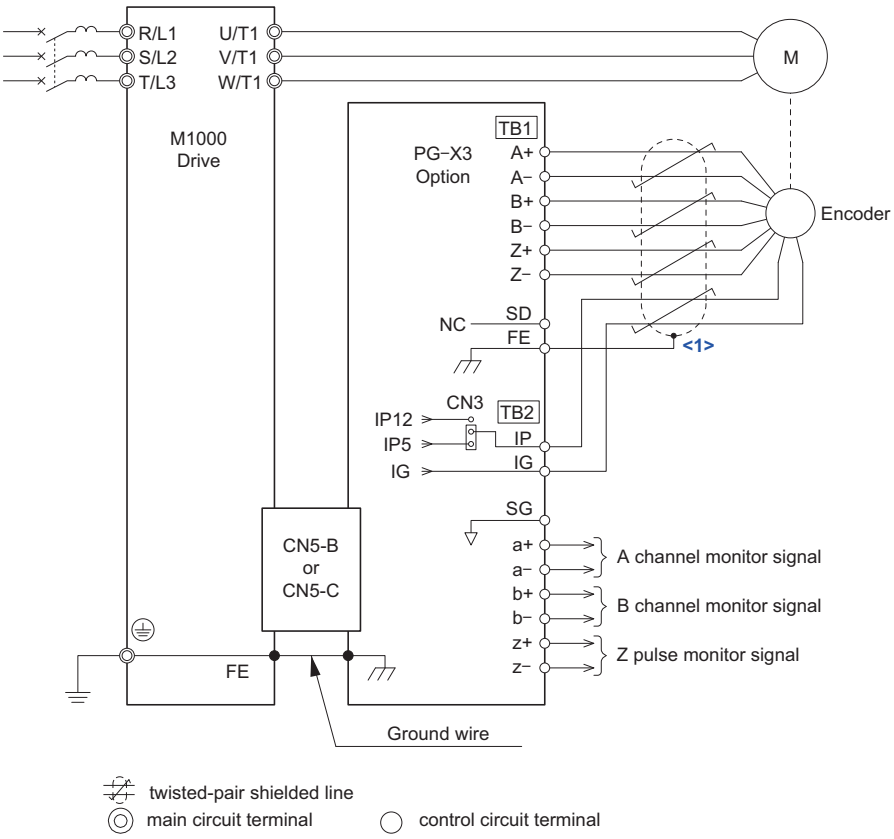
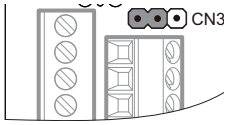
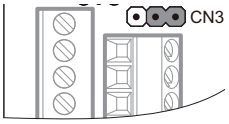


Figure 41 PG-X3 Option and PG Connection Diagram

<1> Ground the shield on the PG side and the drive side. If noise problems arise in the PG signal, remove the shield ground from one end of the signal line or remove the shield ground connection on both ends.

6. Set the voltage for the PG power supply using jumper CN3 located on the option. Position the jumper as shown in ***Table 82*** to select the voltage level.
The positioning of jumper CN3 selects the PG power supply voltage (5.5 V or 12 V). Select the voltage level for the PG connected to the option and motor. If the wrong voltage is selected, the PG may not operate properly or may become damaged as a result.

Table 82 Setting PG Power Supply Voltage (IP) with Jumper CN3

Voltage Level	5.5 V ± 5% (default)	12.0 V ± 5%
Jumper CN3		

7. Replace and secure the front covers of the drive (D, F) and replace the digital operator (E).

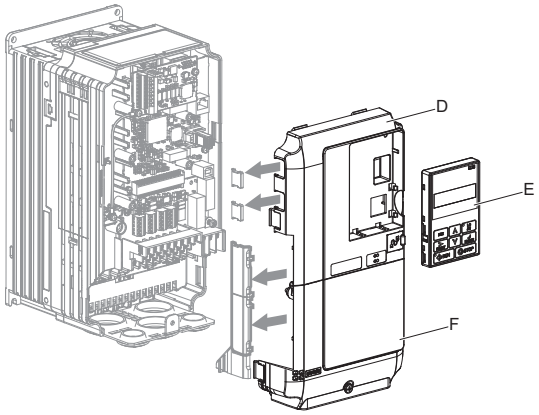


Figure 42 Replace the Front Covers and Digital Operator

Note: Take proper precautions when wiring the option so that the front covers will easily fit back onto the drive. Make sure cables are not pinched between the front covers and the drive when replacing the covers.

8. Set drive parameters for proper motor rotation.
With a two-channel or three-channel encoder, the leading pulse determines the motor rotation direction. A PG signal with leading A pulse is considered to be rotating forward (counter-clockwise when viewing rotation from motor load side).

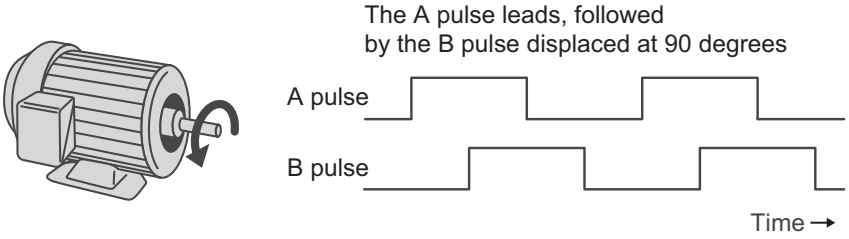


Figure 43 Displacement of A and B Pulses

9. After connecting the PG outputs to the option, apply power to the drive and manually rotate the motor and check the rotation direction by viewing monitor U1-05 on the digital operator.
Reverse motor rotation is indicated by a negative value for U1-05; forward motor rotation is indicated by a positive value.
If monitor U1-05 indicates that the forward direction is opposite of what is intended, reverse the two A channel wires with the two B channel wires on option terminal TB1 as shown in ***Figure 44***.

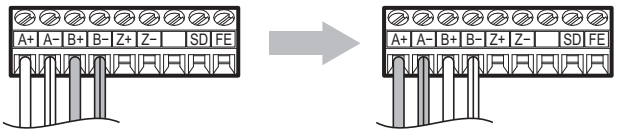


Figure 44 A Channel and B Channel Wire Switching

10. If switching the wires is inconvenient, set drive parameter F1-05/F1-32 to 1 to switch the direction of how the option reads pulses from the PG output.
Please note that when the drive is initialized using A1-03 =1110, 2220, 3330, the value for F1-05/F1-32 will reset to factory default and the parameter will need to be adjusted again to switch the direction.

Wire Gauges, Tightening Torques, and Crimp Terminals

Wire Gauges and Tightening Torque

Wire gauge and torque specifications are listed in ***Table 83***. Magnetek recommends using crimp terminals with the specifications listed in ***Table 84*** to facilitate wiring and ensure proper connection.

Table 83 Wire Gauges and Tightening Torques

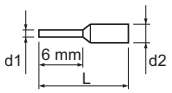
Terminal Signal	Screw Size	Tightening Torque N·m (in·lb)	Bare Cable		Crimp Terminals		Wire Type
			Applicable Gauges mm² (AWG)	Recomm. Gauge mm² (AWG)	Applicable Gauges mm² (AWG)	Recomm. Gauge mm² (AWG)	
A+, A–, B+, B–, Z+, Z–, SD, FE, IP, IG	M2	0.22 to 0.25 (1.95 to 2.21)	Stranded wire: 0.25 to 1.0 (24 to 17) Solid wire: 0.25 to 1.5 (24 to 16)	0.75 (18)	0.25 to 0.5 (24 to 20)	0.5 (20)	Shielded twisted pair, etc.
a+, a–, b+, b–, z+, z–, SG							Shielded cable, etc.

Crimp Terminals

Magnetek recommends using CRIMPFOX 6 by Phoenix Contact or equivalent to crimp the terminal ends.

Note: Properly trim wire ends so loose wire ends do not extend from the crimp terminals.

Table 84 Crimp Terminal Sizes

	Wire Gauge mm² (AWG)	Phoenix Contact Model	L mm (in)	d1 mm (in)	d2 mm (in)
	0.25 (24)	AI 0.25 - 6YE	10.5 (13/32)	0.8 (1/32)	2 (5/64)
	0.34 (22)	AI 0.34 - 6TQ	10.5 (13/32)	0.8 (1/32)	2 (5/64)
	0.5 (20)	AI 0.5 - 6WH	14 (9/16)	1.1 (3/64)	2.5 (3/32)

Terminal Functions

Table 85 Option Terminal Functions

Terminal Block	Terminal	Function	Description
TB1	A+	A pulse signal input	Inputs for the A channel, B channel, and Z pulses from the PG Signal level matches RS-422
	A–	A inverse pulse signal input	
	B+	B pulse signal input	
	B–	B inverse pulse signal input	
	Z+	Z pulse signal input	
	Z–	Z inverse pulse signal input	
	SD	NC pin (open)	Open connection port for use when cable shields should not be grounded
	FE	Ground	Used as the shield ground termination point.
TB2	IP	PG power supply	Output voltage: 12.0 V ± 5% or 5.5 V ± 5% Max. output current: 200 mA <1>
	IG	PG power supply common	
	SG	Monitor signal common	Output signal for monitoring A channel, B channel, and Z pulses from the PG Signal level matches RS-422
	a+	A pulse monitor signal	
	a–	A pulse inverse monitor signal	
	b+	B pulse monitor signal	
	b–	B pulse inverse monitor signal	
	z+	Z pulse monitor signal	
	z–	Z pulse inverse monitor signal	

<1> A separate power supply is needed if the PG requires more than 200 mA to operate. Select a UL-listed class 2 power supply.

■ Troubleshooting

Preventing Noise Interference

Take the following steps to prevent erroneous operation caused by noise interference:

- Use shielded wire for the PG signal lines.
- Limit the length of all motor output power cables to less than 100 m.
- Separate the control wiring to the option, main circuit input power wiring, and motor output power cables.
- Ground the shield on the PG side and the drive side. If noise problems arise in the PG signal, verify that the shield is properly grounded and ground one end of the signal line or remove the ground connection on both ends.

Interface Circuit

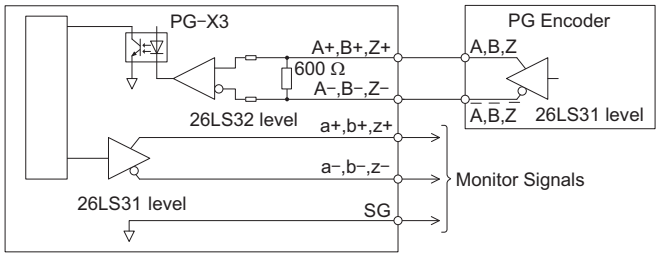


Figure 45 Interface Circuit

◆ PG-F3 Option Card

■ About the PG-F3 Option Card

The PG-F3 Option allows the user to connect certain rotary encoders to M1000 drives. Suitable rotary encoders include either EnDat 2.1/01, EnDat 2.2/01, or EnDat 2.2/22 by HEIDENHAIN, or HIPERFACE by SICK STEGMANN.
The PG-F3 Option facilitates motor speed feedback to the drive and takes advantage of Closed Loop Vector control for PM Motors. The option increases control accuracy and performance.

An encoder signal allows the drive to compensate for subtle variations in the load, while providing the drive with the necessary data to control the output frequency and maintain an accurate constant speed.

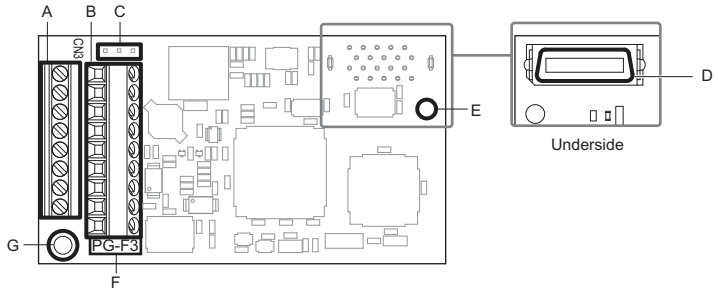
The PG-F3 Option reads a maximum input frequency from the encoder of 20 kHz when using EnDat 2.1/01, EnDat 2.2/01, or HIPERFACE. Be sure to select an encoder with an output of maximum of 20 kHz when operating at maximum speed.

The maximum input frequency is not a concern when using EnDat 2.2/22 because compatible encoder models utilize serial communication.

Set the drive motor control mode to operate in the Closed Loop Vector Control for PM Motors when using the PG-F3 Option.

■ Option Components

PG-F3 Option

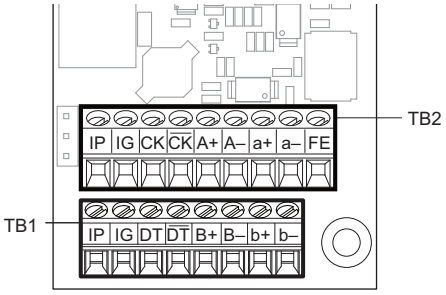


A – Terminal Block TB1
B – Terminal Block TB2
C – Jumper for PG encoder power supply voltage (CN3) <1>
D – Connector (CN5)
E – Installation hole
F – Model number
G – Ground terminal and installation hole <2>

<1> Refer to *Table 89 on page 199* for details.
<2> The ground wires provided in the option shipping package must be connected during installation.

Figure 46 PG-F3 Option Components

Terminal Blocks TB1 and TB2



Refer to *Table 92 on page 202* and *Table 93 on page 203* for details on TB1 and TB2 terminal functions and signal levels.

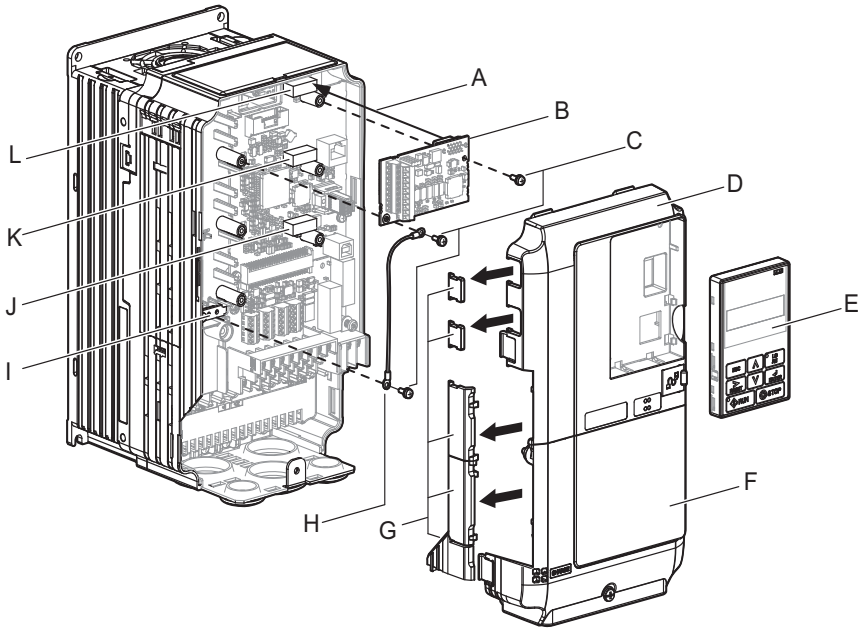
■ Installation Procedure

Prior to Installing the Option

Note: Refer to the instruction manual of a specific drive for details.

Prior to installing the option, wire the drive, make the necessary connections to the drive terminals, and verify that the drive functions normally. Refer to the instruction manual packaged with the drive for information on wiring and connecting the drive.

Figure 47 shows an exploded view of the drive with the option and related components for reference.



A – Insertion point for CN5
B – Option card
C – Included screws
D – Front cover
E – Digital operator
F – Terminal cover
G – Removable tabs for wire routing
H – Ground wire
I – Drive grounding terminal (FE)
J – Connector CN5-A
K – Connector CN5-B
L – Connector CN5-C

Figure 47 Drive Components with Option (L□2M□)

Installing the Option

Refer to the instructions below to install the option.

Note: Refer to the instruction manual of a specific drive for information on removing and installing the operators and the covers.

DANGER! *Electrical Shock Hazard. Disconnect all power to the drive and wait at least the amount of time specified on the drive front cover safety label. After all indicators are off, measure the DC bus voltage to confirm safe level, and check for unsafe voltages before servicing to prevent electric shock. The internal capacitor remains charged even after the power supply is turned off.*

1. Shut off power to the drive, wait the appropriate amount of time for voltage to dissipate, then remove the digital operator (E), front cover (D), and terminal cover (F). Refer to the instruction manual packaged with the drive.

NOTICE: *Damage to Equipment. Observe proper electrostatic discharge procedures (ESD) when handling the option, drive, and circuit boards. Failure to comply may result in ESD damage to circuitry.*

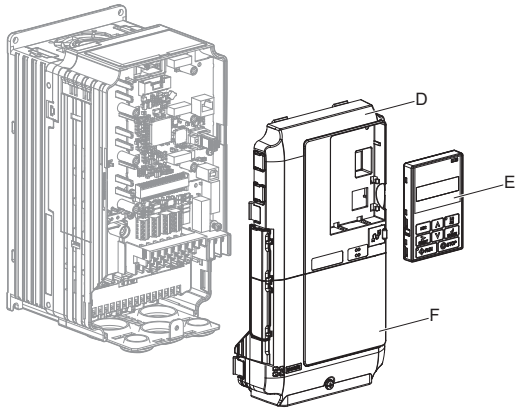


Figure 48 Remove the Front Cover, Terminal Cover, and Digital Operator

2. Insert the option card (B) into the CN5-C (L) connector located on the drive and fasten it into place using one of the included screws (C).

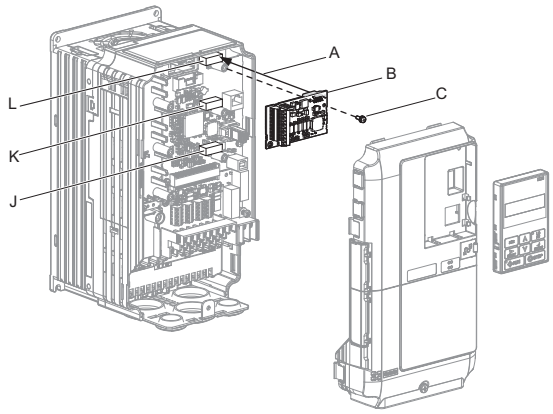


Figure 49 Insert the Option Card

3. Connect the ground wire (H) to the ground terminal (I) using one of the remaining screws (C). Connect the other end of the ground wire (H) to the remaining ground terminal and installation hole on the option (B) using the last remaining provided screw (C).

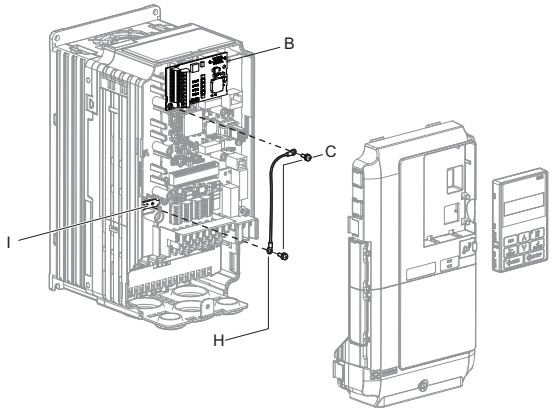


Figure 50 Connect the Ground Wire

Note: There are two screw holes on the drive for use as ground terminals (I). When connecting three options, two ground wires will need to share the same drive ground terminal.

4. Prepare and connect the wire ends as shown in ***Figure 51*** and ***Figure 52***. ***Refer to Table 90 on page 201*** to confirm that the proper tightening torque is applied to each terminal. Take particular precaution to ensure that each wire is properly connected and wire insulation is not accidentally pinched into electrical terminals.

WARNING! *Fire Hazard. Tighten all terminal screws according to the specified tightening torque. Loose electrical connections could result in death or serious injury by fire due to overheating electrical connections. Tightening screws beyond the specified tightening torque may result in erroneous operation, damage the terminal block, or cause a fire.*

NOTICE: *Heat shrink tubing or electrical tape may be required to ensure that cable shielding does not contact other wiring. Insufficient insulation may cause a short circuit and damage the option or drive.*

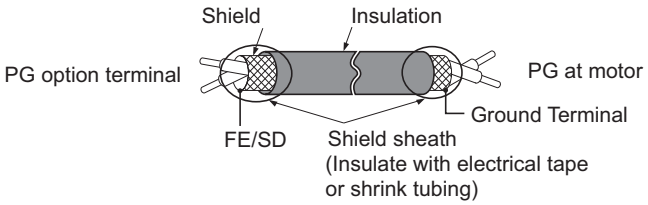


Figure 51 Preparing Ends of Shielded Cable

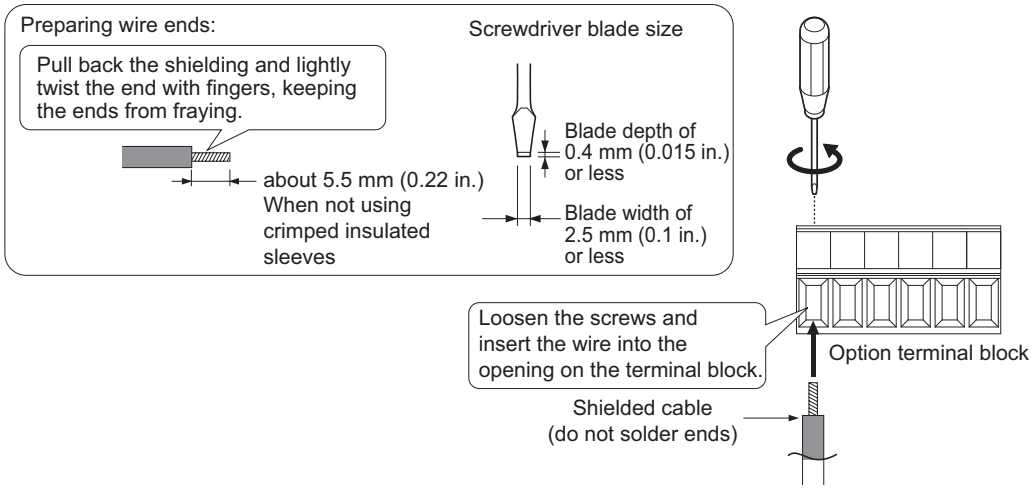


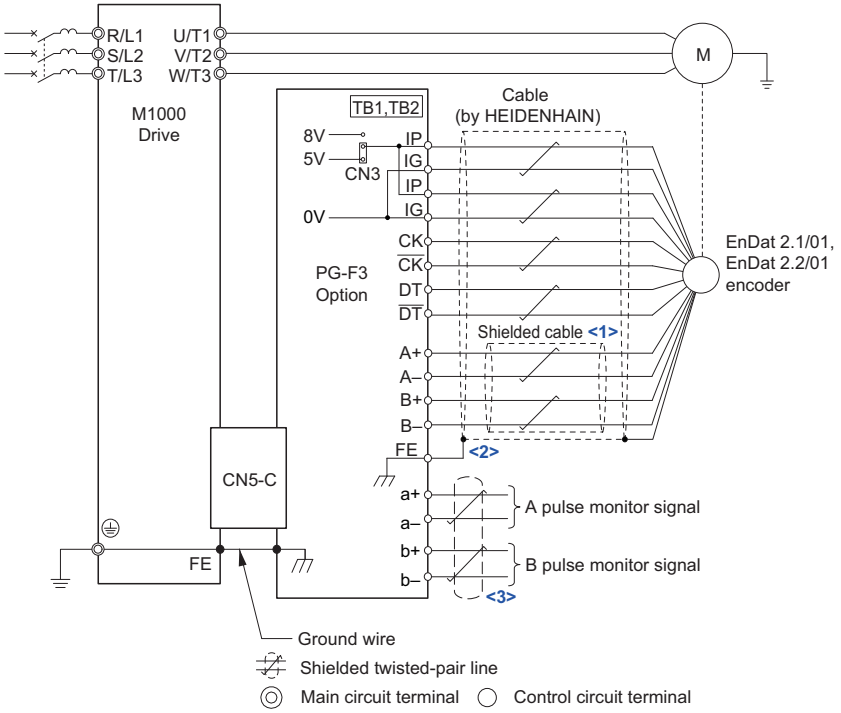
Figure 52 Preparing and Connecting Cable Wiring

5. Wire the motor PG encoder to the terminal block on the option.

- **Wiring EnDat 2.1/01 or EnDat 2.2/01 Encoders**

  Wire the motor PG encoder to the terminal block on the option using a HEIDENHAIN 17-conductor cable. Refer to ***Figure 51*** and ***Figure 52*** for wiring instructions. Refer to ***Figure 53*** for the connection diagram.

  The signal "Sensor Up"must be connected to terminal IP on the PG-F3 option for cables longer than 10 m. Additionally, the "Sensor 0 V"must be connected to terminal IG. Refer to ***Table 92*** and ***Table 93*** for a detailed description of the option terminal functions.



<1> Properly connect the cable shield to terminal IG on the option Terminal Block TB2 or remove the ground connection on both ends.
<2> Ground the shield on the PG encoder side and the drive side. If noise problems arise in the PG encoder signal, remove the shield ground from one end of the signal line or remove the shield ground connection on both ends.
<3> Magnetek recommends using shielded lines or shielded twisted-pair lines.

Figure 53 PG-F3 Option and PG Encoder Connection Diagram (EnDat 2.1/01, EnDat 2.2/01)

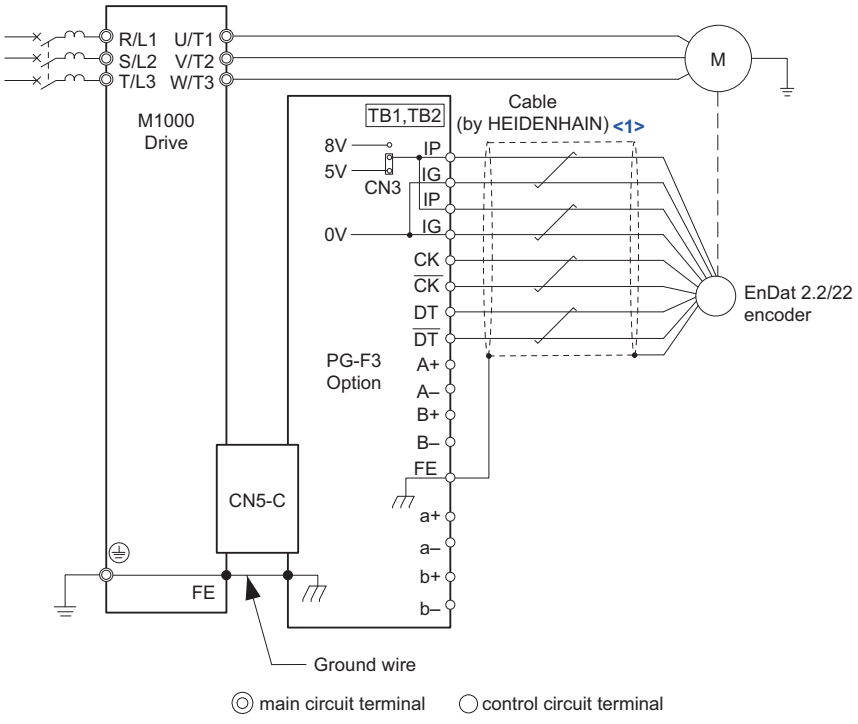
Table 86 PG Encoder Cable Specification (EnDat 2.1/01, EnDat 2.2/01)

Encoder	M1000 PG-F3 Terminals	PG Encoder Cable Color				
		Black Heidenhain	Ziehl	Green Encoder Cable	Torin Encoder Cable	On Site Color
A/	A-	Yellow/Black	Red/Blue	Yellow	Brown	
A	A+	Green/Black	Gray/Pink	Green	Green	
B/	B-	Red/Black	Red	Red	Yellow	
B	B+	Blue/Black	Blue	Blue	Blue	
Data/	/DT	Pink	Brown	Pink	Translucent	
Data	DT	Gray	White	Gray	Gray	
Clock/	/CK	Yellow	Black	Violet	White	
Clock	CK	Violet	Violet	Black	Violet	
0V com	IG	White/Green	Pink	White	Orange/White & Black	
+5V	IP	Brown/Green	Gray	Brown	Orange & Red	
0V Sense (if present)	IG	White	Yellow	--	--	
+5V Sense (if present)	IP	Blue	Green	--	--	
Cable Shield	FE	Encoder Cable Shield	Encoder Cable Shield	Encoder Cable Shield	Big Yellow	

- **Wiring an EnDat 2.2/22 Encoder**

Wire the motor PG encoder to the terminal block on the option using a HEIDENHAIN 8-conductor cable. Refer to ***Figure 51*** and ***Figure 52*** for wiring instructions. Refer to ***Figure 54*** for the connection diagram.

The signal "Sensor Up" must be connected to terminal IP on the PG-F3 option for cables longer than 10 m. Additionally, the "Sensor 0 V" must be connected to terminal IG. ***Refer to Table 92 on page 202*** for a detailed description of the option terminal functions.



<1> Ground the shield on the PG encoder side and the drive side. If noise problems arise in the PG encoder signal, remove the shield ground from one end of the signal line or remove the shield ground connection on both ends.

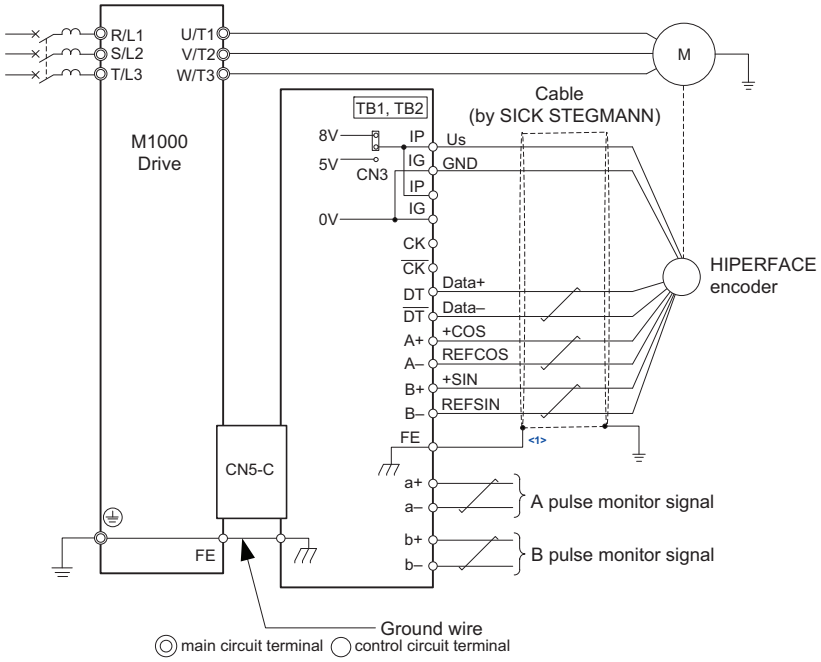
Figure 54 PG-F3 Option and PG Encoder Connection Diagram (EnDat 2.2/22)

Table 87 PG Encoder Cable Specification (EnDat 2.2/22)

Option Terminal	PG Encoder Cable	
	Color	PG Encoder Signal
IP	Brown/Green	Up
	Blue	Sensor Up
IG	White/Green	0V
	White	Sensor 0V
CK	Purple	CLOCK
CK	Yellow	CLOCK
DT	Gray	DATA
DT	Pink	DATA
A+	Green/Black	A+
A–	Yellow/Black	A-
B+	Blue/Black	B+
B–	Red/Black	B-

- **Wiring an HIPERFACE Encoder**

  Wire the motor PG encoder to the terminal block on the option using a SICK STEGMANN 8-conductor cable. Refer to ***Figure 51*** and ***Figure 52*** for wiring instructions. Refer to ***Figure 55*** for the connection diagram. ***Refer to Table 92 on page 202*** for a detailed description of the option terminal functions.



<1> Ground the shield on the PG encoder side and the drive side. If noise problems arise in the PG encoder signal, remove the shield ground from one end of the signal line or remove the shield ground connection on both ends.

Figure 55 PG-F3 Option and PG Encoder Connection Diagram (HIPERFACE)

Table 88 PG Encoder Cable Specification (HIPERFACE)

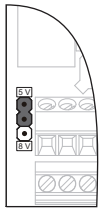
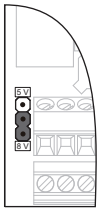
Option Terminal	PG Encoder Cable	
	Color	PG Encoder Signal
IP	Red	Us
IG	Blue	GND
CK	–	–
CK	–	–
DT	Gray/Yellow	DATA+

Option Terminal	PG Encoder Cable	
	Color	PG Encoder Signal
DT	Green/Purple	DATA-
A+	Pink	+COS
A-	Black	REFCOS
B+	White	+SIN
B	Brown	REFSIN

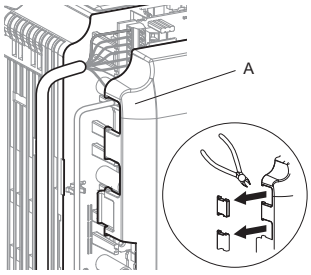
6. Set the voltage for the PG encoder power supply using jumper CN3 located on the option. Position the jumper as shown in ***Table 89*** to select the voltage level.

NOTICE: *The positioning of jumper CN3 selects the PG encoder power supply voltage (5 V or 8 V). Select the voltage level for the PG encoder connected to the option and motor. If the wrong voltage is selected, the PG encoder may not operate properly or may become damaged as a result.*

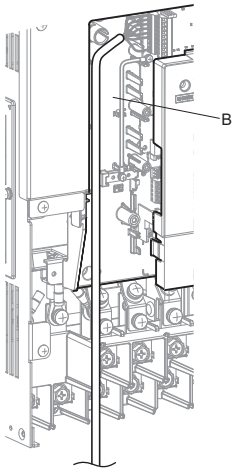
Table 89 Setting the PG Encoder Power Supply Voltage (IP) with Jumper CN3

Voltage Level	5 V ± 5% (default)	8 V ± 10%
Jumper CN3 Position		

7. Route the option wiring.
Depending on the drive model, some drives may require routing the wiring through the side of the front cover to the outside. In these cases, cut out the perforated openings on the left side of the drive front cover as shown in ***Figure 56***-A and leave no sharp edges to damage wiring.
Route the wiring inside the enclosure as shown in ***Figure 56***-B for drives that do not require routing through the front cover.
Refer to the *Peripheral Devices & Options* section of the drive instruction manual for more information.



A – Route wires through the openings provided on the left side of the front cover. ***<1>***



B – Use the open space provided inside the drive to route option wiring.

<1> The drive will not meet NEMA Type 1 requirements if wiring is exposed outside the enclosure.

Figure 56 Wire Routing Examples

8. Replace and secure the front covers of the drive (D, F) and replace the digital operator (E).

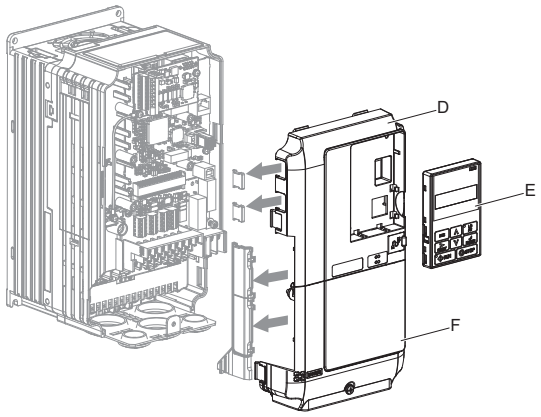


Figure 57 Replace the Front Covers and Digital Operator

Note: Take proper precautions when wiring the option so that the front covers will easily fit back onto the drive. Make sure cables are not pinched between the front covers and the drive when replacing the covers.

9. Set drive parameters in for proper motor rotation.

- **Confirming Motor Rotation with EnDat 2.1/01, EnDat 2.2/01, or HIPERFACE**

  The leading pulse determines the motor rotation direction. A PG encoder signal with leading A phase is considered to be rotating forward (counter-clockwise when viewing rotation from motor load side).

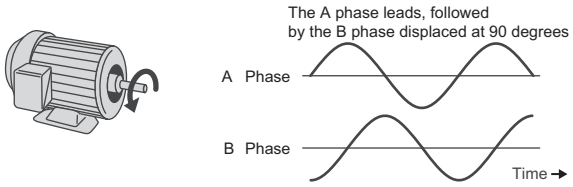


Figure 58 Displacement of A and B Phases

10. After connecting the PG encoder outputs to the option, apply power to the drive and manually rotate the motor and check the rotation direction by viewing monitor U1-05 on the digital operator.

WARNING! *Ensure the drive RUN circuit is locked out and a RUN command is not possible before attempting to manually rotate the motor shaft with the drive powered on. Failure to comply may cause injury to personnel due to inadvertent equipment movement.*

11. Reverse motor rotation is indicated by a negative value for U1-05; forward motor rotation is indicated by a positive value.

If monitor U1-05 indicates that the forward direction is opposite of what is intended, set drive parameter F1-05 to 1 to switch the direction of how the option reads pulses from the PG encoder output.

Note: If the drive is initialized using A1-03 =1110, 2220, or 3330, the value for F1-05 will reset to the factory default and the parameter will need to be readjusted to switch the direction.

- **Confirming Motor Rotation with EnDat 2.2/22**

EnDat 2.2/22 uses serial data transmission and lacks A and B phases, so it is necessary to refer to monitor U1-05 to determine the direction of rotation.

After connecting the PG encoder outputs to the option, apply power to the drive and manually rotate the motor and check the rotation direction by viewing monitor U1-05 on the digital operator.

WARNING! *Ensure the drive RUN circuit is locked out and a RUN command is not possible before attempting to manually rotate the motor shaft with the drive powered on. Failure to comply may cause injury to personnel due to inadvertent equipment movement.*

Reverse motor rotation is indicated by a negative value for U1-05; forward motor rotation is indicated by a positive value.

If the motor is rotating forward, but U1-05 reads that it is rotating in reverse, switch the rotation direction for the PG1 encoder by setting parameter F1-05 to 1.

Note: If the drive is initialized using A1-03 = 1110, 2220, or 3330, the value for F1-05 will reset to the factory default and the parameter will need to be readjusted to switch the direction.

Wire Gauges, Tightening Torque, and Crimp Terminals

Wire gauge and torque specifications are listed in *Table 90*.

Table 90 Wire Gauges and Tightening Torques

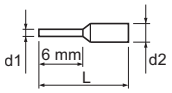
Terminal Signal	Screw Size	Tightening Torque N·m (in·lb)	Bare Cable		Crimp Terminals		Wire Type
			Recomm. Gauge mm²	Applicable Gauges mm²	Applicable Gauges mm²	Recomm. Gauge mm²	
a+, a–, b+, b–, FE	M2	0.22 to 0.25 (1.95 to 2.21)	0.75 (18 AWG)	Stranded wire: 0.25 to 1.0 (24 to 17 AWG) Solid wire: 0.25 to 1.5 (24 to16 AWG)	0.5 (20 AWG)	0.25 to 0.5 (24 to 20 AWG)	Shielded twisted pair, etc.
IP, IG, DT DT, B+, B– CK, CK, A+, A–			<1>		–	–	–

<1> For EnDat 2.1/01 and EnDat 2.2/01, use a HEIDENHAIN 17-pin cable. *Refer to Table 86 on page 197* for details.
For EnDat 2.2/22, use a HEIDENHAIN 8-pin cable. *Refer to Table 87 on page 198* for details.
For HIPERFACE, use a SICK STEGMANN 8-pin cable. *Refer to Table 88 on page 198* for details.

Magnetek recommends using CRIMPFOX 6 by Phoenix Contact or equivalent crimp terminals with the specifications listed in *Table 91* for wiring to ensure proper connections.

Note: Properly trim wire ends so loose wire ends do not extend from the crimp terminals.

Table 91 Crimp Terminal Sizes

	Wire Gauge mm²	Phoenix Contact Model	L mm (in)	d1 mm (in)	d2 mm (in)
	0.25 (24 AWG)	AI 0.25 - 6YE	10.5 (13/32)	0.8 (1/32)	2 (5/64)
	0.34 (22 AWG)	AI 0.34 - 6TQ	10.5 (13/32)	0.8 (1/32)	2 (5/64)
	0.5 (20 AWG)	AI 0.5 - 6WH	14 (9/16)	1.1 (3/64)	2.5 (3/32)

Terminal Functions

Table 92 Option Terminal Functions (EnDat)

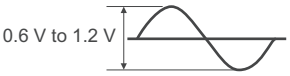
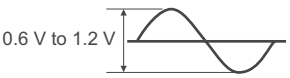
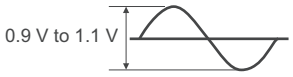
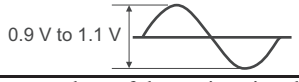
Terminal Block	Terminal	Function	Description
TB1	IP	PG encoder power supply	Supplies power to the PG encoder. • Jumper with terminal CN3 to select the power supply voltage, 5 V or 8 V. • Voltage range: 5 V ±5%, 330 mA 8 V ±10%, 150 mA **Note:** The number of connections to terminals IP and IG differs by wiring length when the power supply is set for +5 V ±5%. • Up to 10 m: One or two connections to both IP and IG. • 10 to 20 m: Two connections to both IP and IG.
	IG	PG encoder power supply common	
	DT	Communication data signal I/O	Reads and processes PG encoder data. Signal level: RS-485 protocol
	DT	Inverse communication data signal I/O	
	B+	B phase signal input	Input for the B phase sine-wave from the PG encoder. • Maximum input frequency: 20 kHz • Input signal differential: B+ - B–  **Note:** Not available when using EnDat 2.2/22.
	B–	Inverse B phase signal input	
	b+	B phase monitor signal output	Outputs a ratio of the B phase frequency. • Output method: Line driver • Output voltage: RS-422 level • Possible resolution: 1/n Set F1-06 to monitor the pulse signal. Varies by drive model. **Note:** Not available when using EnDat 2.2/22.
	b–	Inverse B phase monitor signal output	
TB2	IP	PG encoder power supply	Supplies power to the PG encoder. Connects to terminal IP on the option.
	IG	PG encoder power supply common	Supplies power to the PG encoder. Connects to terminal IG on the option.
	CK	Communication clock signal output	Outputs the communication clock signal to the PG encoder. Signal level: RS-485 protocol
	CK	Inverse communication clock signal output	
	A+	A phase signal input	Input for the A phase sine-wave from the PG encoder. • Maximum input frequency: 20 kHz • Input signal differential: A+ - A–  **Note:** Not available when using EnDat 2.2/22.
	A–	Inverse A phase signal input	
	a+	A phase monitor signal output	Outputs a ratio of the A phase frequency. • Output method: Line driver • Output voltage: RS-422 level • Possible resolution ratio: 1/n Set F1-06 to monitor the pulse signal. Varies by drive model. **Note:** Not available when using EnDat 2.2/22.
	a–	Inverse A phase monitor signal output	
	FE	Ground	Ground terminal for shielded cable.

Table 93 Option Terminal Functions (HIPERFACE)

Terminal Block	Terminal (Signal)	Function	Description
TB1	IP (Us)	PG encoder power supply	Supplies power to the PG encoder. • Jumper with terminal CN3 to select the power supply voltage, 5 V or 8 V. • Voltage range: 5 V ±5%, 330 mA 8 V ±10%, 150 mA
	IG (GND)	PG encoder power supply common	
	DT (Data+)	Communication data signal I/O	Reads and processes PG encoder data. Signal level: RS-485 protocol
	DT (Data-)	Inverse communication data signal I/O	
	B+ (+SIN)	SIN signal input	Input for the sine-wave from the PG encoder. • Maximum input frequency: 20 kHz • Input signal differential: +SIN - REFSIN 
	B- (REFSIN)	Inverse SIN signal input	
	b+	SIN pulse monitor signal output	Outputs a ratio of the sine pulse frequency. • Output method: Line driver • Output voltage: RS-422 level • Possible resolution: 1/n (n = 0 to 32) Set F1-06 to monitor the pulse signal.
	b-	Inverse SIN pulse monitor signal output	
TB2	IP (Us)	PG encoder power supply	Supplies power to the PG encoder. Connects to terminal IP on the option.
	IG (GND)	PG encoder power supply common	Supplies power to the PG encoder. Connects to terminal IG on the option.
	CK	–	Not used.
	CK	–	
	A+ (+COS)	COS signal input	Input for the cosine-wave from the PG encoder. • Maximum input frequency: 20 kHz • Input signal differential: +COS - REFCOS 
	A- (RSFCOS)	Inverse COS signal input	
	a+	COS pulse monitor signal output	Outputs pulses of the cosine signal frequency ratio. • Output method: Line driver • Output voltage: RS-422 level • Possible resolution ratio: 1/n (n = 0 to 32) Set F1-06 to monitor the pulse signal.
	a-	Inverse COS pulse monitor signal output	
	FE	Ground	Ground terminal for shielded cable.

■ Troubleshooting

Preventing Noise Interference

Take the following steps to prevent erroneous operation caused by noise interference:

- Use shielded wire for the PG encoder signal lines.
- Limit the length of the PG encoder signal cables to less than 20 m.
- The signal “Sensor Up” must be connected to terminal IP on the PG-F3 option for cables longer than 10 m. Additionally, the “Sensor 0 V” must be connected to terminal IG.
- Use separate conduit or cable tray dividers to separate option control wiring, main circuit input power wiring, and motor output power cables.

- Ground the shield of the cable on the PG encoder side and the drive side. If electrical interference problems arise in the PG encoder signal, verify that the shield is properly grounded and ground one end of the signal line or remove the ground connection on both ends.
- Properly connect the shield in cable to the IG on the option terminal or remove the ground connection on both ends.

Interface Circuits

EnDat 2.1/01, EnDat 2.2/01

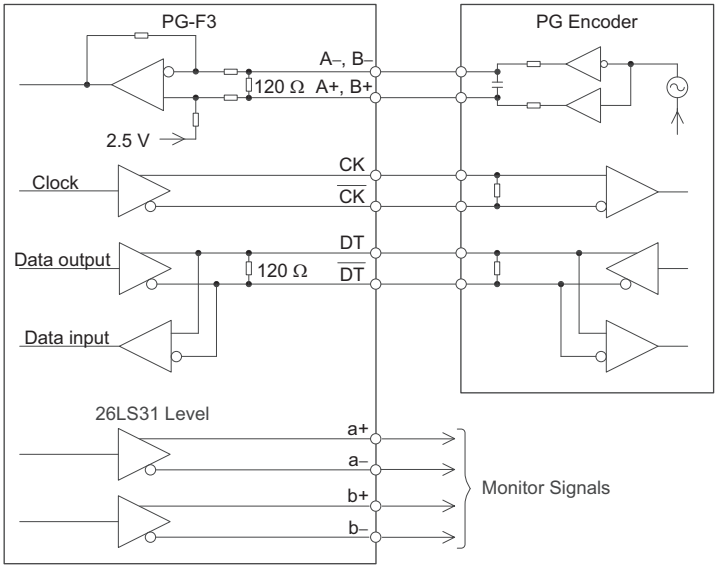


Figure 59 Interface Circuit (EnDat 2.1/01, EnDat 2.2/01)

EnDat 2.2/22

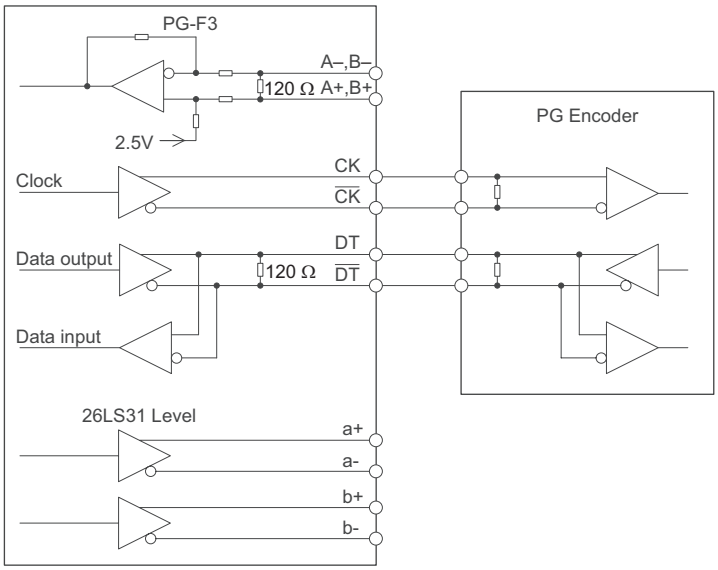


Figure 60 Interface Circuit (EnDat 2.2/22)

HIPERFACE

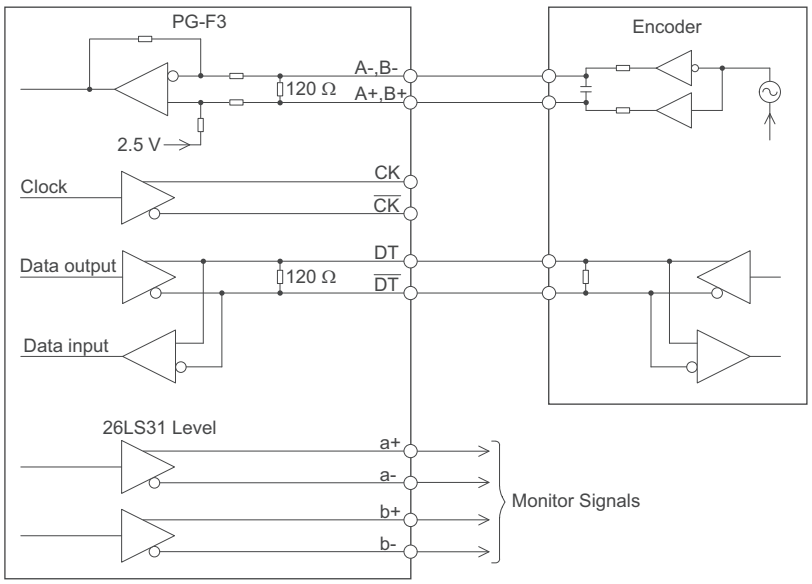
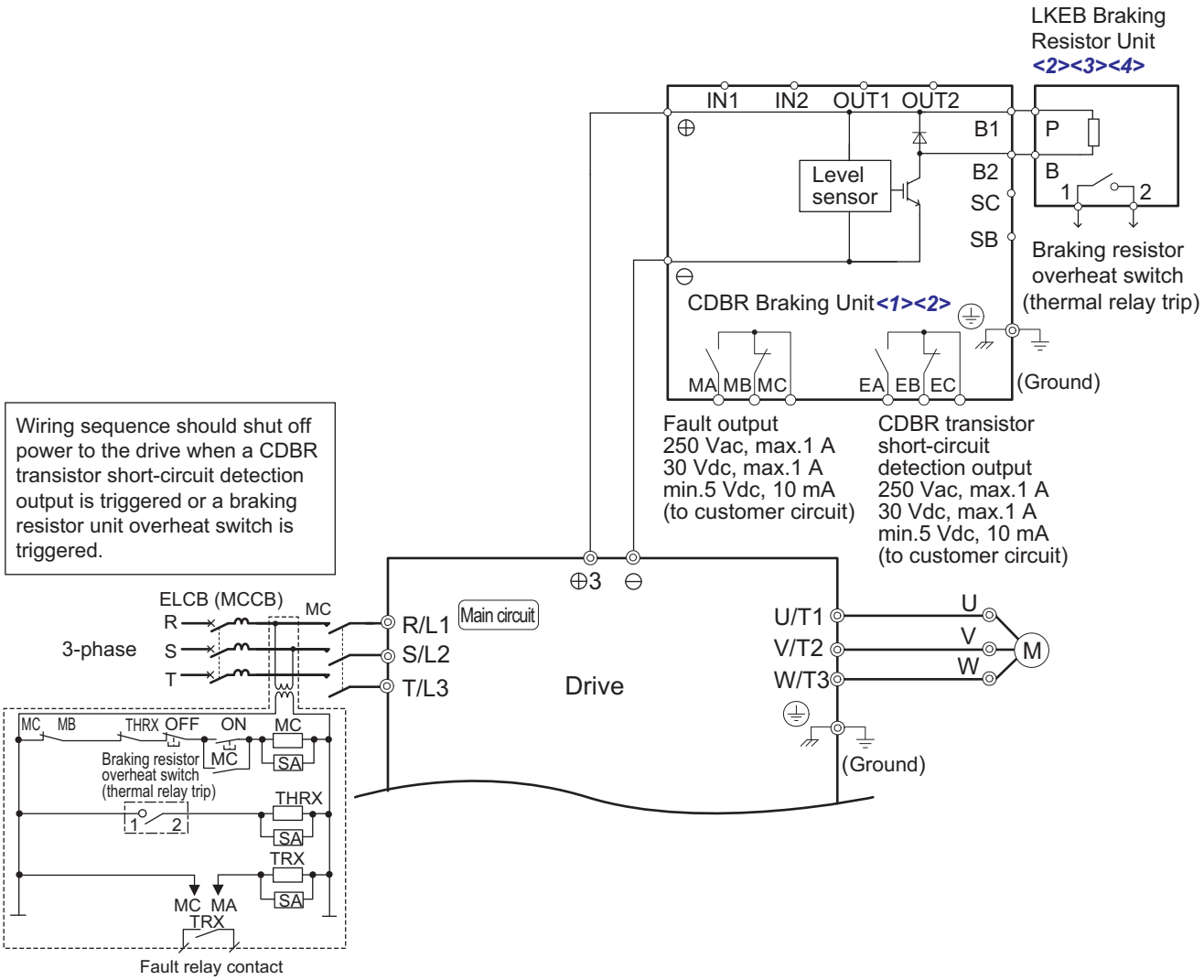


Figure 61 Interface Circuit (HIPERFACE)

◆ External Braking Module

■ Connection Diagram

WARNING! *Fire Hazard. To prevent electrical fire, follow the connection diagrams. Failure to comply may result in serious injury or death.*



<1> Set L8-55 to 0 to disable the protection function for the internal braking transistor when using a regenerative unit or another type of dynamic braking option in lieu of the internal braking transistor. If the protection function is enabled under these conditions, it may cause a braking resistor fault (rF).
<2> Set L3-04 to 0 to disable Stall Prevention when using a regenerative converter, a regenerative unit, or a dynamic braking option. If the function is enabled under these conditions, the drive may not stop within the specified deceleration time.
<3> Set L8-01 to 1 to enable braking resistor overload protection in the drive when using ERF-type resistors.
<4> Be sure to protect non-Magnetek braking resistors by thermal overload relay.

Figure 62 Connection Diagram

■ CDBR Braking Unit Terminal Functions

This section explains terminal functions and specifications to ensure safe and proper installation of the CDBR Braking Unit.

Table 94 CDBR Braking Unit Main Circuit Terminals

Terminal Block	Terminal No.	Terminal Name	Specification
TB3	⊖	Main Circuit Negative Terminal	Connects to the negative ⊖ terminal on the drive.
	⊕	Main Circuit Positive Terminal	Connects to the ⊕3 terminal on the drive.
TB4	B1	Main Circuit B1 Terminal	Connects to the B1 terminal on the LKEB braking resistor unit. May also connect to a braking resistor terminal of a non-Magnetek resistor unit.
	B2	Main Circuit B2 Terminal	Connects to the B2 terminal on the LKEB braking resistor unit. May also connect to a braking resistor terminal of a non-Magnetek resistor unit.
–	⏚	Grounding Terminal	For 200 V class: 100 Ω or less For 400 V class and 600 V class: 10 Ω or less

Table 95 CDBR Braking Unit Control Circuit Terminals

Terminal Block	Terminal No.	Terminal Name	Specification
TB1	IN1	Slave Input	Input the signal when using CDBR braking units in parallel.
	IN2	Slave Input Common	
	OUT1	Master Output	Output the signal when using CDBR braking units in parallel.
	OUT2	Master Output Common	
	SC <1>	Enable Input Common	Enable/Disable contact input to disable the CDBR and activate MA-MB-MC fault contact output.
	SB <1>	Enable Input	
TB2	MA	Fault Contact Output (N.O.)	Output signal when a fault occurs or when SB-SC is closed (default) (example: CDBR braking unit overheating, LKEB braking resistor unit short-circuit detection, external fault). Wiring sequence should shut off power to the drive when the signal is output. Relay output 250 VAC, max. 1 A 30 VDC, max. 1A min. 5 VDC, 10 mA
	MB	Fault Contact Output (N.C.)	
	MC	Fault Contact Output Common	
	EA	CDBR Transistor Short-Circuit Detection Output (N.O.)	Output signal when braking unit fault is detected. If needed, wiring sequence should shut off power to the drive when the signal is output. Relay output 250 VAC, max. 1 A 30 VDC, max. 1 A min. 5 VDC, 10 mA
	EB	CDBR Transistor Short-Circuit Detection Output (N.C.)	
	EC	CDBR Transistor Short-Circuit Detection Output Common	

<1> Digital Input-SB, SC. Powered by internal 24 VDC LVLC source. If external power supply used, it shall be UL Listed Class 2 power source only or equivalent.

■ CDBR Braking Unit LED Display

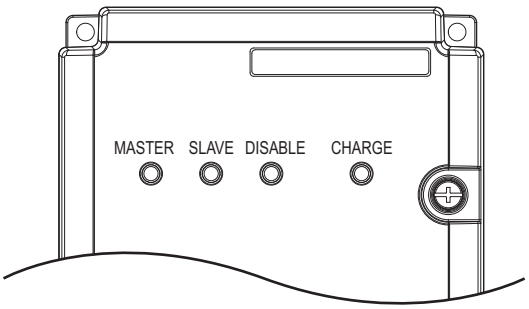


Figure 63 CDBR Braking Unit LED Display

LED	Color	Lit	Off
MASTER	Green	CDBR is functioning as Master	CDBR is functioning as Slave
SLAVE	Green	CDBR is functioning as Slave	CDBR is functioning as Master
DISABLE	Red	Fault has occurred	Normal operation
CHARGE	Red	CDBR is powered on	–

■ Setting and Confirming CDBR Braking Unit Operation

Setting the CDBR Braking Unit

After completing drive and CDBR Braking Unit wiring, confirm the setting of the CDBR Braking Unit onboard switches.

WARNING! *Electrical Shock Hazard. Do not remove covers or touch the circuit boards while the power is on. Failure to comply could result in death or serious injury.*

CAUTION! *Burn Hazard. Do not touch a hot heatsink. Failure to comply could result in minor or moderate injury. To prevent burns, wait at least 15 minutes after power off and ensure the heatsink has cooled down.*

Braking Unit Enable Input Setting (S1, S4, S5 DIP Switch)

The braking unit set to the default setting will turn on only if SB-SC Enable Input is applied.

DIP switch S1 is used to select SINK or SOURCE mode for the SB-SC Enable Input. An external 24 Vdc (Class 2) power supply is required for SOURCE mode.

DIP switch S4 is used to select the contact type, N.O or N.C, that will activate the SB-SC Enable Input.

DIP switch S5 is used to enable or disable the Fault Contact Output MA-MB-MC when SB-SC Enable Input is activated.

DIP switch default settings:

S1 = SINK Mode
S4 = N.O., setting A
S5 = Enable, setting 2

Note: DIP switch S5 is available from Rev. B or later.

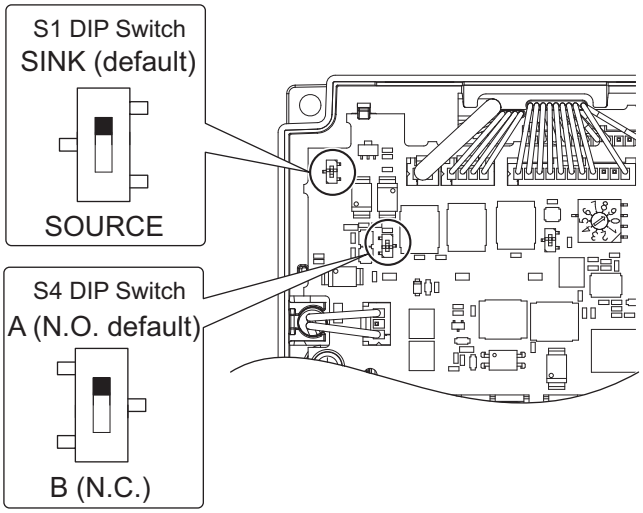


Figure 64 Setting CDBR Onboard DIP Switches

Table 96 CDBR Enable/Disable Status (DIP Switch S1, S4)

DIP Switch S1-SINK/SOURCE	DIP Switch S4-SB/SC Terminals N.O./N.C.	SB-SC-Enable Input	CDBR Status
SINK	A	Open	Enabled
SINK	A	Close	Disabled
SINK	B	Open	Disabled
SINK	B	Close	Enabled
SOURCE	A	0 V Input	Enabled
SOURCE	A	24 V Input	Disabled
SOURCE	B	0 V Input	Disabled
SOURCE	B	24 V Input	Enabled

Sink Mode (0 V Common), Internal Power Supply

Position DIP switch S1 for sinking as shown in ***Figure 65***, when controlling the digital SB-SC inputs by NPN transistors (0 V common/sinking mode) or contacts using the drive internal power supply.

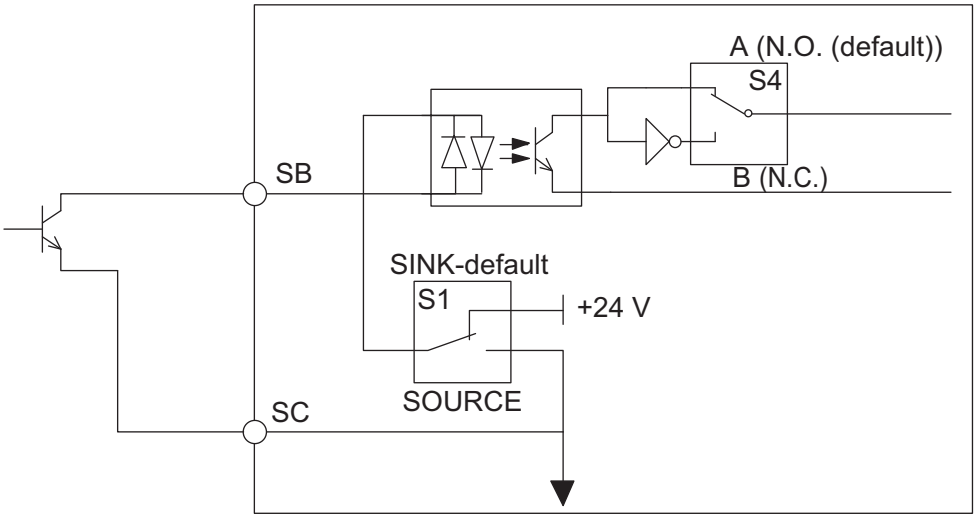


Figure 65 CDBR Braking Unit Sinking Mode using Internal Power Supply

Source Mode (+24 V Common), Internal Power Supply

When controlling digital inputs by PNP transistors (+24 V common/sourcing mode) or contact inputs using the drive internal power supply, set DIP switch S1 for sourcing as shown in ***Figure 66***.

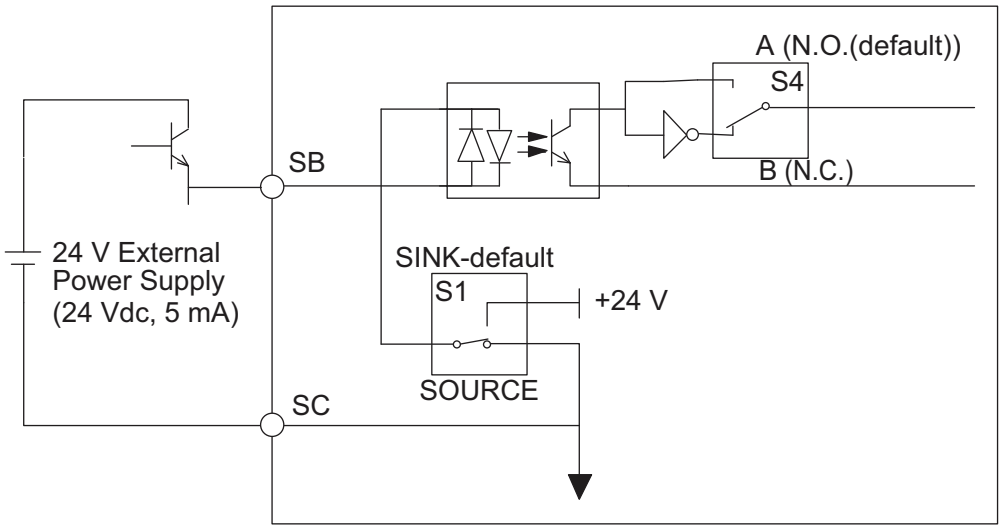


Figure 66 CDBR Braking Unit Sourcing Mode

Master/Slave Selection Switch (S2)

The default setting of DIP switch S2 is OUT (Master). Change the switch position only when operating the unit as a slave device.

Only the properly configured master CDBR should have DIP switch S2 set to OUT (master). All other units in the circuit must have DIP switch S2 set to IN (slave).

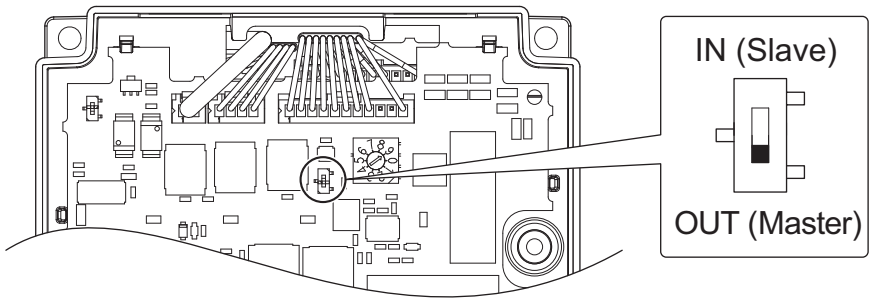


Figure 67 Master/Slave Selection Switch (S2)

CDBR Braking Start Voltage Rotary Switch (S3)

Set the braking start level voltage level rotary switch S3 to match the power supply of the main circuit. The default rotary switch S3 setting is 9. Refer to *Table 97* for details on rotary switch S3 position and braking start voltage.

Note:
1. The setting does not typically require adjustment.
2. Consider the amount of voltage fluctuation in the DC bus when changing rotary switch S3 setting values. If the starting voltage is incorrectly set to a low value, applying power to the drive may activate the CDBR and overheat the braking resistor.
3. Be sure to firmly click the switch into the proper position in accordance with the incoming power supply. A switch that is stuck between positions may cause the CDBR to operate incorrectly.

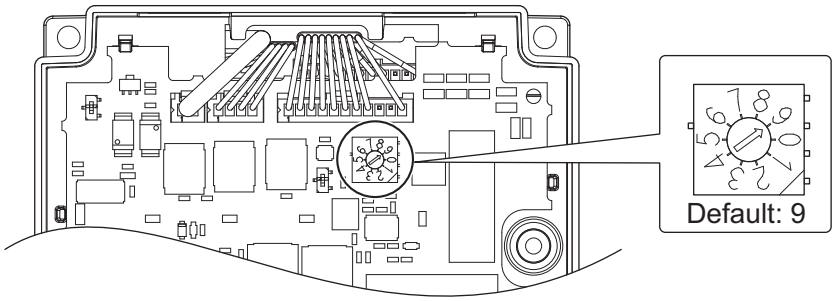


Figure 68 CDBR Voltage Activation Level, Rotary Switch (S3)

Table 97 Rotary Switch S3 Settings and Voltage Activation Levels

No.	200 V Class		400 V Class		600 V Class	
	Input Voltage (V)	Braking Activation Voltage (V) (PN Bus Voltage)	Input Voltage (V)	Braking Activation Voltage (V) (PN Bus Voltage)	Input Voltage (V)	Braking Activation Voltage (V) (PN Bus Voltage)
0	160	270 (TYP)	380	630 (TYP)	500	825 (TYP)
1	170	282 (TYP)	390	644 (TYP)	505	839 (TYP)
2	175	294 (TYP)	400	659 (TYP)	515	853 (TYP)
3	185	307 (TYP)	405	673 (TYP)	525	867 (TYP)
4	190	319 (TYP)	415	688 (TYP)	530	881 (TYP)
5	200	331 (TYP)	425	702 (TYP)	540	894 (TYP)
6	208	343 (TYP)	430	717 (TYP)	550	908 (TYP)
7	215	356 (TYP)	440	731 (TYP)	555	922 (TYP)
8	220	368 (TYP)	450	746 (TYP)	565	936 (TYP)
9 <1>	230	380 (TYP)	460	760 (TYP)	575	950 (TYP)

<1> Default Setting

■ Specifications

Table 98 CDBR Braking Module Specifications

Voltage Class		200 V Class				400 V Class				600 V Class		
Model CDBR-□D		2022	2037	2055	2110	4030	4045	4090	4220	5037	5110	5300
Applicable Motor Output Capacity (kW)		22	37	55	110	30	45	90	220	37	110	300
Output	Peak Discharge Current (A) (10% ED, 10 s)	60	80	120	250	40	60	100	250	40	100	250
	Continuous Rated Discharge Current (A)	20	24	40	80	15	18	30	80	15	30	80
	Braking Voltage Activation Level (VDC)	270 to 380 <1> (Default setting: 380)				630 to 760 <1> (Default setting: 760)				825 to 950 <1> (Default setting 950)		
	Max. Hysteresis (V)	Approx. 8				Approx. 16				Approx. 20		
Input	DC Voltage (V)	243 to 400				460 to 800				607 to 1000		
Protection Function	Heatsink Overheat	Thermistor										
	Charge LED	Charge lamp stays ON until bus voltage drops below 50 V.										
	Overcurrent Protection	Faults the CDBR in the event of IGBT overcurrent.										
Environment	Area of Use	Indoors (free from corrosive gases and dust)										
	Altitude	Up to 1000 meters without denting; up to 3000 m with drive output and current derating. Contact Magnetek or your nearest sales representative for details.										
	Ambient Temperature	IP00, IP20: -10 to +50°C (+14 to +122°F) NEMA Type 1: -10 to +40°C (+14 to +104°F)										
	Storage Temperature	-20 to +60°C (-4 to +140°F)										
	Humidity	95 RH% or less (no condensation)										
	Vibration/Shock	10 to 20 Hz: 9.8 m/s², 20 to 55 Hz: 5.9 m/s²										
Standards		UL 508C, IEC/EN 61800-3 <2>, IEC/EN 61800-5-1 <2>, RoHS										
Protection Design		IP00 enclosure, IP20 enclosure, NEMA Type 1 enclosure										
Heatsink Loss (W)		20	29	48	114	18	27	38	114	18	29	105
Interior Unit Loss (W)		7	10	16	38	6	9	13	38	6	10	35
Total Watt Loss (W)		27	38	64	152	24	36	51	152	24	39	140

<1> Adjustable by ten incremental steps.
<2> Not available for 600 V class models.

■ European Standards

Figure 69 CE Mark

The CE mark indicates compliance with European safety and environmental regulations. It is required for engaging in business and commerce in Europe.

European standards include the Machinery Directive for machine manufacturers, the Low Voltage Directive for electronics manufacturers, and the EMC guidelines for controlling noise.

This option displays the CE mark based on the EMC guidelines.

EMC Guidelines: 2004/108/EC

Drives used in combination with this option and devices used in combination with the drive must also be CE certified and display the CE mark. When using drives displaying the CE mark in combination with other devices, it is ultimately the responsibility of the user to ensure compliance with CE standards. After setting up the device, verify that conditions meet European standards.

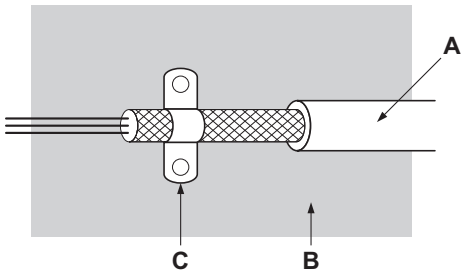
EMC Guidelines Compliance

This option is tested according to European standards IEC/EN61800-3:2004 and complies with EMC guidelines. We declared the CE marking based on the harmonized standards.

Installation Method

Verify the following installation conditions to ensure that other devices and machinery used in combination with this option also comply with EMC guidelines.

1. Use dedicated shield cable for the option and external device (encoder, I/O device, master), or run the wiring through a metal conduit.
2. Keep wiring as short as possible. Ground the shield according to ***Figure 71***.
3. Ground the largest possible surface area of the shield to the metal panel when using dedicated shield cable.



A – Braided shield cable
B – Metal panel
C – Cable clamp (conductive)

Figure 70 Ground Area

Option Installation for CE Compliance: Models PG-□□, DI-□□, DO-□□, AI-□□, AO-□□, SI-□□

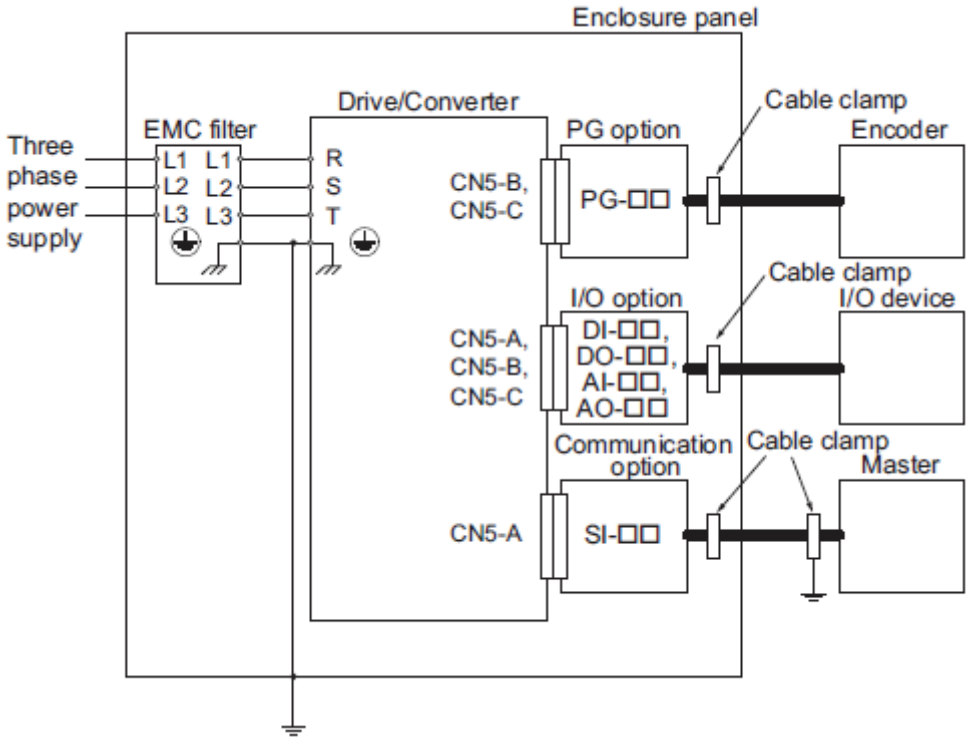


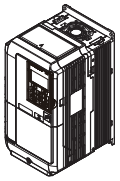
Figure 71 Option Installation for CE Compliance

◆ Installation

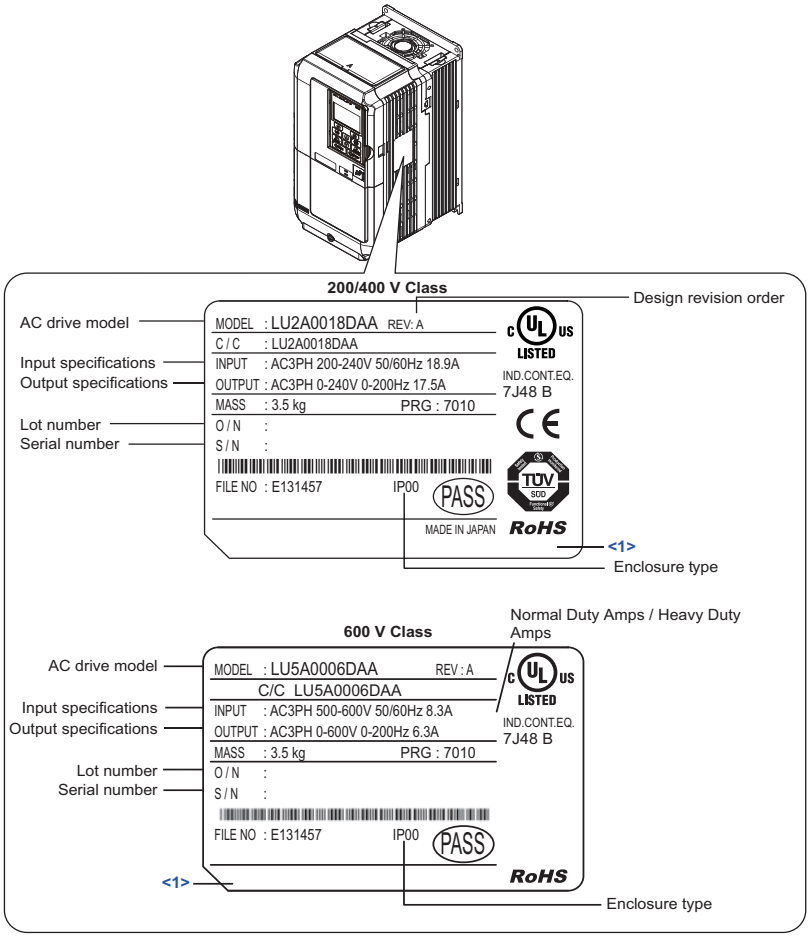
■ Nameplate Check

Please perform the following tasks after receiving the drive:

- Inspect the drive for damage.
  If the drive appears damaged upon receipt, contact the shipper immediately.
- Verify receipt of the correct model by checking the information on the nameplate.
- If you have received the wrong model or the drive does not function properly, contact your supplier.

Description	Drive	Controller Power Supply Cable for Rescue Operation	Quick Start Guide
–			
Quantity	1	1	1

Nameplate



<1> The address of the head office of Magnetek (responsible for product liability) is shown on the nameplate.

Figure 72 Nameplate Information

■ Installation Environment

Install the drive in an environment matching the specifications below to help prolong the optimum performance life of the drive.

Table 99 Installation Environment

Environment	Conditions
Installation Area	Indoors
Ambient Temperature	IP00 enclosure with top protective cover: -10 to +40°C (14 to 104°F) IP00 enclosure: -10 to +50°C (14 to 122°F) Drive reliability improves in environments without wide temperature fluctuations. When using the drive in an enclosure panel, install a cooling fan or air conditioner in the area to ensure that the air temperature inside the enclosure does not exceed the specified levels. Do not allow ice to develop on the drive.
Humidity	95% RH or less and free of condensation
Storage Temperature	-20 to 60°C (-4 to 140°F)
Surrounding Area	• Install the drive in an area free from: • oil mist and dust • metal shavings, oil, water or other foreign materials • radioactive materials • combustible materials (e.g., wood) • harmful gases and liquids • excessive vibration • chlorides • direct sunlight
Altitude	1000 m or lower, up to 3000 m with derating 1000 m (3280 ft.) or lower, up to 3000 m (9842 ft.) with derating (Refer to ***Altitude Derating on page 178***)
Vibration	10 to 20 Hz at 9.8 m/s^2 20 to 55 Hz at 5.9 m/s^2 (LU2M0008 to 2M0180, 4M0005 to 4M0150, and 5M0003 to 5M0077) 2.0 m/s^2 (LU2M0215 to 2M0415, LU4M0180 to 4M0605, and 5M0099 to 5M0200)
Orientation	Install the drive vertically to maintain maximum cooling effects.

NOTICE: *Avoid placing drive peripheral devices, transformers, or other electronics near the drive as the noise created can lead to erroneous operation. If such devices must be used in close proximity to the drive, take proper steps to shield the drive from noise.*

NOTICE: *Prevent foreign matter such as metal shavings and wire clippings from falling into the drive during installation. Failure to comply could result in damage to the drive. Place a temporary cover over the top of the drive during installation. Remove the temporary cover before startup, as the cover will reduce ventilation and cause the drive to overheat.*

■ Installation Orientation and Spacing

WARNING! *Fire Hazard. Provide sufficient cooling when installing the drive inside an enclosed panel or cabinet. Failure to comply could result in overheating and fire. When drives are placed inside the same enclosure panel, install proper cooling to ensure air entering the enclosure does not exceed 40°C (104°F).*

Installation Orientation

Install the drive upright as illustrated in ***Figure 73*** to maintain proper cooling. Refer to ***Installation Orientation and Spacing on page 215*** for details on installing the drive.

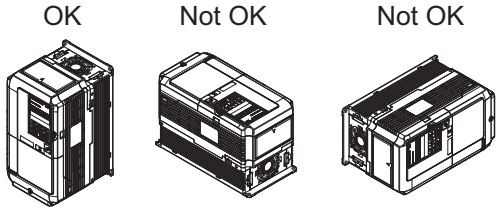
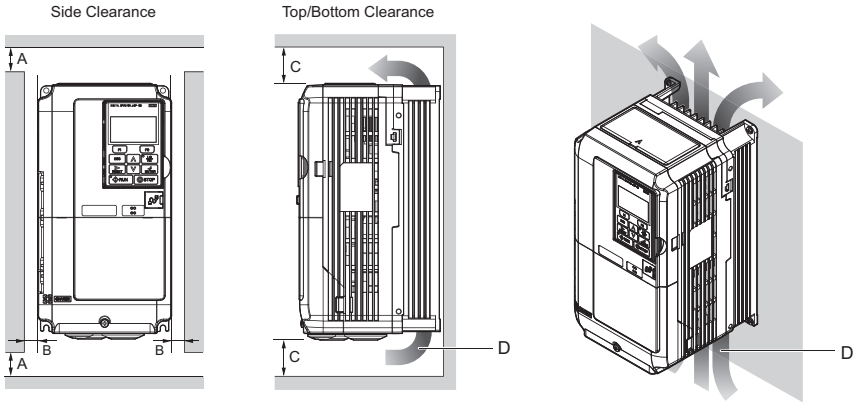


Figure 73 Correct Installation Orientation

Installation Spacing

Figure 74 shows the installation distance required to maintain sufficient space for airflow and wiring.



A – 50 mm (1.97 in.) minimum
B – 30 mm (1.18 in.) minimum
C – 120 mm (4.72 in.) minimum
D – Airflow direction

Figure 74 Correct Installation Spacing

Cable Length Between Drive and Motor

Voltage drop along the motor cable may cause reduced motor torque when the wiring between the drive and the motor is too long, especially at low frequency output. This can also be a problem when motors are connected in parallel with a fairly long motor cable. Drive output current will increase as the leakage current from the cable increases. An increase in leakage current may trigger an overcurrent situation and weaken the accuracy of the current detection.

Adjust the drive carrier frequency according to *Table 100*. If the motor wiring distance exceeds 100 m (328 ft.) because of the system configuration, reduce the ground currents. *Refer to POWER CONVERT A4 Sub-menu on page 50*.

Table 100 Cable Length Between Drive and Motor

Cable Length	50 m (164 ft.) or less	100 m (328 ft.) or less	Greater than 100 m (328 ft.)
Carrier Frequency	15 kHz or less	5 kHz or less	2 kHz or less

Note: When setting carrier frequency for drives running multiple motors, calculate cable length as the total wiring distance to all connected motors.

Ground Wiring

Follow the precautions to wire the ground for one drive or a series of drives.

WARNING! *When using an EMC filter, the leakage current exceeds 3.5 mA. Therefore, according to IEC/EN 61800-5-1, at least one of the conditions below must be satisfied:*
a) The cross-section of the protective earthing conductor must be at least 10 mm^2 (Cu) or 16 mm2 (Al).
b) The power supply must be disconnected automatically in case of discontinuity of the protective earthing conductor.

WARNING! *Electrical Shock Hazard. Always use a ground wire that complies with technical standards on electrical equipment and local installation regulations. Minimize the length of the ground wire. Improper equipment grounding may cause dangerous electrical potentials on equipment chassis, which could result in death or serious injury.*

WARNING! *Electrical Shock Hazard. Be sure to ground the drive ground terminal (200 V class: Ground to 100 Ω or less, 400 V class: Ground to 10 Ω or less, and 600 V class: ground to 10 Ω or less). Improper equipment grounding may cause dangerous electrical potentials on equipment chassis, which could result in death or serious injury.*

NOTICE: *Do not share the ground wire with other devices such as welding machines or large-current electrical equipment. Improper equipment grounding could result in drive or equipment malfunction due to electrical interference.*

NOTICE: *When using more than one drive, ground multiple drives according to instructions. Improper equipment grounding could result in abnormal operation of drive or equipment.*

Refer to *Figure 75* when using multiple drives. Do not loop the ground wire.

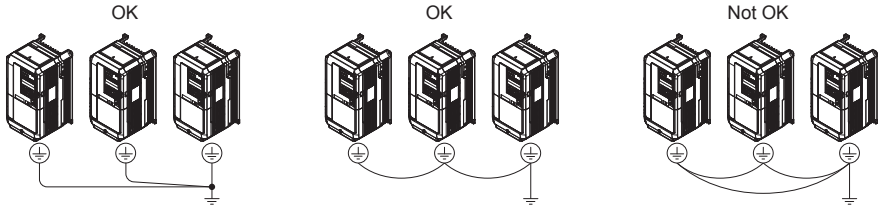


Figure 75 Multiple Drive Wiring

■ Terminal Covers

Removing/Reattaching the Terminal Cover

Removing the Terminal Cover

Models LU2M0018 to 2M0075, 4M0009 to 4M0039, and 5M0003 to 5M0027

1. Loosen the terminal cover screw using a #2 Phillips screwdriver. Screw sizes vary by drive model.

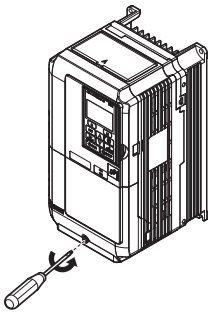


Figure 76 Removing the Terminal Cover

2. Push in on the tab located on the bottom of the terminal cover and gently pull forward to remove the terminal cover.

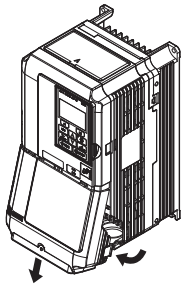


Figure 77 Removing the Terminal Cover

Models LU2M0085 to 2M0415, 4M0045 to 4M0216, and 5M0003 to 5M0027

1. Loosen the screws on the terminal cover, then pull down on the cover.

CAUTION! *Do not completely remove the cover screws, just loosen them. If the cover screws are removed completely, the terminal cover may fall off causing an injury.*

Note: The shape of the terminal covers and the numbers of screws differ depending on the drive models.

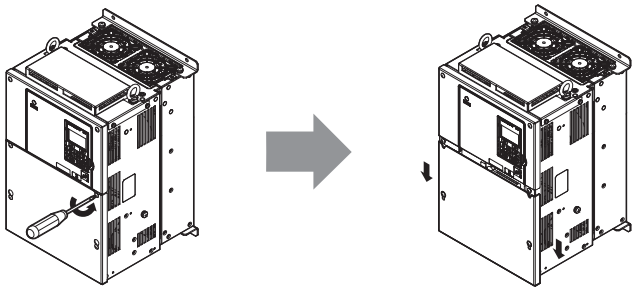


Figure 78 Removing the Terminal Cover

2. Pull forward on the terminal cover to free it from the drive.

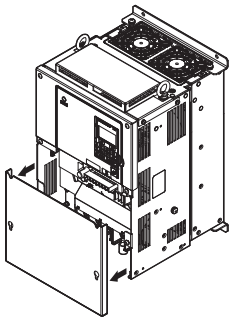


Figure 79 Removing the Terminal Cover

Reattaching the Terminal Cover

Models LU2M0018 to 2M0075, 4M0009 to 4M0039, and 5M0003 to 5M0027

Power lines and signal wiring should pass through the opening provided.

NOTICE: *Equipment Hazard. Separate motor and/or braking circuit wiring (terminals, U/T1, V/T2, W/T3, +3, +2, +1,(-), B1, B2, from all other wiring. Place motor wiring within its own conduit or cable tray with appropriate divider, and use shielded motor cable where appropriate. Improper wiring practices could result in malfunction of drive due to electrical interference.*

Reattach the terminal cover after completing the wiring to the drive and other devices.

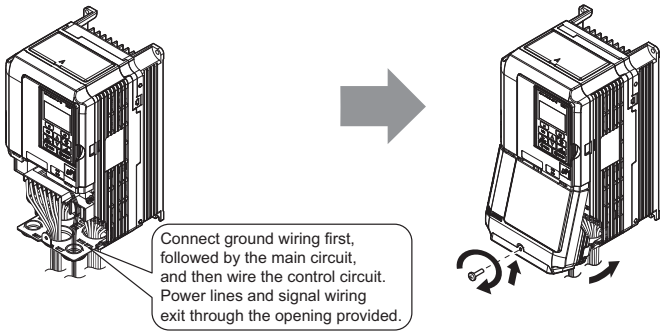


Figure 80 Reattaching the Terminal Cover

Models LU2M0085 to 2M0415, 4M0045 to 4M0216, and 5M0003 to 5M0027

After wiring the terminal board and other devices, double-check connections and reattach the terminal cover.

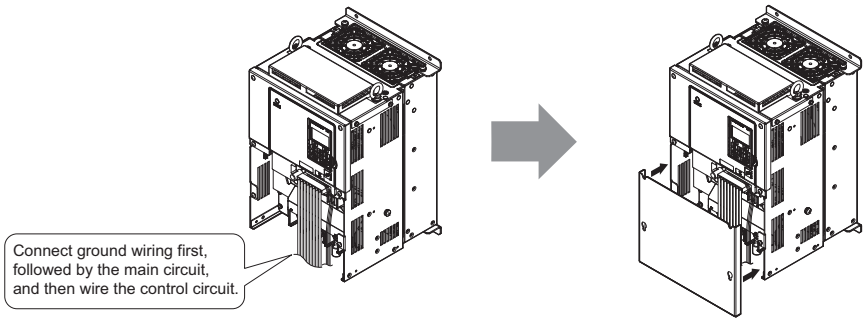


Figure 81 Reattaching the Terminal Cover

■ Digital Operator and Front Cover

Detach the digital operator from the drive for remote operation or when opening the front cover to install an option card.

Note: Be sure to remove the digital operator prior to opening or reattaching the front cover. Leaving the digital operator plugged into the drive when removing the front cover can result in erroneous operation caused by a poor connection. Firmly fasten the front cover back into place before reattaching the digital operator.

Removing/Reattaching the Digital Operator

Removing the Digital Operator

While pressing on the tab located on the right side of the digital operator, pull the digital operator forward to remove it from the drive.

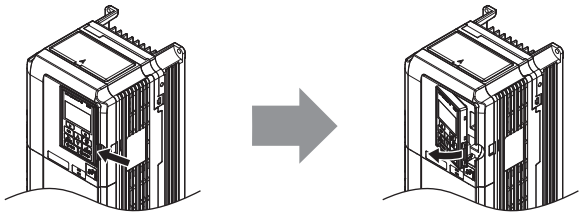


Figure 82 Removing the Digital Operator

Reattaching the Digital Operator

Insert the digital operator into the opening in the top cover while aligning it with the notches on the left side of the opening.

Next, press gently on the right side of the operator until it clicks into place.

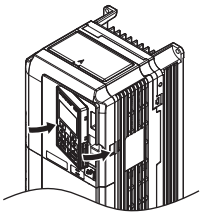


Figure 83 Reattaching the Digital Operator

Removing/Reattaching the Front Cover

Removing the Front Cover

Models LU2M0018 to 2M0075, 4M0009 to 4M0039, and 5M0003 to 5M0027

After removing the terminal cover and the digital operator, loosen the screw that affixes the front cover (model LU2M0047, 4M0024, 4M0031, 5M0017, and 5M0022 does not use a screw to affix the front cover). Pinch inwards on the tabs found on each side of the front cover, then pull forward to remove it from the drive.

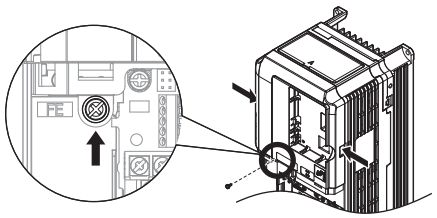


Figure 84 Remove the Front Cover (Models LU2M0018 to 2M0075, 4M0009 to 4M0039, and 5M0003 to 5M0027)

Models LU2M0085 to 2M0415, 4M0045 to 4M0216, and 5M0032 to 5M0062

1. Remove the terminal cover and the digital operator.
2. Loosen the installation screw on the front cover.
3. Use a straight-edge screwdriver to loosen the hooks on each side of the cover that hold it in place.

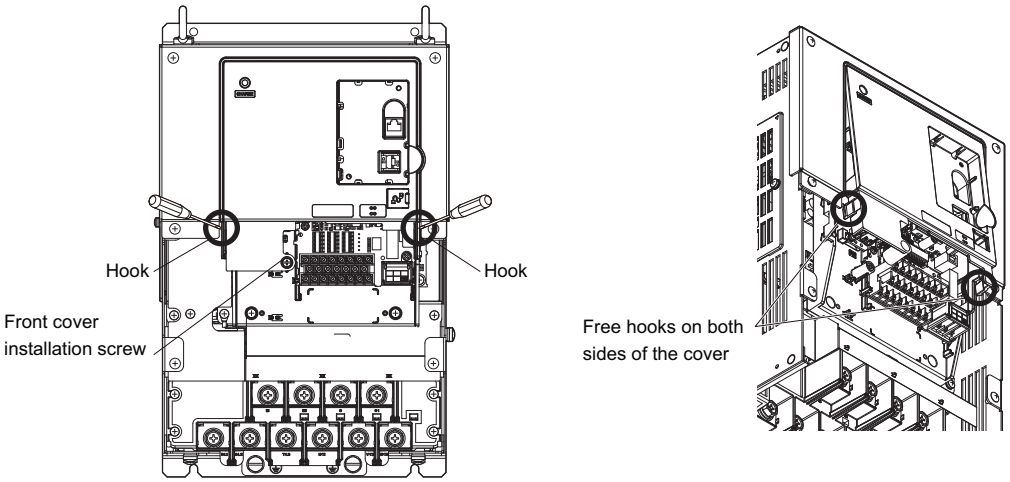


Figure 85 Remove the Front Cover (Models LU2M0085 to 2M0415, 4M0045 to 4M0216, and 5M0032 to 5M0062

4. Unhook the left side of the front cover then swing the left side towards you as shown in ***Figure 86*** until the cover comes off.

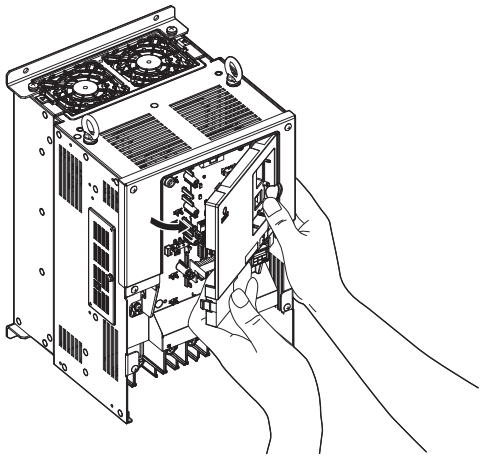


Figure 86 Remove the Front Cover (Models LU2M0085 to 2M0415, 4M0045 to 4M0605, and 5M0032 to 5M0200)

Reattaching the Front Cover
Models LU2M0018 to 2M0075, 4M0009 to 4M0039, and 5M0003 to 5M0027

Reverse the instructions given in ***Removing the Front Cover on page 219*** to reattach the front cover. Pinch inwards on the hooks found on each side of the front cover while guiding it back into the drive. Make sure it clicks firmly into place.

Models LU2M0085 to 2M0415, 4M0045 to 4M0216, and 5M0032 to 5M0062

1. Slide the front cover so the hooks on the top connect to the drive.

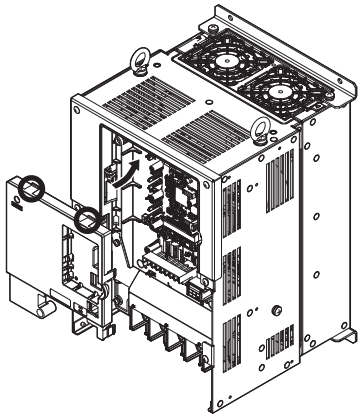


Figure 87 Reattach the Front Cover (Models LU2M0085 to 2M0415, 4M0045 to 4M0216, and 5M0032 to 5M0062)

2. After connecting the hooks to the drive, press firmly on the cover to lock it into place.

■ Protecting Main Circuit Terminals

Insulation Cap or Sleeves

Use insulation caps or sleeves when wiring the drive with crimp terminals. Take particular care to ensure that the wiring does not touch nearby terminals or the surrounding case.

Insulation Barrier

Insulation barriers are packaged with drive models LU4M0370 through 4M0605 to provide added protection between terminals. Magnetek recommends using the provided insulation barriers to ensure proper wiring. Refer to *Figure 88* for instructions on placement of the insulation barriers.

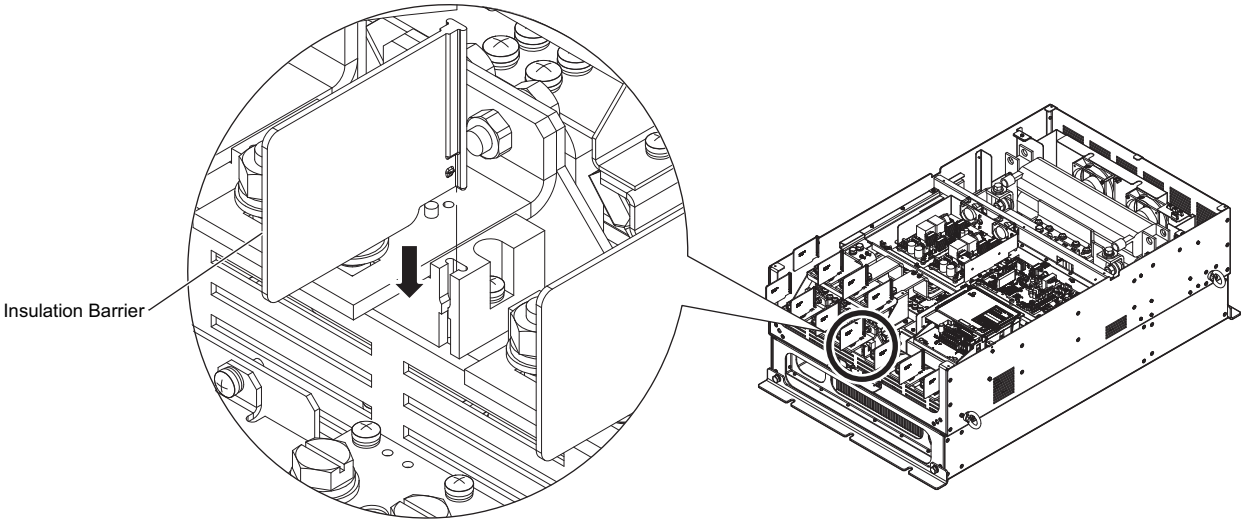


Figure 88 Installing Insulation Barriers

◆ Periodic Inspection and Maintenance

■ Inspection

Power electronics have limited life and may exhibit changes in characteristics or performance deterioration after years of use under normal conditions. To help avoid such problems, it is important to perform preventive maintenance and periodic inspection on the drive.

Drives contain a variety of power electronics such as power transistors, semiconductors, capacitors, resistors, fans, and relays. The electronics in the drive serve a critical role in maintaining proper motor control.

Follow the inspection lists provided in this chapter as a part of a regular maintenance program.

Note: The drive will require more frequent inspection if it is placed in harsh environments, such as:

- High ambient temperatures
- Frequent starting and stopping
- Fluctuations in the AC supply or load
- Excessive vibrations or shock loading
- Dust, metal dust, salt, sulfuric acid, chlorine atmospheres
- Poor storage conditions.

Perform the first equipment inspection one to two years after installation.

Recommended Daily Inspection

Table 101 outlines the recommended daily inspection for Magnetek drives. Check the following items on a daily basis to avoid premature deterioration in performance or product failure. Copy this checklist and mark the "Checked" column after each inspection.

Table 101 General Recommended Daily Inspection Checklist

Inspection Category	Inspection Points	Corrective Action	Checked
Motor	• Inspect for abnormal oscillation or noise coming from the motor.	• Check the load coupling. • Measure motor vibration. • Tighten all loose components.	
Cooling	• Inspect for abnormal heat generated from the drive or motor and visible discoloration.	Check for excessive load. • Excessive load. • Loose connections. • Dirty heatsink or motor. • Ambient temperature.	
	• Inspect drive cooling fan and circulation fan operation.	Check for the following: • Clogged or dirty fan. • Correct fan operation parameter setting.	
Environment	• Verify the drive environment complies with the specifications listed in *Installation Environment on page 215*.	• Eliminate the source of contaminants or correct poor environment.	
Load	• The drive output current should not be higher than the motor or drive rating for an extended period of time.	• Check for the following: • Excessive load. • Correct motor parameter settings.	
Power Supply Voltage	• Check main power supply and control voltages.	• Correct the voltage or power supply to within nameplate specifications. • Verify all main circuit phases.	

Recommended Periodic Inspection

Table 102 outlines the recommended periodic inspections for Magnetek drive installations. Although periodic inspections should generally be performed once a year, the drive may require more frequent inspection in harsh environments or with rigorous use. Operating and environmental conditions, along with experience in each application, will determine the actual inspection frequency for each installation. Periodic inspection will help to avoid premature deterioration in performance or product failure. Copy this checklist and mark the "Checked" column after each inspection.

Periodic Inspection

WARNING! *Electrical Shock Hazard. Do not inspect, connect, or disconnect any wiring while the power is on. Failure to comply can result in serious personal injury. Before servicing the drive, disconnect all power to the equipment. The internal capacitor remains charged even after the power supply is turned off. After shutting off the power, wait for at least the amount of time specified on the drive before touching any components.*

Table 102 Periodic Inspection Checklist

Inspection Area	Inspection Points	Corrective Action	Checked
Main Circuit Periodic Inspection			
General	• Inspect equipment for discoloration from overheating or deterioration. • Inspect for damaged or deformed parts.	• Replace damaged components as required. • The drive has few serviceable parts and may require complete drive replacement.	
	• Inspect for dirt, foreign particles, or dust collection on components.	• Inspect enclosure door seal if used. • Remove foreign particles and dust by sucking them out with a vacuum cleaner to avoid touching parts. • Replace components if cleaning is not possible.	
Conductors and Wiring	• Inspect wiring and connections for discoloration, damage, or heat stress. • Inspect wire insulation and shielding for wear.	• Repair or replace damaged wiring.	
Terminals	• Inspect terminals for stripped, damaged, or loose connections.	• Tighten loose screws and replace damaged screws or terminals.	
Relays and Contactors	• Inspect contactors and relays for excessive noise during operation. • Inspect coils for signs of overheating such as melted or cracked insulation.	• Check coil voltage for overvoltage or undervoltage conditions. • Replace damaged removable relays contactors or circuit board.	
Braking Resistors	• Inspect for discoloration of heat stress on or around resistors.	• Minor discoloration may be acceptable. • Check for loose connections if discoloration exists.	
Electrolytic Capacitor	• Inspect for leaking, discoloration, or cracks. • Check if the cap has come off, for any swelling, or if the sides have burst open.	• The drive has few serviceable parts and may require complete drive replacement.	
Diode, IGBT (Power Transistor)	• Inspect for dust or other foreign material collected on the surface.	Remove foreign particles and dust by sucking them out with a vacuum cleaner to avoid touching parts.	
Motor Periodic Inspection			
Operation Check	• Check for increased vibration or abnormal noise.	• Stop the motor and contact qualified maintenance personnel as required.	
Control Circuit Periodic Inspection			
General	• Inspect terminals for stripped, damaged, or loose connections. • Make sure all terminals have been properly tightened.	• Tighten loose screws and replace damaged screws or terminals. • If terminals are integral to a circuit board, then board or drive replacement may be required.	

Inspection Area	Inspection Points	Corrective Action	Checked
Circuit Boards	• Check for any odor, discoloration, and rust. Make sure connections are properly fastened and that no dust or oil mist has accumulated on the surface of the board.	• Fix any loose connections. • If an antistatic cloth or vacuum plunger cannot be used, replace the board. • Do not use any solvents to clean the board. • Remove foreign particles and dust by sucking them out with a vacuum cleaner to avoid touching parts. • The drive has few serviceable parts and may require complete drive replacement.	
Cooling System Periodic Inspection			
Cooling Fan, Circulation Fan, Control Board Cooling Fan	• Check for abnormal oscillation or unusual noise. • Check for damaged or missing fan blades.	• Clean or replace the fan.	
Heatsink	• Inspect for dust or other foreign material collected on the surface.	Remove foreign particles and dust by sucking them out with a vacuum cleaner to avoid touching parts.	
Air Duct	• Inspect air intake and exhaust openings. They must be free from obstruction and properly installed.	• Visually inspect the area. • Clear obstructions and clean air duct as required.	
Display Periodic Inspection			
Digital Operator	• Make sure data appears on the operator properly. • Inspect for dust or other foreign material that may have collected on surrounding components.	• Contact a Magnetek representative if there is any trouble with the display or keypad. • Clean the digital operator.	

■ Maintenance

The drive has Maintenance Monitors that keep track of component wear. This feature provides advance maintenance warning and eliminates the need to shut down the entire system for unexpected problems. The drive allows the user to check predicted maintenance periods for the components listed below.

- Cooling Fan, Circulation Fan, Control Board Cooling Fan
- Electrolytic Capacitors
- Inrush Prevention Circuit
- IGBTs

For replacement parts, contact the distributor where the drive was purchased or contact Magnetek directly.

Replacement Parts

Table 103 contains the estimated performance life of components that require replacement during the life of the drive. Only use Magnetek replacement parts for the appropriate drive model and revision.

Table 103 Estimated Performance Life

Component	Estimated Performance Life
Cooling Fan, Circulation Fan	10 years
Electrolytic Capacitors	10 years <1>

<1> The drive has few serviceable parts and may require complete drive replacement.

Estimated performance life based on specific usage conditions. These conditions are provided for the purpose of replacing parts to maintain performance. Some parts may require more frequent replacement due to poor environments or rigorous use. Usage conditions for estimated performance life:
Ambient temperature: Yearly average of 40°C (104°F) (IP00 enclosure)
Load factor: 80% maximum
Operation time: 24 hours a day

Performance Life Monitors Maintenance Monitors

The drive calculates the maintenance period for components that may require replacement during the life of the drive. A percentage of the maintenance period is displayed on the digital operator by viewing the appropriate monitor parameter.

When the maintenance period reaches 100%, there is increased risk that the drive may malfunction. Magnetek recommends checking the maintenance period regularly to ensure maximum performance life.

Refer to Periodic Inspection and Maintenance on page 222 for more details.

Table 104 Performance Life Monitors Used for Component Replacement

Parameter	Component	Contents
Fan Elapsed Time (D2)	Cooling Fan, Circulation Fan, Control Board Cooling Fan	Displays the accumulated operation time of the fan, from 0 to 99999 hours. This value is automatically reset to 0 once it reaches 99999.
Fan Life Mon (D2)		Displays the accumulated fan operation time as a percentage of the specified maintenance period.
Cap Life Mon (D2)	DC Bus Capacitors	Displays the accumulated time the capacitors are used as a percentage of the specified maintenance period.
U4-06	Inrush (pre-charge) Relay	Displays the number of times the drive is powered up as a percentage of the performance life of the inrush circuit.
IGBT Life Mon (D2)	IGBT	Displays the percentage of the maintenance period reached by the IGBTs.

Alarm Outputs for Maintenance Monitors

An output can be set up to inform the user when a specific components has neared its expected performance life.

When one of multi-function digital output terminals has been assigned the maintenance monitor function (H2-☐☐ = 2F), the terminal will close when the cooling fan, DC bus capacitors, or DC bus pre-charge relay reach 90% of the expected performance life, or when the IGBTs have reached 50% of their expected performance life. Additionally the digital operator will display an alarm like shown in *Table 105* to indicate the specific components that may need maintenance.

Table 105 Maintenance Alarms

Alarm Display		Function	Corrective Action
LED Operator	LCD Operator		
LT-1 <1>	LT-1	The cooling fans have reached 90% of their designated lifetime.	Replace the cooling fan.
LT-2 <1>	LT-2	The DC bus capacitors have reached 90% of their designated lifetime.	Replace the drive.
LT-3 <1>	LT-3	The DC bus charge circuit has reached 90% of its designated lifetime.	Replace the drive.
LT-4 <1>	LT-4	The IGBTs have reached 50% of their designated lifetime.	Check the load, carrier frequency, and output frequency.
rrPC <2>	TrPC	The IGBTs have reached 90% of their designated lifetime.	Replace the drive.

<1> This alarm message will be output only if the Maintenance Monitor function is assigned to one of the digital outputs (H2-☐☐ = 2F). The alarm will also trigger a digital output that is programmed for alarm indication (H2-☐☐ = 10).
<2> This alarm message will always be output, even if the Maintenance Monitor function is not assigned to any of the digital outputs (H2-☐☐ = 2F). The alarm will also trigger a digital output that is programmed for alarm indication (H2-☐☐ = 10).

Related Drive Parameters

Use parameters o4-03, o4-05, o4-07, and o4-09 to reset a Maintenance Monitor to zero after replacing a specific component. *Refer to U10 Standard Navigation on page 97* for details on parameter settings.

NOTICE: *If these parameters are not reset after the corresponding parts have been replaced, the Maintenance Monitor function will continue to count down the performance life from the value that was reached with the old part. If the Maintenance Monitor is not reset, the drive will not have the correct value of the performance life for the new component.*

■ Drive Replacement

Serviceable Parts

The drive contains some serviceable parts. The following parts can be replaced over the life span of the drive:

- Terminal board I/O PCBs
- Cooling fan(s)
- Front cover

Replace the drive if the main power circuitry is damaged. Contact your local Magnetek representative before replacing parts if the drive is still under warranty. Magnetek reserves the right to replace or repair the drive according to Magnetek warranty policy.

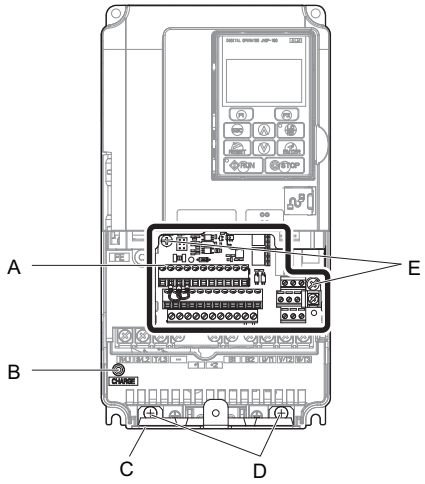
Terminal Board

Crush Hazard. Carrying the drive by the front cover may cause the main body of the drive to fall, resulting in minor or moderate injury. Always hold the case when carrying the drive.

Correctly set parameter o2-04 when replacing the control terminal board. Failure to comply may result in drive damage due to lack of protective functions and poor drive performance.

The drive has a modular I/O terminal block that facilitates quick drive replacement. The terminal board contains on-board memory that stores all drive parameter settings and allows the parameters to be saved and transferred to the replacement drive. To transfer the terminal board, disconnect the terminal board from the damaged drive then reconnect it to the replacement drive. Once transferred, there is no need to manually reprogram the replacement drive.

Note: If the damaged drive and the new replacement drive are have different capacities, the data stored in the control terminal board cannot be transferred to the new drive and an oPE01 error will appear on the display. The control terminal board can still be used, but parameter setting from the old drive cannot be transferred. The replacement drive must be initialized and manually programmed.



A – Removable terminal board
B – Charge LED
C – Bottom cover
D – Bottom cover screws
E – Control terminal board locking screws
F –

Figure 89 Terminal Board

Replacing the Drive

WARNING! *Electrical Shock Hazard. Do not connect or disconnect wiring while the power is on. Failure to comply can result in serious personal injury. Before servicing the drive, disconnect all power to the equipment. The internal capacitor remains charged even after the power supply is turned off. After shutting off the power, wait for at least the amount of time specified on the drive before touching any components.*

WARNING! *Electrical Shock Hazard. Do not allow unqualified personnel to perform work on the drive. Failure to comply could result in serious injury. Installation, maintenance, inspection and servicing must be performed only by authorized personnel familiar with installation, adjustment and maintenance of AC drives.*

NOTICE: *Damage to Equipment. Observe proper electrostatic discharge procedures (ESD) when handling the drive and circuit boards. Failure to comply may result in ESD damage to the drive circuitry.*

The following procedure explains how to replace a drive. This section provides instructions for drive replacement only. To install option cards or other types of options, refer to the specific manuals for those options.

NOTICE: *When transferring a braking transistor, braking resistor, or other type of option from a damaged drive to a new replacement drive, make sure they are working properly before reconnecting them to the new drive. Replace broken options to prevent immediate break down of the replacement drive.*

1. Remove the terminal cover. Refer to ***Terminal Covers on page 217*** for details.

Note: The shape of the terminal covers and the numbers of the screws differ depending on the drive models.

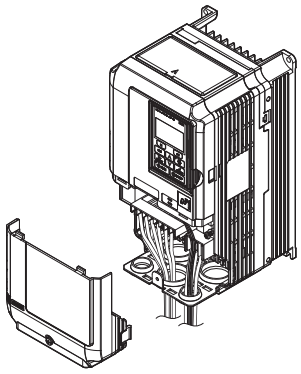


Figure 90 Drive Replacement: Removing the Terminal Cover

2. Loosen the screws holding the terminal board in place. Remove the screw securing the bottom cover and remove the bottom cover from the drive.

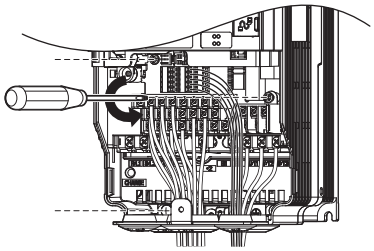


Figure 91 Drive Replacement: Removing the Control Terminal Board

3. Slide the terminal board as illustrated by the arrows to remove it from the drive along with the bottom cover.

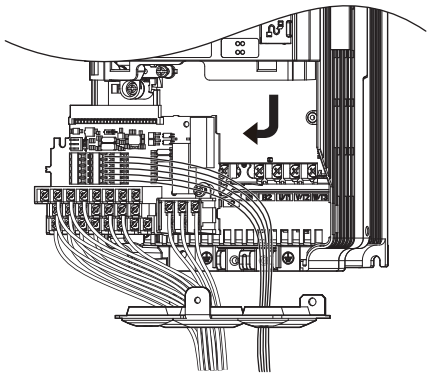


Figure 92 Drive Replacement: Remove the Control Terminal Board

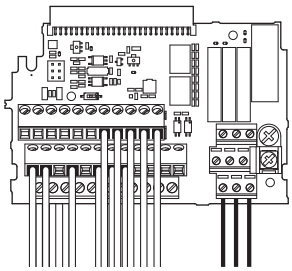


Figure 93 Drive Replacement: Removable Control Terminal Board Disconnected from the Drive

4. Disconnect all option cards and options. Make sure they are intact before reusing them.
5. Replace the drive and wire the main circuit.

Installing the Drive

1. After wiring the main circuit, connect the terminal block to the drive as shown in ***Figure 94***. Use the installation screw to fasten the terminal block into place.

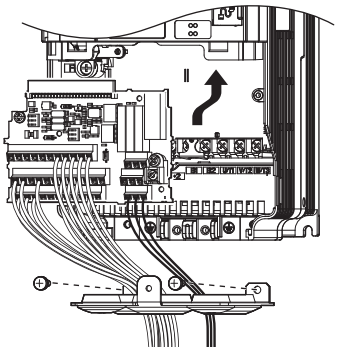


Figure 94 Drive Replacement: Installing the Control Terminal Board

2. Reconnect all options to the new drive in the same way they were installed in the old drive. Connect option boards to the same option ports in the new drive that were used in the old drive.
3. Put the terminal cover back into its original place.
4. After powering on the drive, all parameter settings are transferred from the terminal board to the drive memory. If an oPE04 error occurs, load the parameter settings saved on the terminal board to the new drive by setting parameter A1-03 to 5550. Reset the Maintenance Monitor function timers by setting parameters o4-01 through o4-12 to 0, and parameter o4-13 to 1.

◆ General Safety

■ Supplemental Safety Information

General Precautions
• The diagrams in this manual may be indicated without covers or safety shields to show details. Replace the covers or shields before operating the drive and run the drive according to the instructions described in this manual. • Any illustrations, photographs, or examples used in this manual are provided as examples only and may not apply to all products to which this manual is applicable. • The products and specifications described in this manual or the content and presentation of the manual may be changed without notice to improve the product and/or the manual. • When ordering a new copy of the manual due to damage or loss, contact your Magnetek representative or the nearest Magnetek sales office and provide the manual number shown on the front cover. • If nameplate becomes worn or damaged, order a replacement from your Magnetek representative or the nearest Magnetek sales office.

⚠ WARNING

Read and understand this manual before installing, operating or servicing this drive. The drive must be installed according to this manual and local codes.

The following conventions are used to indicate safety messages in this manual. Failure to heed these messages could result in serious or fatal injury or damage to the products or to related equipment and systems.

⚠ DANGER

Indicates a hazardous situation, which, if not avoided, will result in death or serious injury.

⚠ WARNING

Indicates a hazardous situation, which, if not avoided, could result in death or serious injury.

WARNING! *may also be indicated by a bold key word embedded in the text followed by an italicized safety message.*

⚠ CAUTION

Indicates a hazardous situation, which, if not avoided, could result in minor or moderate injury.

CAUTION! *may also be indicated by a bold key word embedded in the text followed by an italicized safety message.*

NOTICE

Indicates a property damage message.

NOTICE: *may also be indicated by a bold key word embedded in the text followed by an italicized safety message.*

■ Safety Messages

⚠ DANGER

Heed the safety messages in this manual.

Failure to comply will result in death or serious injury.

The operating company is responsible for any injuries or equipment damage resulting from failure to heed the warnings in this manual.

Electrical Shock Hazard

Do not connect or disconnect wiring or service the drive while the power is on.

Failure to comply will result in death or serious injury.

Before servicing, disconnect all power to the equipment. The internal capacitor remains charged even after the power supply is turned off. After shutting off the power, wait for at least the amount of time specified on the drive before touching any components.

⚠ WARNING

Sudden Movement Hazard

The drive system or elevator may start unexpectedly upon application of power, resulting in death or serious injury.

- Clear all personnel from the drive, motor, and machine area before applying power.
- Secure covers, couplings, shaft keys, and machine loads before applying power to the drive.

Ensure there are no short circuits between the main circuit terminals (R/L1, S/L2, and T/L3) or between the ground and main circuit terminals before restarting the drive.

Failure to comply may result in serious injury or death and will cause damage to equipment.

System may start unexpectedly upon application of power when the Auto-restart function is enabled resulting in death or serious injury.

Use care when enabling Auto-restart as this function may cause unintended start of the elevator.

Use parameter S1-12 to enable/disable automatic switching of the Motor Contactor Control output signal during autotuning.

When using setting S1-12 = 1 or 2, ensure that the multi-function output terminals are properly wired and in the correct state before setting parameter S1-12.

Failure to comply could result in damage to the drive, serious injury or death.

Electrical Shock Hazard

Do not attempt to modify or alter the drive in any way not explained in this manual.

Magnetek is not responsible for damage caused by modification of the product made by the user. Failure to comply could result in death or serious injury from operation of damaged equipment.

Do not operate equipment with covers removed.

Failure to comply could result in death or serious injury.

The diagrams in this section may show drives without covers or safety shields to show details. Be sure to reinstall covers or shields before operating the drives and run the drives according to the instructions described in this manual.

⚠ WARNING

When a drive is running a PM motor, voltage continues to be generated at the motor terminals after the drive is shut off while the motor coasts to stop. Take the precautions described below to prevent shock and injury:

- In applications where the machine can still rotate even though the drive has fully stopped a load, install a switch to the drive output side to disconnect the motor and the drive.
- Do not allow an external force to rotate the motor beyond the maximum allowable speed or to rotate the motor when the drive has been shut off.
- Wait for at least the time specified on the warning label after opening the load switch on the output side before inspecting the drive or performing any maintenance.
- Do not open and close the load switch while the motor is running, as this can damage the drive.

If the motor is coasting, make sure the power to the drive is turned on and the drive output has completely stopped before closing the load switch.

Do not connect or disconnect wiring to the drive or motor while the power is on.

Failure to comply will result in death or serious injury. Before servicing, disconnect all power to the equipment. The internal capacitor remains charged even after the power supply is turned off. The charge indicator LED will extinguish when the DC bus voltage is below 50 Vdc. To prevent electric shock, wait at least five minutes after all indicators are OFF and measure the DC bus voltage level to confirm safe level.

Do not operate equipment with covers removed.

Failure to comply could result in death or serious injury.

The diagrams in this section may show drives without covers or safety shields to show details. Be sure to reinstall covers or shields before operating the drives and run the drives according to the instructions described in this manual.

Do not perform work on the drive while wearing loose clothing, jewelry or without eye protection.

Failure to comply could result in death or serious injury.

Remove all metal objects such as watches and rings, secure loose clothing, and wear eye protection before beginning work on the drive.

Do not change wiring, remove covers, connectors or options cards, or attempt to service the drive with power applied to the drive.

Failure to comply could result in death or serious injury. Disconnect all power to the drive and check for unsafe voltages before servicing.

Do not allow unqualified personnel to use the equipment.

Failure to comply could result in death or serious injury.

Maintenance, inspection, and replacement of parts must be performed only by authorized personnel familiar with installation, adjustment and maintenance of AC drives.

Fire Hazard

Drive Short-Circuit Current Rating

Install adequate branch circuit protection according to applicable local codes and this Installation Manual.

Failure to comply could result in fire and damage to the drive or injury to personnel.

The device is suitable for use on a circuit capable of delivering not more than 100,000 RMS symmetrical amperes, 240 Vac maximum (200 V class) and 480 Vac maximum (400 V class), and 600 Vac maximum (600 V class) when protected by branch circuit protection devices specified in this manual.

⚠ WARNING

Applications using a braking option should wire a thermal relay so that the output contactor opens when the thermal relay trips.

Inadequate braking circuit protection could result in death or serious injury by fire from overheating resistors.

Do not use improper combustible materials.

Failure to comply could result in death or serious injury by fire.
Attach the drive to metal or other noncombustible material.

NOTICE

Equipment Hazard

Do not modify the drive circuitry.

Failure to comply could result in damage to the drive and will void warranty.

Magnetek is not responsible for any modification of the product made by the user. This product must not be modified.

Failure to comply could result in damage to the drive or braking circuit.

Observe proper electrostatic discharge procedures (ESD) when handling the drive, circuit boards, and option cards.

Failure to comply may result in ESD damage to the drive circuitry.

Do not operate damaged equipment.

Failure to comply could result in further damage to the equipment.
Do not connect or operate any equipment with visible damage or missing parts.

Do not lift the drive up while the cover is removed.

This can damage the terminal board and other components.

Do not expose the drive to halogen group disinfectants.

Failure to comply may cause damage to the electrical components in the drive.
Do not pack the drive in wooden materials that have been fumigated or sterilized.
Do not sterilize the entire package after the product is packed.

■ General Application Precautions

Motor Selection

Drive Capacity

The output current should not exceed 150% of the drive rated current. Select a drive that can output enough current when accelerating a load at 100%.

For specialized motors, make sure that the motor rated current is less than the rated output current for the drive.

Starting Torque

The startup and acceleration characteristics of the motor are restricted to the drive's overload current rating (150% rated current for 60 s).

The overload rating for the drive determines the starting and accelerating characteristics of the motor. Expect lower torque than when running from line power. To get more starting torque, use a larger drive or increase both the motor and drive capacity.

Stopping
Fast Stop

When the drive faults out, a protective circuit is activated and drive output is shut off. This, however, does not stop the motor immediately. A mechanical brake may be required to stop the motor if Fast Stop deceleration is insufficient.

Mechanical Brake

A mechanical brake is required to prevent the elevator from free falling during a drive fault condition.

Repetitive Starting/Stopping

Elevators and other applications with frequent starts and stops often approach 150% of their rated current values. Heat stress generated from repetitive high current will shorten the life span of the IGBTs. The expected lifetime for the IGBTs is about 3 million start and stop cycles with a default carrier frequency of 2 kHz (LU2M0346, 2M0415, 4M0450 to 4M0605, 5M0099 to 5M0200), 5 kHz (LU4M0112 to 4M0370, 5M0077), or 8 kHz (LU2M0008 to 2M0115, 4M0005 to 4M0091, 5M0003 to 5M0062) and a 150% peak current.

Magnetek recommends lowering the carrier frequency, particularly when audible noise is not a concern. It is beneficial to reduce the load, increase the acceleration and deceleration times, or switch to a larger drive to help keep peak current levels under 150%. Be sure to check the peak current levels when starting and stopping repeatedly during the initial test run, and make adjustments accordingly.

Installation
Enclosure Panels

Keep the drive in a clean environment by installing the drive in an enclosure panel or selecting an installation area free of airborne dust, lint, and oil mist. Be sure to leave the required space between drives to provide for cooling, and take proper measures so the ambient temperature remains within allowable limits and keep flammable materials away from the drive. Magnetek offers protective designs for drives that must be used in areas subjected to oil mist and excessive vibration. Contact Magnetek or your Magnetek agent for details.

Installation Direction

Install the drive upright as specified in the manual. *Refer to Installation on page 214* for more information on installation. Failure to comply may damage the drive due to improper cooling.

Settings
DC Injection Braking

Excessive current during DC Injection Braking and excessive duration of DC Injection Braking can cause motor overheating. Adjust DC Injection parameters to prevent motor overheating.

Acceleration/Deceleration Ramp

Acceleration and deceleration times are affected by the amount of torque generated by the motor, the load torque, and the inertia moment. Set a longer accel/decel time when Stall Prevention is enabled. The accel/decel times are lengthened for as long as the Stall Prevention function is in operation. Install one of the available braking options or increase the capacity of the drive for faster acceleration and deceleration.

General Handling
Selecting a Molded Case Circuit Breaker or Ground Fault Circuit Interrupter (GFCI)

Select an appropriate GFCI. This drive can cause a residual current with a DC component in the protective earthing conductor. Where a residual current operated protective or monitoring device is used for protection in case of direct or indirect contact, always use an GFCI of type B according to IEC/EN 60755.

Select a MCCB (Molded Case Circuit Breaker) with a rated current that is 1.5 to 2 times higher than the rated current of the drive in order to avoid nuisance trips caused by harmonics in the drive input current.

WARNING! *Sudden Movement Hazard. Install a properly controlled contactor on the input-side of the drive for applications where power should be removed from the drive during a fault condition. Improper equipment sequencing could result in death or serious injury.*

Fire Hazard. Shut off the drive with a magnetic contactor (MC) when a fault occurs in any external equipment such as braking resistors. Failure to comply may cause resistor overheating, fire, and injury to personnel.

To get the full performance life out of the electrolytic capacitors and circuit relays, refrain from switching the drive power supply off and on more than once every 30 minutes. Frequent use can damage the drive. Use the drive to stop and start the motor.

Inspection and Maintenance

WARNING! *Electrical Shock Hazard. Capacitors in the drive do not immediately discharge after shutting off the power. Wait for at least the amount of time specified on the drive before touching any components after shutting off the power. Failure to comply may cause injury to personnel from electrical shock.*

CAUTION! *Burn Hazard. Because the heatsink can get very hot during operation, take proper precautions to prevent burns. When replacing the cooling fan, shut off the power and wait at least 15 minutes to be sure that the heatsink has cooled down. Failure to comply may cause burn injury to personnel.*

WARNING! *Electrical Shock Hazard. When a drive is running a PM motor, voltage continues to be generated at the motor terminals after the drive is shut off while the motor coasts to stop. Take the precautions described below to prevent shock and injury:*

- In applications where the machine can still rotate after the drive has fully stopped a load, install a load disconnect switch on the drive output side to disconnect the motor and the drive.
- Do not allow an external force to rotate the motor beyond the maximum allowable speed or to rotate the motor when the drive is powered off.
- Wait for at least the time specified on the warning label after opening the load switch on the output side before inspecting the drive or performing any maintenance.
- Do not open and close the load switch while the motor is running.
- If the motor is coasting, make sure the power to the drive is turned on and the drive output has completely stopped before closing the load switch to reconnect the drive to the motor.

Wiring

Magnetek recommends using ring terminals on all drive models for UL/cUL compliance. Use only the tools recommended by the terminal manufacturer for crimping.

Transporting the Drive

NOTICE: *Never steam clean the drive. During transport, keep the drive from coming into contact with salts, fluorine, bromine, phthalate ester, and other such harmful chemicals. Failure to comply may damage the drive.*

■ Motor Application Precautions

Standard Induction Motors

Insulation Tolerance

NOTICE: *Consider motor voltage tolerance levels and motor insulation in applications with an input voltage of over 440 V or particularly long wiring distances.*

NOTICE: *Ensure that the motor is suitable for inverter duty and/or the motor service factor is adequate to accommodate the additional heating with the intended operating conditions. A motor connected to a PWM drive may operate at a higher temperature than a utility-fed motor and the operating speed range may reduce motor cooling capacity.*

High-Speed Operation

Mechanical damage may occur with the motor bearings and dynamic balance of the machine when operating a motor beyond its rated speed. Operate the motor within specifications to prevent motor damage.

Low-Speed Range

The cooling fan of a standard motor should sufficiently cool the motor at the rated speed. As the self-cooling capability of such a motor reduces with the speed, applying full torque at low speed will possibly damage the motor. Reduce the load torque as the motor slows to prevent motor damage from overheat. Use a motor designed specifically for operation with a drive when 100% continuous torque is needed at low speeds.

Torque Characteristics

Torque characteristics differ compared to operating the motor directly from line power. The user should have a full understanding of the load torque characteristics for the application.

Vibration and Shock

The drive allows selection of high carrier PWM control and low carrier PWM control. Selecting high carrier PWM can help reduce motor oscillation.

If resonance occurs, install shock-absorbing rubber mounts around the base of the motor and utilize the Jump frequency selection to prevent continuous operation in the resonant frequency ranges.

Audible Noise

Noise created during run varies by the carrier frequency setting. When using a high carrier frequency, audible noise from the motor is comparable to the motor noise generated when running from line power. Operating above the rated r/min, however, can create unpleasant motor noise.

Precautions for PM Motors

NOTICE: *Damage to Equipment. Improper sequencing of output motor circuits could result in damage to the drive. Do not connect electromagnetic switches or magnetic contactors to the output motor circuits without proper sequencing. Do not open the main circuit between the drive and the motor while the PM motor is rotating.*

- *Contact Magnetek or your Magnetek agent if you plan to use any PM motor not endorsed by Magnetek.*
- *When using a holding brake, release the brake prior to starting the motor. Failure to set the proper timing can result in speed loss.*

WARNING! *Sudden Movement Hazard. Use the Initial Pole Search Status Signal (H2-□□= 61) to interlock the brake to ensure the brake is not released before the Initial Magnetic Pole Search is completed. Failure to comply may cause inadvertent elevator movement resulting in serious injury.*
This safety message is applicable under these conditions:

- *When applying a PM motor, with an external brake sequence, and the PG-F3 option is not being used.*

WARNING! *Electrical Shock Hazard. The motor must be at a complete stop before performing any maintenance, inspection, or wiring.*

- *With a PM motor, drive output must be fully interrupted when the power is shut off and the motor is still rotating.*
  Failure to comply can result in personal injury from electrical shock.

■ Drive Label Warnings

Always heed the warning information listed in ***Figure 95*** in the position shown in ***Figure 96***.

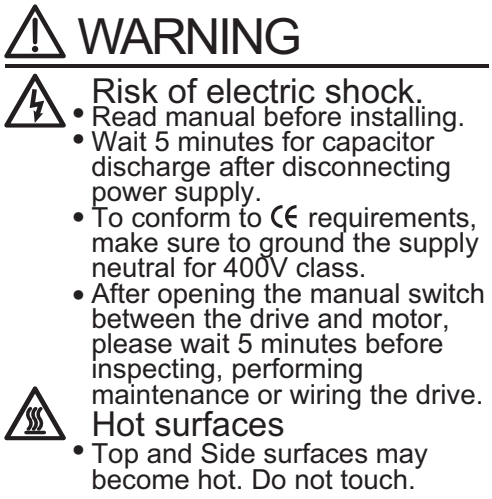


Figure 95 Warning Information

Figure 96 Warning Information Position

■ Warranty Information

Restrictions

The drive is not designed or manufactured for use in devices or systems that may directly affect or threaten human lives or health.

Customers who intend to use the product described in this manual for devices or systems relating to transportation, health care, space aviation, atomic power, electric power, or in underwater applications must first contact their Magnetek representatives or the nearest Magnetek sales office.

WARNING! *Injury to Personnel. This product has been manufactured under strict quality-control guidelines. However, if this product is to be installed in any location where failure of this product could involve or result in a life-and-death situation or loss of human life or in a facility where failure may cause a serious accident or physical injury, safety devices must be installed to minimize the likelihood of any accident.*

M1000 AC Elevator Drive

Data subject to change without notice.

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