MAGNETEK
UNCOMMON POWER

HPV 600 AC Elevator Drive Technical Manual

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Current Ratings

North American

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

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

European

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

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

For more information on altitude, temperature, and carrier frequency derating, see page 6.
** Cube size dimensions, mounting holes, and weights are shown in page 154.*
*** From more information on model numbers, see page 6.*

Drive Specifications

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

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

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

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

Digital Outputs
Two (2) programmable Form-C relays.
- 2A at 30VDC / 250VAC (inductive load)
- Update Rate: 2 msec.

Four (4) programmable opto-isolated open collectors.
- Voltage: 50 Volts DC (max.)
- Capacity: 150 mA
- Update Rate: 2 msec.

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

Analog Outputs
with optional analog output option card

Two (2) programmable differential outputs.
- Voltage: ± 10 Volts DC
- Capacity: 10 mA
- Resolution: 12 Bit
- Update Rate: 2 msec.

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

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

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

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

Drive Derating

Altitude Derating

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

Derating for Carrier Frequency

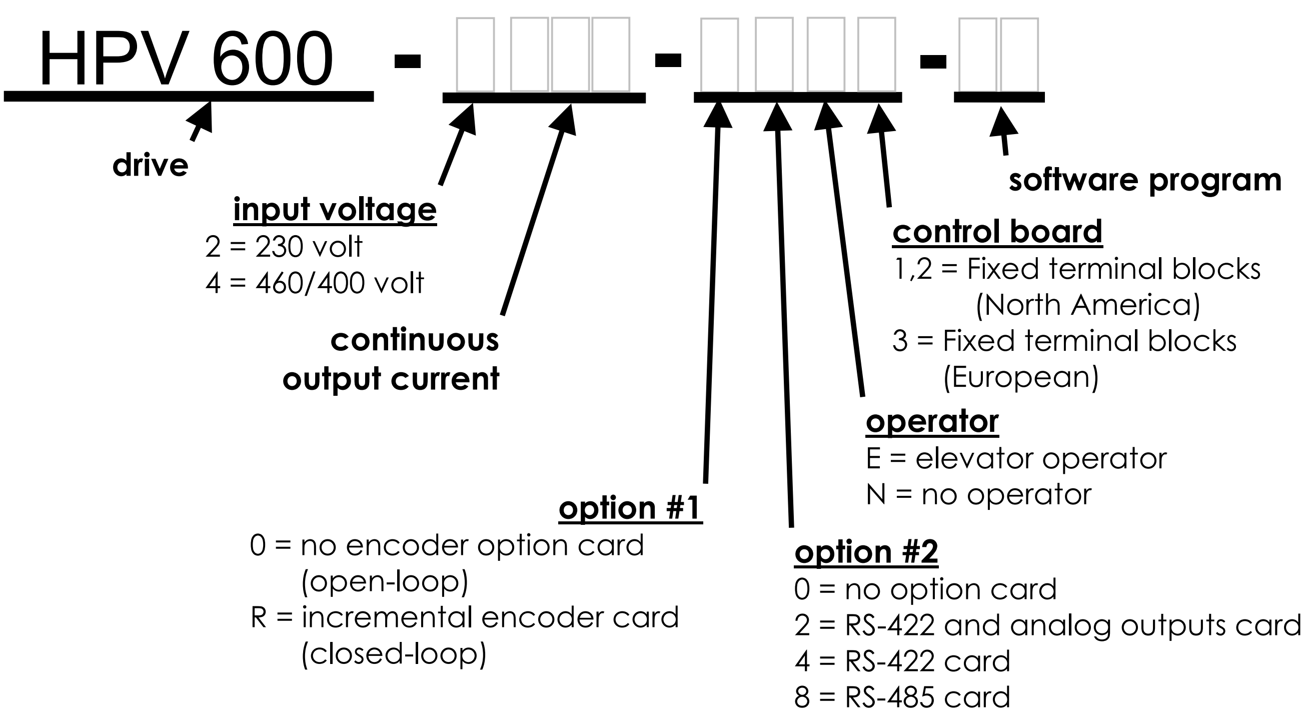
Control ratings apply for carrier frequencies up to and including 10 kHz. Above that linearly derate both the continuous and peak current levels by 5% for each 1kHz.

Derating for Single Phase Input Power

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

Drive Model Number

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



HPV 600 Model Numbers

General Start-Up Procedure

The following is a recommended start-up procedure:

1. The HPV 600 is thoroughly tested at the factory. Verify the drive has been installed without shipping and installation damage.

2. Review the HPV 600 technical manual, shipped with the drive.

3. Verify the proper drive model numbers and voltage ratings as specified on the purchase order.

4. Verify the drive has been installed in accordance with the guidelines detailed below:

   Location of the HPV 600 is important for proper operation of the drive and normal life expectancy. The installation should comply with the following:
   - DO NOT mount in direct sunlight, rain or extreme (condensing) humidity.
   - DO NOT mount where corrosive gases or liquids are present.
   - AVOID exposure to vibration, airborne dust or metallic particles.
   - DO NOT allow the ambient temperature around the control to exceed the ambient temperature listed in the specification.
   - Mount control vertically using mounting holes provided by Magnetek.
   - Allow at least 7cm (2.5 in) clearance above and at least 7 to 13 cm (2.5 to 5 in) clearance below the unit.
   - Allow at least 3 cm (1 in) clearance to either side of the drive.
   - Separate grounded metal conduit is required for input, output and control wiring.

   The unit should be installed in an open ventilated area where free air can be circulated around the control. The installation should comply with the following:
   - When necessary, the cooling should be provided by using filtered air.
   - If the cooling air coming inside the control cabinet contains airborne dust, filter the incoming air as required and clean the cooling surface of the HPV 600 regularly using compressed air and a brush. An uncleaned heatsink operates at an efficiency less than that of cooling design specifications. Therefore, drive may fault on thermal protection if heatsink is not cleaned periodically.

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

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

separate conduits from power and motor wiring.

6. Verify that the input voltage matches the drive's rating.

7. Verify that the motor is wired for the application voltage and amperage.

8. Tighten all of the three-phase power and ground connections. Check that all control and signal terminations are also tight. As they sometimes come loose during the shipment process.

Pre-Power Check

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

- Inspect all equipment for signs of damage, loose connections, or other defects.
- Ensure the three phase line voltage is within ±10% of the nominal input voltage. Also verify the frequency (50 or 60 Hz) is correct for the elevator control system.
- Remove all shipping devices.
- Ensure all electrical connections are secure.
- Ensure that all transformers are connected for proper voltage.

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

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

9. Insure the DC Choke link is in place, if a DC choke is NOT used.

10. Insure a Dynamic Braking Resistor is connected to the drive, see page 154.

11. Measure and verify transformer primary and secondary volts

12. Check for balanced Vac from phase to ground.

13. Verify the accuracy of the drive's input line-to-line voltage in parameter INPUT L-L VOLTS (A4)

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

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

Open-loop Start-Up Procedure

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

Motor Parameter Set-up

1) Select one of the four default motors (listed in Table 1) for the MOTOR ID (A5) parameter (or select a valid motor ID, if available).

   These typical V/f patterns are selectable via the MOTOR ID (A5) are given in the following table. It is best to start with one of the default V/Hz patterns.

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

Table 1 - V/Hz patterns via Motor ID

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

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

Table 2 - Motor Poles Reference

   - Rated Motor Speed at full load in RPM (RATED MTR SPEED (A5))

     Note: The rated motor rpm must be full load speed. If synchronous speed is given, the motor rated rpm can be estimated by:
     - 97.5% of synchronous speed for Nema type B motor design
     - 94% of synchronous speed for Nema type D motor design

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

Table 3 - Synchronous Motor Speeds Reference

3) Use the default value of 2.5% for Stator Resistance (STATOR RESIST(A5))

   NOTE: if operation issues, the stator resistance can be measured, refer the procedure detailed on page 16.

Hoistway Parameter Set-up

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

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

Verify Parameters at Default

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

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

Low speed inspection mode

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

Adjust Motor RPM (Slip)

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

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

High speed mode

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

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

Motor RPM Adjustment Procedure

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

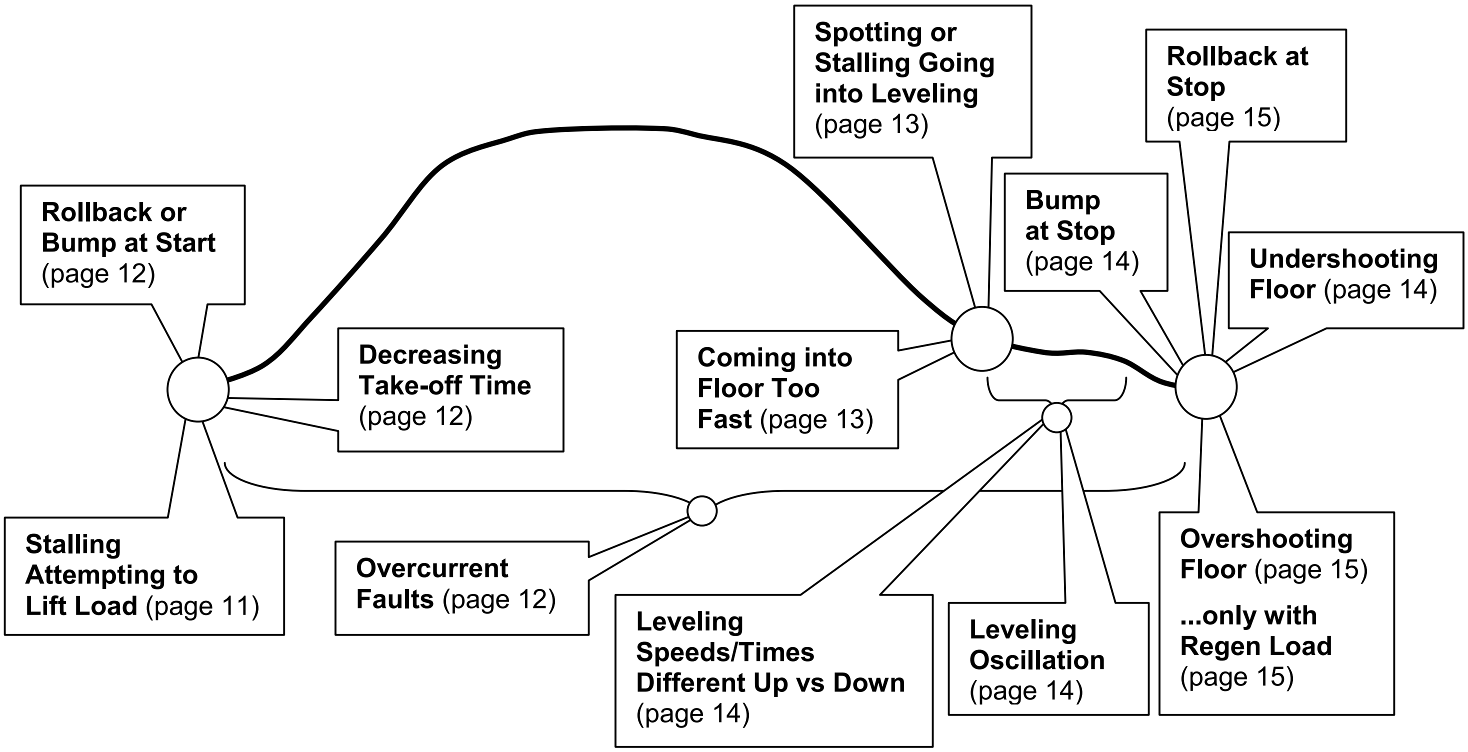
  OR
  - time one complete rotation of the sheave and record the time (in seconds) it takes for exactly one sheave rotation
- Run the car in the DOWN direction
  - measure and record the car speed using a hand tach on the sheave (wait for speed to stabilize)

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

Note: If an OVERCURR FLT occurs, refer to “Overcurrent Faults” in the Performance Adjustments section (page 12)

Note: If stalling occurs when attempting to lift the load, refer to “Stalling Attempting to Lift Load” in the Performance Adjustments section (page 11). Additionally, sometimes the adjustments made to help with stalling attempting to lift load can be set to default once the RATED MTR SPEED (A5) parameter is adjusted properly.

Performance Adjustments



Stalling Attempting to Lift Load

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

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

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

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

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

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

- Measure the stator resistance by completing the procedure detailed on page 16.
- If still stalling after measuring stator resistance, additionally increase STATOR RESIST (A5) parameter (increase increments of 0.1 and observe performance)

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

- Complete the Mid-volts Adjustment Procedure detailed on page 16.
- If still stalling after completing mid-volts adjustment procedure, additionally increase MOTOR MID VOLTS (A5) parameter (increase increments of 0.5 and observe performance)
- Note: Avoid increasing the MOTOR MID VOLTS (A5) parameter too high, since this effects stopping performance (i.e. coming into the floor too fast) or can create Overcurrent Faults

Rollback or Bump at Start

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

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

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

<u>Verify Mechanical Brake Timing</u>

- The mechanical brake should be picked during the DC injection start time (DC START TIME (A1) parameter), see "Mechanical Brake Timing at Start" on page 17.

<u>Increase DC Injection Start Level</u>

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

Decreasing Take-off Time

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

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

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

<u>Increase DC Injection Start Level</u>

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

<u>Increase the Accel S-curve parameters</u>

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

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

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

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

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

Overcurrent Fault

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

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

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

<u>Verify Mechanical Brake Timing</u>

- The mechanical brake should be lifted before the drive is given a non-zero speed command
- The mechanical brake should be picked during the DC injection start time (DC START TIME (A1) parameter) , see "Mechanical Brake Timing at Start" on page 17.

<u>Verify Torque Limits</u>

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

Decrease the S-curve Parameters

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

Verify Motor Min/Mid Voltage Parameters

- MOTOR MID VOLTS (A5) and MOTOR MIN VOLTS (A5) parameters should usually be set at default, see Table 1 on page 9.
- These parameters would only be adjusted slightly with certain issues (see Stalling Attempting to Lift Load (page 11); Spotting or Stalling Going into Leveling (page 13); or Overshooting Floor only with Regen Load (page 16)).

Measuring the Stator Resistance

- Complete the procedure detailed on page 16.

Decrease the Torque Boost

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

Spotting or Stalling Going into Leveling

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

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

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

Decrease Decel Jerk Out and Decel Rates

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

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

Increase the Torque Boost Gain Parameter

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

Measure the Stator Resistance

- Measure the stator resistance by completing the procedure detailed on page 16 and observe performance.

Adjust the Motor Mid Volts parameter

- Complete the Mid-volts Adjustment Procedure detailed on page 16 and observe performance.
- Note: Avoid increasing the MOTOR MID VOLTS (A5) parameter too high, since this effects stopping performance (i.e. coming into the floor too fast) or can create Overcurrent Faults

Coming into Floor Too Fast

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

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

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

Decrease Decel Jerk Out and Decel Rates

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

Decrease the Motor Mid Voltage Parameter

- MOTOR MID VOLTS (A5) and MOTOR MIN VOLTS (A5) parameters should usually be set at default, see Table 1 on page 9.
- These parameters would only be adjusted slightly with certain issues (see Stalling Attempting to Lift Load (page 11); Spotting or Stalling Going into Leveling (page 13); or Overshooting Floor only with Regen Load (page 16)).
- Decrease MOTOR MID VOLTS (A5) parameter (decrease increments of 0.5 and observe performance)
- Note: When decreasing the Motor Mid Volts parameter, watch that the drive does not start stalling (especially with full-load)

Leveling Times Different Up vs Down

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

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

Verify Slip Compensation parameters

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

Complete Motor RPM Adjustment Procedure

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

Leveling Oscillation

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

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

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

Increase the Hunt Prevention Time Parameter

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

Decrease the Distortion Loop Gain Parameters

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

Bump at Stop

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

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

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

Verify Mechanical Brake Timing

The mechanical brake should be dropped during the DC injection stop time (DC STOP TIME (A1) parameter), see "Mechanical Brake Timing at Stop" on page 17.

Decrease Decel Jerk Out Rate

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

Decrease DC Injection Stop Frequency

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

Undershooting Floor

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

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

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

Verify Mechanical Brake Timing

The mechanical brake should be dropped during the DC injection stop time (DC STOP TIME (A1) parameter), see "Mechanical Brake Timing at Stop" on page 17.

Increase Leveling Speed

- Increase leveling speed and observe performance

Increase Decel Jerk Out and Decel Rates

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

Overshooting Floor

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

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

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

Verify Mechanical Brake Timing

The mechanical brake should be dropped during the DC injection stop time (DC STOP TIME (A1) parameter), see "Mechanical Brake Timing at Stop" on page 17.

Decrease Leveling Speed

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

Increase Decel Jerk Out and Decel Rates

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

Decrease the Motor Mid Voltage Parameter

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

Overshooting Floor only with Regen Load

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

- Verify the car DOES NOT overshoot with balanced car and empty-down…if it does refer to Overshooting Floor section on page 15.
- If only overshoots empty-up, increase MOTOR MIN VOLTS (A5) in increments of 0.1 V and observe performance.

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

Rollback at Stop

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

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

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

Verify Mechanical Brake Timing

The mechanical brake should be dropped during the DC injection stop time (DC STOP TIME (A1) parameter) , see “Mechanical Brake Timing at Stop” on page 17.

Decrease Decel Jerk Out Rate

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

Increase DC Injection Stop Level

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

Measuring Stator Resistance Procedure

The stator resistance value can be measured by:

- Remove any two motor wires directly at the terminals of the motor. Since the stator resistance is low, the resistance needs to be measured at the motor terminals in order to avoid the resistance of the motor wires
- Connect the two meter leads together and measure the resistance of the meter leads in ohms (*meter resistance*). Since the stator resistance is low, the resistance of the meter leads need to be taken into account.
- Measure the resistance between the two motor terminals in ohms (*stator resistance*)
- With the motor nameplate values entered in the A5 menu, use the BASE IMPEDANCE (D2) value (in ohms) to calculate the STATOR RESIST (A5) parameter (as a percentage of base impedance):

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

Mid-volts Adjustment Procedure

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

Mechanical Brake Timing at Start

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

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

Mechanical Brake Timing at Stop

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

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

Closed-loop Start-Up Procedure

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

Encoder Set-up

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

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

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

   Electrical Considerations
   - If possible, insulate both the encoder case and shaft from the motor.
   - Use twisted pair cable with shield tied to chassis ground at drive end
   - Use limited slew rate differential line drivers.
   - Do not allow capacitors from internal encoder electronics to case.
   - Do not exceed the operating specification of the encoder/drive.
   - Use the proper encoder supply voltage and use the highest possible voltage available. (i.e. HPV 600 - 12VDC preferred)

   Mechanical Considerations
   - Use direct motor mounting without couplings.
   - Use hub or hollow shaft encoder with concentric motor stub shaft.
   - If possible, use a mechanical protective cover for exposed encoders.

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

Motor Parameter Set-up

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

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

Hoistway Parameter Set-up

4) Enter / Verify The hoistway parameters:

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

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

Low speed inspection mode

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

High speed mode

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

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

Adaptive Tune

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

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

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

The adaptive tune will estimate:

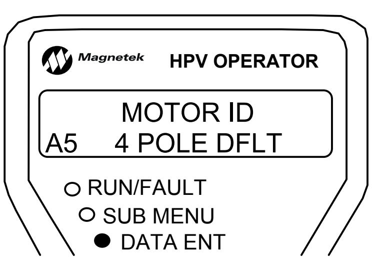
- the motor's percent no load current when the motor torque is below 20%.
- the motor's rated rpm when the motor torque is above 30%.

Using the Adaptive Tune to Obtain Maximum Motor Performance

The following is a step-by-step procedure to optimize the window around which the adaptive tune will estimate its two values.
NOTE: Although the listed speeds are recommended, the adaptive tune procedure can be ran initially at lower speeds, as long as the speed is greater than 10% of contract speed.

Initial Set-up

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

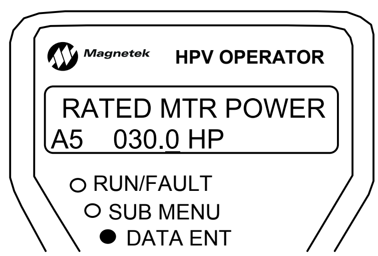


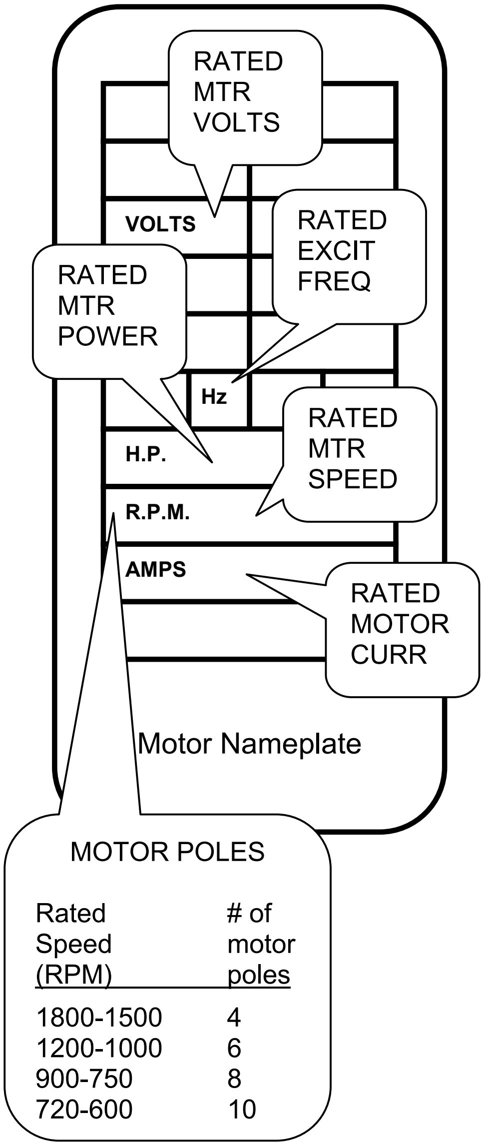
The default motor selections for the motor id will place a zero values in the motor nameplate parameters. This selection will also load nominal values for the other motor parameters listed below.

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

Motor ID Parameters

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

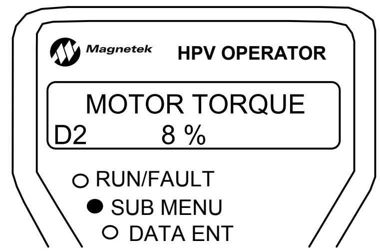




Tuning Motor No-Load Current

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

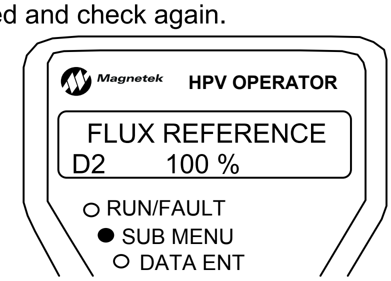
During these runs verify under DISPLAY MENU - POWER DATA D2 that the MOTOR TORQUE is between ±15%. If the value is larger then ±15% the car is not balanced correctly.



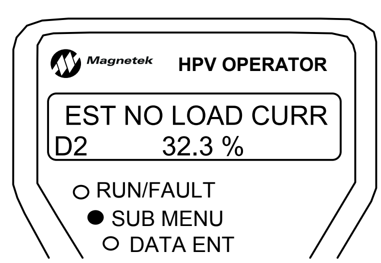
NOTE: If you are having problems getting the motor torque under 15% the cause may be:

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

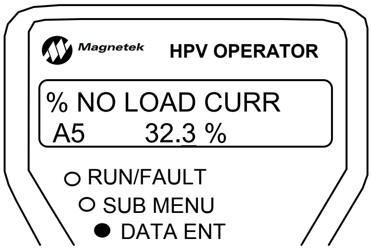
- Also, verify that the FLUX REFERENCE is 100%. If the value is not equal to 100% reduce the speed to less then 70% contract speed and check again.



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



Enter this estimated value into the motor parameter.

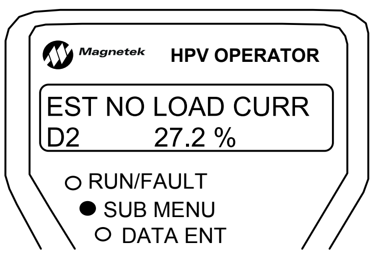


- Continue iterating the above two steps until the two values are within 2%. If the values do not converge after two iterations, verify the information entered in the initial set-up is correct.
- After the values converge, again verify the MOTOR TORQUE < 15% and the FLUX REFERENCE = 100%.

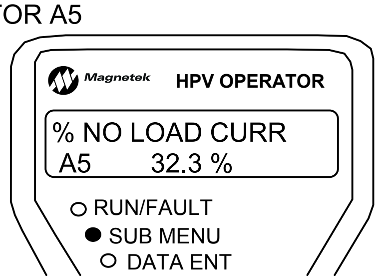
Tuning Motor's Flux Saturation Curve

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

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

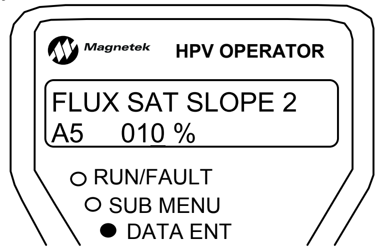


- Compare the displayed value EST NO LOAD CURR with the value entered for % NO LOAD CURR under the ADJUST MENU - MOTOR A5



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

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



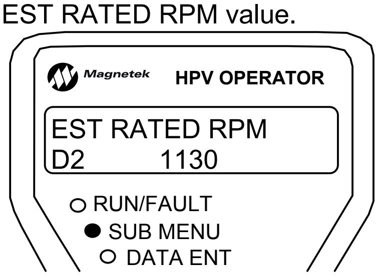
NOTE: If the EST NO LOAD CURR and % NO LOAD CURR are within 2% of each other, then continue on to Tuning the Rated Motor RPM. Continue iterating FLUX SAT SLOPE 2 in 10% increments until the EST NO LOAD CURR and % NO LOAD CURR are within 2% of each other.

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

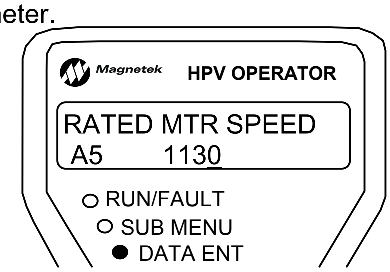
Tuning Rated Motor RPM

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

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



Enter this estimated value into the motor parameter.



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

Estimating System Inertia

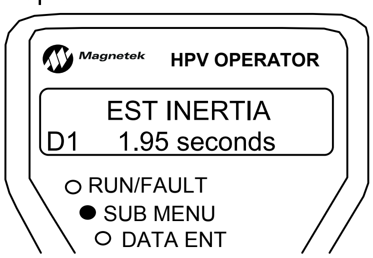
The HPV 600 software can be used to calculate the inertia of the entire elevator, which is used for accurate tuning of the speed regulator.

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

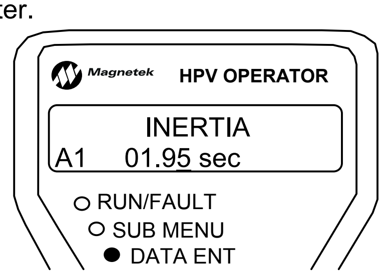
Using the Software to Estimate the System's Inertia

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

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

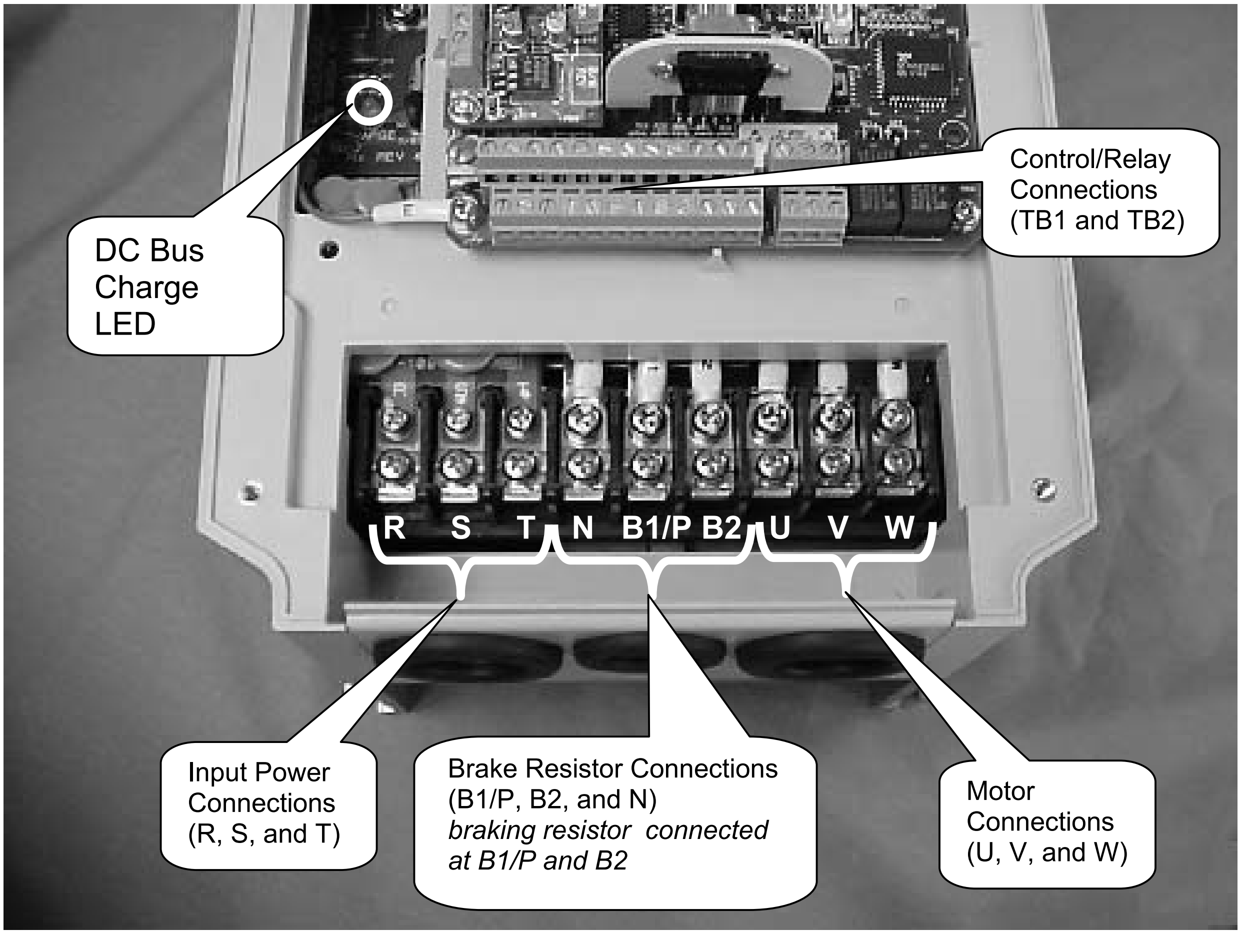


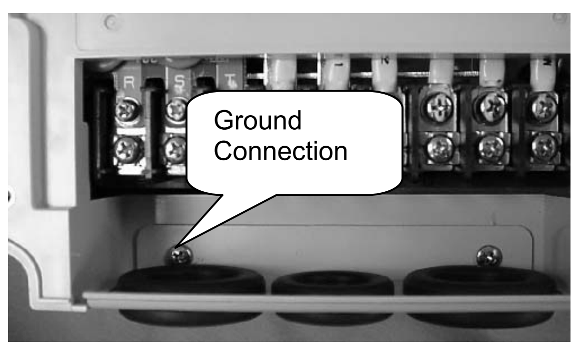
Average the two values and enter the DRIVE A1 parameter.



Terminals

Terminal Layout A-cube





Remember when servicing the HPV 600: Hazardous voltages may exist in the drive circuits even with drive circuit breaker in off position.

IMPORTANT: Use extreme caution: Do not touch any circuit board, the drive, or motor electrical connections without making sure that the unit is properly grounded and that no high voltage is present.

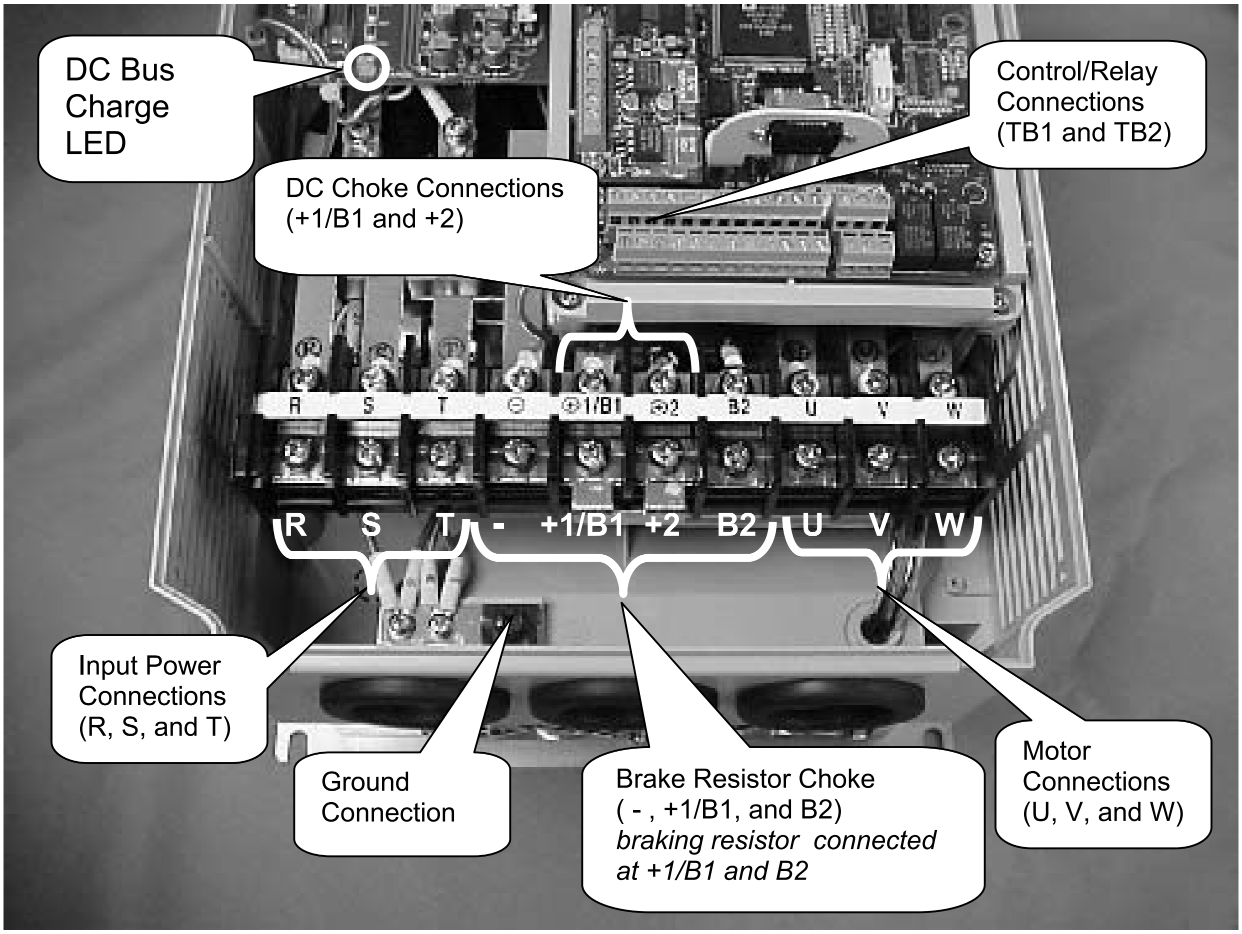
NEVER attempt maintenance unless:

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

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

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

Terminal Layout B-cube



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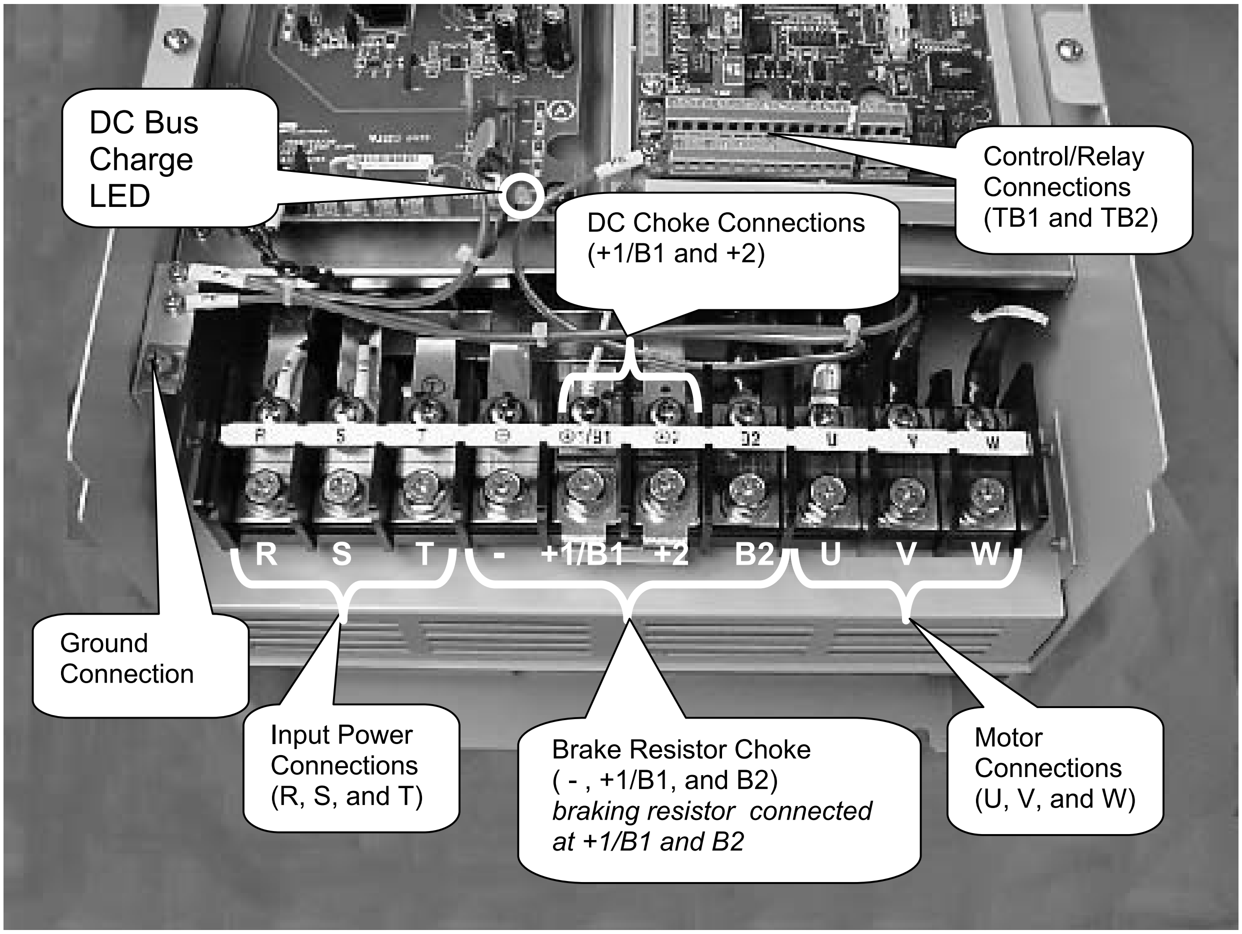
Terminal Layout C-cube



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IMPORTANT: Use extreme caution: Do not touch any circuit board, the drive, or motor electrical connections without making sure that the unit is properly grounded and that no high voltage is present.

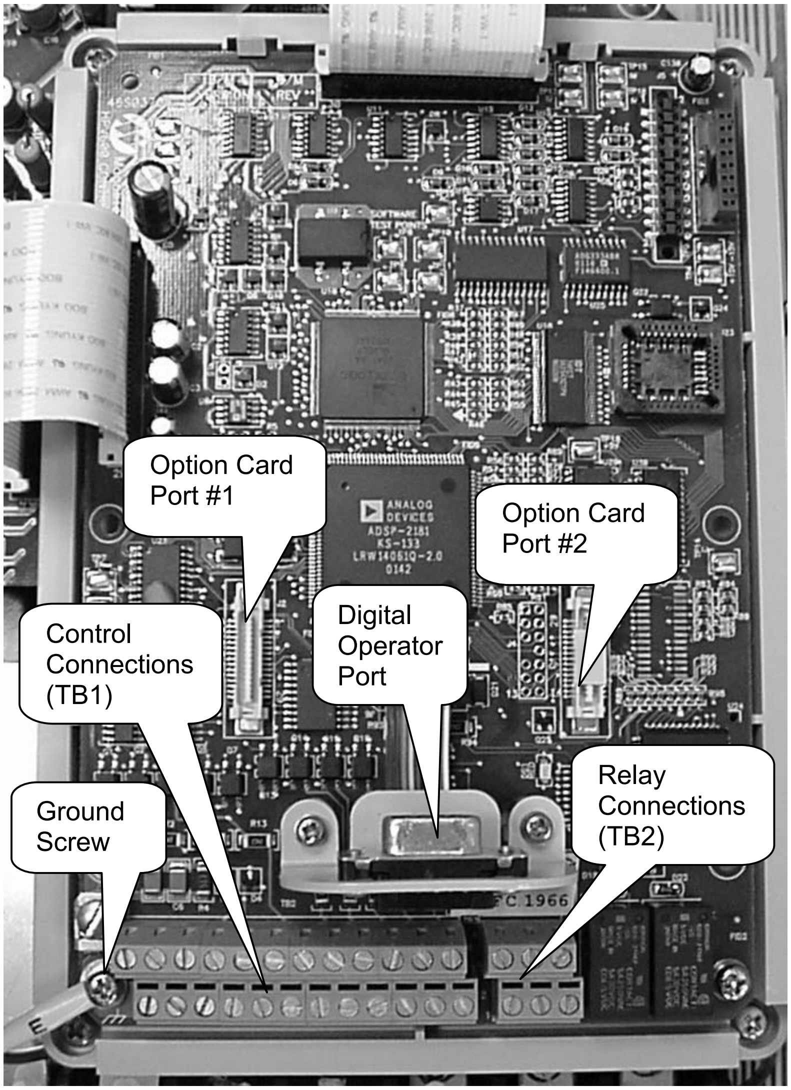
NEVER attempt maintenance unless:

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

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

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

Control Board Layout



Remember when servicing the HPV 600: Hazardous voltages may exist in the drive circuits even with drive circuit breaker in off position.

IMPORTANT: Use extreme caution: Do not touch any circuit board, the drive, or motor electrical connections without making sure that the unit is properly grounded and that no high voltage is present.

NEVER attempt maintenance unless:

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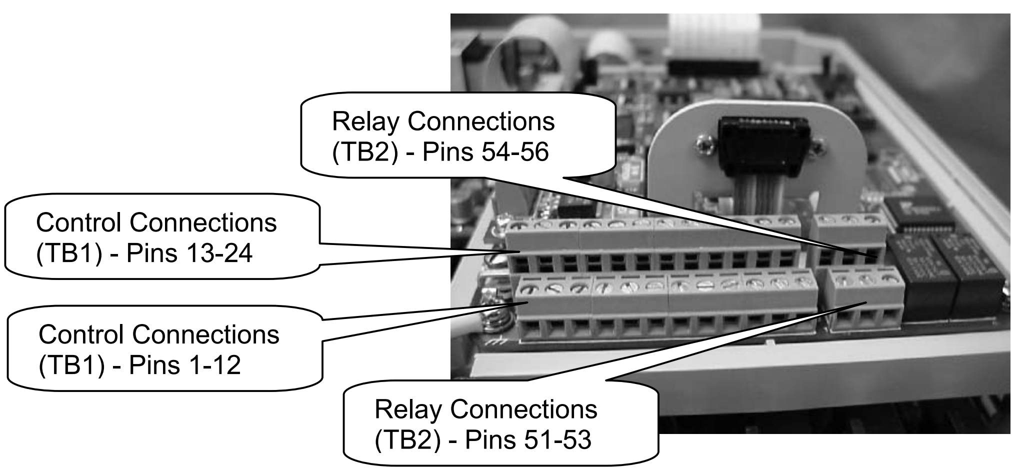
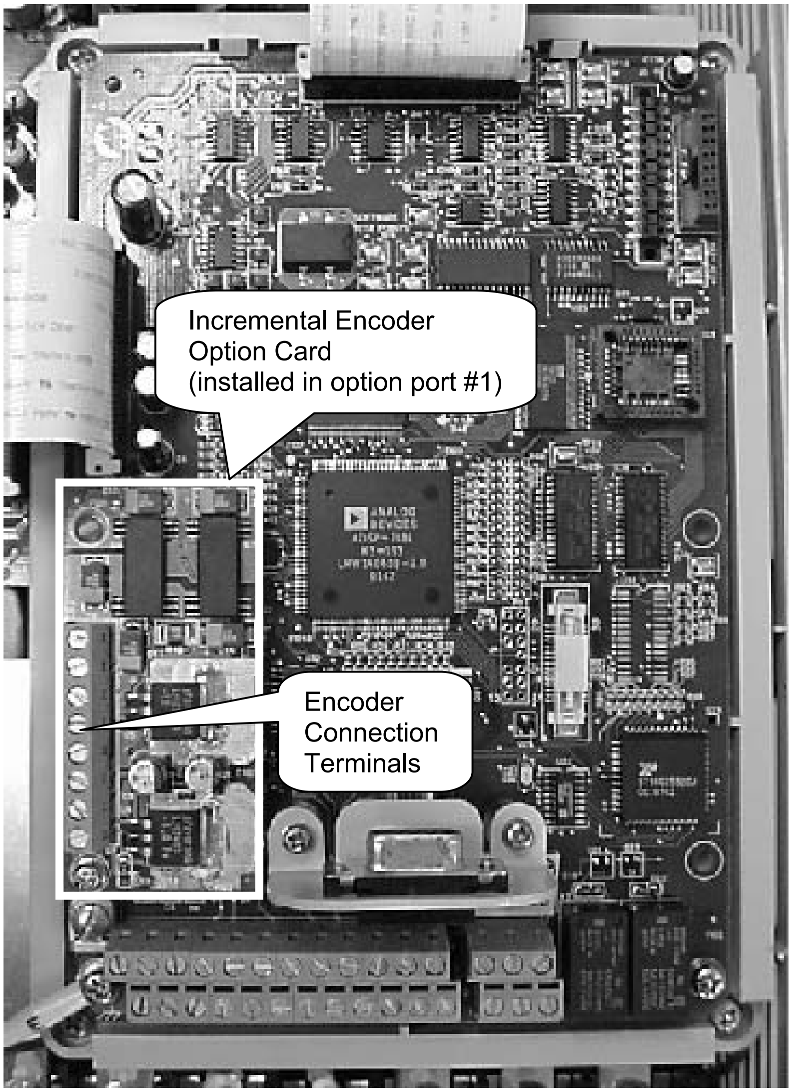
- also, ensure the DC Bus charge light is out.
- even with the light out, we recommend that you use a voltmeter between (N) and (P) to verify that no voltage is present.

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

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



Incremental Encoder Option Card



Remember when servicing the HPV 600: Hazardous voltages may exist in the drive circuits even with drive circuit breaker in off position.

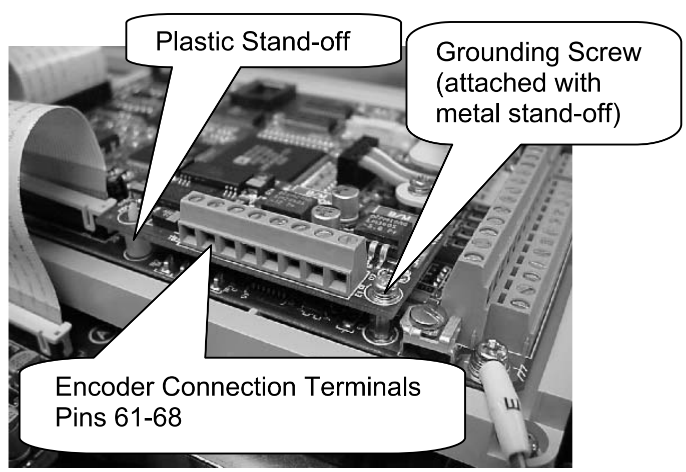
IMPORTANT: Use extreme caution: Do not touch any circuit board, the drive, or motor electrical connections without making sure that the unit is properly grounded and that no high voltage is present.

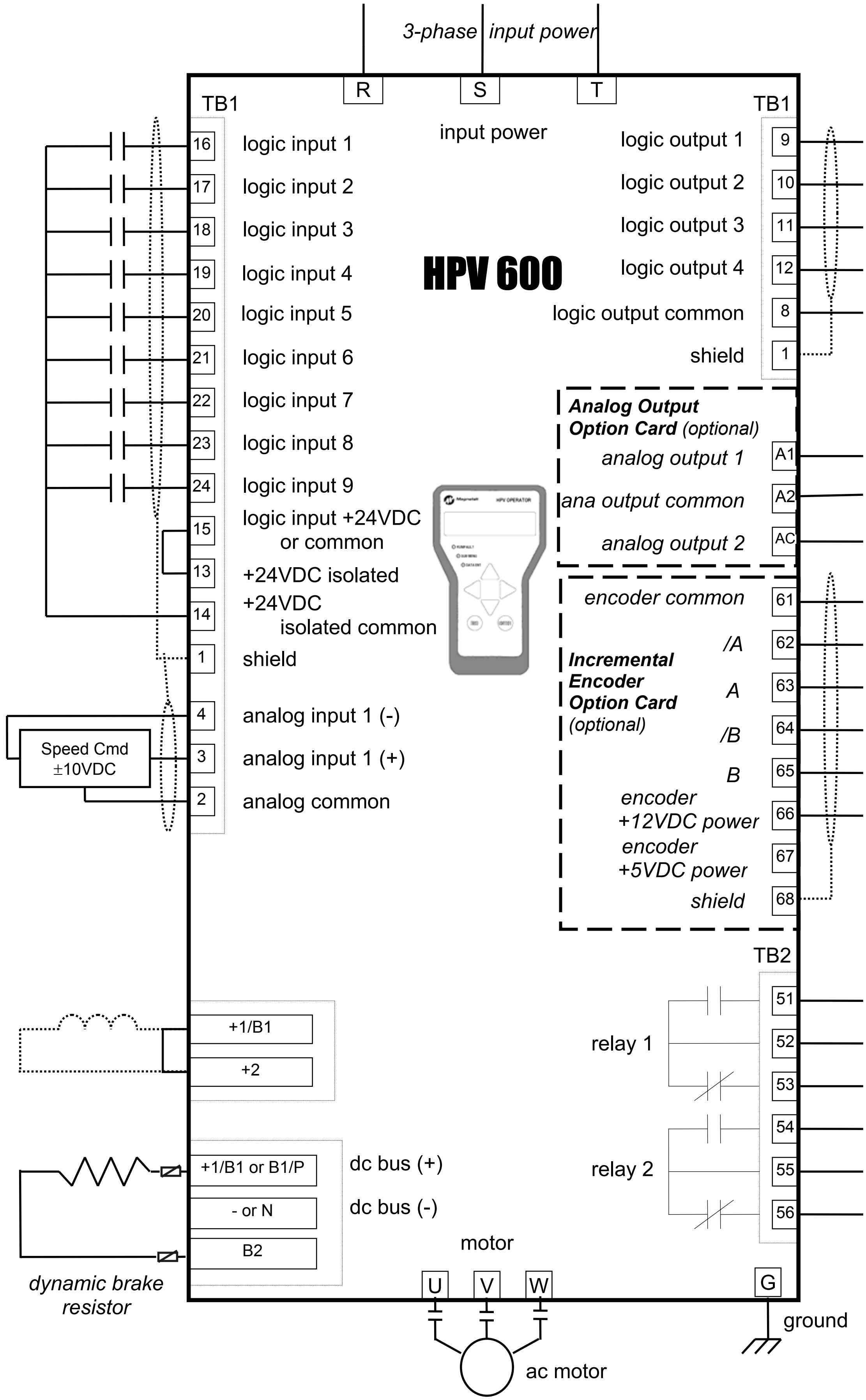
NEVER attempt maintenance unless:

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

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

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



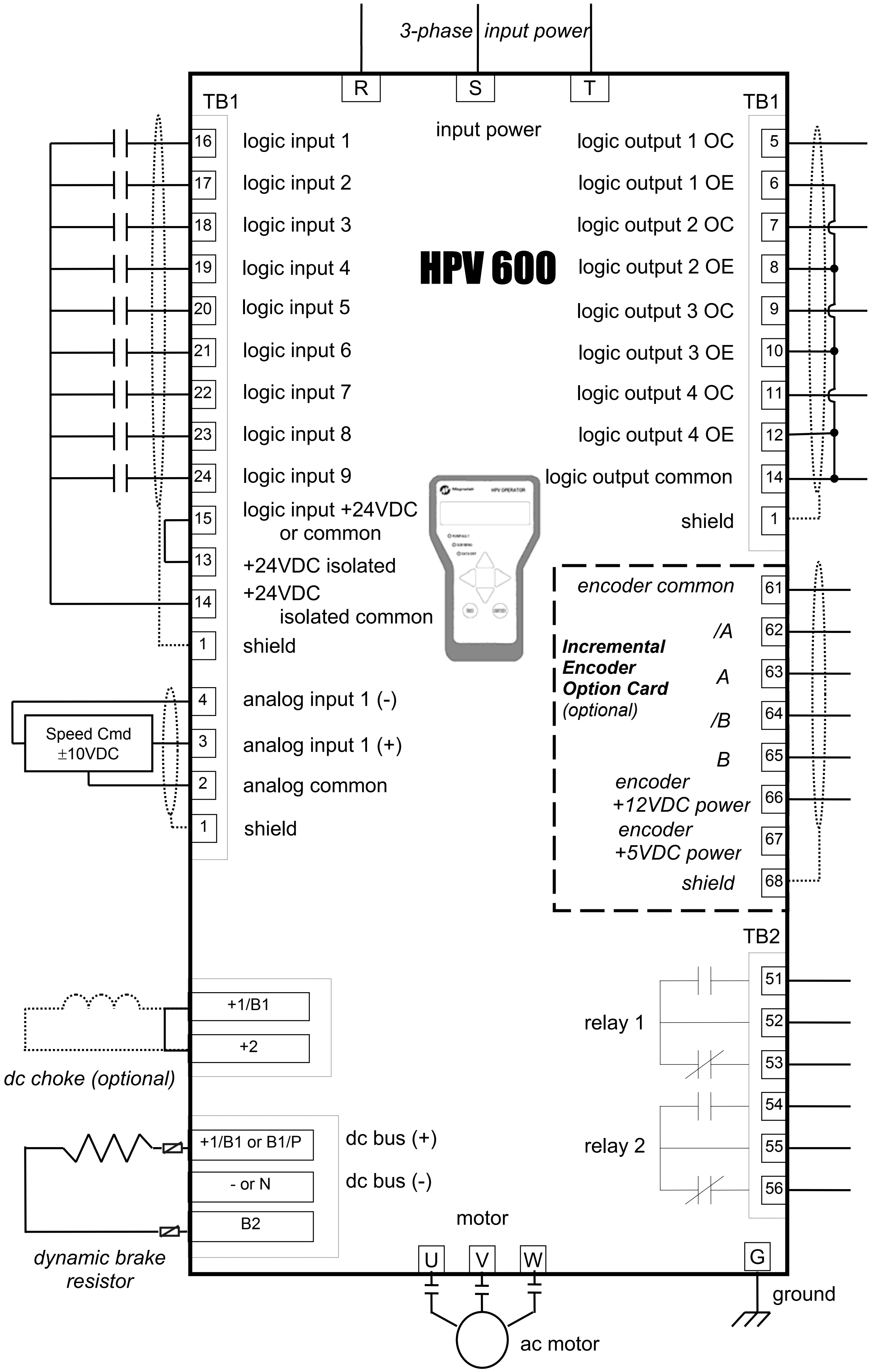


WARNING

Terminal Layout for only Control Boards with part numbers **46S03740-xxxx**

Note the differences in the Logic Output connections between boards since miswiring could result in drive functionality problems or damage

Interconnections



WARNING

Terminal Layout for only Control Boards with part numbers **46S03708-xxxx**

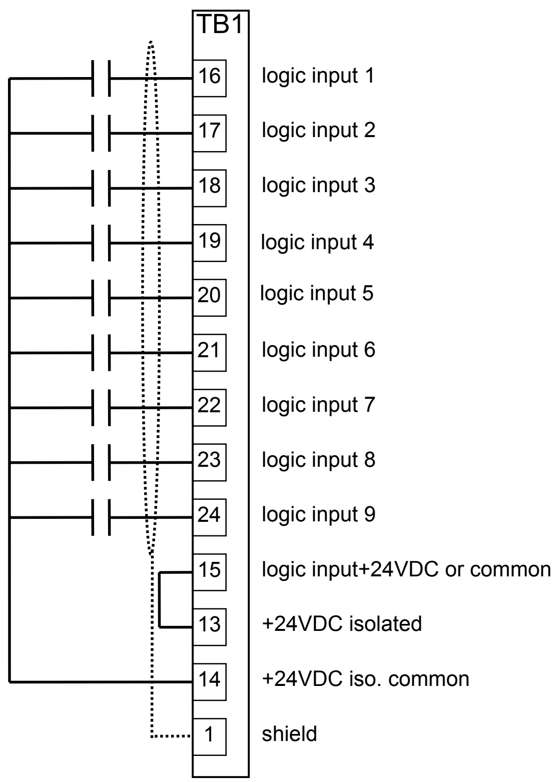
Note the differences in the Logic Output connections between boards since miswiring could result in drive functionality problems or damage

Details

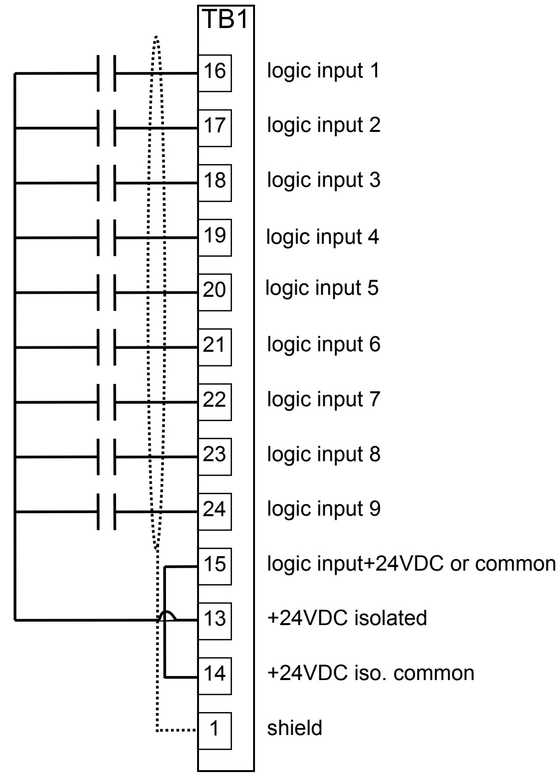
Logic Inputs
The HPV 600's nine programmable logic inputs are opto-isolated. The inputs become "true" by closing contacts or switches between the logic input terminal and voltage source common (or voltage source). The voltage supply for the logic inputs is 24VDC.

IMPORTANT
Internal 24VDC power supply has a capacity of 100 mA

The choices for the voltage source common (or voltage source) depend on if the user is using an external voltage supply or using the internal voltage supply.

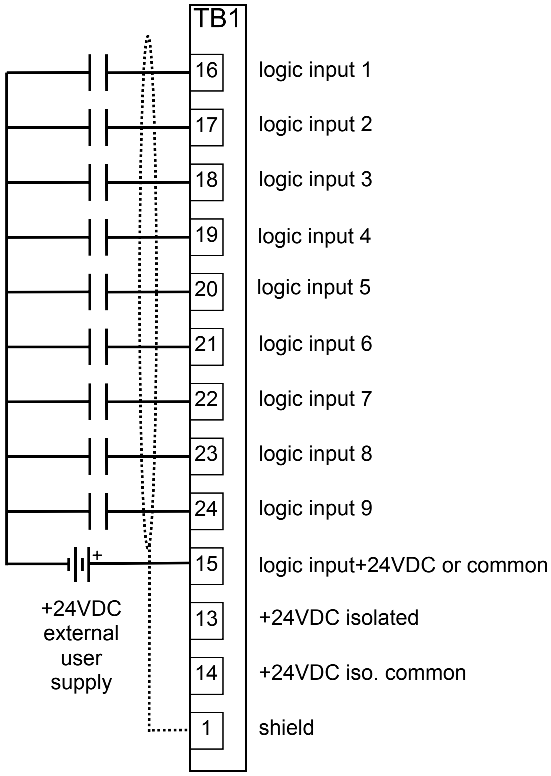


Sinking Logic Inputs (Internal Supply)

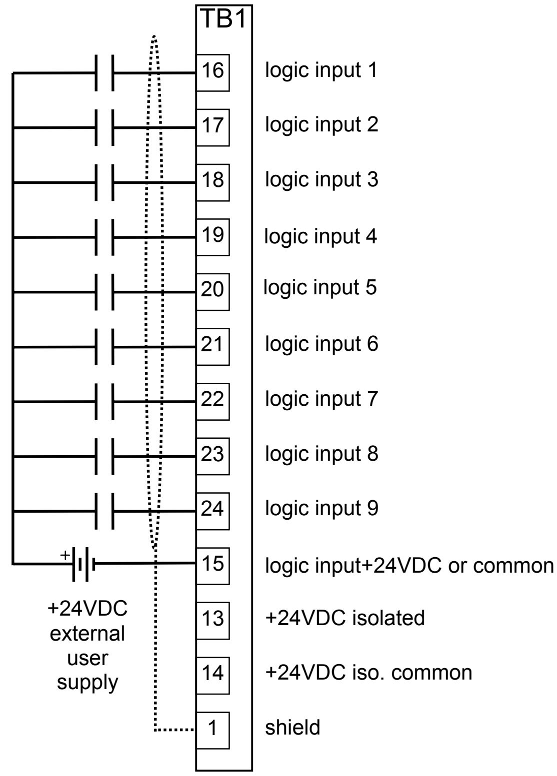


Sourcing Logic Inputs (Internal Supply)

Below shows the connection for using the external voltage supply.



Sinking Logic Inputs (External Supply)



Sourcing Logic Inputs (External Supply)

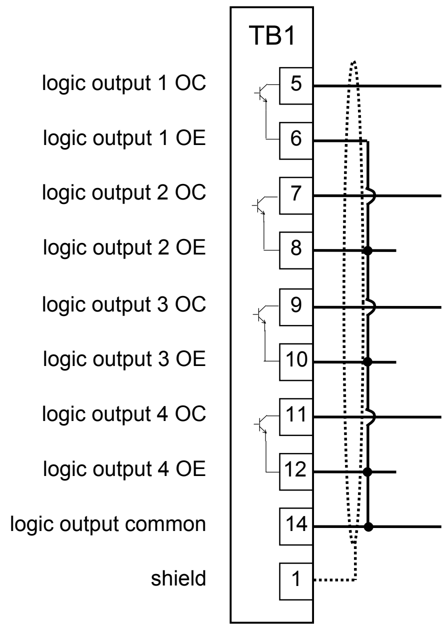
The logic inputs have a current rating of 9mA.

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

Logic Outputs

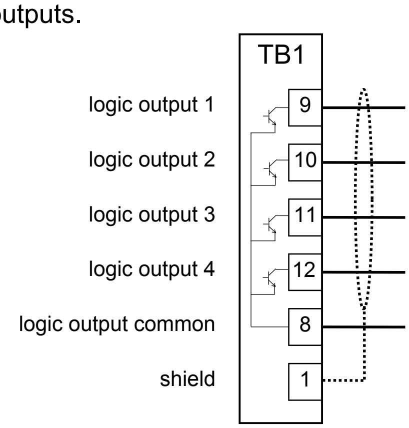
The HPV 600's four programmable logic outputs are opto-isolated. The outputs are normally open and can withstand an applied maximum voltage of 50VDC. When the outputs become "true", the output closes and are capable of sinking up to 150mA between the logic output terminal and the logic output common

HPV 600 Control Boards with the part number (46S03708-xxxx) have four open collector or open-emitter logic outputs. The figure below shows the open-collector configuration. (TB1-14).



Logic Outputs (46S03708-xxxx)

HPV 600 Control Boards with the part number (46S03740-xxxx) have four open collector logic outputs.



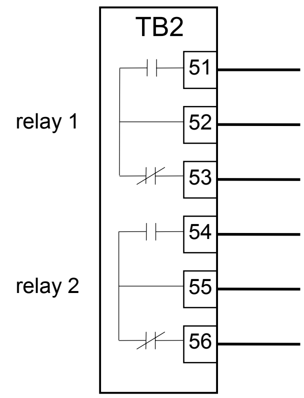
Logic Outputs (46S3740-xxxx)

Relay Outputs

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

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

Below shows the logic output terminals.



Relay Outputs

Encoder

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

Encoder Wiring

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

Reasonable care must be taken when connecting and routing power and signal wiring. Radiated noise from nearby relays (relay coils should have R/C suppressors), transformers, other electronic drives, etc. may be induced into the signal lines causing undesired signal pulses.

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

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

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

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

HPV 600 Encoder Specifications

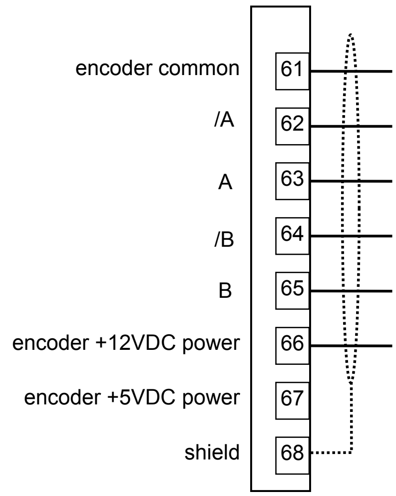
The HPV 600 requires the use of an encoder coupled to the motor shaft. The encoder power can be either a 5VDC or 12VDC supply. The capacity of each 12VDC or 5VDC power supply is 150mA .

The HPV 600 can accept encoder pulses of:
600 to 10,000 pulses per revolution (ppr)
a maximum frequency of 300kHz

IMPORTANT
Motor phasing should match the encoder feedback phasing. If the phasing is not correct, the motor will not accelerate up to speed. It will typically oscillate back and forth at zero speed, and the current will be at the torque limit. Swapping A and /A or switching two motor phases should correct this situation.

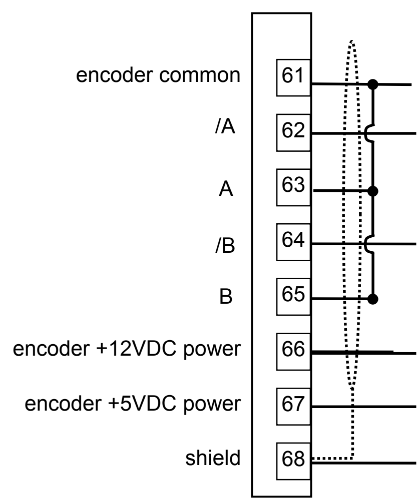
The encoder pulses per revolution must by entered in the ENCODER PULSES parameter.

The encoder connection terminals are shown below.

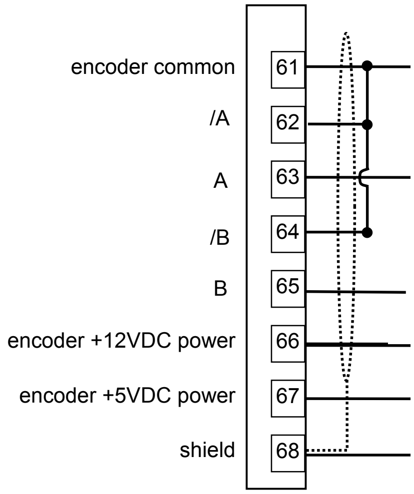


Encoder Option Card Connections

Below shows the connection for the encoder option card, if they are configured to be single ended. This configuration is not recommended, since, the HPV 600 encoder noise immunity circuitry is not in effect.



Single-ended Encoder Option Card Connections
(pn46S03710-0010)



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

Analog Input

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

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

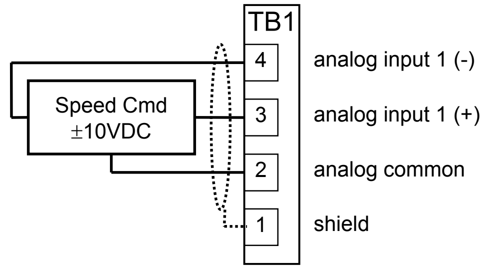
Available with the analog channel is multiplier gain parameter (SPD COMMAND MULT) and bias parameter (SPD COMMAND BIAS). These parameters are used to scale the user's analog command to the proper range for the drive software. The formula below shows the scaling effects of these two parameters.

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

The scaling of the analog input signals follows:
Speed Command
+10VDC = positive contract speed
-10VDC = negative contract speed

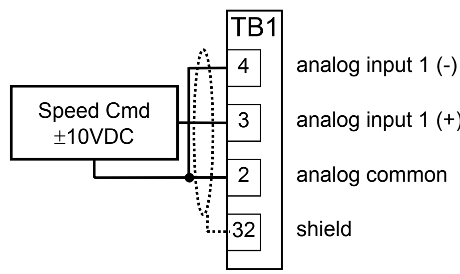
NOTE: The drive cannot recognize voltages outside of the ±10VDC on its analog input channels.

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



Analog Inputs (Differential)

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



Analog Inputs (Single Ended)

Analog Outputs

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

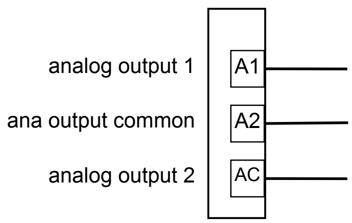
The analog output channels are bipolar and have a voltage range of ±10VDC.

Available with the analog channels is multiplier gain parameters (ANA 1 OUT GAIN and ANA 2 OUT GAIN) and a bias or offset parameters (ANA 1 OUT OFFSET and ANA 2 OUT OFFSET). These parameters are used to scale the user's analog outputs to the proper range for the drive software.

The formula below shows the scaling effects of these two parameters.

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

The connection of these two inputs is shown below.



Analog Outputs
(via option card)

CE Guidelines

Below are guidelines for CE compliance.

Standards

<u>EN 12015</u>
Electromagnetic compatibility – Product family standard for lifts, escalators, and moving walkways – Emission
Rated input currents 0-25A or 25-100A

<u>EN 61800-3</u>
Adjustable speed electrical power drive systems – Part 3: EMC product standard including specific test methods.

<u>EN 12016</u>
Electromagnetic compatibility – Product family standard for lifts, escalators and passenger conveyors Part 2: Immunity.

Recommended Line Filter

A line filter must be connected between the main power supply and input three phase input terminals to comply with the standards listed above. The filters recommended for use with the HPV 600 can be found on page 164.

Installation Guidelines for EMI/RFI Issues

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

Countermeasures For the Enclosure.

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

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

Problems related to these emissions include:

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

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

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

Modifications to the enclosure include the following:

1. The enclosure should be made of ferrous metal and the joints at the top, bottom, and side panels should be continuously welded to make them electrically conductive.

2. The paint on the joint sections should be removed back to the bare metal to provide good electrical conductance.

3. Be careful to avoid gaps which could be created when panels become warped due to over tightening of retaining screws.

4. The section where the cabinet and door fit should have a ridged structure to avoid any gaps where RFI may leak.

5. There should be no conducting sections which are left floating electrically.

6. Both the cabinet and drive unit should be connected to a common ground.

Enclosure Door Construction

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

1. The door should be made of ferrous metal.

2. Conductive packing should be used between the doors and the main unit. Assure conductivity by removing the paint on the sections which contact the door.

3. Be careful to avoid gaps which could be opened when panels are warped due to the tightening retaining screws, etc.

Wiring External to the Enclosure

To help comply, the treatment of cables is the most important countermeasure. The grounding and the treatment of gaps in the external connection sections between the control panel and the machine are also important. It is recommended that the OEM / installer examine the present structure of all cable entrances.

Screened/shielded cable must be used for the motor cable (20 meters, 65 feet. max). The best method would be to use appropriate EMI couplings, but as an alternative, the screen of the motor cable must be grounded at both ends by a short connection using as large an area as practical. The output lead section of the control panel should be treated to minimize leakage of RFI by eliminating clearances. The grounding surfaces should be metal conductors (steel solid or flexible conduit) and conductance should be assured by the following:

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

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

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

Wiring Internal to the Enclosure

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

Panel Layout

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

Parameters

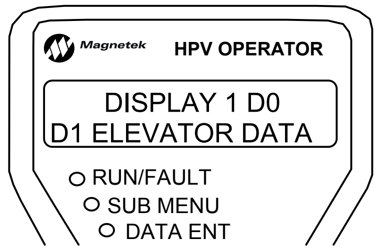
Parameter Introduction

This section describes the parameter menu structure; how to navigate this menu structure via the HPV 600 digital operator; and a detailed description of each parameter.

Parameters are grouped under six major menus:

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

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



Menus

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

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

Display 1 D0
- Elevator Data D1
- Power Data D2

Adjust A0
- Drive A1
- S-Curves A2
- Multistep Ref A3
- Power Convert A4
- Motor A5

Configure C0
- User Switches C1
- Logic Inputs C2
- Logic Outputs C3
- Analog Outputs C4

Utility U0
- Password U1
- Hidden Items U2
- Units U3
- Ovrspeed Test U4
- Restore Dflts U5
- Drive Info U6
- Hex Monitor U7
- Language Sel U8 *(closed-loop only)*

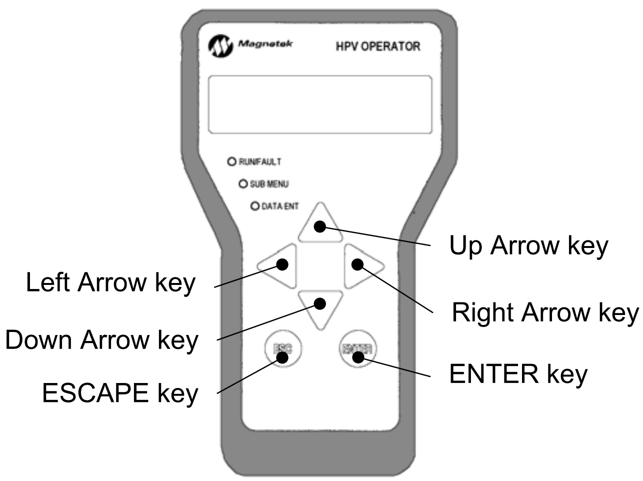
Faults F0
- Active Faults F1
- Fault History F2

Display 2 D0
- Elevator Data D1
- Power Data D2

Menu/Sub-Menu Tree

Menu Navigation

The digital operator keys operate on three levels, the menu level, the sub-menu level and the entry level. At the menu level, they function to navigate between menus or sub-menus. At the sub-menu level, they navigate between sub-menus or menu items. At the entry level, they are used to adjust values or select options. Six (6) keys are used for this navigation, they are:
1) The up arrow key.
2) The down arrow key.
3) The left arrow key.
4) The right arrow key.
5) The “ENTER” key.
6) The “ESCAPE” key.

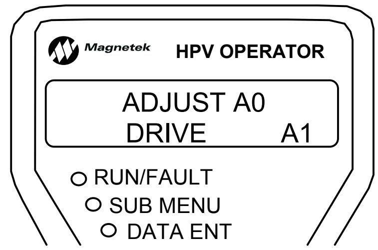


Digital Operator Keys

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

Navigation at the Menu Level

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

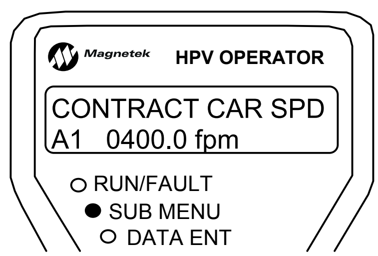


Each menu will remember the last accessed sub-menu. The left and right arrow keys will navigate between these last active sub-menus. This remembrance of last active sub-menu is volatile and will be lost at power down.

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

Navigation at the Sub-menu Level

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

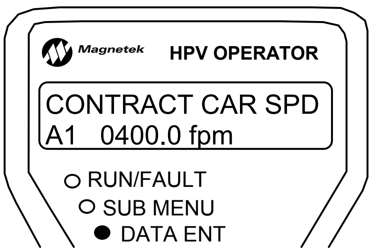


At any time pressing the “ESCAPE” key will return to the menu level. Upon exiting a sub-menu via the “ESCAPE” key, the last item number is “remembered”. The next time this sub-menu is entered, it is entered at the “remembered” item number.

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

Navigation at the Entry Level

When in the entry level, the DATA ENT LED on the digital operator is lit. At the entry level, the function of keys are redefined. The “ESCAPE” key remains as the key used to move back to the higher level (in this case to the sub-menu level). The left and right arrow keys are used as cursor positioning keys and the up and down arrow keys are used as increment and decrement keys.



Hidden Parameters

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

Display D0

Elevator Data D1
- Speed Command
- Speed Reference
- Speed Feedback
- Encoder Speed
- Logic Outputs
- Logic Inputs

Power Data D2
- Motor Current
- % Motor Current
- Motor Voltage
- Motor Frequency
- Motor Torque
- Power Output
- DC Bus Voltage
- Slip Frequency
- Motor Overload
- Drive Overload
- Flux Current
- Torque Current
- Flux Voltage
- Torque Voltage
- Base Impedance

Adjust A0

Drive A1
- Contract Car Spd
- Contract Mtr Spd
- Contact Flt Time
- Cont Dwell Time
- Brake Pick Time
- Brake Hold Time
- Brake Drop Delay
- DC Start Level
- DC Stop Level
- DC Stop Freq
- DC Start Time
- DC Stop Time
- Overspeed Mult
- Stall Test Level
- Stall Fault Time
- Slip Comp Time
- Slip Comp Gain
- Torq Boost Time
- Torq Boost Gain
- Spd Command Bias
- Spd Command Mult
- Mains Dip Speed
- Zero Speed Level
- Zero Speed Time
- Up/Dwn Threshold
- Mtr Torque Limit
- Regen Torq Limit
- Ana 1 Out Offset
- Ana 2 Out Offset
- Ana 1 Out Gain
- Ana 2 Out Gain
- Flt Reset Delay
- Flt Resets/Hour
- Up To Spd. Level
- Trq Lim Msg Dly
- Encoder Pulses

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

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

Power Convert A4
- Id Reg Diff Gain
- Id Reg Prop Gain
- Iq Reg Diff Gain
- Iq Reg Prop Gain
- Id Dist Loop Gn
- Iq Dist Loop Gn
- Id Dist Loop Fc
- Iq Dist Loop Fc
- I Reg Cross Freq
- Dist Lp Off Freq
- Ilimt Integ Gain
- Hunt Prev Gain
- Hunt Prev Time
- Pwm Frequency
- Switching Delay
- Vc Correction
- UV Alarm Level
- UV Fault Level
- Extern Reactance
- Input L-L Volts

Motor A5
- Motor Id
- Rated Mtr Pwr
- Rated Mtr Volts
- Rated Excit Freq
- Motor Mid Volts
- Motor Mid Freq
- Motor Min Volts
- Motor Min Freq
- Rated Motor Curr
- Motor Poles
- Rated Mtr Speed
- % No Load Curr
- Stator Leakage X
- Rotor Leakage X
- Stator Resist
- Motor Iron Loss
- Motor Mech Loss
- Ovld Start Level
- Ovld Time Out

Open-loop Parameter Tree (D0 and A0)

Configure C0

User Switches C1
- Spd Command Src
- Run Command Src
- Motor Rotation
- Spd Ref Release
- Cont Confirm Src
- Fault Reset Src
- Overspd Test Src
- Brake Pick Src
- Brake Pick Cnfm
- Brake Hold Src
- Brk Pick Flt Ena
- Brk Hold Flt Ena
- Dir Confirm
- Stall Test Ena
- Stallp Regen Ena
- S-curve Abort
- Stop Mode Sel
- Mains Dip Ena
- Auto Stop Ena
- Db Protection
- Torque Calc Sel
- Drv Fast Disable

Logic Inputs C2
- Logic Input 1
- Logic Input 2
- Logic Input 3
- Logic Input 4
- Logic Input 5
- Logic Input 6
- Logic Input 7
- Logic Input 8
- Logic Input 9

Logic Outputs C3
- Logic Output 1
- Logic Output 2
- Logic Output 3
- Logic Output 4
- Relay Coil 1
- Relay Coil 2

Analog Outputs C4
- Analog Output 1
- Analog Output 2

Utility U0

Password U1
- Enter Password
- New Password
- Password Lockout

Hidden Items U2
- Hidden Items Enable

Units U3
- Units Selection

Ovrspeed Test U4
- Overspeed Test?

Restore Dflts U5
- Restore Motor Defaults
- Restore Drive Defaults

Drive Info U6
- Drive Version
- Boot Version
- Cube ID
- Drive Type

Hex Monitor U7
- address

Faults F0

Active Faults F1
- Display Active Faults
- Reset Active Faults

Fault History F2
- Display Fault History
- Clear Fault History

Open-loop Parameter Tree (C0, U0, and F0)

Display D0

Elevator Data D1

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

Power Data D2

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

Adjust A0

Drive A1

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

S-Curves A2

- Accel Rate 0
- Decel Rate 0
- Accel Jerk In 0
- Accel Jerk Out 0
- Decel Jerk In 0
- Decel Jerk Out 0
- Accel Rate 1
- Decel Rate 1
- Accel Jerk In 1
- Accel Jerk Out 1
- Decel Jerk In 1
- Decel Jerk Out 1
- Accel Rate 2
- Decel Rate 2
- Accel Jerk In 2
- Accel Jerk Out 2
- Decel Jerk In 2
- Decel Jerk Out 2
- Accel Rate 3
- Decel Rate 3
- Accel Jerk In 3
- Accel Jerk Out 3
- Decel Jerk In 3
- Decel Jerk Out 3

Multistep Ref A3

- Speed Command 1
- Speed Command 2
- Speed Command 3
- Speed Command 4
- Speed Command 5
- Speed Command 6
- Speed Command 7
- Speed Command 8
- Speed Command 9
- Speed Command 10
- Speed Command 11
- Speed Command 12
- Speed Command 13
- Speed Command 14
- Speed Command 15

Power Convert A4

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

Motor A5

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

Closed-loop Parameter Tree (D0 and A0)

Configure C0

User Switches C1

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

Logic Inputs C2

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

Logic Outputs C3

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

Analog Outputs C4

- Analog Output 1
- Analog Output 2

Utility U0

Password U1

- New Password
- Enter Password
- Password Lockout

Hidden Items U2

- Hidden Items Enable

Units U3

- Units Selection

Ovrspeed Test U4

- Overspeed Test?

Restore Dflts U5

- Restore Motor Defaults
- Restore Drive Defaults

Drive Info U6

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

Hex Monitor U7

- address

Language Sel U8

- English
- Deutsch (German)

Faults F0

Active Faults F1

- Display Active Faults
- Reset Active Faults

Fault History F2

- Display Fault History
- Clear Fault History

Closed-loop Parameter Tree (C0, U0, and F0)

Adjust A0 menu

Drive A1 submenu

A1	parameter	description	default	units	min	max	hidden item	run lock out
	CONTRACT CAR SPD	Elevator contract speed	200.0 1.000	fpm or m/s	0.0 0.00	3000.0 16.00	N	Y
	CONTRACT MTR SPD	Motor speed at elevator contract speed	1130.0	rpm	50.0	3000.0	N	Y
	CONTACT FLT TIME	Time delay before enabling drive outputs and time before a contactor fault is declared (when drive is controlling motor contactor)	0.10	seconds	0.10	5.00	N	N
	CONT DWELL TIME	Time delay when disabling enabling drive outputs to open motor contactor and delays contactor fault (when drive is controlling motor contactor)	0.50	seconds	0.00	5.00	N	N
	BRAKE PICK TIME	Time before a brake pick fault is declared (when drive is controlling mechincal brake)	1.00	seconds	0.00	5.00	N	N
	BRAKE HOLD TIME	Time before a brake hold fault is declared (when drive is controlling mechincal brake)	0.20	seconds	0.00	5.00	N	N
	BRAKE PICK DELAY	The time delay from a drive run command until the brake is picked. (when drive is controlling mechincal brake)	0.50	seconds	0.00	5.00	N	Y
	BRAKE DROP DELAY	If ramp to stop is selected, this parameter sets the time delay to set the brake after decelerating to the greater of DC Start Freq or Motor Min Freq. (when drive is controlling mechincal brake)	0.50	seconds	0.00	5.00	N	Y
	DC START LEVEL	The level of DC injection current at start as a percent of motor rated current.	50.0	% rated motor current	0.0	150.0	N	Y

A1	parameter	description	default	units	min	max	hidden item	run lock out
	DC STOP LEVEL	The level of DC injection current at stop as a percent of motor rated current.	50.0	% rated motor current	0.0	150.0	N	Y
	DC STOP FREQ	The frequency level where the drive initiates output of DC injection current during a controlled stop.	0.5	Hz	0.0	10.0	N	Y
	DC START TIME	The time DC injection current is applied following valid run command until release of the speed command.	1.00	seconds	0.00	5.00	N	Y
	DC STOP TIME	The time DC injection current is applied after the drive decelerates to level defined by the DC STOP FREQ parameter.	1.00	seconds	0.00	5.00	N	Y
	OVERSPEED MULT	Multiplier for overspeed test	125.0	% contract speed	100.0	150.0	N	N
	STALL TEST LEVEL	The level of motor current as a percent of rated that will cause a stall test fault.	200.0	% rated motor current	0.0	200.0	N	Y
	STALL FAULT TIME	Time before a stall fault is declared when above the defined stall test level	5.00	seconds	0.00	9.99	N	N
	SLIP COMP TIME	Slip compensation filter time constant.	1.50	seconds	0.01	1.00	N	N
	SLIP COMP GAIN	Multiplier of motor rated slip at rated torque.	1.00	none	0.00	2.00	N	N
	TORQ BOOST TIME	Torque boost filter time constant.	0.05	seconds	0.01	1.00	N	N
	TORQ BOOST GAIN	Multiplier of automatic torque boost	0.00	none	0.00	2.00	N	N
	SPD COMMAND BIAS	Subtracts an effective voltage to actual speed command voltage	0.00	volts	0.00	6.00	N	Y
	SPD COMMAND MULT	Scales analog speed command	1.00	none	0.90	5.00	N	Y
	MAINS DIP SPEED	Multiplier for contract speed when in ‘low voltage’ mode	25.00	% contract speed	5.00	99.99	N	Y
	ZERO SPEED LEVEL	Threshold for zero speed logic output	25.00	% contract speed	00.00	99.99	N	Y
	ZERO SPEED TIME	Time before zero speed logic output is declared true.	0.10	seconds	0.00	9.99	N	Y

A1	parameter	description	default	units	min	max	hidden item	run lock out
	UP/DWN THRESHOLD	Threshold for detection of up or down direction	1.00	% contract speed	0.00	9.99	N	Y
	MTR TORQUE LIMIT	Motoring current limit as a percent of the drive's rated current	200.0	% rated torque	0.0	275.0	N	N
	REGEN TORQ LIMIT	Regenerating current limit as a percent of the drive's rated current	200.0	% rated torque	0.0	275.0	N	N
	ANA 1 OUT OFFSET	Subtracts an effective voltage to actual analog output 1	0.00	%	-99.9	99.9	N	Y
	ANA 2 OUT OFFSET	Subtracts an effective voltage to actual analog output 2	0.00	%	-99.9	99.9	N	Y
	ANA 1 OUT GAIN	Scaling factor for analog output 1	1.0	none	0.0	10.0	N	Y
	ANA 2 OUT GAIN	Scaling factor for analog output 2	1.0	none	0.0	10.0	N	Y
	FLT RESET DELAY	Time before a fault is automatically reset	5	seconds	0	120	N	N
	FLT RESETS / HOUR	Number of faults that is allowed to be automatically reset per hour	3	faults	0	10	N	N
	UP TO SPD. LEVEL	Threshold for up to spd logic output	80.00	% contract speed	0.00	110.00	N	N
	TRQ LIM MSG DLY	Delay Torque Limit Hit message for this time.	0.50	seconds	0.00	10.00	N	Y
	ENCODER PULSES	Only used for diagnostics… Encoder counts per revolution for use only by ENCODER SPEED (D1) display	1024	none	600	10000	N	Y

Detailed descriptions

CONTRACT CAR SPD
(Contract Car Speed)
This parameter programs the elevator contract speed in feet per minute (fpm) or meters per second (m/s).

CONTRACT MTR SPD
(Contract Motor Speed)
This parameter programs the motor speed at elevator contract speed in revolutions per minute (rpm).

CONTACT FLT TIME
(Contact Fault Time)
When external logic outputs are used to control the closing of the motor contactor, this parameter sets the amount of time delay at start until the drive output is enabled and current flows. And when external logic inputs are used to confirm the closing of the motor contactor, this parameter sets the time allowed for the contactor's auxiliary contacts to reach the user commanded state before a CONTACTOR FLT occurs.

CONT DWELL TIME
(Contact Dwell Time)
When external logic outputs are used to control the closing of the motor contactor, this parameter sets the amount of time delay from disabling the drive outputs following a stop until the motor contactor opens. And when external logic inputs are used to confirm the closing of the motor contactor, this parameter extends the time allowed for the contactor's auxiliary contacts to reach the user commanded state before a CONTACTOR FLT occurs.

BRAKE PICK TIME
(Brake Pick Time)
If the brake pick fault is enabled, this parameter sets the time allowed for the brake pick feedback not to match the brake pick command before a BRK PICK FLT occurs.

BRAKE HOLD TIME
(Brake Hold Time)
If the brake hold fault is enabled, this parameter sets the time allowed for the brake hold feedback not match the brake hold command before a BRK HOLD FLT occurs.

BRAKE PICK DELAY
(Brake Pick Delay)
When external logic outputs are used to control the mechanical brake, this is the time delay from a drive run command until the brake is picked. This time delay needs to be set for the following: have DC injection current before the mechanical brake is picked and have DC injection current after the mechanical brake is picked to allow the brake to fully open.

BRAKE DROP DELAY
(Brake Drop Delay)
When external logic outputs are used to control the mechanical brake and ramp to stop is selected, this parameter sets the time delay to set the brake after decelerating to the DC Stop Freq. This time delay needs to be set for the following: have DC injection current before the mechanical brake is closed and have DC injection current after the mechanical brake is closed to allow the brake to fully close.

DC START LEVEL
(DC Injection Current Start Level)
The level of DC injection current at start as a percent of motor rated current. The DC injection current will hold the motor shaft in a fixed position as the drive outputs a DC current to the motor. At the start, it is important to have DC injection current before the mechanical brake is picked and to have DC injection current after the mechanical brake is picked to allow the brake to fully open.

DC STOP LEVEL
(DC Injection Current Stop Level)
The level of DC injection current at stop as a percent of motor rated current. To hold the motor shaft in a fixed position the drive will output a DC current to the motor. At the stop, it is important to have DC injection current before the mechanical brake is closed and to have DC injection current after the mechanical brake is closed to allow the brake to fully close.

DC STOP FREQ
(DC Injection Stopping Frequency)
The frequency at which DC injection begins to occur when the drive is decelerating to a stop. If ramp to stop is selected and the run command is removed, the drive decelerates from it's current speed to the DC stop frequency and then DC injection is applied.

DC START TIME
(DC Injection Current Start Time)
The time DC injection current is applied following valid run command until release of the speed command. After receiving a valid run command the drive will maintain DC Start Level current for DC Start Time seconds before releasing the internal speed reference allowing the drive to ramp up in speed. At the start, it is important to have DC injection current before the mechanical brake is picked and to have DC injection current after the mechanical brake is picked to allow the brake to fully open.

DC STOP TIME
(DC Injection Current Stop Time)
The level of DC injection current at stop as a percent of drive's rated current. If ramp to stop is selected, the drive will ramp down in speed following removal of the run command to the DC Stop Freq and will then output DC Stop Level current for DC Stop Time seconds. At the stop, it is important to have DC injection current before the mechanical brake is closed and to have DC injection current after the mechanical brake is closed to allow the brake to fully close.

OVERSPEED MULT
(Over Speed Multiplier)
This parameter sets the percentage of contract speed for the OVERSPEED TEST (U4).

STALL TEST LEVEL
(Stall Test Level)
This parameter sets the percentage of motor current the drive uses (in conjunction with STALL FAULT TIME(A1)) to determine when an STALL FAULT occurs. In order for a STALL TEST FAULT to occur, it must be enabled by the STALL TEST ENA (C1) parameter.

STALL FAULT TIME
(Stall Fault Time)
This parameter sets the time that the drive can be at or above the STALL TEST LVL(A1), before the drive declares an STALL TEST FAULT. In order for a STALL TEST FAULT to occur, it must be enabled by the STALL TEST ENA (C1) parameter.

SLIP COMP TIME
(Slip Compensation Time Constant)
Slip compensation filter time constant. Adjusted for slip compensation response and stability. By increasing the value of the parameter, the response time of the slip compensation function will become slower. Reducing the parameter to a lower value makes the slip compensation function respond more quickly. Note: Adjusting the parameter too low may result in unstable motor operation or adjusting the parameter too high will result in very poor response.

NOTE: it is usually best to leave this parameter set at default of 1.5 seconds.

Slip compensation allows an open-loop drive to maintain constant motor speed regardless of loading. The function adjusts the drive's output frequency (and output voltage) to compensate for motor slip as the motor load is increased. The compensation is based on the motor rated speed, frequency and calculated motor torque, therefore a valid value must be entered for the Rated Motor Speed (RATED MTR SPEED(A5))

SLIP COMP GAIN
(Slip Compensation Gain)
Multiplier of motor rated slip at rated torque. Setting the parameter to 1.00 compensates the drive output frequency by rated slip at rated torque. Setting the Slip Compensation Gain to 0.00 disables the slip compensation function.

NOTE: it is usually best to leave this parameter set at the default of 1.0.

Slip compensation allows an open-loop drive to maintain constant motor speed regardless of loading. The function adjusts the drive's output frequency (and output voltage) to compensate for motor slip as the motor load is increased. The compensation is based on the motor rated speed, frequency and calculated motor torque, therefore a valid value must be entered for the Rated Motor Speed (RATED MTR SPEED(A5))

TORQ BOOST TIME
(Torque Boost Time Constant)
This parameter is the torque boost filter time constant. Adjusted for torque compensation response and stability. Increasing the value of the parameter, decreases response. Reducing the parameter to a lower value increases response.

NOTE: it is usually best to leave this parameter set at the default of 0.5 seconds.

Torque compensation automatically boosts the drive's output voltage, in excess of the programmed V/Hz pattern, as the load demand increases. Torque compensation counters the voltage drop in the motor stator resistance. This function has the greatest effect at low speeds improving load response. When using torque compensation, a valid value must be entered for the motor's no-load current (% NO LOAD CURR(A5))

TORQ BOOST GAIN
(Torque Boost Gain)
This gain controls the differential term in the voltage boost function. This effects the rate of response of the torque boost. Setting the Torque Boost Gain to 0.00 disables the torque boost function.

NOTE: this function is defaulted off (TORQ BOOSTGAIN=0.0). If adjustments need to be made follow the guidelines listed in the "Performance Adjustments" on page 11.

Torque compensation automatically boosts the drive's output voltage, in excess of the programmed V/Hz pattern, as the load demand increases. Torque compensation counters the voltage drop in the motor stator resistance. This function has the greatest effect at low speeds improving load response. When using torque compensation, a valid value must be entered for the motor's no-load current (% NO LOAD CURR(A5))

SPD COMMAND BIAS
(Speed Command Bias)
This parameter subtracts an effective voltage to the actual analog speed command voltage signal.

$$\left(\begin{matrix}\textit{analog}\\\textit{channel\#1}\\\textit{input}\\\textit{voltage}\end{matrix} - \begin{matrix}\textit{SPD}\\\textit{COMMAND}\\\textit{BIAS}\end{matrix}\right) \times \begin{matrix}\textit{SPD}\\\textit{COMMAND}\\\textit{MULT}\end{matrix} = \begin{matrix}\textit{signal}\\\textit{drive}\\\textit{software}\\\textit{uses}\end{matrix}$$

SPD COMMAND MULT
(Speed Command Multiplier)
This parameter scales the analog speed command.

$$\left(\begin{matrix}\textit{analog}\\\textit{channel\#1}\\\textit{input}\\\textit{voltage}\end{matrix} - \begin{matrix}\textit{SPD}\\\textit{COMMAND}\\\textit{BIAS}\end{matrix}\right) \times \begin{matrix}\textit{SPD}\\\textit{COMMAND}\\\textit{MULT}\end{matrix} = \begin{matrix}\textit{signal}\\\textit{drive}\\\textit{software}\\\textit{uses}\end{matrix}$$

MAINS DIP SPEED
(Mains Dip Speed Multiplier)
This parameter sets the percentage of contract speed for the speed to be reduced when the drive goes into 'low voltage' mode. The Mains Dip function is enabled by the Mains Dip Enable (MAINS DIP ENA(C1)) parameter. When the drive goes into 'low voltage' mode, it reduces the speed by the percentage defined by this parameter. 'Low voltage' mode is defined as when the drive declares a UV alarm, which is defined by the Input line-to-line voltage (INPUT L-L VOLTS(A4)) parameter and the Undervoltage Alarm Level (UV ALARM LEVEL(A4)).

ZERO SPEED LEVEL
(Zero Speed Level)
This parameter sets the threshold for zero speed detection. This is only used to generate the zero speed logic output.
Note: if DIR CONFIRM (C1) is enabled, this parameter also sets the threshold for the termination of the test to confirm the polarity of the analog speed command.

ZERO SPEED TIME
(Zero Speed Time)
This parameter sets the time at which the drive is at the ZERO SPEED LEVEL (A1) before zero speed logic output is true.

UP/DWN THRESHOLD
(Directional Threshold)
This parameter sets the threshold for the direction sense logic outputs. If speed feedback does not reach this level, the drive will not detect a directional change. This is only used to generate the direction sense logic outputs (car going up and car going down).

MTR TORQUE LIMIT
(Motoring Current Limit)
This parameter sets the motoring current limit as a percentage of the drive's rated current. This parameter helps define the Stall Prevention (Current Limit) function. Stall prevention causes the drive to deviate from the commanded speed to limit motor current to a user set level. When the motoring current limit is reached (MTR TORQUE LIMIT(A1)), the stall prevention function will reduce speed. Also, the responsiveness of the stall prevention function is determined by the Current Limit Integral Gain (ILIMT INTEG GAIN(A4)) parameter.

REGEN TORQ LIMIT
(Regenerating Current Limit)
This parameter sets the regenerative current limit as a percentage of the drive's rated current. This parameter helps define the Stall Prevention (Current Limit) function. Stall prevention causes the drive to deviate from the commanded speed to limit motor current to a user set level. When the regenerating current limit is reached (REGEN TORQ LIMIT(A1)), the stall prevention function will increase speed in an effort to shed load. Stall prevention can optionally be disabled in regeneration by the Stall Prevention Regen Enable (STALLP REGEN ENA(C1)) parameter. Also, the responsiveness of the stall prevention function is determined by the Current Limit Integral Gain (ILIMT INTEG GAIN) parameter.

ANA 1 OUT OFFSET
(Digital to Analog #1 Output Offset)
Offset for scaling Analog Output Channel #1.

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

ANA 2 OUT OFFSET
(Digital to Analog #2 Output Offset)
Offset for scaling Analog Output Channel #2.

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

ANA 1 OUT GAIN
(Digital to Analog #1 Output Gain)
Adjusts the scaling for the Analog Output Channel #1.
NOTE: value of 1.0 = 0 to 10VDC signal.

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

ANA 2 OUT GAIN
(Digital to Analog #2 Output Gain)
Adjusts the scaling for the Analog Output Channel #2.
NOTE: value of 1.0 = 0 to 10VDC signal.

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

FLT RESET DELAY
(Fault Reset Delay)
When the drive is set for automatic fault reset, this is the time before a fault is automatically reset.

FLT RESETS/HOUR
(Fault Resets per Hour)
When the drive is set for automatic fault reset, this is the number of faults that is allowed to be automatically reset per hour.

UP TO SPD. LEVEL
(Up to Speed Level)
This parameter sets the threshold for the up to speed logic output. This is only used to generate the up to speed logic output.

TRQ LIM MSG DLY
(Torque Limit Message Delay)
This parameter will delay posting the Torque Limit Hit message for the time set by this parameter. This prevents nuisance postings of this alarm message.

ENCODER PULSES
(Encoder Pulses)
Only used for diagnostics…
This parameter sets the pulses per revolution (before the x4 logic) the drive receives from the encoder for only by the ENCODER SPEED (D1) display.

Adjust A0 menu

S-Curves A2 submenu

A2	parameter	description	default	units	min	max	hidden item	run lock out
	ACCEL RATE 0	Acceleration rate limit	ft/s^2 or m/s^2	N	Y	2.60 0.800	N	Y
	DECEL RATE 0	Deceleration rate limit	ft/s^2 or m/s^2	N	Y	2.60 0.800	N	Y
	ACCEL JERK IN 0	Rate of increase of acceleration, up to ACCEL RATE, when increasing elevator speed	ft/s^3 or m/s^3	N	Y	2.0 0.60	N	Y
	ACCEL JERK OUT 0	Rate of decrease of acceleration to zero when approaching contract elevator speed	ft/s^3 or m/s^3	N	Y	2.0 0.60	N	Y
	DECEL JERK IN 0	Rate of increase of deceleration, up to DECEL RATE, when decreasing elevator speed	ft/s^3 or m/s^3	N	Y	2.0 0.60	N	Y
	DECEL JERK OUT 0	Rate of decrease of deceleration to zero when slowing the elevator to leveling speed	ft/s^3 or m/s^3	N	Y	2.0 0.60	N	Y
	ACCEL RATE 1	Acceleration rate limit	ft/s^2 or m/s^2	N	Y	2.60 0.800	N	Y
	DECEL RATE 1	Deceleration rate limit	ft/s^2 or m/s^2	N	Y	2.60 0.800	N	Y
	ACCEL JERK IN 1	Rate of increase of acceleration, up to ACCEL RATE, when increasing elevator speed	ft/s^3 or m/s^3	N	Y	2.0 0.60	N	Y
	ACCEL JERK OUT 1	Rate of decrease of acceleration to zero when approaching contract elevator speed	ft/s^3 or m/s^3	N	Y	2.0 0.60	N	Y
	DECEL JERK IN 1	Rate of increase of deceleration, up to DECEL RATE, when decreasing elevator speed	ft/s^3 or m/s^3	N	Y	2.0 0.60	N	Y
	DECEL JERK OUT 1	Rate of decrease of deceleration to zero when slowing the elevator to leveling speed	ft/s^3 or m/s^3	N	Y	2.0 0.60	N	Y
	ACCEL RATE 2	Acceleration rate limit	ft/s^2 or m/s^2	N	Y	2.60 0.800	N	Y
	DECEL RATE 2	Deceleration rate limit	ft/s^2 or m/s^2	N	Y	2.60 0.800	N	Y

Open-loop S-Curves A2

A2	parameter	description	default	units	min	max	hidden item	run lock out
	ACCEL JERK IN 2	Rate of increase of acceleration, up to ACCEL RATE, when increasing elevator speed	ft/s^3 or m/s^3	N	Y	2.0	N	Y
	ACCEL JERK OUT 2	Rate of decrease of acceleration to zero when approaching contract elevator speed	ft/s^3 or m/s^3	N	Y	2.0 0.60	N	Y
	DECEL JERK IN 2	Rate of increase of deceleration, up to DECEL RATE, when decreasing elevator speed	ft/s^3 or m/s^3	N	Y	2.0 0.60	N	Y
	DECEL JERK OUT 2	Rate of decrease of deceleration to zero when slowing the elevator to leveling speed	ft/s^3 or m/s^3	N	Y	2.0 0.60	N	Y
	ACCEL RATE 3	Acceleration rate limit	ft/s^2 or m/s^2	N	Y	2.60 0.800	N	Y
	DECEL RATE 3	Deceleration rate limit	ft/s^2 or m/s^2	N	Y	2.60 0.800	N	Y
	ACCEL JERK IN 3	Rate of increase of acceleration, up to ACCEL RATE, when increasing elevator speed	ft/s^3 or m/s^3	N	Y	2.0 0.60	N	Y
	ACCEL JERK OUT 3	Rate of decrease of acceleration to zero when approaching contract elevator speed	ft/s^3 or m/s^3	N	Y	2.0 0.60	N	Y
	DECEL JERK IN 3	Rate of increase of deceleration, up to DECEL RATE, when decreasing elevator speed	ft/s^3 or m/s^3	N	Y	2.0 0.60	N	Y
	DECEL JERK OUT 3	Rate of decrease of deceleration to zero when slowing the elevator to leveling speed	ft/s^3 or m/s^3	N	Y	2.0 0.60	N	Y

Detailed descriptions

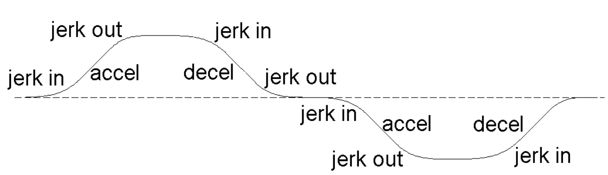
The HPV 600 speed command is passed through an internal S-curve in order to produce the speed reference. In general, the S curve function takes an arbitrary speed command and generates a speed reference subject to the conditions that the maximum accel, decel and jerk rates not be exceeded. The speed command is typically the target speed that the reference is headed to.

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

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

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

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



S-Curve

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

Parameters for S-curve-0 (SC0):

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

Parameters for S-curve-1 (SC1):

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

Parameters for S-curve-2 (SC2):

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

Parameters for S-curve-3 (SC3):

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

S-Curve Pattern Selection

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

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

S-curve Availability

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

Selecting S-curves

Adjust A0 menu

Multistep Ref A3 submenu

A3	parameter	description	default	units	min	max	hidden item	run lock out
	SPEED COMMAND 1	Multi-step speed command #1	0.0 0.000	ft/min or m/sec	-3000 -16.00	3000 16.00	N	Y
	SPEED COMMAND 2	Multi-step speed command #2	0.0 0.000	ft/min or m/sec	-3000 -16.00	3000 16.00	N	Y
	SPEED COMMAND 3	Multi-step speed command #3	0.0 0.000	ft/min or m/sec	-3000 -16.00	3000 16.00	N	Y
	SPEED COMMAND 4	Multi-step speed command #4	0.0 0.000	ft/min or m/sec	-3000 -16.00	3000 16.00	N	Y
	SPEED COMMAND 5	Multi-step speed command #5	0.0 0.000	ft/min or m/sec	-3000 -16.00	3000 16.00	N	Y
	SPEED COMMAND 6	Multi-step speed command #6	0.0 0.000	ft/min or m/sec	-3000 -16.00	3000 16.00	N	Y
	SPEED COMMAND 7	Multi-step speed command #7	0.0 0.000	ft/min or m/sec	-3000 -16.00	3000 16.00	N	Y
	SPEED COMMAND 8	Multi-step speed command #8	0.0 0.000	ft/min or m/sec	-3000 -16.00	3000 16.00	N	Y
	SPEED COMMAND 9	Multi-step speed command #9	0.0 0.000	ft/min or m/sec	-3000 -16.00	3000 16.00	N	Y
	SPEED COMMAND 10	Multi-step speed command #10	0.0 0.000	ft/min or m/sec	-3000 -16.00	3000 16.00	N	Y
	SPEED COMMAND 11	Multi-step speed command #11	0.0 0.000	ft/min or m/sec	-3000 -16.00	3000 16.00	N	Y
	SPEED COMMAND 12	Multi-step speed command #12	0.0 0.000	ft/min or m/sec	-3000 -16.00	3000 16.00	N	Y
	SPEED COMMAND 13	Multi-step speed command #13	0.0 0.000	ft/min or m/sec	-3000 -16.00	3000 16.00	N	Y
	SPEED COMMAND 14	Multi-step speed command #14	0.0 0.000	ft/min or m/sec	-3000 -16.00	3000 16.00	N	Y
	SPEED COMMAND 15	Multi-step speed command #15	0.0 0.000	ft/min or m/sec	-3000 -16.00	3000 16.00	N	Y

Detailed descriptions

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

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

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

IMPORTANT

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

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

Multi-step Selection

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

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

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

Adjust A0 menu

Power Convert A4 submenu

A4	parameter	description	default	units	min	max	hidden item	run lock out
	Id REG DIFF GAIN	Flux current regulator differential gain	0.50	none	0.10	2.00	Y	N
	Id REG PROP GAIN	Flux current regulator proportional gain	0.30	none	0.10	1.00	Y	N
	Iq REG DIFF GAIN	Torque current regulator differential gain	1.00	none	0.10	2.00	Y	N
	Iq REG PROP GAIN	Torque current regulator proportional gain	0.30	none	0.10	1.00	Y	N
	Id DIST LOOP GN	Flux current distortion loop gain	0.50	none	0.00	1.50	Y	N
	Iq DIST LOOP GN	Torque current distortion loop gain	0.30	none	0.00	1.50	Y	N
	Id DIST LOOP Fc	Flux current distortion loop corner frequency	5.0	Hz	0.1	30.0	Y	N
	Iq DIST LOOP Fc	Torque current distortion loop corner frequency	5.0	Hz	0.1	30.0	Y	N
	I REG CROSS FREQ	Current regulator crossover frequency	100.0	% of DC stop freq.	0.0	300.0	Y	N
	DIST LP OFF FREQ	Distortion loop rolloff frequency	60.0	Hz	0.0	99.9	Y	N
	ILIMT INTEG GAIN	Stall Prevention (Current Limit) integral gain	1.00	none	0.00	9.99	N	N
	HUNT PREV GAIN	Torque slew rate gain; increasing gain slows drive torque response	1.00	none	0.00	4.00	N	N
	HUNT PREV TIME	Hunt prevention filter time constant.	0.20	seconds	0.01	1.00	N	N
	PWM FREQUENCY	Carrier frequency	10.0	kHz	2.5	16.0	N	N
	SWITCHING DELAY	Transistor switching delay	0.00	μsec	-5.00	5.00	Y	N
	VC CORRECTION	Conduction voltage correction	2.50	V	0.00	5.00	Y	N
	UV ALARM LEVEL	Voltage level for undervoltage alarm	90	%nominal dc bus	80	99	N	N
	UV FAULT LEVEL	Voltage level for undervoltage fault	80	%nominal dc bus	50	99	N	N
	EXTERN REACTANCE	External choke reactance	0.0	% base Z	0.0	10.0	N	Y
	INPUT L-L VOLTS	Nominal line-line AC input Voltage, RMS	460 or 230	Volts	110	480	N	N

Detailed descriptions

Id REG DIFF GAIN
(Current Regulator Differential Gain for Flux Generation)
The differential gain for the current regulator flux generation. This parameter is meant for advanced operation, therefore, the parameter will rarely need to be changed from the default value.

Id REG PROP GAIN
(Current Regulator Proportional Gain for Flux Generation)
The proportional gain for the current regulator flux generation**.** This parameter is meant for advanced operation, therefore, the parameter will rarely need to be changed from the default value.

Iq REG DIFF GAIN
(Current Regulator Differential Gain for Torque Generation)
The differential gain for the current regulation of motor torque. This parameter is meant for advanced operation, therefore, the parameter will rarely need to be changed from the default value.

Iq REG PROP GAIN
(Current Regulator Proportional Gain for Torque Generation)
The proportional gain for the current regulator torque generation. This parameter is meant for advanced operation, therefore, the parameter will rarely need to be changed from the default value.

Id DIST LOOP GN
(Distortion Loop Gain on Flux Current Generation)
The proportional gain on the distortion loop regulator for flux current. This parameter is meant for advanced operation, therefore, the parameter will rarely need to be changed from the default value.

Iq DIST LOOP GN
(Distortion Loop Gain on Torque Current Generation)
The proportional gain on the distortion loop regulator for torque current. This parameter is meant for advanced operation, therefore, the parameter will rarely need to be changed from the default value.

Id DIST LOOP Fc
(Corner Frequency on Distortion Loop for Flux Current)
The high-pass corner frequency on the distortion loop regulator for flux current. This parameter is meant for advanced operation, therefore, the parameter will rarely need to be changed from the default value.

Iq DIST LOOP Fc
(Corner Frequency on Distortion Loop for Torque Current)
The high-pass corner frequency on the distortion loop regulator for torque current. This parameter is meant for advanced operation, therefore, the parameter will rarely need to be changed from the default value.

I REG CROSS FREQ
(Current Regulator Crossover Frequency)
Transition frequency between control at low frequency and higher frequency. This parameter is meant for advanced operation, therefore, the parameter will rarely need to be changed from the default value.

DIST LP OFF FREQ
(Distortion Loop Rolloff Frequency)
The frequency at which the distortion loops begin to be phased out. This parameter is meant for advanced operation, therefore, the parameter will rarely need to be changed from the default value.

ILIMT INTEG GAIN
(Current Limit Integral Gain)
The Stall Prevention (Current Limit) function's integral gain. This determines the response of the function. Stall prevention causes the drive to deviate from the commanded speed to limit motor current to a user set level. When the motoring current limit is reached (MTR TORQUE LIMIT(A1)), the stall prevention function will reduce speed. When the regenerating current limit is reached (REGEN TORQ LIMIT(A1)), the stall prevention function will increase speed in an effort to shed load. Stall prevention can optionally be disabled in regeneration by the Stall Prevention Regen Enable (STALLP REGEN ENA(C1)) parameter.

HUNT PREV GAIN
(Hunt Prevent Gain)
Determines the response to changes in torque (torque slew rate gain). Increasing the gain slows drive torque response (more dampening). Be cautious not to set the parameter too high or the drive will become unstable.

NOTE: it is usually best to leave this parameter set at the default of 1.0 seconds.

Hunting can occur following a load change, but it may also occur when the motor is settling into a steady speed. Hunting may cause the motor to vibrate at lower speeds. The Hunt Prevention function will help to reduce or suppress this oscillation.

HUNT PREV TIME
(Hunt Prevention Time Constant)
Hunt prevention filter time constant. Adjusted for hunt prevention response and stability. By increasing the value of the parameter, the response time of the hunt prevention function will become slower. Reducing the parameter to a lower value makes the hunt prevention function respond more quickly. Note: the function works better with a lower time constant.

NOTE: it is usually best to leave this parameter set at the default of 0.2 seconds.

Hunting can occur following a load change, but it may also occur when the motor is settling into a steady speed. Hunting may cause the motor to vibrate at lower speeds. The Hunt Prevention function will help to reduce or suppress this oscillation.

PWM FREQUENCY
(PWM Frequency)
This parameter sets the PWM or 'carrier' frequency of the drive. The carrier is defaulted at 10.0 kHz, which is well out of audible range. The drive does not derate when the PWM frequency is set to 10kHz or below.

SWITCHING DELAY
(Transistor Switching Delay)
This parameter is hardware dependent and should not be adjusted.

VC CORRECTION
(Conduction Voltage Correction)
This parameter is hardware dependent and should not be adjusted.

UV ALARM LEVEL
(Undervoltage Alarm Level)
This parameter sets the level (as a percentage of the INPUT L-L VOLTS(A4)) at which an under voltage alarm will be declared.

UV FAULT LEVEL
(Undervoltage Fault Level)
This parameter sets the level (as a percentage of the INPUT L-L VOLTS(A4)) at which an under voltage fault will occur.

EXTERN REACTANCE
(External Reactance)
This parameter sets the externally connected reactance (as a percentage of base impedance) between the drive and the motor.

INPUT L-L VOLTS
(Input Line to Line Voltage - Input Voltage)
This parameter sets the input voltage or AC line input voltage to the drive. This parameter is used only to determine the UV alarm and fault levels.

Adjust A0 menu

Motor A5 submenu

A5	parameter	description	default	units	min	max	hidden item	run lock out
	MOTOR ID	Motor Identification		none			N	Y
	RATED MTR POWER	Rated motor output power	Per ID	HP or KW	1.0	500.0	N	Y
	RATED MTR VOLTS	Rated motor terminal RMS voltage	Per ID	Volts	190.0	575.0	N	Y
	RATED EXCIT FREQ	Rated excitation frequency	Per ID	Hz	5.0	400.0	N	Y
	MOTOR MID VOLTS	Voltage at middle frequency. Limited by the motor's rated voltage.	Per ID	Volts	0.1	575.0	N	Y
	MOTOR MID FREQ	Middle frequency point used to define the V/Hz profile.	Per ID	Hz	0.1	400.0	N	Y
	MOTOR MIN VOLTS	Voltage at minimum frequency.	Per ID	Volts	0.1	100.0	N	Y
	MOTOR MIN FREQ	Minimum frequency point used to define the V/Hz profile.	Per ID	Hz	0.1	10.0	N	Y
	RATED MOTOR CURR	Rated motor current	Per ID	Amps	1.00	800.00	N	Y
	MOTOR POLES	Motor poles	Per ID	none	2	32	N	N
	RATED MTR SPEED	Rated motor speed at full load	Per ID	RPM	50.0	3000.0	N	N
	% NO LOAD CURR	Percent no load current	Per ID	% rated motor current	10.0	80.0	N	N
	STATOR LEAKAGE X	Stator leakage reactance	Per ID	% base Z	0.0	20.0	Y	N
	ROTOR LEAKAGE X	Rotor leakage reactance	Per ID	% base Z	0.0	20.0	Y	N
	STATOR RESIST	Stator resistance	Per ID	% base Z	0.0	20.0	Y	N
	MOTOR IRON LOSS	Iron loss at rated frequency	Per ID	% rated power	0.0	15.0	Y	N
	MOTOR MECH LOSS	Mechanical loss at rated frequency	Per ID	% rated power	0.0	15.0	Y	N
	OVLD START LEVEL	Maximum continuous motor current	Per ID	% rated current	100	150	Y	Y
	OVLD TIME OUT	Time that defines motor overload curve	Per ID	seconds	5.0	120.0	Y	Y

Open-loop Motor A5

Detailed description

MOTOR ID
(Motor Identification)
This parameter allows for the selection of specific sets of motor parameters. A listing of each Motor Ids with its corresponding set of motor parameters is shown below.

motor parameter	Motor ID			
	4 pole 400 v	4 pole 200 v	6 pole 400 v	6 pole 200 v
Rated Mtr Power	0.0 HP/KW	0.0 HP/KW	0.0 HP/KW	0.0 HP/KW
Rated Mtr Volts	0.0 V	0.0 V	0.0 V	0.0 V
Rated Excit Freq	0.0 Hz	0.0 Hz	0.0 Hz	0.0 Hz
Motor Mid Volts	28.0V	14.0V	28.0V	14.0V
Motor Mid Freq	3.0Hz	3.0Hz	3.0Hz	3.0Hz
Motor Min Volts	9.0V	4.0V	9.0V	4.0V
Motor Min Freq	1.0Hz	1.0Hz	1.0Hz	1.0Hz
Rated Motor Curr	0.0 A	0.0 A	0.0 A	0.0 A
Motor Poles	4	4	6	6
Rated Mtr Speed	0.0 rpm	0.0 rpm	0.0 rpm	0.0 rpm
% No Load Curr	35.0%	35.0%	45.0%	45.0%
Stator Leakage X	9.0%	9.0%	7.5%	7.5%
Rotor Leakage X	9.0%	9.0%	7.5%	7.5%
Stator Resist	2.5%	2.5%	2.5%	2.5%
Motor Iron Loss	0.5%	0.5%	0.5%	0.5%
Motor Mech Loss	1.0%	1.0%	1.0%	1.0%

Motor ID Parameters

NOTE: The default motor selections need to have the motor nameplate information entered in the appropriate motor parameters. The other motor parameters are already set to nominal values.

RATED MTR PWR
(Rated Motor Power)
This parameter sets the rated power in horsepower (HP) or kilowatts (kW) of the motor. Note: value should be obtained from the motor nameplate

RATED MTR VOLTS
(Rated Motor Voltage)
This parameter sets the rated motor voltage. Note: value should be obtained from the motor nameplate

RATED EXCIT FREQ
(Rated Motor Excitation Frequency)
This parameter sets the excitation frequency of the motor. Note: value should be obtained from the motor nameplate

MOTOR MID VOLTS
(V/Hz Pattern Voltage at Middle Frequency)
This parameter sets rated voltage at the V/Hz pattern middle frequency. This setting is limited by the motor's rated voltage (RATED MTR VOLTS(A5)). Note: a SETUP FLT #9 will occur if the below formula is not meet.

$$\begin{pmatrix} MOTOR \\ MIN \\ VOLTS \end{pmatrix} < \begin{pmatrix} MOTOR \\ MID \\ VOLTS \end{pmatrix} < \begin{pmatrix} RATED \\ MTR \\ VOLTS \end{pmatrix}$$

MOTOR MID FREQ
(V/Hz Pattern Middle Frequency)
This parameter sets middle frequency used to define the V/Hz pattern. Note: a SETUP FLT #9 will occur if the below formula is not meet.

$$\begin{pmatrix} MOTOR \\ MIN \\ FREQ \end{pmatrix} < \begin{pmatrix} MOTOR \\ MID \\ FREQ \end{pmatrix} < \begin{pmatrix} RATED \\ EXCIT \\ FREQ \end{pmatrix}$$

MOTOR MIN VOLTS
(V/Hz Pattern Voltage at Minimum Frequency)
This parameter sets voltage at the V/Hz pattern minimum frequency. Note: a SETUP FLT #9 will occur if the below formula is not meet.

$$\begin{pmatrix} MOTOR \\ MIN \\ VOLTS \end{pmatrix} < \begin{pmatrix} MOTOR \\ MID \\ VOLTS \end{pmatrix} < \begin{pmatrix} RATED \\ MTR \\ VOLTS \end{pmatrix}$$

MOTOR MIN FREQ
(V/Hz Pattern Minimum Frequency)
This parameter sets minimum frequency used to define the V/Hz pattern. Note: a SETUP FLT #9 will occur if the below formula is not meet.

$$\begin{pmatrix} \textit{MOTOR} \\ \textit{MIN} \\ \textit{FREQ} \end{pmatrix} < \begin{pmatrix} \textit{MOTOR} \\ \textit{MID} \\ \textit{FREQ} \end{pmatrix} < \begin{pmatrix} \textit{RATED} \\ \textit{EXCIT} \\ \textit{FREQ} \end{pmatrix}$$

RATED MOTOR CURR
(Rated Motor Amps)
This parameter sets the rated motor current. Note: value should be obtained from the motor nameplate

MOTOR POLES
(Motor Poles)
This parameter sets the number of poles in the motor.
NOTE: This must be an even number or a Setup Fault #3 will occur. Note: value should be obtained from the motor nameplate or use table below as reference

Rated Speed (RPM)	# of motor poles
1300-1800	4
900-1200	6
660-900	8

RATED MTR SPEED
(Rated Motor Speed)
This parameter sets the rated rpm of the motor (nameplate speed). NOTE: This is a function of the motor only and does not need to be the same as the CONTRACT MTR SPD (A1) parameter setting. Note: value should be obtained from the motor nameplate or use table below as reference

Rated Speed (RPM)	# of motor poles
1300-1801	4
900-1201	6
660-900	8

% NO LOAD CURR
(Percent No Load Current)
This parameter sets the percent no load current of the motor.

STATOR LEAKAGE X
(Stator Leakage Reactance)
This parameter sets the stator reactance leakage, as a percent of the BASE IMPEDANCE, which appears in the Power Data display.
NOTE: The base impedance is based on the RATED MTR PWR (A5) and RATED MTR VOLTS (A5) parameters.

ROTOR LEAKAGE X
(Rotor Leakage Reactance)
This parameter sets the rotor reactance leakage, as a percent of the BASE IMPEDANCE (D2), which appears in the Power Data display.
NOTE: The base impedance is based on the RATED MTR PWR (A5) and RATED MTR VOLTS (A5) parameters.

STATOR RESIST
(Stator Resistance)
This parameter sets the amount of resistance in the motor stator, as a percent of the BASE IMPEDANCE (D2), which appears in the Power Data display.
NOTE: The base impedance is based on the RATED MTR PWR (A5) and RATED MTR VOLTS (A5) parameters.

MOTOR IRON LOSS
(Motor Iron Loss)
This parameter sets the motor iron loss at rated frequency.

MOTOR MECH LOSS
(Motor Mechanical Losses)
This parameter sets the motor mechanical losses at rated frequency.

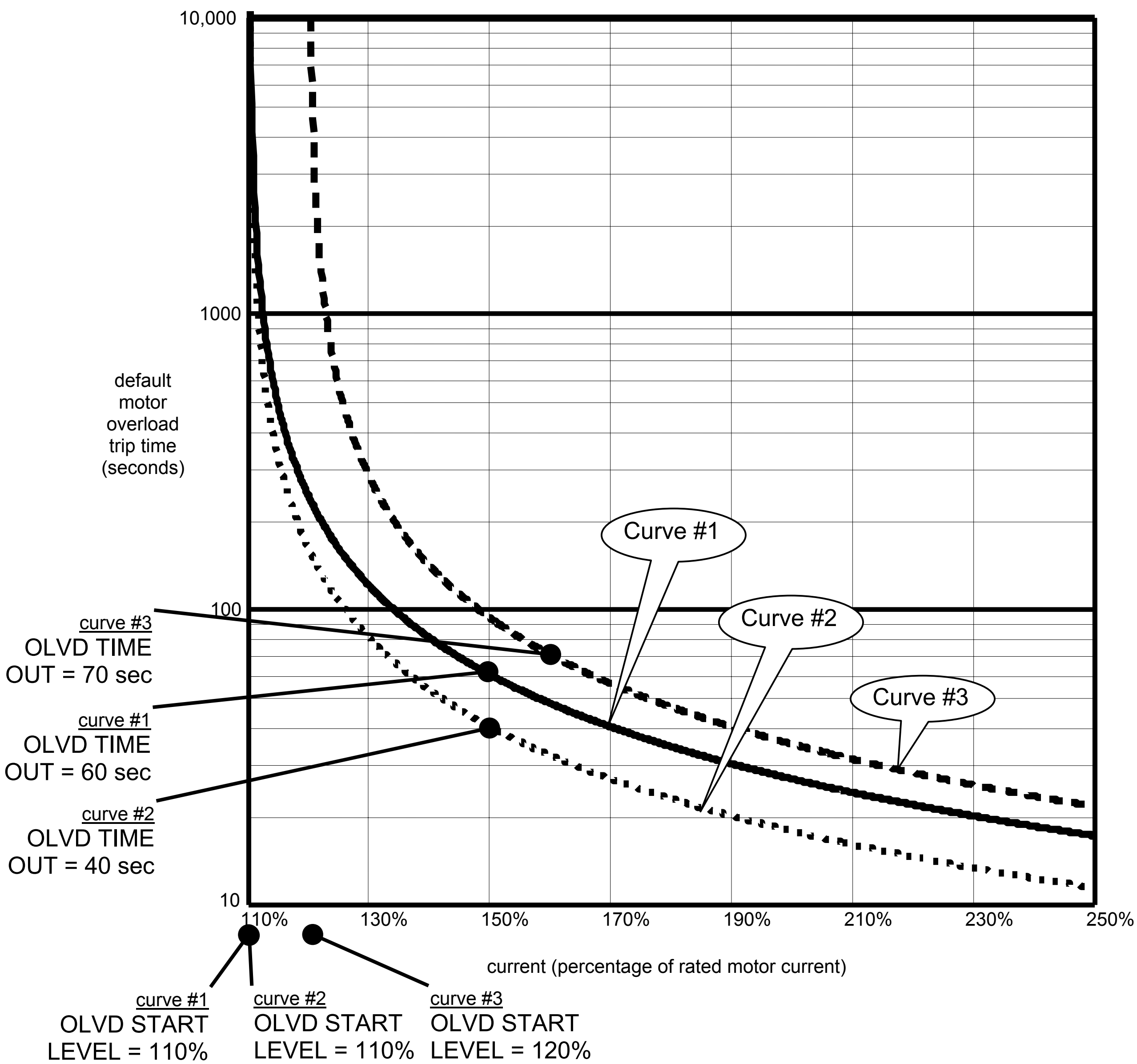
OVLD START LEVEL
(Motor Overload Start Level)
This parameter defines maximum current at which motor can run continuously. This parameter is also one of the two parameters that define the motor overload curve.
The motor overload parameters can be adjusted by the user. The following two parameters are used to define the motor overload curve.

- motor current overload start level (OVLD START LEVEL(A5)) parameter
- motor current time out (OVLD TIME OUT(A5)) parameter

Three overload curves are shown. Curve #1 is the default motor overload curve. The parameter settings that define the three overload curves are shown.

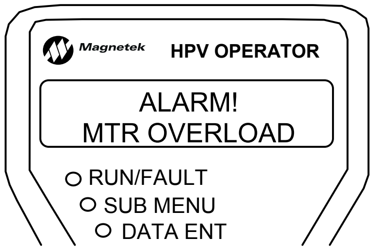
	OVLD START LEVEL	OVLD TIME OUT
curve #1	110%	60 sec
curve #2	110%	40 sec
curve #3	120%	70 sec

Motor Overload Parameters



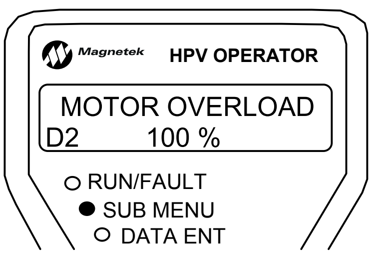
Motor Overload Curve

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



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

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



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

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

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

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

OVLD TIME OUT
(Motor Overload Time Out)
This parameter defines the amount of time before a motor overload alarm occurs when the motor is running at the current level defined below:

$$\left(\begin{array}{c} OVLD \\ START \\ LEVEL: \end{array}\right) + \left(\begin{array}{c} 40\% \\ rated \\ motor \\ current \end{array}\right)$$

This is the other parameter used to define the overload curve.

Configure C0 menu

User Switches C1 submenu

C1	parameter	description	default	choices	hidden item	run lock out
	SPD COMMAND SRC	Speed Command Source	MULTI-STEP	analog input multi-step serial	N	Y
	RUN COMMAND SRC	Run Command Source	EXTERNAL TB1	external tb1 serial serial+extrn	N	Y
	MOTOR ROTATION	Allows user to reverse direction of motor rotation.	FORWARD	forward reverse	N	Y
	SPD REF RELEASE	Determines when speed reference release is asserted (for use when the drive controls the mechanical brake)	REG RELEASE	reg release brake picked	N	Y
	CONT CONFIRM SRC	Determines if an external logic input is used for contactor confirm.	NONE	none external tb1	N	Y
	FAULT RESET SRC	Fault reset source	EXTERNAL TB1	external tb1 serial automatic	N	Y
	OVERSPD TEST SRC	Determines external logic source to initiate overspeed test	EXTERNAL TB1	external tb1 serial	N	Y
	BRAKE PICK SRC	Determines the source of the brake pick command (if drive controls mechanical brake)	INTERNAL	internal serial	N	Y
	BRAKE PICK CNFM	Determines if a logic input is used for brake pick confirm	NONE	none external tb1	N	Y
	BRAKE HOLD SRC	Determines the source of the brake hold command. (if drive controls mechanical brake)	INTERNAL	internal serial	N	Y
	BRK PICK FLT ENA	Brake pick fault enable(if drive controls mechanical brake)	DISABLE	disable enable	N	Y
	BRK HOLD FLT ENA	Brake hold fault enable(if drive controls mechanical brake)	DISABLE	disable enable	N	Y
	DIR CONFIRM	Allows confirmation of polarity of analog speed command	DISABLE	disable enable	N	Y
	STALL TEST ENA	Stall Test function enable	ENABLE	disable enable	N	Y

C1	parameter	description	default	choices	hidden item	run lock out
	STALLP REGEN ENA	Regeneration Stall Prevention function enable	DISABLE	disable enable	N	Y
	S-CURVE ABORT	Addresses handling of a speed command change before S-Curve target speed	DISABLE	disable enable	N	Y
	STOP MODE SEL	Selects stopping mode	RAMP	ramp coast	N	Y
	MAINS DIP ENA	Mains Dip function enable	DISABLE	disable enable	N	Y
	AUTO STOP ENA	Auto Stop function enable	DISABLE	disable enable	N	Y
	DB PROTECTION	Dynamic braking protection fault or alarm selection	FAULT	fault alarm	Y	Y
	TORQUE CALC SEL	Torque Calculation Select	STATOR FLUX	air gap power stator flux	Y	Y
	DRV FAST DISABLE	Addresses how fast the drive responses to the removal of DRIVE ENABLE logic input	DISABLE	disable enable	Y	Y

Detailed descriptions

SPD COMMAND SRC
(Speed Command Source)
This parameter designates the source of the drive's speed command.
The three possible sources for the speed command are following:

- Multi-Step Command - user defined fifteen discrete speed commands (CMD1 - CMD15). Four logic inputs are used as speed command selections (CMD0 is reserved for zero speed. But, the user can specify CMD1 - CMD15 to be any speed command either positive or negative)
- Analog Channel – a bipolar (±10V) signal. Available with the analog channel is a Speed Command Multiplier (SPD COMMAND MULT(A1)) and Speed Command Bias (SPD COMMAND BIAS(A1)). These parameters are used to scale the user's analog speed command to the proper range for use by the drive software.
- Serial Channel – need a RS-422 serial port option card installed.

RUN COMMAND SRC
(Run Command Source)
This parameter allows the user to choose the source of the run command from one of the following sources: an external run signal from a logic input (external tb1), a run signal transferred across a serial channel (serial), or a signal from both the serial channel and a logic input (serial+extrn). If a signal is required from a logic input (either external tb1 or serial+extrn), the Run signal on TB1 must be selected.

MOTOR ROTATION
(Motor Rotation)
This parameter allows the user to change the direction of the motor rotation. As an example, if the car controller is commanding the up direction and the car is actually going in a down direction, this parameter can be changed to allow the motor rotation to match the car controller command.

SPD REF RELEASE
(Speed Reference Release)
The user can select when the Speed Reference Release signal is asserted:

- If the user does not want the drive to wait for the mechanical brake to be picked then SPD REF RELEASE can be made equal to REG RELEASE;
- If the user does want the drive to wait for the brake to be picked then SPD REF RELEASE is not asserted until BRAKE PICKED becomes true.

CONT CONFIRM SRC
(Contactor Confirm Source)
This switch selects if hardware confirmation of motor contactor closure is necessary before drive attempts to pass current through motor. If hardware confirmation is available set to EXTERNAL TB1 and select the Contact Cnfirm signal on a logic input terminal.

FAULT RESET SRC
(Fault Reset Source)
This parameter determines the source of the drive's external fault reset from one of the following sources: an external fault reset signal from a logic input (external tb1), a fault reset signal transferred across a serial channel (serial), or the drive automatically resets the faults (automatic). The user also has the option to reset faults directly through the operator.
Automatic Fault Reset
If the fault reset source is set to automatic, the faults will be reset according to the setting of the FLT RESET DELAY (A1) and FLT RESETS/HOUR (A1) parameters. When a logic input is defined as "fault reset" and this logic input signal is transitioned from false to true: an active fault will be reset and automatic fault reset counter (defined by FLT RESETS/HOUR(A1)) will be reset to zero.

CAUTION

If the run signal is asserted at the time of a fault reset, the drive will immediately go into a run state. Unless using the auto-fault reset function (FAULT RESET SRC (C1)=automatic), then the run command needs to be cycled to be reset automatically, but will reset if initiated by a logic input without cycling the run command.

OVERSPEED TEST SRC
(Overspeed Test Source)
This switch determines the source of the overspeed test. Operation of the overspeed test function is specified by the OVRSPEED MULT (A1) parameter. Regardless of the setting of this parameter, the user can call for the overspeed test via the Digital Operator.

BRAKE PICK SRC
(Brake Pick Source)
If the BRAKE PICK SRC (C1) is set to INTERNAL, the HPV 600 will attempt to pick (lift) the brake when magnetizing current has been developed in the motor.

BRAKE PICK CNFM
(Brake Pick Confirm)
If this switch is set to EXTERNAL TB1, the HPV 600 will wait for brake pick confirmation before releasing the speed reference. When set to EXTERNAL TB1, the MECH BRK PICK signal on TB1 must also be selected.

BRAKE HOLD SRC
(Brake Hold Source)
If set to internal, the drive will command the mechanical brake to hold mode until confirmation of brake picked exists.

BRK PICK FLT ENA
(Brake Pick Fault Enable)
When this parameter is set to ENABLE, the brake pick command and confirmation must match within the specified time in BRK PICK TIME (A1) parameter or a brake pick fault is declared.

BRK HOLD FLT ENA
(Brake Hold Fault Enable)
When this parameter is set to ENABLE, the brake hold command and confirmation must match within the specified time in BRK HOLD TIME (A1) parameter or a brake hold fault is declared.

DIR CONFIRM
(Direction Confirm)
When enabled, the function allows confirmation of the polarity of the initial analog speed command via the Run Up or Run Down logic input commands.

- If the Run Up logic input is selected and true with the polarity of the analog signal positive, then the analog speed command is accepted unchanged.
- If the logic input Run Down logic input is selected and true with the polarity of the analog speed command negative, the analog speed command is accepted unchanged.
- If however, the logic input Run Up is true and the polarity is negative or the logic input Run Down is true and the polarity is positive, then the speed command is held at zero.

STALL TEST ENA
(Stall Test Enable)
When enabled, the function checks that motor current goes at or above a percentage (defined by STALL TEST LVL(A1)) for defined amount of time (defined by STALL FAULT TIME(A1)). If the motor current exceeds the defined parameters a STALL TEST FAULT will be declared.

STALLP REGEN ENA
(Regeneration Stall Prevention Enable)
When enabled, the Stall Prevention (Current Limit) function is enabled during regeneration. When the defined regeneration current limit is reached (REGEN TORQ LIMIT(A1)), the stall prevention function will increase speed in an effort to shed load. Also, the responsiveness of the stall prevention function is determined by the Current Limit Integral Gain (ILIMT INTEG GAIN(A4)) parameter.

S-CURVE ABORT
(S-Curve Abort)
This parameter, S-CURVE ABORT (C1), addresses how the S-Curve Speed Reference Generator handles a reduction in the speed command before the S-Curve Generator has reached its target speed.
<u>Disabled</u>
With a normal S-curve function, a change in the speed command is never allowed to violate the defined acceleration or jerk rates. If a reduction in the speed command is issued before the S-Curve generator has reached its target speed, then the jerk rate dictates what speed is reached before the speed may be reduced.
<u>Enabled</u>
The optional S-Curve abort has been selected. In this case when the speed command is reduced, the speed reference immediately starts to reduce violating the jerk limit (thus no jerk out phase), which could be felt in the elevator.
For optional S-Curve abort to be active requires that:

- The speed command source must be selected as Multi-step (SPD COMMAND SRC (C1) =multi-step).
- The S-curve Abort function must be ENABLED (S-CURVE ABORT (C1) = enabled).

STOP MODE SEL
(Stopping Mode Selection)
This parameter defines the stopping method. If the parameter is set to 'ramp', the drive will do a controller stop, apply DC injection braking, and set the BRAKE PICK logic output to false (or set mechanical brake, if drive is controlling the brake). If the parameter is set to 'coast', the drive will immediately disable the drive outputs and set the BRAKE PICK logic output to false (or set mechanical brake, if drive is controlling the brake).

MAINS DIP ENA
(Mains Dip Enable)
When enabled, the function will reduce the speed (by the percentage defined by the MAINS DIP SPEED (A1) parameter) when the drive goes into 'low voltage' mode. 'Low voltage' mode is defined as when the drive declares a UV alarm, which is defined by the Input line-to-line voltage (INPUT L-L VOLTS(A4)) parameter and the Undervoltage Alarm Level (UV ALARM LEVEL(A4))

DB PROTECTION
(Dynamic Braking Resistor Protection Selection)
The dynamic braking IGBT is limited as to when it can be turned "on" (i.e. send power to the dynamic braking resistors).

The dynamic braking IGBT is allowed to be "on" while the drive is running (i.e. while the speed regulator is released) and for a period of ten (10) seconds after the drive is stopped. If the dynamic braking IGBT is still "on" ten seconds after the drive stops running, the drive will turn "off" the dynamic braking IGBT (thus stop sending power to the dynamic braking resistors) and declare a "DB VOLTAGE" fault or alarm (whether fault or alarm, depends on setting of this parameter).

AUTO STOP ENA
(Auto Stop Enable)
When enabled, this function will cause the drive to perform a controlled stop when the speed reference is removed but the run input is maintained. The drive will resume running if a new speed reference is issued.

TORQUE CALC SEL
(Torque Calculation Select)
This parameter select between one of two methods for calculating torque in the motor. The result is used to produce the proper voltage boost at low speed. This parameter is meant for advanced operation, therefore, the parameter will rarely need to be changed from the default value.

DRV FAST DISABLE
(Drive Fast Disable Function)
This function determines how fast the drive responses to the removal of DRIVE ENABLE logic input. Note: The removal of the DRIVE ENABLE logic input will turn-off the drive output gates.

Disable
With the removal of the DRIVE ENABLE logic input, the drive's output gates will turn off within 4 msec.

Enable
With the removal of the DRIVE ENABLE logic input, the drive's output gates will turn off within 1.5-2.0 msec.

Configure C0 menu

Logic Inputs C2 submenu

C2	parameter	description	default	hidden item	run lock out
	LOGIC INPUT 1	logic input #1	DRIVE ENABLE	N	Y
	LOGIC INPUT 2	logic input #2	RUN	N	Y
	LOGIC INPUT 3	logic input #3	FAULT RESET	N	Y
	LOGIC INPUT 4	logic input #4	UP/DWN	N	Y
	LOGIC INPUT 5	logic input #5	S-CURVE SEL 0	N	Y
	LOGIC INPUT 6	logic input #6	STEP REF B0	N	Y
	LOGIC INPUT 7	logic input #7	STEP REF B1	N	Y
	LOGIC INPUT 8	logic input #8	STEP REF B2	N	Y
	LOGIC INPUT 9	logic input #9	EXTRN FAULT 1	N	Y
	choices				
	contact cfirm	Auxiliary contacts from motor contactor (normally open).			
	drive enable	Must be asserted to permit drive to run. This does not initiate run, just permits initiation.			
	extrn fault 1	User input fault #1 – normally open – fault active when input is on			
	extrn fault 2	User input fault #2 – normally open – fault active when input is on			
	extrn fault 3	User input fault #3 – normally open – fault active when input is on			
	extrn /flt 4	User input fault #4 – normally closed – fault active when input is off			
	fault reset	Asserting this input attempts to reset faults.			
	mech brake hold	Auxiliary contacts from mechanical brake. Asserted when brake is in hold mode.			
	mech brake pick	Auxiliary contacts from mechanical brake. Asserted when brake is picked (lifted).			
	nc cntct cfirm	Auxiliary contacts from motor contactor (normally closed).			
	no function	Input not assigned			
	ospd test src	Asserting input, applies the overspeed multiplier to the speed command for the next run.			
	run	If drive is enabled through the DRIVE ENABLE logic input, this function will start drive operation.			
	run down	If drive is enabled through the DRIVE ENABLE logic input, this function will start drive operation with negative speed commands.			
	run up	If drive is enabled through the DRIVE ENABLE logic input, this function will start drive operation with positive speed commands.			
	s-curve sel 0	Bit 0 of S-curve selection			
	s-curve sel 1	Bit 1 of S-curve selection			
	step ref b0	Bit 0 of multi-step speed command selection			
	step ref b1	Bit 1 of multi-step speed command selection			
	step ref b2	Bit 2 of multi-step speed command selection			
	step ref b3	Bit 3 of multi-step speed command selection			
	up/dwn	This logic can be used to change the sign of the speed command. false = no inversion, true = inverted.			

Detailed descriptions

LOGIC INPUT x
(Logic Inputs 1-9)
This parameter defines the function of the logic inputs.
NOTE: The user can assign particular functions to each input terminal. Only one function per terminal is allowed and multiple terminals cannot have the same function. When a function is assigned to an input terminal, it is removed from the list of possible selections for subsequent terminals.
NOTE: The *current* setting of each parameter is displayed in all caps; all other choices in the list are displayed in lower case.

Choices

contact cfirm (Contact Confirm Signal)
Closure of the auxiliary contacts confirming closure of the motor contactor (normally open).

drive enable (Drive Enable)
Enables drive to run. This signal must be asserted to permit drive to run. This does not initiate run, just permits initiation.

extrn fault 1 (External Fault 1)
extrn fault 2 (External Fault 2)
extrn fault 3 (External Fault 3)
Closure of this contact will cause the drive to declare a fault and perform a fault shutdown.

extrn /flt 4 (External /Fault 4)
Opening of this contact will cause the drive to declare a fault and perform a fault shutdown.

fault reset (Fault Reset)
If the FAULT RESET SRC (C1) switch is set to EXTERNAL TB1, the drive's fault circuit will be reset when this signal is true. If the FAULT RESET SRC (C1) switch is set to AUTOMATIC, the drive's fault circuit will be reset when this signal is true and the automatic fault reset counter (defined by FLT RESETS/HOUR (A1)) will be reset to zero.
NOTE: This input is edge sensitive and the fault is reset on the transition from false to true.

mech brk hold (Mechanical Brake Hold Signal)
Auxiliary contact closures confirming when the mechanical brake is in the hold mode (engaged).

mech brk pick (Mechanical Brake Pick Signal)
Closure of auxiliary contacts confirming the mechanical brake has been picked (lifted).

nc cntact cfirm (NC - Contact Confirm Signal)
Closure of the auxiliary contacts confirming closure of the motor contactor (normally closed).

no function (No Function)
When this setting is selected for one of the TB1 input terminals, any logic input connected to that terminal will have no effect on drive operation.

ospd test src (Overspeed Test Source)
This function works only if the OVRSPEED TEST SRC (C1) switch is set to EXTERNAL TB1. A true signal on this input applies the OVERSPEED MULT (A1) to the speed command for the next run. After the run command has dropped, the drive returns to 'normal' mode and must be re-configured to perform the overspeed function again. The OVERSPEED FLT level is also increased by the OVERSPEED MULT (A1), allowing the elevator to overspeed without tripping out on an overspeed fault.
NOTE: This input must be taken false then true each time that an overspeed test is run. If the input is left in the true, it is ignored after the first overspeed test.

run (Run)
If drive is enabled through the DRIVE ENABLE logic input, this function will start drive operation.

run down (Run Down)
If drive is enabled through the DRIVE ENABLE logic input, this function will start drive operation with negative speed commands.
Note: if both RUN UP and RUN DOWN are true then the run is not recognized.
Note: if DIR CONFIRM (C1) is enabled, this input will not change the polarity of the speed command and will be used to confirm the polarity of the analog speed command as well as starting the operation of the drive.

run up (Run Up)
If drive is enabled through the DRIVE ENABLE logic input, this function will start drive operation with positive speed commands.
Note: if both RUN UP and RUN DOWN are true then the run is not recognized.
Note: if DIR CONFIRM (C1) is enabled, this input is also used to confirm the polarity of the analog speed command as well as starting the operation of the drive.

s-curve sel 0 (S-Curve Select bit-0)
s-curve sel 1 (S-Curve Select bit-1)
These two bits are used to select one of four s-curve selections.

step ref b0 (Speed Selection bit-0)
step ref b1 (Speed Selection bit-1)
step ref b2 (Speed Selection bit-2)
step ref b3 (Speed Selection bit-3)
Four inputs, which must be used together as a 4-bit command for multi-step speed selection.

up/dwn (Up/Down Signal)
This signal is used to change the sign of the speed command. Default is FALSE; therefore, positive commands are for the up direction and negative speed command are for the down direction. Making this input true reverses the car's direction.

Configure C0 menu

Logic Outputs C3 submenu

C2	parameter	description	default	hidden item	run lock out
	LOGIC OUTPUT 1	logic output #1	READY TO RUN	N	Y
	LOGIC OUTPUT 2	logic output #2	RUN COMMANDED	N	Y
	LOGIC OUTPUT 3	logic output #3	MTR OVERLOAD	N	Y
	LOGIC OUTPUT 4	logic output #4	READY TO RUN	N	Y
	RELAY COIL 1	relay output #1	FAULT	N	Y
	RELAY COIL 2	relay output #2	SPEED REG RLS	N	Y
	choices				
	alarm	An alarm declared by the drive			
	alarm+flt	A fault or alarm is declared by the drive			
	brake alarm	A brake fault is declared while the drive is running			
	brake hold	The brake pick confirmation is received			
	brake pick	Signal used to pick (open) the mechanical brake			
	brk hold flt	Brake hold state has not matched the commanded state			
	brk igbt flt	Brake IGBT has reached overcurrent			
	brk pick flt	Brake pick state has not matched the commanded state			
	car going dwn	The motor is moving in negative direction faster than user specified speed			
	car going up	The motor is moving in positive direction faster than user specified speed			
	charge fault	DC bus has not charged			
	close contact	The drive has been enabled & commanded to run and no faults are present			
	contactor flt	Contactor state has not matched the commanded state			
	drv overload	The drive has exceeded the drive overload curve			
	fan alarm	Cooling fan failure			
	fault	A fault declared by the drive			
	flux confirm	The drive’s current level has reached 75% of the dc inject start level			
	fuse fault	DC bus fuse is open			
	ground fault	Sum of all phase currents exceeds 50% of rated current			
	motor trq lim	The drive has exceeded the motoring torque limit			
	mtr overload	The motor has exceeded the motor overload curve			
	no function	Output not assigned			
	not alarm	The output is true when an alarm is NOT present.			
	over curr flt	Phase current exceeded 250%			
	overtemp flt	Heatsink temperature exceeded 90°C (194°F)			
	overvolt flt	DC bus voltage exceeded 850VDC for 460V drive or 425 VDC for 230V drive			
	ovrtemp alarm	Heatsink temperature exceeded 80°C (176°F)			
	phase fault	Open motor phase			
	ramp down ena	Indicates the speed reference is being ramped to zero through auto stop			
	ready to run	The drive’s software has initialized and no faults are present			
	regen trq lim	The drive has exceeded the regenerating torque limit			
	run commanded	The drive is being commanded to run			
	run confirm	The drive has been enabled & commanded to run; no faults are present; the contactor has closed; and the IGBTs are firing			
	speed ref rls	Flux is confirmed and drive is NOT in DC injection			
	spd ref rls 2	Drive being commanded to run, NOT in DC injection, and using multi-step speed commands			
	speed reg rls	Flux is confirmed and brake is commanded to be picked (if used)			
	stltst active	The drive is declaring a stall test fault			
	undervolt flt	DC bus voltage has dropped below a specified percent			
	up to speed	The motor speed is above a user defined level			
	uv alarm	DC bus voltage has dropped below a specified percent			
	zero speed	The motor speed is below a user defined level			

Detailed description

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

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

Choices

alarm (Alarm)
The output is true when an alarm is declared by the drive.

alarm+flt (Alarm and/or Fault)
The output is true when a fault and/or an alarm is declared by the drive.

brake alarm (Brake Alarm)
The output is true when the dynamic brake resistor is in an overcurrent condition and the drive is in a run condition.

brake hold (Brake Hold)
The output is true when the brake pick confirmation is received. It is used to show the mechanical brake is remaining open. This function is used with brakes that need to have less than 100% voltage to hold the brake open.

brake pick (Brake Pick)
The output is true when the speed regulator is released and is used to open the mechanical brake.

brk hold flt (Brake Hold Fault)
The output is true when the brake hold command and the brake feedback do not match for the user specified time.

brk igbt flt (Brake Fault)
The output is true when the dynamic brake resistor is in a overcurrent condition and the drive is not in a run condition.

brk pick flt (Brake Pick Fault)
The output is true when the brake pick command and the brake feedback do not match for the user specified time.

car going dwn (Car Going Down)
The output is true when the motor moves in negative direction faster than the user specified speed.

car going up (Car Going Up)
The output is true when motor moves in positive direction faster than user specified speed.

charge fault (Charging Fault)
The output is true when the DC bus voltage has not stabilized above the voltage fault level or the charge contactor has not closed after charging.

close contact (Close Motor Contactor)
The output is true when the run command is given, the drive is enabled, the software has initialized, and no faults are present.

contactor flt (Contactor Fault)
The output is true when the command to close the contactor and the contactor feedback do not match before the user specified time.

drv overload (Drive Overload)
The output is true when the drive has exceeded the drive overload curve.

fan alarm (Fan Alarm)
The output is true when the fan on the drive is not functioning.

fault (Fault)
The output is true when a fault is declared by the drive.

flux confirm (Motor Flux Confirmation)
The output is true when the drive has confirmed the initial current level is equal to 75% of the dc inject at start current level. This is done to ensure flux is present in the motor before releasing the speed reference.

fuse fault (Fuse Fault)
The output is true when the DC bus fuse has blown.

ground fault (Ground Fault)
The output is true when the sum of all phase current exceeds 50% of rated current of the drive.

motor trq lim (Motor Torque Limit)
The output is true when the torque limit has been reached while the drive is in the motoring mode. The motoring mode is defined as the drive delivering energy to the motor.

mtr overload (Motor Overload)
The output is true when the motor has exceeded the user defined motor overload curve.

no function (No Function)
This setting indicates that the terminal or relay will not change state for any operating condition; i.e. the output signal will be constantly false.

not alarm (Not Alarm)
The output is true when an alarm is NOT present.

over curr flt (Motor overload current fault)
The output is true when the phase current has exceeded 250% of rated current.

overtemp flt (Heatsink Over Temperature Fault)
The output is true when the drive's heatsink has exceeded 90°C (194°F).

overvolt flt (Over Voltage Fault)
The output is true when the DC bus voltage exceeds 850VDC for a 460V class drive or 425VDC for a 230V class drive.

ovrtemp alarm (Drive Over Temperature Alarm)
The output is true when the drive's heatsink temperature has exceeded 80°C (176°F).

phase fault (Phase Loss)
The output is true when the drive senses an open motor phase.

ramp down ena (Ramp Down Enable)
This output is true while the drive is ramping down the speed reference to zero via the auto stop function.

ready to run (Ready to Run)
The output is true when the drive's software has been initialized and no faults are present.

regen trq lim (Regeneration Torque Limit)
The output is true when the torque limit has been reached while the drive is in the regenerative mode. The regenerative mode is defined as when the motor is returning energy to the drive. When the drive is in regenerative mode, the energy is dissipated via the dynamic brake circuitry (internal brake IGBT and external brake resistor).

run commanded (Run Commanded)
The output is true when the drive is being commanded to run.

run confirm (Run Command Confirm)
The output is true after the software has initialized, no faults are present, the drive has been commanded to run, the contactor has closed and the IGBTs are firing.

speed ref rls (Speed Reference Release)
The output is true when the flux is confirmed and drive is NOT in DC injection.

spd ref rls 2 (Speed Reference Release 2)
The output is true when:

- software initialized and no faults present
- drive being commanded to run (contact confirm true, if used)
- not in DC injection
- SPEED COMMAND SRC(C1) parameter = multi-step

speed reg rls (Speed Regulator Release)
The output is true when the flux is confirmed at 75% and brake is commanded to be picked (if used)

stltst active (Stall Test Active)
The output is true when the drive is declaring a Stall Test Fault. The Stall Test Fault checks that motor current goes at or above a percentage (defined by STALL TEST LVL(A1)) for defined amount of time (defined by STALL FAULT TIME(A1)). If the motor current exceeds the defined parameters a STALL TEST FAULT will be declared.

undervolt flt (Low Voltage Fault)
The output is true when the DC bus voltage drops below the user specified percent of the input line-to-line voltage.

up to speed (Up to Speed)
The output is true when the motor speed is above the user specified speed

uv alarm (Low Voltage Alarm)
The output is true when the DC bus voltage drops below the user specified percent of the input line-to-line voltage.

zero speed (Zero Speed)
The output is true when the motor speed is below the user specified speed for the user specified time

Configure C0 menu

Analog Outputs C4 submenu

C4	parameter	description	default	hidden item	run lock out
	ANALOG OUTPUT 1	analog output #1		N	Y
	ANALOG OUTPUT 2	analog output #2		N	Y
	choices				
	bus voltage	Measured DC bus voltage			
	current out	Percent motor current			
	drv overload	Percent of drive overload trip level reached			
	flux current	Measured flux producing current			
	flux voltage	Flux producing voltage			
	frequency out	Electrical frequency			
	mtr overload	Percent of motor overload trip level reached			
	power output	Calculated power output			
	slip freq	Commanded slip frequency			
	speed command	Speed command before S-Curve			
	speed feedbk	Speed reference including all compensations included (slip comp, etc.)			
	speed ref	Speed reference after S-Curve			
	torq current	Measured torque producing current			
	torq voltage	Torque producing voltage			
	torque output	Calculated torque output			
	voltage out	RMS motor terminal voltage			

Detailed description

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

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

Choices

bus voltage (DC Bus Voltage Output)
Measured DC bus voltage.
D/A Units: % of peak bus

current out (Current Output)
Percent motor current.
D/A Units: % rated current

drv overload (Drive Overload)
Percent of drive overload trip level reached.
D/A Units: % of trip point

flux current (Flux Producing Current)
Measured flux producing current.
D/A Units: % rated current

flux voltage (Flux Producing Voltage)
Flux producing voltage reference.
D/A Units: % rated volts

frequency out (Frequency Output)
Electrical frequency.
D/A Units: % rated freq

mtr overload (Motor Overload)
Percent of motor overload trip level reached.
D/A Units: % of trip point

power output (Power Output)
Calculated power output.
D/A Units: % rated power

slip freq (Motor Slip Frequency)
Commanded slip frequency.
D/A Units: % rated freq

speed command (Speed Command)
Speed command before S-Curve
D/A Units: % rated speed

speed feedbk (Speed Feedback)
Speed reference including all compensations included (slip comp, etc.)
D/A Units: % rated speed

speed ref (Speed Reference)
Speed reference after S-Curve
D/A Units: % rated speed

torq current (Torque Producing Current)
Measured torque producing current.
D/A Units: % rated current

torq voltage (Torque Producing Voltage)
Torque producing voltage reference.
D/A Units: % rated volts

torque output (Torque Output)
Calculated torque output.
D/A Units: % rated torque

voltage out (Voltage Output)
RMS motor terminal voltage.
D/A Units: % rated volts

Display D0 menu

Elevator Data D1 submenu

D1	parameter	description	units	hidden item
	SPEED COMMAND	Speed command before speed reference generator	ft/min or m/s	N
	SPEED REFERENCE	Speed reference after speed reference generator	ft/min or m/s	N
	SPEED FEEDBACK	Speed reference including all compensations included (slip comp, etc.)	ft/min or m/s	N
	ENCODER SPEED	Only used for diagnostics… Display encoder speed in rpm	rpm	N
	LOGIC OUTPUTS	Displays the status of the logic outputs	1=true 0=false	N
	LOGIC INPUTS	Displays the status of the logic inputs	1=true 0=false	N

Detailed descriptions

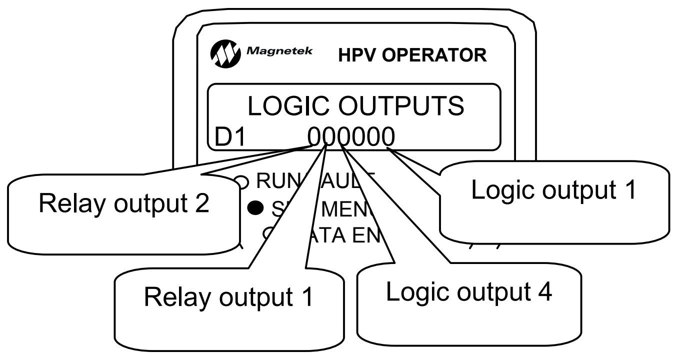
SPEED COMMAND
(Speed Command)
Monitors the speed command before the speed reference generator (input to the S-Curve). This command comes from either multi-step references, speed command from analog channel, or the serial channel.

SPEED REFERENCE
(Speed Reference)
Monitors the speed reference being used by the drive. This is the speed command after passing through the speed reference generator (which uses a S-Curve).

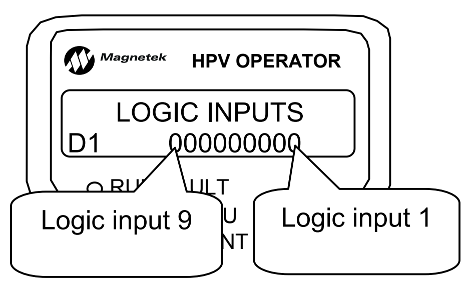
SPEED FEEDBACK
(Speed Feedback)
Monitors the speed reference being used by the drive that includes all compensations (slip comp, etc.)

ENCODER SPEED
Only used for diagnostics…
Monitors encoder speed in rpm.

LOGIC OUTPUTS
(Logic Outputs Status)
This display shows the condition of the logic outputs. (1=true 0=false)



LOGIC INPUTS
(Logic Inputs Status)
This display shows the condition of the logic inputs. (1=true 0=false)



Display D0 menu

Power Data D2 submenu

D2	parameter	description	units	hidden item
	MOTOR CURRENT	RMS motor current	Amps	N
	% MOTOR CURRENT	Percent motor current	%rated current	N
	MOTOR VOLTAGE	RMS motor terminal voltage	Volts	N
	MOTOR FREQUENCY	Electrical frequency output	Hz	N
	MOTOR TORQUE	Calculated motor torque output	% rated torque	N
	POWER OUTPUT	Calculated drive power output	KW	N
	DC BUS VOLTAGE	Measured DC bus voltage	Volts	N
	SLIP FREQUENCY	Commanded slip frequency	Hz	Y
	MOTOR OVERLOAD	Percent of motor overload trip level reached	%	Y
	DRIVE OVERLOAD	Percent of drive overload trip level reached	%	Y
	FLUX CURRENT	Measured flux producing current	%rated current	Y
	TORQUE CURRENT	Measured torque producing current	%rated current	Y
	FLUX VOLTAGE	Flux voltage reference	% rated volts	Y
	TORQUE VOLTAGE	Torque voltage reference	% rated volts	Y
	BASE IMPEDANCE	Drive calculated base impedance	Ohms	Y
	EST STATOR RESIST	Approximate estimate of the motor's stator resistance (do not use for tuning drive)	% base impedance	Y

Detailed description

MOTOR CURRENT
(RMS Motor Current Output)
Monitors the RMS motor output current.

% MOTOR CURRENT
(Percent Motor Current)
Monitors the motor current as a percent of rated motor current.

MOTOR VOLTAGE
(Motor Voltage Output)
Monitors the RMS motor terminal line-line voltage.

MOTOR FREQUENCY
(Motor Frequency Output)
Monitors the electrical frequency of the motor output.

MOTOR TORQUE
(Motor Torque Output)
Calculated motor output torque in terms of percent rated torque.

POWER OUTPUT
(Power Output)
Calculated drive power output.

DC BUS VOLTAGE
(DC Bus Voltage)
Measured voltage of the DC bus.

SLIP FREQUENCY
(Slip Frequency)
Displays the commanded slip frequency of the motor.

MOTOR OVERLOAD
(Motor Overload)
Displays the percentage of motor overload trip level reached. Once this value reaches 100% the motor has exceeded its user defined overload curve and a motor overload alarm is declared by the drive. For more information on the motor overload curve., see page 64.

DRIVE OVERLOAD
(Drive Overload)
Displays the percentage of drive overload trip level reached. Once this value reaches 100% the drive has exceeded its overload curve and a drive overload fault is declared.

FLUX CURRENT
(Flux Current)
Displays the flux producing current of the motor.

TORQUE CURRENT
(Torque Current)
Displays the torque producing current of the motor.

FLUX VOLTAGE
(Flux Voltage)
Displays the flux voltage reference.

TORQUE VOLTAGE
(Torque Voltage)
Displays the torque voltage reference.

BASE IMPEDANCE
(Base Impedance)
Displays the drive calculated base impedance, which is based on the RATED MTR PWR (A5) and the RATED MTR VOLTS (A5) parameters. This value is used to calculate the Per Unit values of the system impedances (i.e. EXTERN REACTANCE (A4) and STATOR RESIST(A5)).

EST STATOR RESIST
(Estimated Stator Resistance)
Approximate estimate of the motor's stator resistance (do not use for tuning drive)

Adjust A0 menu

Drive A1 submenu

A1	parameter	description	default	units	min	max	hidden item	run lock out
	CONTRACT CAR SPD	Elevator contract speed	400.0 2.00	fpm or m/s	0.0 0.00	3000.0 16.00	N	Y
	CONTRACT MTR SPD	Motor speed at elevator contract speed	1130.0	rpm	50.0	3000.0	N	Y
	RESPONSE	Sensitivity of the speed regulator	10.0	rad/sec	1.0	20.0	N	N
	INERTIA	System inertia	2.00	sec	0.25	50.00	N	N
	INNER LOOP XOVER	Inner speed loop crossover frequency (only with Ereg speed regulator)	2.0	rad/sec	0.1	20.0	N	N
	GAIN REDUCE MULT	Percentage of response of the speed regulator used when in the low gain mode	100	%	10	100	Y	N
	GAIN CHNG LEVEL	Speed level to change to low gain mode (only with internal gain switch)	100.0	% rated speed	000.0	100.0	Y	N
	TACH RATE GAIN	Helps with the effects of rope resonance	00.0	%	00.0	30.0	Y	N
	SPD PHASE MARGIN	Sets phase margin of speed regulator (only with PI speed regulator)	80	degrees	45	90	Y	N
	RAMPED STOP TIME	Time to ramp torque from rated torque to zero (only with torque ramp down stop function)	0.20	seconds	0.00	2.50	Y	N
	CONTACT FLT TIME	Time delay before enabling drive outputs and time before a contactor fault is declared (when drive is controlling motor contactor)	0.50	seconds	0.00	5.00	Y	N
	BRAKE PICK TIME	Time before a brake pick fault is declared (when drive is controlling mechincal brake)	1.00	seconds	0.00	5.00	Y	N
	BRAKE HOLD TIME	Time before a brake hold fault is declared (when drive is controlling mechincal brake)	0.20	seconds	0.00	5.00	Y	N
	OVERSPEED LEVEL	Threshold for detection of overspeed fault	115.0	% contract speed	90.0	150.0	Y	N

A1	parameter	description	default	units	min	max	hidden item	run lock out
	OVERSPEED TIME	Time before a overspeed fault is declared when above the defined overspeed level	1.00	seconds	0.00	9.99	Y	N
	OVERSPEED MULT	Multiplier for overspeed test	125.0	%	100.0	150.0	Y	N
	ENCODER PULSES	Encoder counts per revolution	1024	none	600	10000	N	Y
	SPD DEV LO LEVEL	Range around the speed reference for speed deviation low logic output	10.0	% contract speed	0.1	20.0	Y	N
	SPD DEV TIME	Time before speed deviation low logic output is true	0.50	seconds	0.00	9.99	Y	N
	SPD DEV HI LEVEL	Level for declaring speed deviation alarm	10.0	% contract speed	0.0	99.9	Y	N
	SPD COMMAND BIAS	Subtracts an effective voltage to actual speed command voltage	0.00	volts	0.00	6.00	Y	Y
	SPD COMMAND MULT	Scales analog pre-torque command	1.00	none	0.90	5.00	Y	Y
	PRE TORQUE BIAS	Subtracts an effective voltage to actual pre-torque command voltage	0.00	volts	0.00	6.00	Y	Y
	PRE TORQUE MULT	Scales analog speed command	1.00	none	0.90	5.00	Y	Y
	ZERO SPEED LEVEL	Threshold for zero speed logic output	25.00	% contract speed	00.00	99.99	Y	Y
	ZERO SPEED TIME	Time before zero speed logic output is declared true.	0.10	seconds	0.00	9.99	Y	Y
	UP/DWN THRESHOLD	Threshold for detection of up or down direction	1.00	% contract speed	0.00	9.99	Y	Y
	MTR TORQUE LIMIT	Motoring torque limit	200.0	% rated torque	0.0	200.0	N	N
	REGEN TORQ LIMIT	Regenerating torque limit	200.0	% rated torque	0.0	200.0	N	N
	FLUX WKN FACTOR	Defines the torque limit at higher speeds	100.0	% torque	60.0	99.9	Y	N
	ANA OUT 1 OFFSET	Subtracts an effective voltage to actual analog output 1	0.00	%	0.0	99.9	Y	N
	ANA OUT 2 OFFSET	Subtracts an effective voltage to actual analog output 2	0.00	%	0.0	99.9	Y	N
	ANA OUT 1 GAIN	Scaling factor for analog output 1	1.0	none	0.0	10.0	Y	N
	ANA OUT 2 GAIN	Scaling factor for analog output 2	1.0	none	0.0	10.0	Y	N
	FLT RESET DELAY	Time before a fault is automatically reset	5	seconds	0	120	Y	N

A1	parameter	description	default	units	min	max	hidden item	run lock out
	FLT RESETS / HOUR	Number of faults that is allowed to be automatically reset per hour	3	faults	0	10	Y	N
	UP TO SPD. LEVEL	Threshold for up to spd logic output	80.00	% contract speed	0.00	110.00	Y	N
	MAINS DIP SPEED	Multiplier for contract speed when in 'low voltage' mode	25.00	%	0.00	99.99	Y	N
	RUN DELAY TIMER	Allows the user to delay the drive's recognition of the RUN signal	0.00	seconds	0.00	0.99	Y	Y
	AB ZERO SPD LEV	Sets the speed point that will be considered as zero speed for the auto brake function	0.00	%	0.00	2.00	Y	Y
	AB OFF DELAY	Determines the time after zero speed is that the Auto Brake logic output goes false	0.00	seconds	0.00	9.99	Y	Y
	CONTACTOR DO DLY	Allows the user to delay the drive's dropout of the motor contactor.	0.00	seconds	0.00	5.00	Y	Y
	TRQ LIM MSG DLY	Determines the amount of time the drive is in torque limit before the alarm message is displayed.	0.50	seconds	0.00	10.00	Y	Y
	SER2 INSP SPD	Defines the serial mode 2 inspection speed *(only serial mode 2)*	30.0 0.150	ft/min or m/sec	0.0 0.000	100.0 0.500	Y	Y
	SER2 RS CRP SPD	Defines the creep speed that will be used in the "rescue mode" *(only serial mode 2)*	10.0 0.050	ft/min or m/sec	0.0 0.000	300.0 1.500	Y	Y
	SER2 RS CPR TIME	Defines the maximum time the drive will continue to run at rescue creep speed *(only serial mode 2)*	180.0	seconds	0.0	200.0	Y	Y
	SER2 FLT TOL	Defines the maximum time that may elapse between valid run time messages before a serial fault is declared *(only serial mode 2)*	0.04	seconds	0.00	2.00	Y	Y
	ROLLBACK GAIN	Anti-rollback gain	1	none	1	99	Y	Y
	NOTCH FILTER FRQ	Notch filter center frequency	20	Hz	5	60	Y	Y

Closed-loop Drive A1

A1	parameter	description	default	units	min	max	hidden item	run lock out
	NOTCH FILT DEPTH	Notch filter maximum attenuation	0	%	0	100	Y	Y
	MSPD DELAY 1-4	Determines the recognition time delay for a defined multi-step speed command	0.000	seconds	0.000	10.000	Y	Y

Detailed descriptions

CONTRACT CAR SPD
(Contract Car Speed)
This parameter programs the elevator contract speed in feet per minute (fpm) or meters per second (m/s).

CONTRACT MTR SPD
(Contract Motor Speed)
This parameter programs the motor speed at elevator contract speed in revolutions per minute (rpm).

RESPONSE
(Response)
This parameter sets the sensitivity of the drive's speed regulator in terms of the speed regulator bandwidth in radians. The responsiveness of the drive as it follows the speed reference will increase as this number increases. If the number is too large, the motor current and speed will become jittery. If this number is too small, the motor will become sluggish.

INERTIA
(System Inertia)
This parameter sets the equivalent of the system inertia in terms of the time it takes the elevator to accelerate to motor base speed at rated torque.

INNER LOOP XOVER
(Inner Loop Cross Over)
This parameter sets the inner speed loop cross over frequency. This parameter is only used by the Elevator Speed Regulator (Ereg).

GAIN REDUCE MULT
(Gain Reduce Multiplier)
This parameter is the percent of 'response' the speed regulator should use in the 'low gain' mode. This value reduces the RESPONSE value when the drive is in 'low gain' mode. (i.e. setting this parameter to 100% equals no reduction in gain in the 'low gain' mode)

GAIN CHNG LEVEL
(Gain Change Level)
When the gain control is set to internal, the drive will control the high/low gain switch. This parameter sets the speed reference level, when the drive is in 'low gain' mode.

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

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

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

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

The high / low gain switch determines when the HPV 600 is in 'low gain' mode. In the 'low gain' mode, the gain reduce multiplier has an effect on the speed regulator's response (gain).
The drive allows for the high / low gain switch to be controlled either externally or internally. The high / low gain source parameter (HI/LO GAIN SRC) allows for this external or internal selection.

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

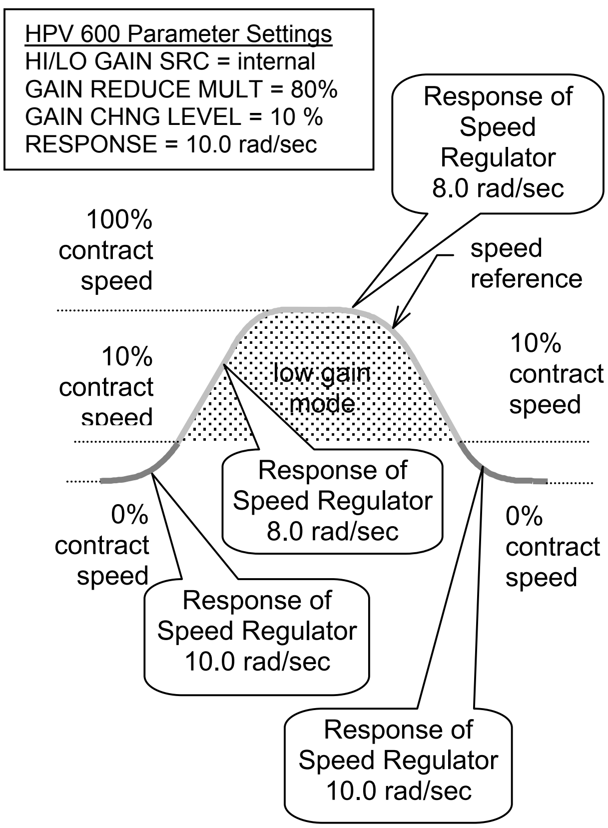
- a logic input
- the serial channel.

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

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

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

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



High / Low Gain Example

TACH RATE GAIN
(Tach Rate Gain)
This parameter can be used to help to reduce the effects of rope resonance. It should be adjusted only after the INERTIA (A1), and RESPONSE (A1) has been set correctly.

The tach rate function is available for high performance systems that exhibit problems with rope resonance characteristics.

This function subtracts a portion of the speed feedback derivative from the output of the speed regulator. The Tach Rate Gain parameter (TACH RATE GAIN (A1)) selects a unitless gain factor that determines how much of the derivative is subtracted.

SPD PHASE MARGIN
(Speed Phase Margin)
This parameter sets the phase margin of the speed regulator assuming a pure inertial load. This parameter is only used by the PI speed regulator.

RAMPED STOP TIME
(Ramped Stop Time)
This parameter is only used by the torque ramp down stop function and sets the time to ramp torque from rated torque to zero.
After the elevator lands and the brake is applied, the torque ramp down function allows the torque to ramp down at an even level. This helps eliminate the 'bump' felt upon landing caused by the torque being immediately dropped to zero.

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

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

The Ramp Down Enable has the following three possible sources:

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

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

A method of providing the Ramp Down Enable would be with a logic signal (EXTERNAL TB1) that is dedicated to that function. The Ramp Down Enable would be asserted while the Run command is still present and remain there until the ramp is completed, after which the Run command would be removed.

The RUN LOGIC option to trigger the Ramp Down Enable from the Run command is provided. In this case, removal of the Run command enables the Ramp Down Stop Function.

The time it takes for the HPV 600 to perform its ramped stop is determined by the Ramped Stop Time Parameter. The Ramped Stop Time parameter (RAMPED STOP TIME(A1)) selects the amount of time it would take for the drive to ramp from the rated torque to zero torque.

CONTACT FLT TIME
(Contact Fault Time)
When external logic outputs are used to control the closing of the motor contactor, this parameter sets the amount of time delay at start until the drive output is enabled and current flows. And when external logic inputs are used to confirm the closing of the motor contactor, this parameter sets the time allowed for the contactor's auxiliary contacts to reach the user commanded state before a CONTACTOR FLT occurs.

BRAKE PICK TIME
(Brake Pick Time)
If the brake pick fault is enabled, this parameter sets the time allowed for the brake pick feedback not to match the brake pick command before a BRK PICK FLT occurs.

BRAKE HOLD TIME
(Brake Hold Time)
If the brake hold fault is enabled, this parameter sets the time allowed for the brake hold feedback not match the brake hold command before a BRK HOLD FLT occurs.

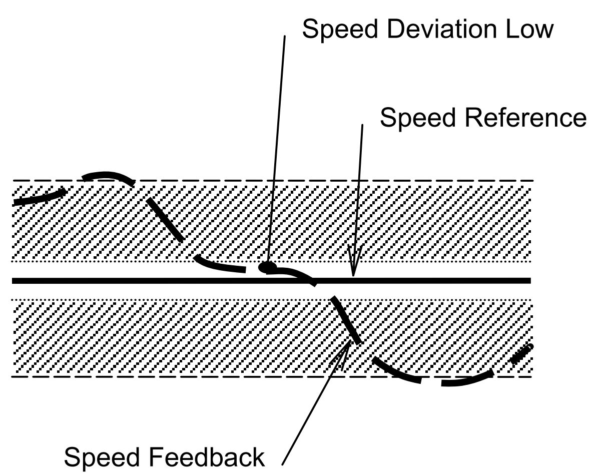
OVERSPEED LEVEL
(Overspeed Level)
This parameter sets the percentage of rated speed the drive uses (in conjunction with OVERSPEED TIME, below) to determine when an OVERSPEED fault occurs.

OVERSPEED TIME
(Overspeed Time)
This parameter sets the time that the drive can be at or above the OVERSPEED LEVEL (A1), before the drive declares an OVERSPEED FLT.

OVERSPEED MULT
(Over Speed Multiplier)
This parameter sets the percentage of contract speed for the OVERSPEED TEST (U4).

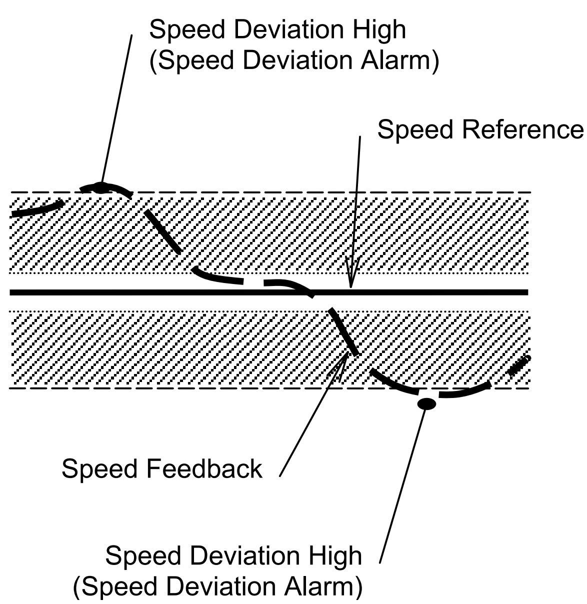
ENCODER PULSES
(Encoder Pulses)
This parameter sets the pulses per revolution (before the x4 logic) the drive receives from the encoder.

SPD DEV LO LEVEL
(Speed Deviation Low Level)
This parameter defines a range around the speed reference. When the speed feedback is within this range (in conjunction with SPD DEV TIME (A1)) the drive will set the SPEED DEV LO logic output. The Speed Deviation Low function indicates that the speed feedback is tracking the speed reference within a defined range for a defined period of time. The Speed Deviation Low function has the ability to set a configurable logic output. The logic output will be true, when the speed feedback is tracking the speed reference within a defined range around the speed reference for a defined period of time. The defined range is determined by the Speed Deviation Low Level parameter (SPD DEV LO LEVEL(A1)) and the defined time is determined by the Speed Deviation Time parameter (SPD DEV TIME).



SPD DEV TIME
(Speed Deviation Time)
This parameter defines the time the speed feedback needs to be in the range around the speed reference defined by SPD DEV LO LEVEL (A1) before the Speed Deviation Low logic output is true.

SPD DEV HI LEVEL
(Speed Deviation High Level)
This parameter defines a threshold around the speed reference. If the speed feedback is outside of this threshold the drive will declare a Speed Deviation Alarm and the Speed Deviation Low logic output will become true. The Speed Deviation High function annunciates a Speed Deviation Alarm and has the ability to set a configurable logic output. The alarm will be annunciated and the logic output will be true, when the speed feedback is not properly tracking the speed reference and is outside a defined range around the speed reference. The defined range is determined by the Speed Deviation High Level parameter (SPD DEV HI LEVEL(A1)).



SPD COMMAND BIAS
(Speed Command Bias)
This parameter subtracts an effective voltage to the actual analog speed command voltage signal.

$$\left(\begin{matrix}\textit{analog}\\ \textit{channel\#1}\\ \textit{input}\\ \textit{voltage}\end{matrix} - \begin{matrix}\textit{SPD}\\ \textit{COMMAND}\\ \textit{BIAS}\end{matrix}\right) \times \begin{matrix}\textit{SPD}\\ \textit{COMMAND}\\ \textit{MULT}\end{matrix} = \begin{matrix}\textit{signal}\\ \textit{drive}\\ \textit{software}\\ \textit{uses}\end{matrix}$$

SPD COMMAND MULT
(Speed Command Multiplier)
This parameter scales the analog speed command.

$$\left(\begin{matrix}\textit{analog}\\ \textit{channel\#1}\\ \textit{input}\\ \textit{voltage}\end{matrix} - \begin{matrix}\textit{SPD}\\ \textit{COMMAND}\\ \textit{BIAS}\end{matrix}\right) \times \begin{matrix}\textit{SPD}\\ \textit{COMMAND}\\ \textit{MULT}\end{matrix} = \begin{matrix}\textit{signal}\\ \textit{drive}\\ \textit{software}\\ \textit{uses}\end{matrix}$$

PRE TORQUE BIAS
(Pre-Torque Bias)
This parameter subtracts an effective voltage to the actual analog pre torque command (channel 2) voltage signal.

$$\left(\begin{matrix}\textit{analog}\\ \textit{channel\#2}\\ \textit{input}\\ \textit{voltage}\end{matrix} - \begin{matrix}\textit{PRE}\\ \textit{TORQUE}\\ \textit{BIAS}\end{matrix}\right) \times \begin{matrix}\textit{PRE}\\ \textit{TORQUE}\\ \textit{MULT}\end{matrix} = \begin{matrix}\textit{signal}\\ \textit{drive}\\ \textit{software}\\ \textit{uses}\end{matrix}$$

PRE TORQUE MULT
(Pre-Torque Multiplier)
This parameter scales the analog pretorque command (channel 2).

$$\left(\begin{matrix}\textit{analog}\\ \textit{channel\#2}\\ \textit{input}\\ \textit{voltage}\end{matrix} - \begin{matrix}\textit{PRE}\\ \textit{TORQUE}\\ \textit{BIAS}\end{matrix}\right) \times \begin{matrix}\textit{PRE}\\ \textit{TORQUE}\\ \textit{MULT}\end{matrix} = \begin{matrix}\textit{signal}\\ \textit{drive}\\ \textit{software}\\ \textit{uses}\end{matrix}$$

ZERO SPEED LEVEL
(Zero Speed Level)
This parameter sets the threshold for zero speed detection. This is only used to generate the zero speed logic output.
Note: if DIR CONFIRM (C1) is enabled, this parameter also sets the threshold for the termination of the test to confirm the polarity of the analog speed command.

ZERO SPEED TIME
(Zero Speed Time)
This parameter sets the time at which the drive is at the ZERO SPEED LEVEL (A1) before zero speed logic output is true.

UP/DWN THRESHOLD
(Directional Threshold)
This parameter sets the threshold for the direction sense logic outputs. If speed feedback does not reach this level, the drive will not detect a directional change. This is only used to generate the direction sense logic outputs (car going up and car going down).

MTR TORQUE LIMIT
(Motoring Current Limit)
This parameter sets the maximum torque allowed at when in the motoring mode. This

parameter may need adjustment to reduce the effects of field weakening.

REGEN TORQ LIMIT
(Regenerating Current Limit)
This parameter sets the maximum amount of regenerative torque the drive will see during regeneration. This parameter may need adjustment to reduce the effects of field weakening.

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

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

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

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

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

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

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

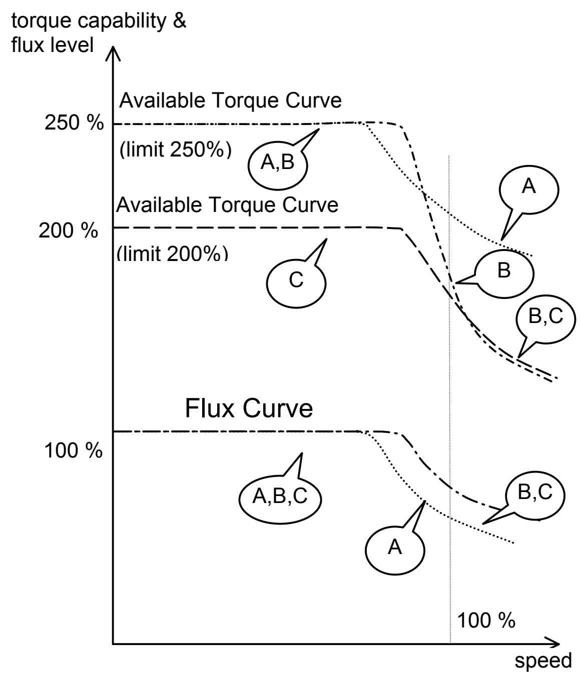
By lowering the torque limit you can effectively reduce the amount of field weakening needed and reduce the amount of current needed by the motor at motor's rated speed. The trade-off is you have lower over-all torque available.

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

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

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

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



A: torque limit = 250% / flux weakening factor = 100%
B: torque limit = 250% / flux weakening factor = 80%
C: torque limit = 200% / flux weakening factor = 100%

Speed-Torque Curves (Examples)

ANA 1 OUT OFFSET
(Digital to Analog #1 Output Offset)
Offset for scaling Analog Output Channel #1.

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

ANA 2 OUT OFFSET
(Digital to Analog #2 Output Offset)
Offset for scaling Analog Output Channel #2.

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

ANA 1 OUT GAIN
(Digital to Analog #1 Output Gain)
Adjusts the scaling for the Analog Output Channel #1.
NOTE: value of 1.0 = 0 to 10VDC signal.

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

ANA 2 OUT GAIN
(Digital to Analog #2 Output Gain)
Adjusts the scaling for the Analog Output Channel #2.
NOTE: value of 1.0 = 0 to 10VDC signal.

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

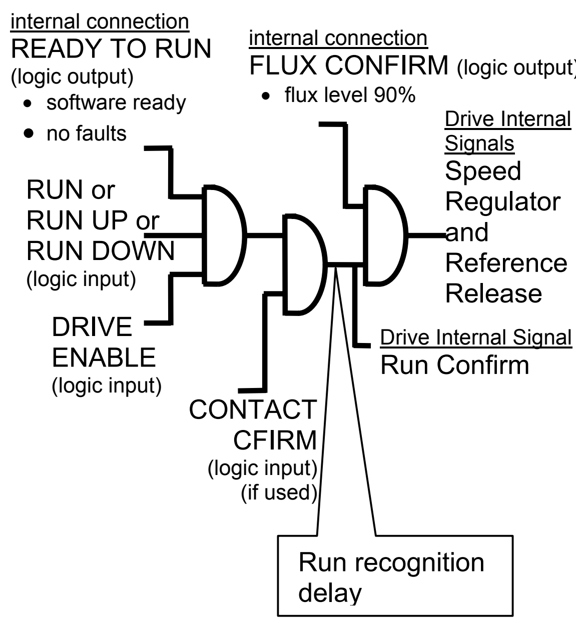
FLT RESET DELAY
(Fault Reset Delay)
When the drive is set for automatic fault reset, this is the time before a fault is automatically reset.

FLT RESETS/HOUR
(Fault Resets per Hour)
When the drive is set for automatic fault reset, this is the number of faults that is allowed to be automatically reset per hour.

UP TO SPD. LEVEL
(Up to Speed Level)
This parameter sets the threshold for the up to speed logic output. This is only used to generate the up to speed logic output.

MAINS DIP SPEED
(Mains DIp Speed Multiplier)
This parameter sets the percentage of contract speed for the speed to be reduced when the drive goes into 'low voltage' mode. The Mains Dip function is enabled by the Mains Dip Enable (MAINS DIP ENA(C1)) parameter. When the drive goes into 'low voltage' mode, it reduces the speed by the percentage defined by this parameter. 'Low voltage' mode is defined as when the drive declares a UV alarm, which is defined by the Input line-to-line voltage (INPUT L-L VOLTS(A4)) parameter and the Undervoltage Alarm Level (UV ALARM LEVEL(A4)).

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



AB ZERO SPD LEV
(Auto Brake Zero Speed Level)
This parameter sets the speed point that will be considered as zero speed for the auto brake function. The units are % of contract speed and the parameter has a maximum value of 2.00% and a default value of 0.00%.

In order to the use the Auto Brake function, a logic output needs to be configured for AUTO BRAKE (C3), the parameter SPD COMMAND SRC(C1)=MULTI-STEP, the parameter SPD REF RELEASE(C1)=BRAKE PICKED, and the parameter BRAKE PICK CFRM(C1)=INTERNAL TIME or EXTERNAL TB1.

AB OFF DELAY
(Auto Brake Off Delay)
This parameter determines the time after zero speed is reached (level determined by the AB ZERO SPD LEV (A1) parameter) that the Auto Brake logic output goes false. The units are seconds and the parameter has a maximum value of 9.99 seconds and a default value of 0.00 seconds.

CONTACTOR DO DLY
(Contactor Drop-out Delay)
When the drive controls the motor contactor via CLOSE CONTACT logic output, this parameter, CONTACTOR DO DLY (A1), allows the user to delay the drive's dropout of the motor contactor. The CONTACTOR DO DLY Timer Delay starts when the speed regulator release signal goes false and can be set from 0.00 to 5.00 seconds.

TRQ LIM MSG DLY
(Torque Limit Message Delay)
This parameter determines the amount of time the drive is in torque limit before the "HIT TORQUE LIMIT" alarm message is displayed. The units are seconds and the parameter has a maximum value of 10.00 seconds and a default value of 0.50 seconds.

SER2 INSP SPD
(Serial Mode 2 Inspection Speed)
Used only with custom serial protocol (mode 2)
When in Serial Mode 2, this parameter defines the inspection speed to be used. To run in inspection speed via serial mode 2 requires that the run command for inspection speed come from two sources, a command sent in a serial message and via hardware as a logic input defined as "SER2 INSP ENA".

SER2 RS CRP SPD
(Serial Mode 2 Rescue Creep Speed)
Used only with custom serial protocol (mode 2)
When in Serial Mode 2 and SER2 FLT MODE (C1)=rescue, this parameter defines the creep speed that will be used in the "rescue mode".

SER2 RS CRP TIME
(Serial Mode 2 Rescue Creep Time)
Used only with custom serial protocol (mode 2)
When in Serial Mode 2 and SER2 FLT MODE (C1)=rescue, this parameter defines the maximum time the drive will continue to run at rescue creep speed (defined by SER2 RS CRP SPD (A1) parameter) when reacting to a serial fault. The time is defined as the time running at creep speed. It does not include the time it takes to decelerate to creep speed.

SER2 FLT TOL
(Serial Mode 2 Fault Tolerance)
Used only with custom serial protocol (mode 2)
When in Serial Mode 2, this parameter defines the maximum time that may elapse between valid run time messages while in serial run mode before a serial fault is declared.

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

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

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

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

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

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

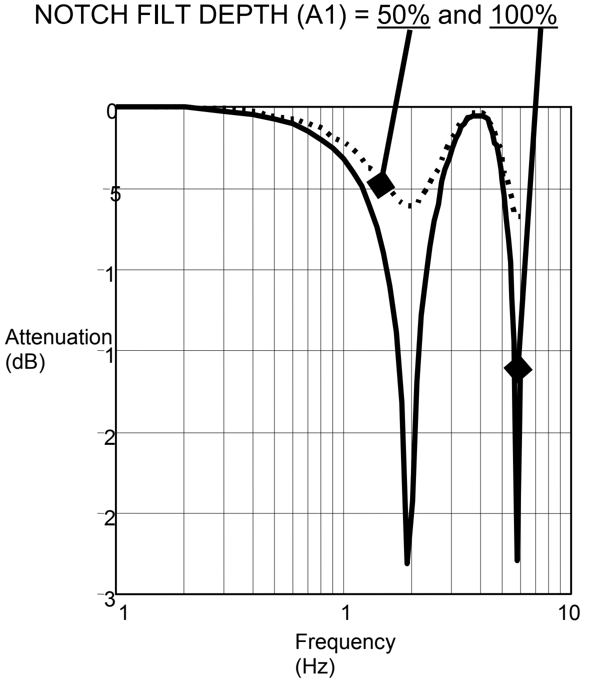
***IMPORTANT**: too high a setting for this parameter can lead to drive instability.*

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

Notch Filter
Although originally created for gearless applications where elevator rope resonance is sometimes an issue, this filter affects the torque command output of the speed regulator and will filter out specific frequencies. By filtering a specific frequency, the speed regulator will avoid exciting a mechanical resonance if one exists at that frequency.

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

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

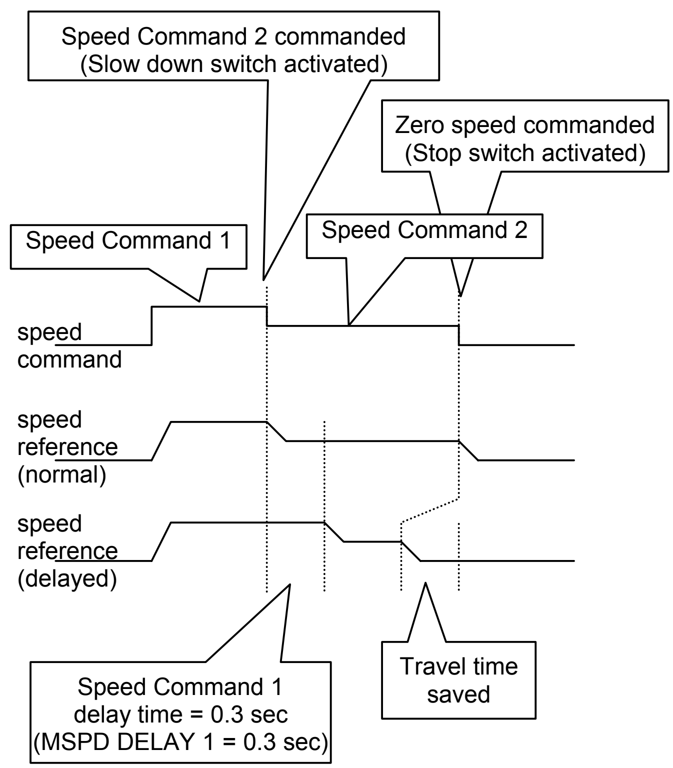


NOTCH FILT DEPTH
(Notch Filter Depth)
This parameter determines notch filter maximum attenuation.
Note: A filter depth setting of zero (NOTCH FILT DEPTH (A1) =0) removes the filter.

MSPD DELAY 1-4
(Multi-step Speed Delay)
These four parameters determine the recognition time delay for a multi-step speed commands defined by MLT-SPD TO DLY1-4 (C1) parameters.

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

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



Adjust A0 menu

S-Curves A2 submenu

A2	parameter	description	default	units	min	max	hidden item	run lock out
	ACCEL RATE 0	Acceleration rate limit	ft/s^2 or m/s^2	N	Y	2.60 0.800	N	Y
	DECEL RATE 0	Deceleration rate limit	ft/s^2 or m/s^2	N	Y	2.60 0.800	N	Y
	ACCEL JERK IN 0	Rate of increase of acceleration, up to ACCEL RATE, when increasing elevator speed	ft/s^3 or m/s^3	N	Y	2.0 0.60	N	Y
	ACCEL JERK OUT 0	Rate of decrease of acceleration to zero when approaching contract elevator speed	ft/s^3 or m/s^3	N	Y	2.0 0.60	N	Y
	DECEL JERK IN 0	Rate of increase of deceleration, up to DECEL RATE, when decreasing elevator speed	ft/s^3 or m/s^3	N	Y	2.0 0.60	N	Y
	DECEL JERK OUT 0	Rate of decrease of deceleration to zero when slowing the elevator to leveling speed	ft/s^3 or m/s^3	N	Y	2.0 0.60	N	Y
	ACCEL RATE 1	Acceleration rate limit	ft/s^2 or m/s^2	N	Y	2.60 0.800	N	Y
	DECEL RATE 1	Deceleration rate limit	ft/s^2 or m/s^2	N	Y	2.60 0.800	N	Y
	ACCEL JERK IN 1	Rate of increase of acceleration, up to ACCEL RATE, when increasing elevator speed	ft/s^3 or m/s^3	N	Y	2.0 0.60	N	Y
	ACCEL JERK OUT 1	Rate of decrease of acceleration to zero when approaching contract elevator speed	ft/s^3 or m/s^3	N	Y	2.0 0.60	N	Y
	DECEL JERK IN 1	Rate of increase of deceleration, up to DECEL RATE, when decreasing elevator speed	ft/s^3 or m/s^3	N	Y	2.0 0.60	N	Y
	DECEL JERK OUT 1	Rate of decrease of deceleration to zero when slowing the elevator to leveling speed	ft/s^3 or m/s^3	N	Y	2.0 0.60	N	Y
	ACCEL RATE 2	Acceleration rate limit	ft/s^2 or m/s^2	N	Y	2.60 0.800	N	Y
	DECEL RATE 2	Deceleration rate limit	ft/s^2 or m/s^2	N	Y	2.60 0.800	N	Y

A2	parameter	description	default	units	min	max	hidden item	run lock out
	ACCEL JERK IN 2	Rate of increase of acceleration, up to ACCEL RATE, when increasing elevator speed	ft/s^3 or m/s^3	N	Y	2.0	N	Y
	ACCEL JERK OUT 2	Rate of decrease of acceleration to zero when approaching contract elevator speed	ft/s^3 or m/s^3	N	Y	2.0 0.60	N	Y
	DECEL JERK IN 2	Rate of increase of deceleration, up to DECEL RATE, when decreasing elevator speed	ft/s^3 or m/s^3	N	Y	2.0 0.60	N	Y
	DECEL JERK OUT 2	Rate of decrease of deceleration to zero when slowing the elevator to leveling speed	ft/s^3 or m/s^3	N	Y	2.0 0.60	N	Y
	ACCEL RATE 3	Acceleration rate limit	ft/s^2 or m/s^2	N	Y	2.60 0.800	N	Y
	DECEL RATE 3	Deceleration rate limit	ft/s^2 or m/s^2	N	Y	2.60 0.800	N	Y
	ACCEL JERK IN 3	Rate of increase of acceleration, up to ACCEL RATE, when increasing elevator speed	ft/s^3 or m/s^3	N	Y	2.0 0.60	N	Y
	ACCEL JERK OUT 3	Rate of decrease of acceleration to zero when approaching contract elevator speed	ft/s^3 or m/s^3	N	Y	2.0 0.60	N	Y
	DECEL JERK IN 3	Rate of increase of deceleration, up to DECEL RATE, when decreasing elevator speed	ft/s^3 or m/s^3	N	Y	2.0 0.60	N	Y
	DECEL JERK OUT 3	Rate of decrease of deceleration to zero when slowing the elevator to leveling speed	ft/s^3 or m/s^3	N	Y	2.0 0.60	N	Y

Closed-loop S-Curves A2

Detailed descriptions

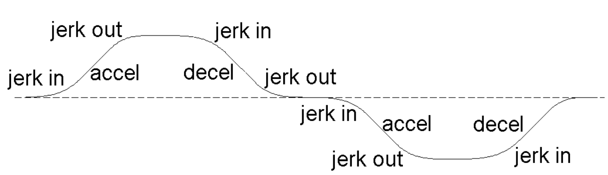
The HPV 600 speed command is passed through an internal S-curve in order to produce the speed reference. In general, the S curve function takes an arbitrary speed command and generates a speed reference subject to the conditions that the maximum accel, decel and jerk rates not be exceeded. The speed command is typically the target speed that the reference is headed to.

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

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

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

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



S-Curve

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

Parameters for S-curve-0 (SC0):

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

Parameters for S-curve-1 (SC1):

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

Parameters for S-curve-2 (SC2):

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

Parameters for S-curve-3 (SC3):

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

S-Curve Pattern Selection

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

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

S-curve Availability

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

Selecting S-curves

Adjust A0 menu

Multistep Ref A3 submenu

A3	parameter	description	default	units	min	max	hidden item	run lock out
	SPEED COMMAND 1	Multi-step speed command #1	0.0 0.000	ft/min or m/sec	-3000 -16.00	3000 16.00	N	Y
	SPEED COMMAND 2	Multi-step speed command #2	0.0 0.000	ft/min or m/sec	-3000 -16.00	3000 16.00	N	Y
	SPEED COMMAND 3	Multi-step speed command #3	0.0 0.000	ft/min or m/sec	-3000 -16.00	3000 16.00	N	Y
	SPEED COMMAND 4	Multi-step speed command #4	0.0 0.000	ft/min or m/sec	-3000 -16.00	3000 16.00	N	Y
	SPEED COMMAND 5	Multi-step speed command #5	0.0 0.000	ft/min or m/sec	-3000 -16.00	3000 16.00	N	Y
	SPEED COMMAND 6	Multi-step speed command #6	0.0 0.000	ft/min or m/sec	-3000 -16.00	3000 16.00	N	Y
	SPEED COMMAND 7	Multi-step speed command #7	0.0 0.000	ft/min or m/sec	-3000 -16.00	3000 16.00	N	Y
	SPEED COMMAND 8	Multi-step speed command #8	0.0 0.000	ft/min or m/sec	-3000 -16.00	3000 16.00	N	Y
	SPEED COMMAND 9	Multi-step speed command #9	0.0 0.000	ft/min or m/sec	-3000 -16.00	3000 16.00	N	Y
	SPEED COMMAND 10	Multi-step speed command #10	0.0 0.000	ft/min or m/sec	-3000 -16.00	3000 16.00	N	Y
	SPEED COMMAND 11	Multi-step speed command #11	0.0 0.000	ft/min or m/sec	-3000 -16.00	3000 16.00	N	Y
	SPEED COMMAND 12	Multi-step speed command #12	0.0 0.000	ft/min or m/sec	-3000 -16.00	3000 16.00	N	Y
	SPEED COMMAND 13	Multi-step speed command #13	0.0 0.000	ft/min or m/sec	-3000 -16.00	3000 16.00	N	Y
	SPEED COMMAND 14	Multi-step speed command #14	0.0 0.000	ft/min or m/sec	-3000 -16.00	3000 16.00	N	Y
	SPEED COMMAND 15	Multi-step speed command #15	0.0 0.000	ft/min or m/sec	-3000 -16.00	3000 16.00	N	Y

Detailed descriptions

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

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

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

IMPORTANT

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

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

Multi-step Selection

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

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

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

Adjust A0 menu

Power Convert A4 submenu

A4	parameter	description	default	units	min	max	hidden item	run lock out
	Id REG DIFF GAIN	Flux current regulator differential gain	1.00	none	0.80	1.20	Y	N
	Id REG PROP GAIN	Flux current regulator proportional gain	0.30	none	0.00	0.40	Y	N
	Iq REG DIFF GAIN	Torque current regulator differential gain	1.00	none	0.80	1.20	Y	N
	Iq REG PROP GAIN	Torque current regulator proportional gain	0.30	none	0.00	0.40	Y	N
	PWM FREQUENCY	Carrier frequency	10.0	kHz	2.5	16.0	N	N
	UV ALARM LEVEL	Voltage level for undervoltage alarm	90	%nominal dc bus	80	99	Y	N
	UV FAULT LEVEL	Voltage level for undervoltage fault	80	%nominal dc bus	50	99	Y	N
	EXTERN REACTANCE	External choke reactance	0.0	% base Z	0.0	10.0	Y	Y
	INPUT L-L VOLTS	Nominal line-line AC input Voltage, RMS	460 or 230	Volts	110	480	N	N

Detailed descriptions

Id REG DIFF GAIN
(Current Regulator Differential Gain for Flux Generation)
The differential gain for the current regulator flux generation. This parameter is meant for advanced operation, therefore, the parameter will rarely need to be changed from the default value.

Id REG PROP GAIN
(Current Regulator Proportional Gain for Flux Generation)
The proportional gain for the current regulator flux generation**.** This parameter is meant for advanced operation, therefore, the parameter will rarely need to be changed from the default value.

Iq REG DIFF GAIN
(Current Regulator Differential Gain for Torque Generation)
The differential gain for the current regulation of motor torque. This parameter is meant for advanced operation, therefore, the parameter will rarely need to be changed from the default value.

Iq REG PROP GAIN
(Current Regulator Proportional Gain for Torque Generation)
The proportional gain for the current regulator torque generation. This parameter is meant for advanced operation, therefore, the parameter will rarely need to be changed from the default value.

PWM FREQUENCY
(PWM Frequency)
This parameter sets the PWM or 'carrier' frequency of the drive. The carrier is defaulted at 10.0 kHz, which is well out of audible range. The drive does not derate when the PWM frequency is set to 10kHz or below.

UV ALARM LEVEL
(Undervoltage Alarm Level)
This parameter sets the level (as a percentage of the INPUT L-L VOLTS(A4)) at which an under voltage alarm will be declared.

UV FAULT LEVEL
(Undervoltage Fault Level)
This parameter sets the level (as a percentage of the INPUT L-L VOLTS(A4)) at which an under voltage fault will occur.

EXTERN REACTANCE
(External Reactance)
This parameter sets the externally connected reactance (as a percentage of base impedance) between the drive and the motor.

INPUT L-L VOLTS
(Input Line to Line Voltage - Input Voltage)
This parameter sets the input voltage or AC line input voltage to the drive. This parameter is used only to determine the UV alarm and fault levels.

Adjust A0 menu

Motor A5 submenu

A5	parameter	description	default	units	min	max	hidden item	run lock out
	MOTOR ID	Motor Identification		none			N	Y
	RATED MTR POWER	Rated motor output power	Per ID	HP or KW	1.0	500.0	N	Y
	RATED MTR VOLTS	Rated motor terminal RMS voltage	Per ID	Volts	190.0	575.0	N	Y
	RATED EXCIT FREQ	Rated excitation frequency	Per ID	Hz	5.0	400.0	N	Y
	RATED MOTOR CURR	Rated motor current	Per ID	Amps	1.00	800.00	N	Y
	MOTOR POLES	Motor poles	Per ID	none	2	32	N	N
	RATED MTR SPEED	Rated motor speed at full load	Per ID	RPM	50.0	3000.0	N	Y
	% NO LOAD CURR	Percent no load current	Per ID	% rated motor current	10.0	80.0	N	N
	STATOR LEAKAGE X	Stator leakage reactance	Per ID	% base Z	0.0	20.0	Y	N
	ROTOR LEAKAGE X	Rotor leakage reactance	Per ID	% base Z	0.0	20.0	Y	N
	STATOR RESIST	Stator resistance	Per ID	% base Z	0.0	20.0	Y	N
	MOTOR IRON LOSS	Iron loss at rated frequency	Per ID	% rated power	0.0	15.0	Y	N
	MOTOR MECH LOSS	Mechanical loss at rated frequency	Per ID	% rated power	0.0	15.0	Y	N
	OVLD START LEVEL	Maximum continuous motor current	Per ID	% rated current	100	150	Y	Y
	OVLD TIME OUT	Time that defines motor overload curve	Per ID	seconds	5.0	120.0	Y	Y
	FLUX SAT BREAK	Flux saturation curve slope change point.	Per ID	% flux	0	100	Y	Y
	FLUX SAT SLOPE 1	Flux saturation curve slope for low fluxes	Per ID	PU slope	0.00	200.0	Y	Y
	FLUX SAT SLOPE 2	Flux saturation curve slope for high fluxes	Per ID	PU slope	0.00	200.0	Y	Y

Detailed description

MOTOR ID
(Motor Identification)
This parameter allows for the selection of specific sets of motor parameters. A listing of each Motor Ids with its corresponding set of motor parameters is shown below.

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

Motor ID Parameters

NOTE: The default motor selections need to have the motor nameplate information entered in the appropriate motor parameters. The other motor parameters are already set to nominal values.

RATED MTR PWR
(Rated Motor Power)
This parameter sets the rated power in horsepower (HP) or kilowatts (kW) of the motor. Note: value should be obtained from the motor nameplate

RATED MTR VOLTS
(Rated Motor Voltage)
This parameter sets the rated motor voltage. Note: value should be obtained from the motor nameplate

RATED EXCIT FREQ
(Rated Motor Excitation Frequency)
This parameter sets the excitation frequency of the motor. Note: value should be obtained from the motor nameplate

RATED MOTOR CURR
(Rated Motor Amps)
This parameter sets the rated motor current. Note: value should be obtained from the motor nameplate

MOTOR POLES
(Motor Poles)
This parameter sets the number of poles in the motor.
NOTE: This must be an even number or a Setup Fault #3 will occur. Note: value should be obtained from the motor nameplate or use table below as reference

Rated Speed (RPM)	# of motor poles
1300-1802	4
900-1202	6
660-900	8

RATED MTR SPEED
(Rated Motor Speed)
This parameter sets the rated rpm of the motor (nameplate speed). NOTE: This is a function of the motor only and does not need to be the same as the CONTRACT MTR SPD (A1) parameter setting. Note: value should be obtained from the motor nameplate or use table below as reference

Rated Speed (RPM)	# of motor poles
1300-1803	4
900-1203	6
660-900	8

% NO LOAD CURR
(Percent No Load Current)
This parameter sets the percent no load current of the motor.

STATOR LEAKAGE X
(Stator Leakage Reactance)
This parameter sets the stator reactance leakage, as a percent of the BASE IMPEDANCE (D2), which appears in the Power Data display. NOTE: The base impedance is based on the RATED MTR PWR (A5) and RATED MTR VOLTS (A5) parameters.

ROTOR LEAKAGE X
(Rotor Leakage Reactance)
This parameter sets the rotor reactance leakage, as a percent of the BASE IMPEDANCE (D2), which appears in the Power Data display.
NOTE: The base impedance is based on the RATED MTR PWR (A5) and RATED MTR VOLTS (A5) parameters.

STATOR RESIST
(Stator Resistance)
This parameter sets the amount of resistance in the motor stator, as a percent of the BASE IMPEDANCE (D2), which appears in the Power Data display.
NOTE: The base impedance is based on the RATED MTR PWR (A5) and RATED MTR VOLTS (A5) parameters.

MOTOR IRON LOSS
(Motor Iron Loss)
This parameter sets the motor iron loss at rated frequency.

MOTOR MECH LOSS
(Motor Mechanical Losses)
This parameter sets the motor mechanical losses at rated frequency.

OVLD START LEVEL
(Motor Overload Start Level)
This parameter defines maximum current at which motor can run continuously. This parameter is also one of the two parameters that define the motor overload curve.
The motor overload parameters can be adjusted by the user. The following two parameters are used to define the motor overload curve.

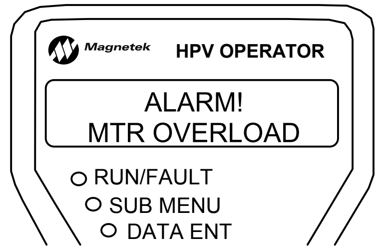
- motor current overload start level (OVLD START LEVEL(A5)) parameter
- motor current time out (OVLD TIME OUT(A5)) parameter

Three overload curves are shown. Curve #1 is the default motor overload curve. The parameter settings that define the three overload curves are shown.

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

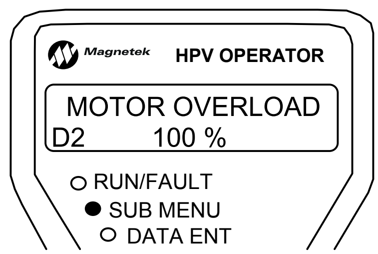
Motor Overload Parameters

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



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

Under the POWER DATA display sub-menu, The MOTOR OVERLOAD (D2) value displays the percentage of motor overload trip level reached. Once this value reaches 100% the motor has exceeded its user defined overload curve and a motor overload alarm is declared by the drive.



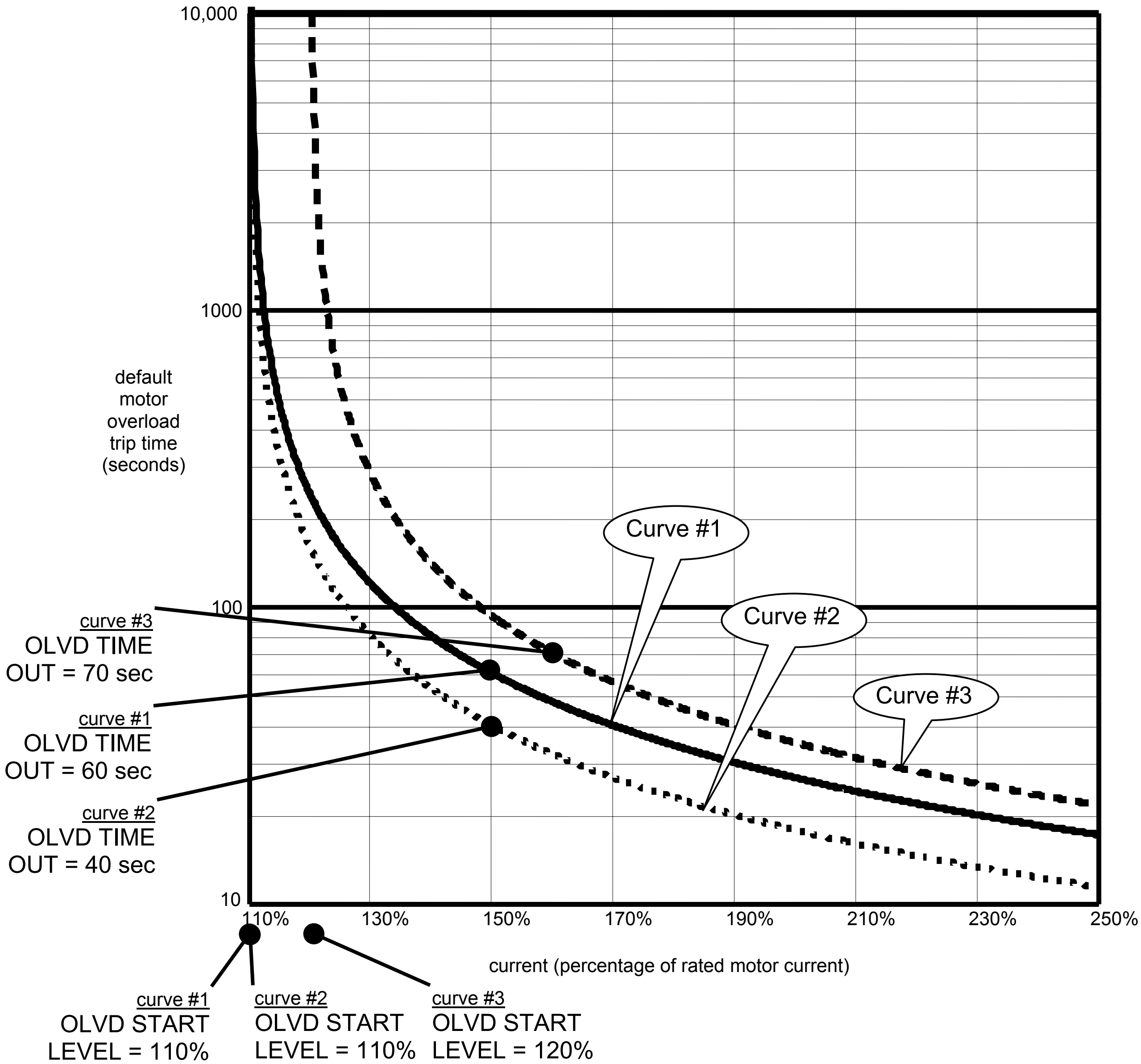
The drive will only declare a motor overload and the user is responsible for action.

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

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

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

Closed-loop Motor A5



Motor Overload Curve

OVLD TIME OUT
(Motor Overload Time Out)
This parameter defines the amount of time before a motor overload alarm occurs when the motor is running at the current level defined below:

$$\begin{pmatrix}\text{OVLD}\\ \text{START}\\ \text{LEVEL:}\end{pmatrix} + \begin{pmatrix}\text{40\%}\\ \text{rated}\\ \text{motor}\\ \text{current}\end{pmatrix}$$

This is the other parameter used to define the overload curve.

FLUX SAT BREAK
(Flux Saturation Break Point)
This parameter sets the flux saturation curve slope change point.

FLUX SAT SLOPE 1
(Flux Saturation Slope #1)
This parameter sets the flux saturation curve slope for low fluxes.

FLUX SAT SLOPE 2
(Flux Saturation Slope #2)
This parameter sets the flux saturation curve slope for high fluxes.

Configure C0 menu

User Switches C1 submenu

C1	parameter	description	default	choices	hidden item	run lock out
	SPD COMMAND SRC	Speed Command Source	MULTI-STEP	analog input multi-step serial ser mult step	Y	Y
	RUN COMMAND SRC	Run Command Source	EXTERNAL TB	external tb serial serial+extrn	Y	Y
	HI/LO GAIN SRC	High / low gain change switch source	INTERNAL	external tb serial internal	Y	Y
	SPEED REG TYPE	Chooses speed regulator: Ereg or PI regulator	ELEV SPD REG	elev spd reg pi speed reg external reg	Y	Y
	MOTOR ROTATION	Allows user to reverse direction of motor rotation.	FORWARD	forward reverse	Y	Y
	SPD REF RELEASE	Determines when speed reference release is asserted (for use when the drive controls the mechanical brake)	REG RELEASE	reg release brake picked	Y	Y
	CONT CONFIRM SRC	Determines if an external logic input is used for contactor confirm.	NONE	none external tb	Y	Y
	PreTorque SOURCE	Determines if a pre torque command is used and if used, it determines the source of the pre torque command.	NONE	none analog input serial	Y	Y
	PreTorque LATCH	Chooses if analog pre-torque command is latched	EXTERNAL TB	external tb serial	Y	Y
	PTorq LATCH CLCK	Determines source of pre torque latch control (if used)	NONE	none external tb1	Y	Y
	FAULT RESET SRC	Fault reset source	EXTERNAL TB	external tb serial automatic	Y	Y
	OVERSPD TEST SRC	Determines external logic source to initiate overspeed test	EXTERNAL TB	external tb serial	Y	Y
	BRAKE PICK SRC	Determines the source of the brake pick command (if drive controls mechanical brake)	INTERNAL	internal serial	Y	Y
	BRAKE PICK CNFM	Determines if a logic input is used for brake pick confirm	NONE	none external tb	Y	Y

C1	parameter	description	default	choices	hidden item	run lock out
	BRAKE HOLD SRC	Determines the source of the brake hold command. (if drive controls mechanical brake)	INTERNAL	internal serial	Y	Y
	RAMPED STOP SEL	Chooses between normal stop and torque ramp down stop	NONE	none ramp on stop	Y	Y
	RAMP DOWN EN SRC	Determines the source that signals the torque ramp down stop (if used)	EXTERNAL TB	external tb run logic serial	Y	Y
	BRK PICK FLT ENA	Brake pick fault enable(if drive controls mechanical brake)	DISABLE	disable enable	Y	Y
	BRK HOLD FLT ENA	Brake hold fault enable(if drive controls mechanical brake)	DISABLE	disable enable	Y	Y
	EX TORQ CMD SRC	Sets source of external torque command	NONE	none serial	Y	Y
	DIR CONFIRM	Allows confirmation of polarity of analog speed command	DISABLED	disabled enabled	Y	Y
	S-CURVE ABORT	Addresses handling of a speed command change before S-Curve target speed	DISABLED	disabled enabled	Y	Y
	FAST FLUX	Addresses the method the HPV 900 uses to build up flux in the motor	DISABLED	disabled enabled	Y	Y
	MAINS DIP ENA	Mains Dip function enable	DISABLE	disable enable	Y	Y
	DB PROTECTION	Dynamic braking protection fault or alarm selection	FAULT	fault alarm	Y	Y
	ENCODER FAULT	Allows the user to temporarily disable the Encoder Fault.	ENABLE	disable enable	Y	Y
	STOPPING MODE	Determines the multi-step stopping mode	IMMEDIATE	immediate ramp to stop	Y	Y
	AUTO STOP	Auto Stop function enable	DISABLE	disable enable	Y	Y
	SERIAL MODE	Serial protocol selection	MODE 1	mode 1 mode 2 mode 2 test	Y	Y
	SER2 FLT MODE	Defines the reaction to a serial communications fault while in Serial Mode 2 *(only serial mode 2)*	IMMEDIATE	immediate run remove rescue	Y	Y
	DRV FAST DISABLE	Addresses how fast the drive responses to the removal of DRIVE ENABLE logic input	DISABLE	disable enable	Y	Y

C1	parameter	description	default	choices	hidden item	run lock out
	MLT-SPD TO DLY1	Assigns multi-step speed command to recognition delay timer 1	NONE	none mspd 1 mspd 2 mspd 3 mspd 4 mspd 5 mspd 6 mspd 7 mspd 8 mspd 9 mspd 10 mspd 11 mspd 12 mspd 13 mspd 14 mspd 15	Y	Y
	MLT-SPD TO DLY2	Assigns multi-step speed command to recognition delay timer 2	NONE		Y	Y
	MLT-SPD TO DLY3	Assigns multi-step speed command to recognition delay timer 3	NONE		Y	Y
	MLT-SPD TO DLY4	Assigns multi-step speed command to recognition delay timer 4	NONE		Y	Y

Detailed descriptions

SPD COMMAND SRC
(Speed Command Source)
This parameter designates the source of the drive's speed command.
The three possible sources for the speed command are following:

- Serial Channel - a RS-422 serial port located on the drive control board (either speed profile or multi-step speed commands)
  = serial – speed profile
  (only used in serial mode 1)
  = ser mult step – serial multi-step speed commands (only used in serial mode 2)
- Analog Channel – a bipolar (±10V) signal. Available with the analog channel is a Speed Command Multiplier (SPD COMMAND MULT(A1)) and Speed Command Bias (SPD COMMAND BIAS(A1)). These parameters are used to scale the user's analog speed command to the proper range for use by the drive software.
- Multi-Step Command - user defined fifteen discrete speed commands (CMD1 - CMD15). Four logic inputs are used as speed command selections (CMD0 is reserved for zero speed. But, the user can specify CMD1 - CMD15 to be any speed command either positive or negative)

RUN COMMAND SRC
(Run Command Source)
This parameter allows the user to choose the source of the run command from one of the following sources: an external run signal from a logic input (external tb1), a run signal transferred across a serial channel (serial), or a signal from both the serial channel and a logic input (serial+extrn). If a signal is required from a logic input (either externaltb1 or serial+extrn), the Run signal on TB1 must be selected.

HI/LO GAIN SRC
(High / Low Gain Source)
This parameter determines the source of the high / low gain switch.

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

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

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

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

The high / low gain switch determines when the HPV 600 is in 'low gain' mode. In the 'low gain' mode, the gain reduce multiplier has an effect on the speed regulator's response (gain). The drive allows for the high / low gain switch to be controlled either externally or internally. The high / low gain source parameter (HI/LO GAIN SRC) allows for this external or internal selection.

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

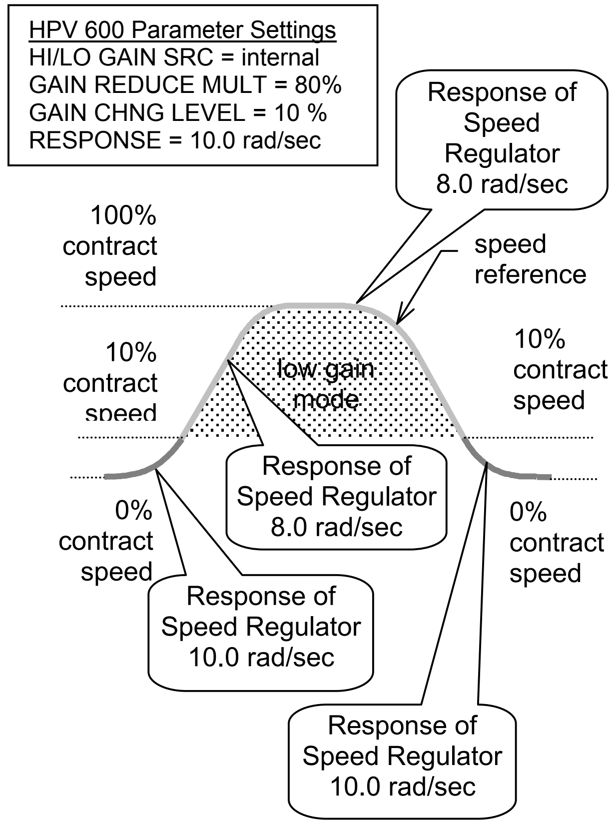
- a logic input
- the serial channel.

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

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

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

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



High / Low Gain Example

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

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

IMPORTANT
This assumes the car controller is doing its own closed-loop speed regulation. (i.e. a completely closed outer speed loop with the car controller having its own encoder feedback).
The source of the external torque command is determined by the EXT TORQ CMD SRC (C1) parameter.

The HPV 600 has the following two closed loop speed regulation options and an option for turning off the internal speed regulator:

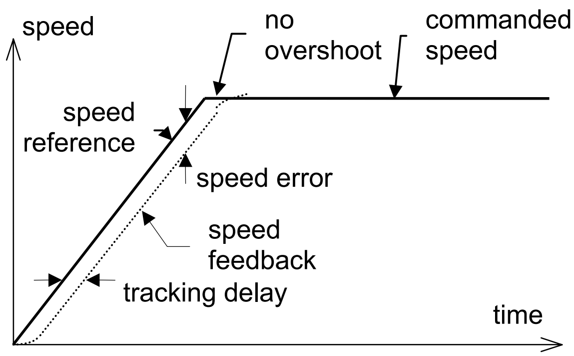
- Elevator Speed Regulator (Ereg)
- PI Speed Regulator
- External Speed Regulator

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

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

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

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



Ereg Example

The Elevator Speed Regulator is tuned by:

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

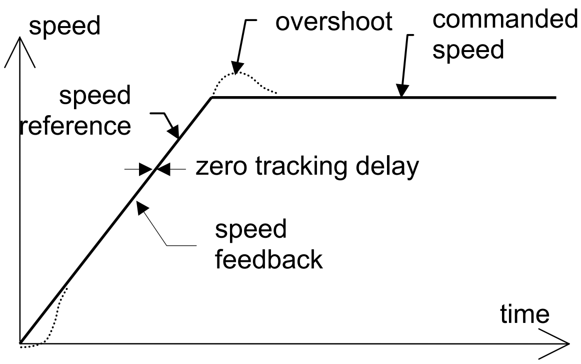
The tracking delay shown is defined as (1/RESPONSE) seconds. The tracking delay is not effected by the gain reduce multiplier.

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

$$\textit{inner loop crossover} < \textit{response} \times \textit{gain reduce multiplier}$$

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

Because of this overshoot, the PI regulator is not recommended for elevator control



PI Speed Regulator Example

The PI Speed Regulator is tuned by:

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

MOTOR ROTATION
(Motor Rotation)
This parameter allows the user to change the direction of the motor rotation. As an example, if the car controller is commanding the up direction and the car is actually going in a down direction, this parameter can be changed to allow the motor rotation to match the car controller command.

SPD REF RELEASE
(Speed Reference Release)
The user can select when the Speed Reference Release signal is asserted:

- If the user does not want the drive to wait for the mechanical brake to be picked then SPD REF RELEASE can be made equal to REG RELEASE;
- If the user does want the drive to wait for the brake to be picked then SPD REF RELEASE is not asserted until BRAKE PICKED becomes true.

CONT CONFIRM SRC
(Contactor Confirm Source)
This switch selects if hardware confirmation of motor contactor closure is necessary before drive attempts to pass current through motor. If hardware confirmation is available set to EXTERNAL TB1 and select the Contact Cnfirm signal on a logic input terminal.

PreTorque SOURCE
(Pre-Torque Source)
This switch determines if a pre torque command is used and if used the source.

Pre-torque is the value of torque that the drive should produce as soon as the speed regulator is released to prevent rollback due to unbalanced elevator loads.

This 'priming' of the speed regulator is done with the pre-torque command, which is used when the speed regulator release is asserted.

The two possible sources for the pre-torque command are following:

- serial channel
- analog channel

The serial channel is a RS-422 or 485 serial port on option card. The analog pre-torque signal is bipolar (±10V). Available with the analog channel is a Pre-Torque Command Multiplier (PRE TORQUE MULT (A1)) and Pre-Torque Bias (PRE TORQUE BIAS(A1)). These parameters are used to scale the user's analog pre-torque command to the proper range for use by the drive software.

Pre-Torque LATCH
This parameter determines if the pre-torque signal is latched.
NOTE: If PreTorque Source has been set to NONE, the setting does not have any effect on the operation of the drive.

Some car controllers send both analog pre-torque and speed commands . To facilitate this, the HPV 600 has the option of latching the pre-torque command.

If pre-torque latching is selected using the Pre-Torque Latch parameter, a FALSE to TRUE transition on the pre-torque latch clock latches the value on the pre-torque channel into the drive. This channel is allowed to change any time except during this transition without affecting the value of the latched pre-torque command.

The Pre-Torque Latch Clock controls when the pre-torque command is latched. The Pre-Torque Latch clock parameter (PTorq LATCH CLCK) determines the source of this latch control. The two choices for latch control are the serial channel or a logic input (EXTERNAL TB1).

The latched pre-torque command is used by the speed regulator when the internal Speed Regulator Release signal is asserted. Once the pre-torque command is used the latch and the pre-torque command is cleared.

PTorq LATCH CLCK
(Pre-Torque Latch Clock)
If the PRE-TORQUE LATCH has been set to LATCHED, then this parameter chooses the source for latch control. If set to EXTERNAL TB1, the Pre-Trq Latch signal on TB1 must be selected.

FAULT RESET SRC
(Fault Reset Source)
This parameter determines the source of the drive's external fault reset from one of the following sources: an external fault reset signal from a logic input (external tb1), a fault reset signal transferred across a serial channel (serial), or the drive automatically resets the faults (automatic). The user also has the option to reset faults directly through the operator.
<u>Automatic Fault Reset</u>
If the fault reset source is set to automatic, the faults will be reset according to the setting of the FLT RESET DELAY (A1) and FLT RESETS/HOUR (A1) parameters. When a logic input is defined as "fault reset" and this logic input signal is transitioned from false to true: an active fault will be reset and automatic fault reset counter (defined by FLT RESETS/HOUR(A1)) will be reset to zero.

CAUTION

If the run signal is asserted at the time of a fault reset, the drive will immediately go into a run state. Unless using the auto-fault reset function (FAULT RESET SRC (C1)=automatic), then the run command needs to be cycled to be reset automatically, but will reset if initiated by a logic input without cycling the run command.

OVERSPEED TEST SRC
(Overspeed Test Source)
This switch determines the source of the overspeed test. Operation of the overspeed test function is specified by the OVRSPEED MULT (A1) parameter. Regardless of the setting of this parameter, the user can call for the overspeed test via the Digital Operator.

BRAKE PICK SRC
(Brake Pick Source)
If the BRAKE PICK SRC (C1) is set to INTERNAL, the HPV 600 will attempt to pick (lift) the brake when magnetizing current has been developed in the motor.

BRAKE PICK CNFM
(Brake Pick Confirm)
If this switch is set to EXTERNAL TB1, the HPV 600 will wait for brake pick confirmation before releasing the speed reference. When set to EXTERNAL TB1, the MECH BRK PICK signal on TB1 must also be selected.

BRAKE HOLD SRC
(Brake Hold Source)
If set to internal, the drive will command the mechanical brake to hold mode until confirmation of brake picked exists.

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

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

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

The Ramp Down Enable has the following three possible sources:

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

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

A method of providing the Ramp Down Enable would be with a logic signal (EXTERNAL TB1) that is dedicated to that function. The Ramp Down Enable would be asserted while the Run command is still present and remain there until the ramp is completed, after which the Run command would be removed.

The RUN LOGIC option to trigger the Ramp Down Enable from the Run command is provided. In this case, removal of the Run command enables the Ramp Down Stop Function.

The time it takes for the HPV 600 to perform its ramped stop is determined by the Ramped Stop Time Parameter. The Ramped Stop Time parameter (RAMPED STOP TIME(A1)) selects the amount of time it would take for the drive to ramp from the rated torque to zero torque.

RAMP DOWN EN SRC
(Ramp Down Enable Source)
If RUN LOGIC is selected, the user can remove the run command and the drive will delay in dropping the run command until torque ramp down stop function is complete.
If EXTERNAL TB1 or SERIAL is selected, the user must keep the run command while allowing the Torque Ramp Down Stop function to be completed.

BRK PICK FLT ENA
(Brake Pick Fault Enable)
When this parameter is set to ENABLE, the brake pick command and confirmation must match within the specified time in BRK PICK TIME (A1) parameter or a brake pick fault is declared.

BRK HOLD FLT ENA
(Brake Hold Fault Enable)
When this parameter is set to ENABLE, the brake hold command and confirmation must match within the specified time in BRK HOLD TIME (A1) parameter or a brake hold fault is declared.

EX TORQ CMD SRC
(Torque Command Source)
Sets the source of the external torque command when the SPEED REG TYPE (C1) is set to external reg.

NOTE:

- if SPEED REG TYPE is set to external reg and EX TORQ CMD SRC is set to serial, the drive is a torque controller
- if SPEED REG TYPE is set for a speed regulator (either pi speed reg or elev spd reg) and EX TORQ CMD SRC is set to either serial, the torque command is an auxiliary torque command (torque feedforward command)

DIR CONFIRM
(Direction Confirm)
When enabled, the function allows confirmation of the polarity of the initial analog speed command via the Run Up or Run Down logic input commands.

- If the Run Up logic input is selected and true with the polarity of the analog signal positive, then the analog speed command is accepted unchanged.
- If the logic input Run Down logic input is selected and true with the polarity of the analog speed command negative, the analog speed command is accepted unchanged.
- If however, the logic input Run Up is true and the polarity is negative or the logic input Run Down is true and the polarity is positive, then the speed command is held at zero.

S-CURVE ABORT
(S-Curve Abort)
This parameter, S-CURVE ABORT (C1), addresses how the S-Curve Speed Reference Generator handles a reduction in the speed command before the S-Curve Generator has reached its target speed.
<u>Disabled</u>
With a normal S-curve function, a change in the speed command is never allowed to violate the defined acceleration or jerk rates. If a reduction in the speed command is issued before the S-Curve generator has reached its target speed, then the jerk rate dictates what speed is reached before the speed may be reduced.
<u>Enabled</u>
The optional S-Curve abort has been selected. In this case when the speed command is reduced, the speed reference immediately starts to reduce violating the jerk limit (thus no jerk out phase), which could be felt in the elevator.
For optional S-Curve abort to be active requires that:

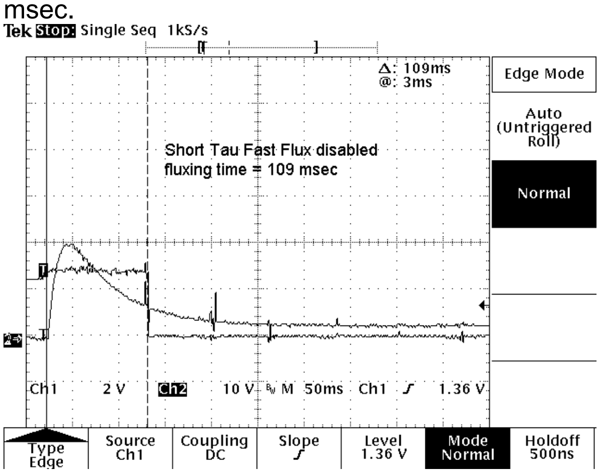
- The speed command source must be selected as Multi-step (SPD COMMAND SRC=multi-step).

- The S-curve Abort function must be ENABLED (S-CURVE ABORT = enabled).

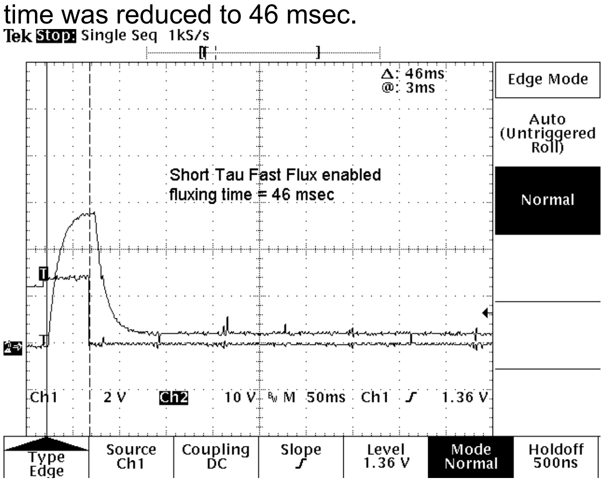
FAST FLUX
(Fast Flux Enable)
This parameter addresses the method the HPV 600 uses to build up flux in the motor. Enabling the Fast Flux function can decrease the motor fluxing time significantly. By decreasing the motor's flux time, the starting takeoff time will also be decreased.

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

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



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



MAINS DIP ENA
(Mains Dip Enable)
When enabled, the function will reduce the speed (by the percentage defined by the MAINS DIP SPEED parameter) when the drive goes into 'low voltage' mode. 'Low voltage' mode is defined as when the drive declares a UV alarm, which is defined by the Input line-to-line voltage (INPUT L-L VOLTS) parameter and the Undervoltage Alarm Level (UV ALARM LEVEL)

DB PROTECTION
(Dynamic Braking Resistor Protection Selection)
The dynamic braking IGBT is limited as to when it can be turned "on" (i.e. send power to the dynamic braking resistors).

The dynamic braking IGBT is allowed to be "on" while the drive is running (i.e. while the speed regulator is released) and for a period of ten (10) seconds after the drive is stopped. If the dynamic braking IGBT is still "on" ten seconds after the drive stops running, the drive will turn "off" the dynamic braking IGBT (thus stop sending power to the dynamic braking resistors) and declare a "DB VOLTAGE" fault or alarm (whether fault or alarm, depends on setting of this parameter).

ENCODER FAULT
(Encoder Fault Enable)
This parameter allows the user to temporarily disable the Encoder Fault. Adding this feature allows the user to temporarily disable the Encoder Fault during the initial start-up process, when the motor model (defined by the A5 Motor Parameters) is not clearly defined.

When the Encoder Fault is disabled (ENCODER FAULT (C1) = disabled), the drive will display the warning message "EncoderFault OFF", every time the RUN command is removed.

IMPORTANT: After the motor parameters in A5 have been established, the Encoder Fault should be enabled (ENCODER FAULT (C1) = enabled).

Note: the default for the ENCODER FAULT (C1) parameter is enabled.

STOPPING MODE
(Multi-step Stopping Mode Selection)
When the speed command source is set to multi-step (SPD COMMAND SRC (C1)=multi-step), the parameter, STOPPING MODE (C1), determines the stopping mode of the HPV 600. The two selectable methods for the Stopping Mode parameter are "Immediate" and "Ramp to stop".

Note: If the SPD COMMAND SRC (C1) parameter is set to any other definition other than "multi-step", the drive will behave to the "immediate" stopping mode (independent of the setting of the STOPPING MODE (C1) parameter).

The "Immediate" stopping mode requires the drive to be at zero speed prior to removing the "Run" command. The "Immediate" selection is how the HPV 600 has traditionally behaved prior to the addition of this parameter.

The "Ramp to stop" stopping mode is intended for use when removing the "Run" command prior to the drive reaching zero speed (as defined by the AB ZERO SPD LEV (A1) parameter). When the "Run" command is removed and the speed reference is above zero speed, the speed reference will ramp to zero speed following the selected s-curve.

AUTO STOP
(Auto Stop Function Enable)
When the speed command source is set to multi-step or serial (SPD COMMAND SRC (C1)=multi-step or serial), the parameter determines the stopping mode of the drive. The two selectable methods for the STOPPING MODE (C1)* parameter are "Immediate" and "Ramp to stop".

The Auto Stop function determines how the drive logic will respond to a zero or non-zero speed command. The function will only work when the speed command source is either mult-step or serial (SPD COMMAND SRC (C1)=multi-step or serial).

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

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

- Both a Run command and a non-zero speed command are required to start the drive
- Either the removal of the Run command or the setting the speed command to zero will initiate a stop.

Remember, when the auto stop function is enabled (AUTO STOP (C1)=enabled) both a non-zero multi-step/serial speed command AND the run command are required to start the drive. It makes no difference which signal is enabled first, the drive does not start until both are present. When initiating a stop, which signal is removed first does make a difference.

SERIAL MODE
(Serial Mode Selection)
This parameter selects between two serial protocols.
The choices are:

- Mode 1 – selects the Magnetek standard protocol.
- Mode 2 – selects a custom protocol.
- Mode 2 Test – test mode used only when testing custom protocol serial mode 2.

SER2 FLT MODE
(Serial Mode 2 Fault Mode)
Used only with custom serial protocol (mode 2)
This parameter defines the reaction to a serial communications fault while in Serial Mode 2.
There are three possible settings:

- Immediate – upon sensing a serial communications fault while in the run mode will result in an immediate stop. The equivalent to removal of the "Drive Enable" logic input.
- Run Remove – upon sensing a serial communications fault while in the run mode, the drive will react in the same manner that removal of the run command would react. In this case, the type of stop will be defined by the STOPPING MODE (C1) parameter.
- Rescue – upon sensing a serial communications fault while in the run mode, an attempt will be made to continue to run at a low speed to the next floor. Upon sensing the fault, the drive will decelerate to a creep speed and continue to run at that speed until

the first of the two following termination conditions are reached.

- The hardware "Drive Enable" logic input is removed.
- A timer set by parameter SER2 RS CRP TIME (A1) has elapsed.

DRV FAST DISABLE
(Drive Fast Disable Function)
This function determines how fast the drive responses to the removal of DRIVE ENABLE logic input. Note: The removal of the DRIVE ENABLE logic input will turn-off the drive output gates.
Disable
With the removal of the DRIVE ENABLE logic input, the drive's output gates will turn off within 4 msec.
Enable
With the removal of the DRIVE ENABLE logic input, the drive's output gates will turn off within 1.5-2.0 msec.

MLT-SPD TO DLY1
(Multi-step Speed Command Delay 1)
This parameter assigns multi-step speed command to recognition delay timer 1 as defined by the MSPD DELAY 1 (A1) parameter.

MLT-SPD TO DLY2
(Multi-step Speed Command Delay 2)
This parameter assigns multi-step speed command to recognition delay timer 2 as defined by the MSPD DELAY 2 (A1) parameter.

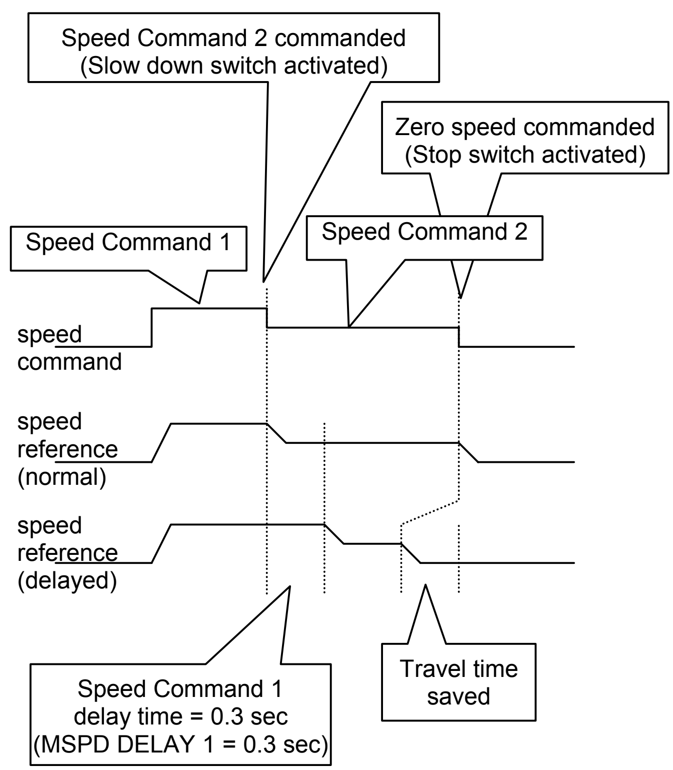
MLT-SPD TO DLY3
(Multi-step Speed Command Delay 3)
This parameter assigns multi-step speed command to recognition delay timer 3 as defined by the MSPD DELAY 3 (A1) parameter.

MLT-SPD TO DLY4
(Multi-step Speed Command Delay 4)
This parameter assigns multi-step speed command to recognition delay timer 4 as defined by the MSPD DELAY 4 (A1) parameter.

Multi-step Speed Command Delay Function

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

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



Configure C0 menu

Logic Inputs C2 submenu

C2	parameter	description	default	hidden item	run lock out
	LOGIC INPUT 1	logic input #1	DRIVE ENABLE	Y	Y
	LOGIC INPUT 2	logic input #2	RUN	Y	Y
	LOGIC INPUT 3	logic input #3	FAULT RESET	Y	Y
	LOGIC INPUT 4	logic input #4	UP/DWN	Y	Y
	LOGIC INPUT 5	logic input #5	S-CURVE SEL 0	Y	Y
	LOGIC INPUT 6	logic input #6	STEP REF B0	Y	Y
	LOGIC INPUT 7	logic input #7	STEP REF B1	Y	Y
	LOGIC INPUT 8	logic input #8	STEP REF B2	Y	Y
	LOGIC INPUT 9	logic input #9	EXTRN FAULT 1	Y	Y
	choices				
	contact cfirm	Auxiliary contacts from motor contactor.			
	drive enable	Must be asserted to permit drive to run. This does not initiate run, just permits initiation.			
	extrn fault 1	User input fault #1			
	extrn fault 2	User input fault #2			
	extrn fault 3	User input fault #3			
	extrn /flt 4	User input fault #4			
	fault reset	Asserting this input attempts to reset faults.			
	low gain sel	Low gain for the speed regulator is chosen when this input is asserted.			
	mech brake hold	Auxiliary contacts from mechanical brake. Asserted when brake is in hold mode.			
	mech brake pick	Auxiliary contacts from mechanical brake. Asserted when brake is picked (lifted).			
	no function	Input not assigned			
	ospd test src	Asserting input, applies the overspeed multiplier to the speed command for the next run.			
	pre-trq latch	Transition from false to true latches pre torque command.			
	run	If drive is enabled through the DRIVE ENABLE logic input, this function will start drive operation.			
	run down	If drive is enabled through the DRIVE ENABLE logic input, this function will start drive operation with negative speed commands.			
	run up	If drive is enabled through the DRIVE ENABLE logic input, this function will start drive operation with positive speed commands.			
	s-curve sel 0	Bit 0 of S-curve selection			
	s-curve sel 1	Bit 1 of S-curve selection			
	ser2 insp ena	defines one of the two sources of inspection run command *(only serial mode 2)*			
	step ref b0	Bit 0 of multi-step speed command selection			
	step ref b1	Bit 1 of multi-step speed command selection			
	step ref b2	Bit 2 of multi-step speed command selection			
	step ref b3	Bit 3 of multi-step speed command selection			
	trq ramp down	Asserting this ramps torque output to zero at "Ramped Stop Time parameter" rate.			
	up/dwn	This logic can be used to change the sign of the speed command. false = no inversion, true = inverted.			

Detailed descriptions

LOGIC INPUT x
(Logic Inputs 1-9)
This parameter defines the function of the logic inputs.
NOTE: The user can assign particular functions to each input terminal. Only one function per terminal is allowed and multiple terminals cannot have the same function. When a function is assigned to an input terminal, it is removed from the list of possible selections for subsequent terminals.
NOTE: The *current* setting of each parameter is displayed in all caps; all other choices in the list are displayed in lower case.

Choices
contact cfirm (Contact Confirm Signal)
Closure of the auxiliary contacts confirming closure of the motor contactor.

drive enable (Drive Enable)
Enables drive to run. This signal must be asserted to permit drive to run. This does not initiate run, just permits initiation.

extrn fault 1 (External Fault 1)
extrn fault 2 (External Fault 2)
extrn fault 3 (External Fault 3)
Closure of this contact will cause the drive to declare a fault and perform a fault shutdown.

extrn /flt 4 (External /Fault 4)
Opening of this contact will cause the drive to declare a fault and perform a fault shutdown.

fault reset (Fault Reset)
If the FAULT RESET SRC (C1) switch is set to EXTERNAL TB1, the drive's fault circuit will be reset when this signal is true. If the FAULT RESET SRC (C1) switch is set to AUTOMATIC, the drive's fault circuit will be reset when this signal is true and the automatic fault reset counter (defined by FLT RESETS/HOUR(A!)) will be reset to zero.
NOTE: This input is edge sensitive and the fault is reset on the transition from false to true.

low gain sel (Low Gain Select Signal)
If the HI/LO GAIN SRC (C1) switch is set to EXTERNAL TB1, the low gain mode is chosen for the speed regulator when this signal is true.

mech brk hold (Mechanical Brake Hold Signal)
Auxiliary contact closures confirming when the mechanical brake is in the hold mode (engaged).

mech brk pick (Mechanical Brake Pick Signal)
Closure of auxiliary contacts confirming the mechanical brake has been picked (lifted).

no function (No Function)
When this setting is selected for one of the TB1 input terminals, any logic input connected to that terminal will have no effect on drive operation.

ospd test src (Overspeed Test Source)
This function works only if the OVRSPEED TEST SRC (C1) switch is set to EXTERNAL TB1. A true signal on this input applies the OVERSPEED MULT to the speed command for the next run. After the run command has dropped, the drive returns to 'normal' mode and must be re-configured to perform the overspeed function again. The OVERSPEED FLT level is also increased by the OVERSPEED MULT, allowing the elevator to overspeed without tripping out on an overspeed fault.
NOTE: This input must be taken false then true each time that an overspeed test is run. If the input is left in the true, it is ignored after the first overspeed test.

pre-trq latch (Pre-Torque Latch)
Closing a contact between this input and ground latches the pre torque command present on the analog channel.

run (Run)
If drive is enabled through the DRIVE ENABLE logic input, this function will start drive operation.

run down (Run Down)
If drive is enabled through the DRIVE ENABLE logic input, this function will start drive operation with negative speed commands.
Note: if both RUN UP and RUN DOWN are true then the run is not recognized.
Note: if DIR CONFIRM (C1) is enabled, this input will not change the polarity of the speed command and will be used to confirm the polarity of the analog speed command as well as starting the operation of the drive.

run up (Run Up)
If drive is enabled through the DRIVE ENABLE logic input, this function will start drive operation with positive speed commands.
Note: if both RUN UP and RUN DOWN are true then the run is not recognized.
Note: if DIR CONFIRM (C1) is enabled, this input is also used to confirm the polarity of the analog speed command as well as starting the operation of the drive.

s-curve sel 0 (S-Curve Select bit-0)
s-curve sel 1 (S-Curve Select bit-1)
These two bits are used to select one of four s-curve selections.

ser2 insp ena (Serial Mode 2 Inspection Enable)
Used only with custom serial protocol (mode 2) Defines the logic input to be used as one of the two sources of inspection run command when using serial mode 2. This input must be true as well as a comparable inspection run command sent serially for the drive to run in inspection mode.

step ref b0 (Speed Selection bit-0)
step ref b1 (Speed Selection bit-1)
step ref b2 (Speed Selection bit-2)
step ref b3 (Speed Selection bit-3)
Four inputs, which must be used together as a 4-bit command for multi-step speed selection.

trq ramp down (Torque Ramp Down Signal)
This function works only if the RAMP STOP SEL (C1) switch is set to RAMP TO STOP and RAMP DOWN EN SRC (C1) is set to EXTERNAL TB1.

up/dwn (Up/Down Signal)
This signal is used to change the sign of the speed command. Default is FALSE; therefore, positive commands are for the up direction and negative speed command are for the down direction. Making this input true reverses the car's direction.

Configure C0 menu

Logic Outputs C3 submenu

C2	parameter	description	default	hidden item	run lock out
	LOGIC OUTPUT 1	logic output #1	READY TO RUN	Y	Y
	LOGIC OUTPUT 2	logic output #2	RUN COMMANDED	Y	Y
	LOGIC OUTPUT 3	logic output #3	MTR OVERLOAD	Y	Y
	LOGIC OUTPUT 4	logic output #4	READY TO RUN	Y	Y
	RELAY COIL 1	relay output #1	FAULT	Y	Y
	RELAY COIL 2	relay output #2	SPEED REG RLS	Y	Y
	choices				
	alarm	An alarm declared by the drive			
	alarm+flt	A fault or alarm is declared by the drive			
	auto brake	Signal used to pick (open) the mechanical brake via Auto Brake function (only multi-step speed commands)			
	brake alarm	A brake fault is declared while the drive is running			
	brake hold	The brake pick confirmation is received			
	brake pick	Signal used to pick (open) the mechanical brake			
	brk hold flt	Brake hold state has not matched the commanded state			
	brk igbt flt	Brake IGBT has reached overcurrent			
	brk pick flt	Brake pick state has not matched the commanded state			
	car going dwn	The motor is moving in negative direction faster than user specified speed			
	car going up	The motor is moving in positive direction faster than user specified speed			
	charge fault	DC bus has not charged			
	close contact	The drive has been enabled & commanded to run and no faults are present			
	contactor flt	Contactor state has not matched the commanded state			
	curr reg flt	The actual current measurement does not match commanded current			
	drv overload	The drive has exceeded the drive overload curve			
	encoder flt	Encoder is disconnected or not functioning, while attempting to run			
	fan alarm	Cooling fan failure			
	fault	A fault declared by the drive			
	flux confirm	The drive's estimate of flux has reached 75% of reference.			
	fuse fault	DC bus fuse is open			
	ground fault	Sum of all phase currents exceeds 50% of rated current			
	in low gain	Low gain or response is now being used by the speed regulator			
	motor trq lim	The drive has exceeded the motoring torque limit			
	mtr overload	The motor has exceeded the motor overload curve			
	no function	Output not assigned			
	not alarm	The output is true when an alarm is NOT present.			
	over curr flt	Phase current exceeded 300%			
	overspeed flt	The drive has exceeded the overspeed level			
	overtemp flt	Heatsink temperature exceeded 90°C (194°F)			
	overvolt flt	DC bus voltage exceeded 850VDC for 460V drive or 425 VDC for 230V drive			
	ovrtemp alarm	Heatsink temperature exceeded 80°C (176°F)			
	phase fault	Open motor phase			
	ramp down ena	Indicates the torque is being ramped to zero			
	ready to run	The drive's software has initialized and no faults are present			
	regen trq lim	The drive has exceeded the regenerating torque limit			
	run commanded	The drive is being commanded to run			
	run confirm	The drive has been enabled & commanded to run; no faults are present; the contactor has closed; and the IGBTs are firing			
	speed dev	The speed feedback is failing to properly track the speed reference			
	speed dev low	The speed feedback is properly tracking the speed reference			
	speed ref rls	Flux is confirmed and drive is NOT in DC injection			
	speed reg rls	Flux is confirmed and brake is commanded to be picked (if used)			

Closed-loop Logic Outputs C3

C2	parameter	description	default	hidden item	run lock out
	undervolt flt	DC bus voltage has dropped below a specified percent			
	up to speed	The motor speed is above a user defined level			
	uv alarm	DC bus voltage has dropped below a specified percent			
	zero speed	The motor speed is below a user defined level			

Detailed description

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

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

Choices

alarm (Alarm)
The output is true when an alarm is declared by the drive.

alarm+flt (Alarm and/or Fault)
The output is true when a fault and/or an alarm is declared by the drive.

auto brake (Auto Brake)
The output is controlled by the Auto Brake function and is used to open the mechanical brake.

brake alarm (Brake Alarm)
The output is true when the dynamic brake resistor is in an overcurrent condition and the drive is in a run condition.

brake hold (Brake Hold)
The output is true when the brake pick confirmation is received. It is used to show the mechanical brake is remaining open. This function is used with brakes that need to have less than 100% voltage to hold the brake open.

brake pick (Brake Pick)
The output is true when the speed regulator is released and is used to open the mechanical brake.

brk hold flt (Brake Hold Fault)
The output is true when the brake hold command and the brake feedback do not match for the user specified time.

brk igbt flt (Brake Fault)
The output is true when the dynamic brake resistor is in a overcurrent condition and the drive is not in a run condition.

brk pick flt (Brake Pick Fault)
The output is true when the brake pick command and the brake feedback do not match for the user specified time.

car going dwn (Car Going Down)
The output is true when the motor moves in negative direction faster than the user specified speed.

car going up (Car Going Up)
The output is true when motor moves in positive direction faster than user specified speed.

charge fault (Charging Fault)
The output is true when the DC bus voltage has not stabilized above the voltage fault level or the charge contactor has not closed after charging.

close contact (Close Motor Contactor)
The output is true when the run command is given, the drive is enabled, the software has initialized, and no faults are present.

contactor flt (Contactor Fault)
The output is true when the command to close the contactor and the contactor feedback do not match before the user specified time.

curr reg flt (Current Regulator Fault)
The output is true when the actual current measurement does not match commanded current.

drv overload (Drive Overload)
The output is true when the drive has exceeded the drive overload curve.

encoder flt (Encoder Fault)
The output is true when the drive is declaring an encoder fault

fan alarm (Fan Alarm)
The output is true when the fan on the drive is not functioning.

fault (Fault)
The output is true when a fault is declared by the drive.

flux confirm (Motor Flux Confirmation)
The output is true when the drive has confirmed there is enough flux to issue a speed regulator release (the drive's estimate of flux must reach 75% of reference).

fuse fault (Fuse Fault)
The output is true when the DC bus fuse has blown.

ground fault (Ground Fault)
The output is true when the sum of all phase current exceeds 50% of rated current of the drive.

in low gain (In Low Gain)
The output is true when the speed regulator is in "low gain" mode.

motor trq lim (Motor Torque Limit)
The output is true when the torque limit has been reached while the drive is in the motoring mode. The motoring mode is defined as the drive delivering energy to the motor.

mtr overload (Motor Overload)
The output is true when the motor has exceeded the user defined motor overload curve.

no function (No Function)
This setting indicates that the terminal or relay will not change state for any operating condition; i.e. the output signal will be constantly false.

not alarm (Not Alarm)
The output is true when an alarm is NOT present.

over curr flt (Motor overload current fault)
The output is true when the phase current has exceeded 300% of rated current.

overspeed flt (Overspeed Fault)
The output is true when the motor has gone beyond the user defined percentage contract speed for a specified amount of time.

overtemp flt (Heatsink Over Temperature Fault)
The output is true when the drive's heatsink has exceeded 90°C (194°F).

overvolt flt (Over Voltage Fault)
The output is true when the DC bus voltage exceeds 850VDC for a 460V class drive or 425VDC for a 230V class drive.

ovrtemp alarm (Drive Over Temperature Alarm)
The output is true when the drive's heatsink temperature has exceeded 80°C (176°F).

phase fault (Phase Loss)
The output is true when the drive senses an open motor phase.

ramp down ena (Ramp Down Enable)
The output is true after a torque ramp down stop has been initiated by either a logic input, the serial channel, or internally by the drive. When this output is true the torque is being ramped to zero.

ready to run (Ready to Run)
The output is true when the drive's software has been initialized and no faults are present.

regen trq lim (Regeneration Torque Limit)
The output is true when the torque limit has been reached while the drive is in the regenerative mode. The regenerative mode is defined as when the motor is returning energy to the drive. When the drive is in regenerative mode, the energy is dissipated via the dynamic brake circuitry (internal brake IGBT and external brake resistor).

run commanded (Run Commanded)
The output is true when the drive is being commanded to run.

run confirm (Run Command Confirm)
The output is true after the software has initialized, no faults are present, the drive has been commanded to run, the contactor has closed and the IGBTs are firing.

speed dev (Speed Deviation)
The output is true when the speed feedback is failing to properly track the speed reference. The speed deviation needs to be above a user defined level.
(Speed Dev. = reference - feedback)

speed dev low (Speed Deviation Low Level)
The output is true when the speed feedback is properly tracking the speed reference. The speed deviation needs to be within a user defined range for a user defined period of time.
(Speed Dev. = reference - feedback)

speed ref rls (Speed Reference Release)
The output is true when the flux is confirmed and drive is NOT in DC injection.

speed reg rls (Speed Regulator Release)
The output is true when the flux is confirmed at 75% and brake is commanded to be picked (if used)

undervolt flt (Low Voltage Fault)
The output is true when the DC bus voltage drops below the user specified percent of the input line-to-line voltage.

up to speed (Up to Speed)
The output is true when the motor speed is above the user specified speed

uv alarm (Low Voltage Alarm)
The output is true when the DC bus voltage drops below the user specified percent of the input line-to-line voltage.

zero speed (Zero Speed)
The output is true when the motor speed is below the user specified speed for the user specified time.

Configure C0 menu

Analog Outputs C4 submenu

C4	parameter	description	default	hidden item	run lock out
	ANALOG OUTPUT 1	analog output #1	TORQUE REF	N	Y
	ANALOG OUTPUT 2	analog output #2	SPEED FEEDBK	N	Y
	choices				
	aux torq cmd	Additional torque command from auxiliary source			
	bus voltage	Measured DC bus voltage			
	current out	Percent motor current			
	drv overload	Percent of drive overload trip level reached			
	flux current	Measured flux producing current			
	flux output	Measured flux output			
	flux ref	Flux reference used by vector control			
	flux voltage	Flux producing voltage			
	frequency out	Electrical frequency			
	mtr overload	Percent of motor overload trip level reached			
	power output	Calculated power output			
	pretorque ref	Pre-torque reference			
	slip freq	Commanded slip frequency			
	spd rg tq cmd	Torque command from speed regulator			
	speed command	Speed command before S-Curve			
	speed error	Speed reference minus speed feedback			
	speed feedbk	Speed feedback used by speed regulator			
	speed ref	Speed reference after S-Curve			
	tach rate cmd	Torque command from tach rate gain function			
	torq current	Measured torque producing current			
	torq voltage	Torque producing voltage			
	torque output	Calculated torque output			
	torque ref	Torque reference used by vector control			
	voltage out	RMS motor terminal voltage			

Detailed description

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

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

Choices

aux torq cmd (Auxiliary Torque Command)
Additional torque command from auxiliary source, when used.
D/A Units: % rated torque

bus voltage (DC Bus Voltage Output)
Measured DC bus voltage.
D/A Units: % of peak in

current out (Current Output)
Percent motor current.
D/A Units: % rated current

drv overload (Drive Overload)
Percent of drive overload trip level reached.
D/A Units: % of trip point

flux current (Flux Producing Current)
Measured flux producing current.
D/A Units: % rated current

flux output (Flux Output)
Measured flux output.
D/A Units: % rated flux

flux ref (Flux Reference)
Flux reference used by vector control.
D/A Units: % rated flux

flux voltage (Flux Producing Voltage)
Flux producing voltage reference.
D/A Units: % rated volts

frequency out (Frequency Output)
Electrical frequency.
D/A Units: % rated freq

mtr overload (Motor Overload)
Percent of motor overload trip level reached.
D/A Units: % of trip point

power output (Power Output)
Calculated power output.
D/A Units: % rated power

pretorque ref (PreTorque Reference)
Pre-torque reference.
D/A Units: % base torque

slip freq (Motor Slip Frequency)
Commanded slip frequency.
D/A Units: % rated freq

spd rg tq cmd (Speed Regulator Torque Command)
Torque command from speed regulator.
D/A Units: % base torque

speed command (Speed Command)
Speed command before S-Curve
D/A Units: % rated speed

speed error (Speed Error)
Speed reference minus speed feedback.
D/A Units: % rated speed

speed feedbk (Speed Feedback)
Speed feedback used by speed regulator.
D/A Units: % rated speed

speed ref (Speed Reference)
Speed reference after S-Curve
D/A Units: % rated speed

tach rate cmd (Tachometer Rate Command)
Torque command from tach rate gain function.
D/A Units: % base torque

torq current (Torque Producing Current)
Measured torque producing current.
D/A Units: % rated current

torq voltage (Torque Producing Voltage)
Torque producing voltage reference.
D/A Units: % rated volts

torque output (Torque Output)
Calculated torque output.
D/A Units: % rated torque

torque ref (Torque Reference)
Torque reference used by vector control.
D/A Units: % base torque

voltage out (Voltage Output)
RMS motor terminal voltage.
D/A Units: % rated volts

Display D0 menu

Elevator Data D1 submenu

D1	parameter	description	units	hidden item
	SPEED COMMAND	Speed command before speed reference generator	ft/min or m/s	N
	SPEED REFERENCE	Speed reference after speed reference generator	ft/min or m/s	N
	SPEED FEEDBACK	Encoder feedback used by speed regulator	ft/min or m/s	N
	SPEED ERROR	Speed reference minus speed feedback	ft/min or m/s	N
	PRE-TORQUE REF	Pre-torque reference	% rated torque	N
	SPD REG TORQ CMD	Torque command from speed regulator	% rated torque	Y
	TACH RATE CMD	Torque command after tach rate gain function	% rated torque	Y
	AUX TORQUE CMD	Feedforward torque command from auxiliary source	% rated torque	Y
	EST INERTIA	Estimated elevator system inertia	seconds	N
	RX COM STATUS	Serial communication status display	1=true 0=false	N
	LOGIC OUTPUTS	Displays the status of the logic outputs	1=true 0=false	N
	LOGIC INPUTS	Displays the status of the logic inputs	1=true 0=false	N

Detailed descriptions

SPEED COMMAND
(Speed Command)
Monitors the speed command before the speed reference generator (input to the S-Curve). This command comes from either multi-step references, speed command from analog channel, or the serial channel.

SPEED REFERENCE
(Speed Reference)
Monitors the speed reference being used by the drive. This is the speed command after passing through the speed reference generator (which uses a S-Curve).

SPEED FEEDBACK
(Speed Feedback)
Monitors the speed feedback coming from the encoder. It is based on contract speed, motor rpm and encoder pulses per revolution. The drive converts from motor RPM to linear speed using the relationship between the CONTRACT CAR SPD (A1) and CONTRACT MTR SPD (A1) parameters.

SPEED ERROR
(Speed Error)
Monitors the speed error between the speed reference and the speed feedback. It is equal to the following equation:

$$\left| \begin{pmatrix} \textit{speed} \\ \textit{reference} \end{pmatrix} - \begin{pmatrix} \textit{speed} \\ \textit{feedback} \end{pmatrix} \right| = \begin{matrix} \textit{speed} \\ \textit{error} \end{matrix}$$

PRE-TORQUE REF
(Pre-Torque Reference)
Monitors the pre torque reference, coming from either analog channel #2 or the serial channel.

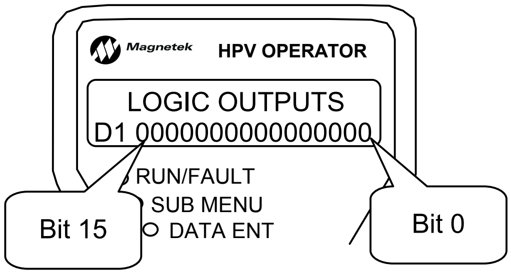
SPD REG TORQ CMD
(Regulator Torque Command)
Monitors the speed regulator's torque command. This is the torque command before it passes through the tach rate gain function or the auxiliary torque command. It is the torque required for the motor to follow the speed reference.

TACH RATE CMD
(Tachometer Rate Command)
Monitors the torque command from the tach rate gain function, (if used).

AUX TORQUE CMD
(Auxiliary Torque Command)
Monitors the feedforward torque command from auxiliary source, when used.

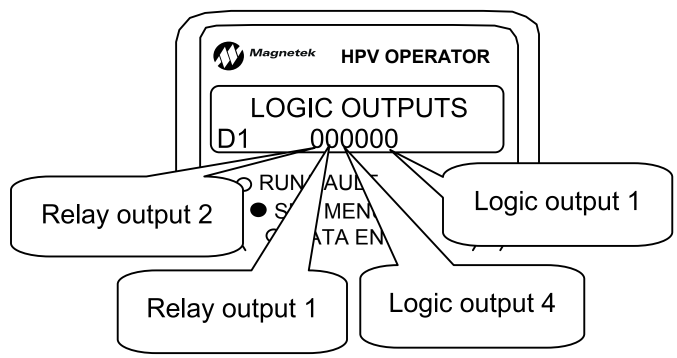
EST INERTIA
(Estimated Inertia)
Estimated elevator system inertia.

RX COM STATUS
(Serial Communications Status)
Serial communication status display.

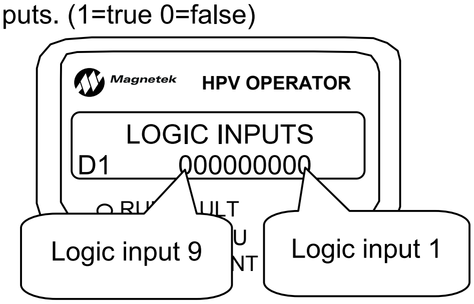


Bit	Severity	Name Description/Reason
0	Info	RX_INVALID_SETUP_ID Invalid setup id on setup message
1	Info	RX_SETUP_IN_RUN A setup message to write was received while the serial run bit was set.
2	Fatal	RX_TIMEOUT A COMM FAULT was declared because of a communication time-out.
3	Info / Fatal	RX_INVALID_CHECKSUM If COMM FAULT was declared because of bad message checksums.
4	Info	RX_INVALID_MESSAGE Invalid header character in message..
5	Info	RX_FIFO_OVERRUN Overflow has occurred.
6	Info	RX_INVALID_RUN_ID Set if the Cmd_Id sent in the RUN MESSAGE is not in range.
7	Info	RX_INVALID_MONITOR_ID *(Not available in Mode 2)* Set if the Monitor_Id received in the run message is not in range.
8	Info	RX_INVALID_FAULT_ID Set if the Fault_Id sent in the setup message is not in range.
9	Info	RX_FAULT_DETECTED COMM FAULT has been detected
10	Info	Fault_Mode_1 *(Not available in Mode 1)* Immediate Shutdown Mode
11	Info	Fault_Mode_2 *(Not available in Mode 1)* Run Removal Shutdown Mode
12	Info	Fault_Mode_3 *(Not available in Mode 1)* Rescue Shutdown Mode
13		N/a
14		N/a
15	Fatal	RX_COMM_FAULT COMM FAULT has been declared by the drive

LOGIC OUTPUTS
(Logic Outputs Status)
This display shows the condition of the logic outputs. (1=true 0=false)



LOGIC INPUTS
(Logic Inputs Status)
This display shows the condition of the logic inputs. (1=true 0=false)



Display D0 menu

Power Data D2 submenu

D2	parameter	description	units	hidden item
	TORQUE REFERENCE	Torque reference used by the drive control	% rated torque	N
	MOTOR CURRENT	RMS motor current	Amps	N
	% MOTOR CURRENT	Percent motor current	%rated current	N
	MOTOR VOLTAGE	RMS motor terminal voltage	Volts	N
	MOTOR FREQUENCY	Electrical frequency output	Hz	N
	MOTOR TORQUE	Calculated motor torque output	% rated torque	N
	POWER OUTPUT	Calculated drive power output	KW	N
	DC BUS VOLTAGE	Measured DC bus voltage	Volts	N
	FLUX REFERENCE	Flux reference used by vector control	% rated flux	Y
	FLUX OUTPUT	Measured flux output	% rated flux	Y
	SLIP FREQUENCY	Commanded slip frequency	Hz	Y
	MOTOR OVERLOAD	Percent of motor overload trip level reached	%	Y
	DRIVE OVERLOAD	Percent of drive overload trip level reached	%	Y
	FLUX CURRENT	Measured flux producing current	%rated current	Y
	TORQUE CURRENT	Measured torque producing current	%rated current	Y
	FLUX VOLTAGE	Flux voltage reference	% rated volts	Y
	TORQUE VOLTAGE	Torque voltage reference	% rated volts	Y
	BASE IMPEDANCE	Drive calculated base impedance	Ohms	Y
	EST NO LOAD CURR	Estimated no load current	%rated current	N
	EST RATED RPM	Estimated rated RPM	RPM	N

Detailed description

TORQUE REFERENCE
(Torque Reference)
Monitors the torque reference used by the drive control.

MOTOR CURRENT
(RMS Motor Current Output)
Monitors the RMS motor output current.

% MOTOR CURRENT
(Percent Motor Current)
Monitors the motor current as a percent of rated motor current.

MOTOR VOLTAGE
(Motor Voltage Output)
Monitors the RMS motor terminal line-line voltage.

MOTOR FREQUENCY
(Motor Frequency Output)
Monitors the electrical frequency of the motor output.

MOTOR TORQUE
(Motor Torque Output)
Calculated motor output torque in terms of percent rated torque.

POWER OUTPUT
(Power Output)
Calculated drive power output.

DC BUS VOLTAGE
(DC Bus Voltage)
Measured voltage of the DC bus.

FLUX REFERENCE
(Flux Reference)
Flux reference used by the vector control of the drive.

FLUX OUTPUT
(Flux Output)
Measured value of the flux output.

SLIP FREQUENCY
(Slip Frequency)
Displays the commanded slip frequency of the motor.

MOTOR OVERLOAD
(Motor Overload)
Displays the percentage of motor overload trip level reached. Once this value reaches 100% the motor has exceeded its user defined overload curve and a motor overload alarm is declared by the drive.

DRIVE OVERLOAD
(Drive Overload)
Displays the percentage of drive overload trip level reached. Once this value reaches 100% the drive has exceeded its overload curve and a drive overload fault is declared.

FLUX CURRENT
(Flux Current)
Displays the flux producing current of the motor.

TORQUE CURRENT
(Torque Current)
Displays the torque producing current of the motor.

FLUX VOLTAGE
(Flux Voltage)
Displays the flux voltage reference.

TORQUE VOLTAGE
(Torque Voltage)
Displays the torque voltage reference.

BASE IMPEDANCE
(Base Impedance)
Displays the drive calculated base impedance, which is based on the RATED MTR PWR and the RATED MTR VOLTS parameters. This value is used to calculate the Per Unit values of the system impedances (i.e. EXTERN REACTANCE and STATOR RESIST).

EST NO LOAD CURR
(Estimated No Load Current)
Estimated no load current of the motor calculated by the adaptive tune.

EST RATED RPM
(Estimated Rated RPM)
Estimated rated rpm of the motor calculated by the adaptive tune.

Utility U0 menu

U0	parameter	description	default	choices	hidden item	run lock out
U1	PASSWORD					
	ENTER PASSWORD	Allows the user to enter in a password	012345		N	N
	NEW PASSWORD	Used to change the established password			N	N
	PASSWORD LOCKOUT	Used to enable and disable password lockout	DISABLED	disabled enabled	N	N
U2	HIDDEN ITEMS					
	HIDDEN ITEMS	Selects if the “hidden” parameters will be displayed on the Digital Operator.	ENABLED	enabled disabled	N	N
U3	UNITS					
	UNITS SELECTION	Choose either Metric units or standard English measurements units	ENGLISH	english metric	N	Y
U4	OVRSPEED TEST					
	OVERSPEED TEST?	Allows for Overspeed Test to be enabled via the digital operator	NO	no yes	N	Y
U5	RESTORE DFLTS					
	RESTORE MOTOR DEFAULTS?	Resets all parameters to default values except parameters in MOTOR A5			N	Y
	RESTORE DRIVE DEFAULTS?	Resets the parameters in the MOTOR A5 to the defaults defined by the MOTOR ID			N	Y
U6	DRIVE INFO					
	DRIVE VERSION	Shows the software version of the drive software			N	N
	BOOT VERSION	Shows the lower level software version of the drive			N	N
	CUBE ID	Displays the cube identification number of the drive			N	N
U7	HEX MONITOR	For Magnetek personnel			N	N
U5	LANGUAGE SEL *(closed-loop only)*					
	LANGUAGE SELECT	Selects language for operator text	ENGLISH	english deutsch *(german)*	N	N

Detailed Description

PASSWORD
(Password Function)

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

- ENTER PASSWORD
- NEW PASSWORD
- PASSWORD LOCKOUT

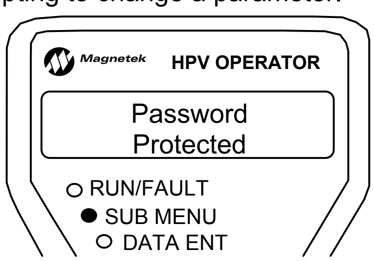
Password Function

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

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

Parameter Protection

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

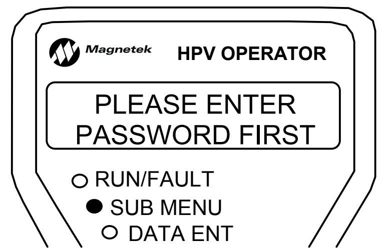


In order to change a parameter after password lockout has been enabled, the following two steps must be followed in the PASSWORD sub-menu:
1) A valid password must be entered in the ENTER PASSWORD screen.
2) The password lockout must be DISABLED in the PASSWORD LOCKOUT screen.

PASSWORD Sub-menu Protection

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

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



ENTER PASSWORD Screen

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

NEW PASSWORD Screen

This screen is used to change the established password.

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

PASSWORD LOCKOUT Screen

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

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

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

UNITS
(Units Selection Function)
When the UNITS SELECTION sub-menu is displayed, the user can choose either Metric units or standard English measurements units for use by the drive's parameters.
IMPORTANT
The units selection must be made before entering any setting values into the parameters. The user can not toggle between units after drive has been programmed.

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

An overspeed test can be initiated by:
- an external logic input
- the serial channel
- directly from the digital operator.

Overspeed Test via Logic Input

The external logic input can be used by:
- Setting the Overspeed Test Source parameter to external tb1.
- Defining an logic input terminal to ospd test src.

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

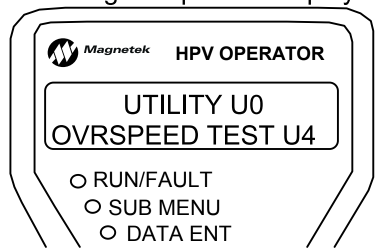
Overspeed Test via Serial Channel

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

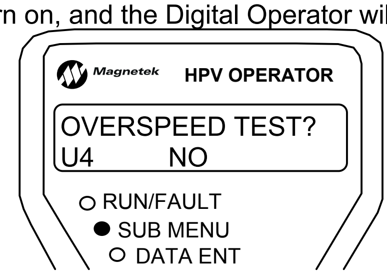
Overspeed Test via Operator

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

- While the Digital Operator display shows

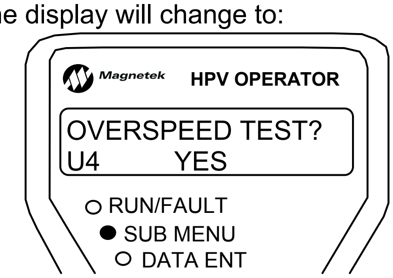


Press the ENTER key. The sub-menu LED will turn on, and the Digital Operator will display:



- Press the ENTER key again. The sun menu LED will go out and data ent LED will turn on.

- Press the up arrow or down arrow key and the display will change to:



- Press the ENTER key to begin the overspeed test.

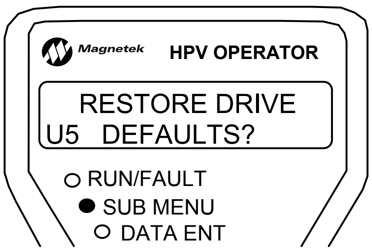
The value in the Overspeed Mult parameter is applied to the speed reference and the overspeed level, so that the elevator can be operated at greater than contract speed and not trip on an Overspeed Fault.
When the Run command is remove after the overspeed test, overspeed test reverts back to its default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

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

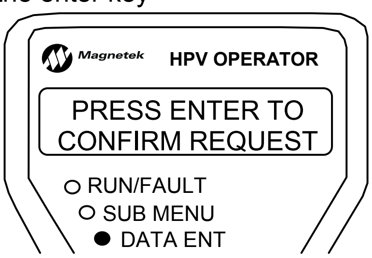
RESTORE DRIVE DEFAULTS

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

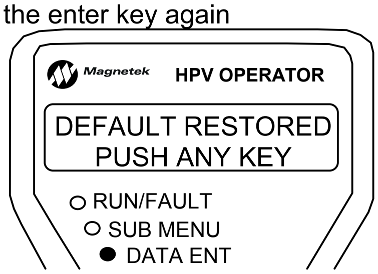
The following shows how to restore the drive defaults:



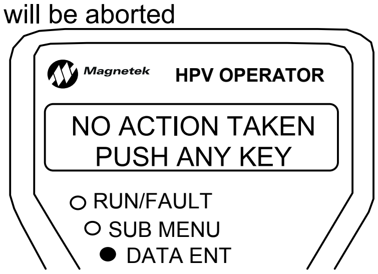
Press the enter key



Press the enter key again

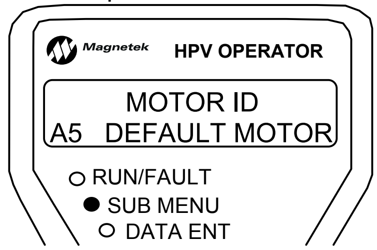


If the esc key is pressed, instead the reset action will be aborted

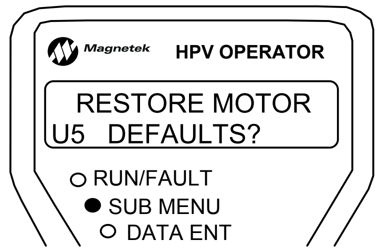


RESTORE MOTOR DEFAULTS

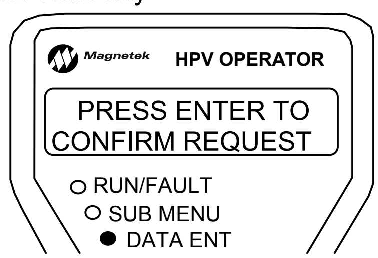
This function resets the parameters in the MOTOR A5 sub-menu to the defaults defined by the MOTOR ID parameter in that sub-menu.



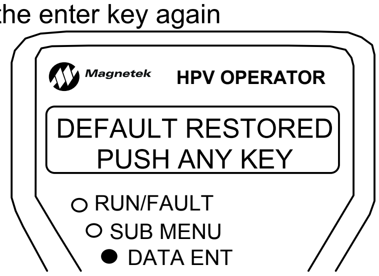
The following shows how to restore the motor defaults for the defined motor ID:



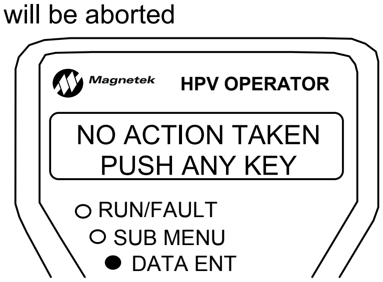
Press the enter key



Press the enter key again



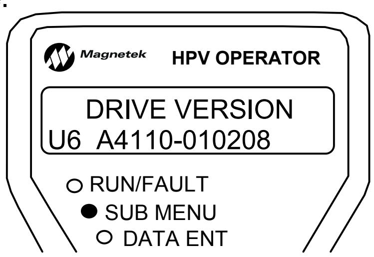
If the esc key is pressed, instead the reset action will be aborted



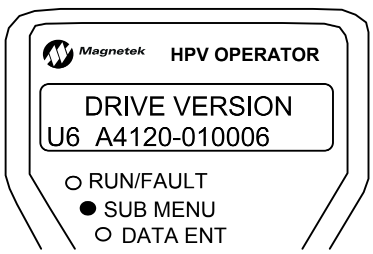
DRIVE INFO
(Drive Information)
Four different screens are included in this sub-menu, each display an identification number.

DRIVE VERSION Screen

Shows the software version of the drive software.



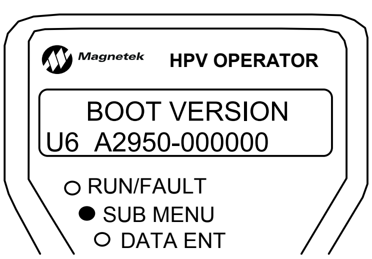
HPV 600 Closed-loop Software



HPV 600 Open-loop Software

BOOT VERSION Screen

Shows the lower level software version of the drive.



CUBE ID Screen

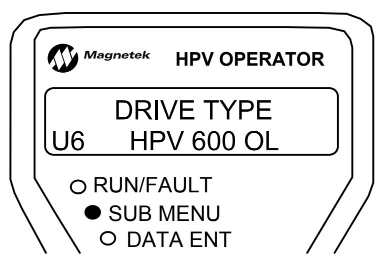
Displays the cube identification number of the drive.

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

Cube ID Numbers

DRIVE TYPE Screen

Shows the the drive software type HPV 600 or HPV 900 and OL (open-loop) or CL (closed-loop)



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

LANGUAGE SEL
(Language Selection Function)
When the Language Selection sub-menu is displayed, the user can choose either English or Deutsch (German) for the operator's text.

Fault F0 menu

F0	parameter	description	hidden item	run lock out
F1	ACTIVE FAULTS			
	DISPLAY ACTIVE FAULTS?	Contains a list of the active faults	N	N
	RESET ACTIVE FAULTS?	Allows for reset of active faults	N	N
F2	FAULT HISTORY			
	DISPLAY FAULT HISTORY?	Contains a list of up to the last sixteen faults	N	N
	CLEAR FAULT HISTORY?	Allows for the clearing of the fault history	N	N

Detailed Descriptions

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

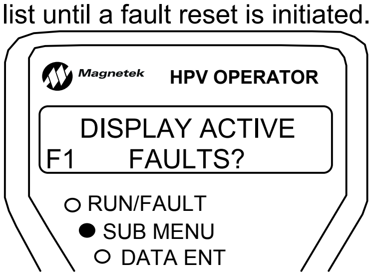
This menu also allows for clearing of active faults in order to get the drive ready to return to operation after a fault shutdown.

ACTIVE FAULTS
(Active Faults)

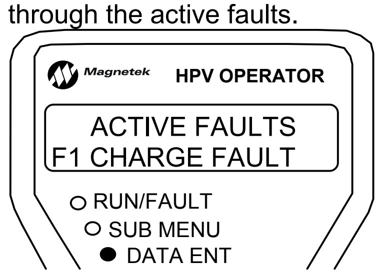
This sub-menu contains a list of the active faults. This sub-menu also allows the user to reset the active faults.

Active Faults List

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



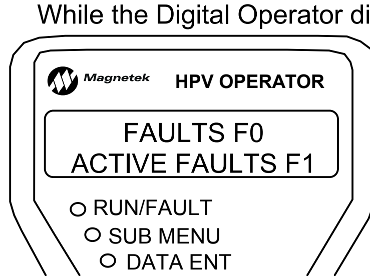
Press the enter key to enter the active fault list. Use the up and down arrow keys to scroll through the active faults.



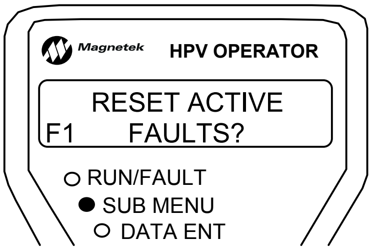
Resetting Active Faults

The Reset Active Faults function allows the user to initiate a fault reset via the digital operator, regardless of the setting of the Fault Reset Source parameter. (see section 3.5.1)

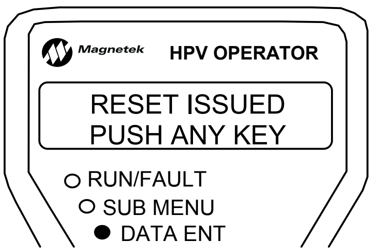
- While the Digital Operator display shows:



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



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



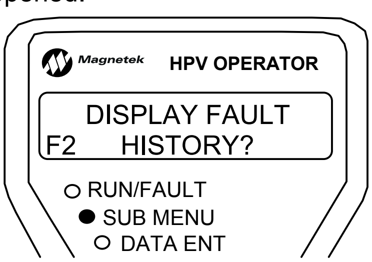
FAULT HISTORY
(Fault History)

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

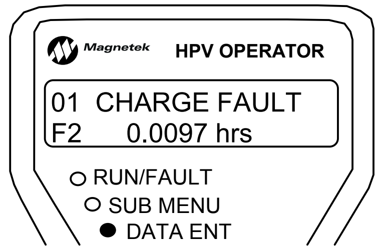
NOTE: The fault history is not affected by the fault reset or a power loss. The fault history can only be cleared by a function in this sub-menu.

Fault History

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



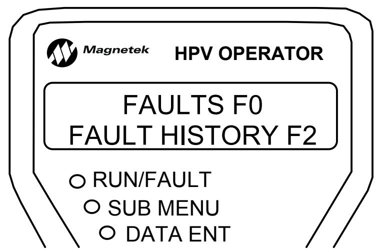
Press the enter key to enter the fault history. Use the up and down arrow keys to scroll through the faults.



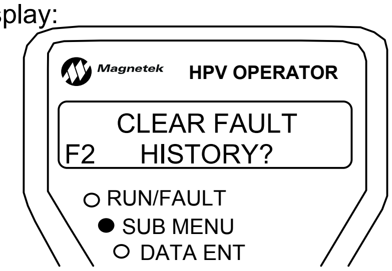
Clearing Fault History

The fault history is not affected by the fault reset or a power loss. The fault history can only be cleared via the user function described below.

- While the Digital Operator display shows:



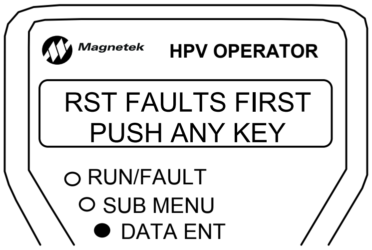
Press the ENTER key. The sub-menu LED will turn ON, and the Digital Operator will display:



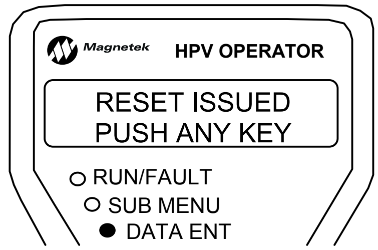
- Press the ENTER key again to begin the fault reset procedure.

Fault F0

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



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



Maintenance

Maintenance Overview

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

The HPV 600 needs to have sufficient air flow for long, reliable operation. Accumulated dust and dirt accumulation can reduce air flow and cause the heat sinks to overheat. The heat sinks can be kept clean by brushing, while using a vacuum cleaner.

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

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

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

WARNING
Hazardous voltages may exist in the drive circuits even with drive circuit breaker in off position. NEVER attempt preventive maintenance unless incoming power and control power is disconnected and locked out. Also, ensure the DC Bus charge light is out.

Drive Servicing

Remember when servicing the HPV 600:
Hazardous voltages may exist in the drive circuits even with drive circuit breaker in off position.

IMPORTANT
Use extreme caution: Do not touch any circuit board, the drive, or motor electrical connections without making sure that the unit is properly grounded and that no high voltage is present.

NEVER attempt maintenance unless:
the incoming three phase power and control power is disconnected and locked out.
also, ensure the DC Bus charge light is out.
even with the light out, we recommend that you use a voltmeter between (+3) and (-) to verify that no voltage is present.

If after 5 minutes the DC bus charge light remains ON or voltage remains between terminals (+3) and (-):
First, check that the incoming three phase power is disconnected
Once the incoming three phase power is disconnected, it will be necessary to discharge the DC bus with a “bleeder” resistor.

Discharging DC bus with “Bleeder” Resistor

IMPORTANT
Use extreme caution when connecting the bleeding resistor.

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

Reforming Bus Capacitors

The following is a procedure for reforming the electrolytic bus capacitors.
If the drive has been stored for more than 9-months, it is recommended that the bus capacitors be reformed.
After 18 months of storage it is ***mandatory*** that the bus capacitors are reformed.

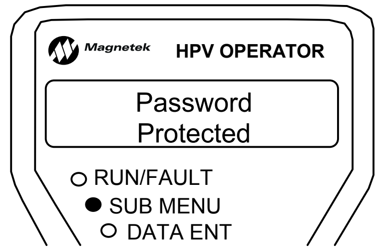
The bus capacitors in the HPV 600 can be reformed *without removing them from the drive.*

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

Parameters Locked Out

The following three conditions would cause parameter changes to be locked out.
The password protection is enabled.
The drive is running and the parameter being changed is protected by Run Lockout.
The hidden items are disabled and the parameter to be change is a hidden parameter.

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



Troubleshooting

Faults and Alarms

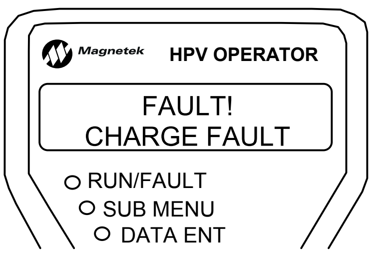
Two classes of warnings are reported by the HPV 600; these are identified as Faults and Alarms.

Faults and Fault Annunciation

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

There are four means of fault annunciation.

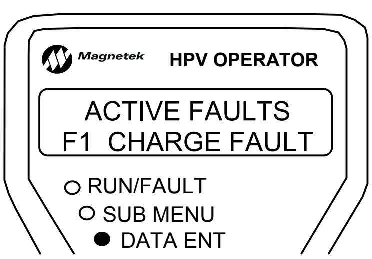
A priority message will be seen on the Digital Operator:



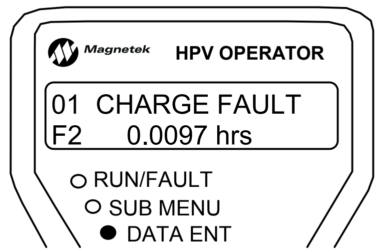
A priority message will overwrite what ever is currently displayed. The user can clear this message by pressing any key on the Digital Operator keypad. If another fault is present, the next fault will appear as a priority message.

NOTE: Clearing the fault priority message from the display DOES NOT clear the fault from the active fault list. The faults must be cleared by a fault reset before the drive will run.

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



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



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

Fault Clearing

Most faults can be cleared by performing a fault reset. The fault reset can be initiated by:
an external logic input
the serial channel
automatically by the drive

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

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

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

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

Note:

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

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

Name	Description	Possible Causes & Corrective Action
Bridge Fault	The integrated power module is sensing an overcurrent or overtemperature condition *(only B and C-cubes)*	**Overcurrent Problem** • Check for a possible short between the motor windings. • Verify dynamic brake resistor size (could be too small) **Overtemperature Problem** • Reduce Ambient Temperature • Clean heat sink • Check for cooling fan failure The drive may need to be replaced, if no other problem found.
Charge Fault	The DC bus voltage has not stabilized above the voltage fault level within 2 seconds or the charge contactor has not closed after charging. OR The DC bus voltage is below the UV Fault level as defined by the INPUT L-L VOLTS (A4) and UV FAULT LEVEL (A4) parameters	**DC Choke Connection** • Check that the DC choke link is present or if using DC choke, check DC choke connections **Low Input Voltage** • Check INPUT L-L VOLTS (A4) and UV FAULT LEVEL (A4) parameters • Disconnect Dynamic Braking resistor and re-try. • Verify proper input voltage and increase, if necessary, the input AC voltage within the proper range • Check for a missing input phase • Check power line disturbances due to starting of other equipment **Drive Accurately Reading the Dc Bus** • Measure the dc bus with a meter • Compare that with the value on the digital operator, DC BUS VOLTAGE (D2) Drive may need to be replaced
Comm Fault	The drive is being operated by serial communications and one of the following has occurred: • Communication time-out – if the serial run bit is set and the drive does not receive a run-time message for 40 msec • Bad message checksum – drive has detected three consecutive bad message checksums	**Bad Serial Connection** • Remove and re-seat the RS-422 serial cable • Check car controller serial driver board • Check the serial cable connected to the drive's RS-422 port • Also, the drive's control board may need to be replaced.
Comm Fault Invalid Checksum *(operator)*	The operator received four consecutive invalid messages.	**Noise or Bad Connector Connection** • Remove and re-seat the operator in its cradle. • If re-seating of the operator does not work, the operator or the drive's control board may need to be replaced.
Comm Fault No Drv Handshake *(operator)*	The operator lost communications with the drive's control board.	**Bad Connector Connection** • Remove and re-seat the operator in its cradle. • If re-seating of the operator does not work, the operator or the drive's control board may need to be replaced.

Name	Description	Possible Causes & Corrective Action
Contactor Flt	The command to close the contactor and the contactor feedback do not match for the time specified by the Contact Flt Time parameter.	**Check Parameter Settings and Contactor** ➲ Check CONTACT FLT TIME (A1) parameter for the correct contactor fault time. ➲ Check wiring to logic input configured as CONTACT CFIRM ➲ Contactor hardware problem If nuisance fault, the fault can be disabled by CONT CONFIRM SRC (C1) parameter (set to none).
Cube data Flt	The cube (drive) parameters checksum is invalid.	**Parameters Corrupted** ➲ Re-enter parameters and power-cycle ➲ If re-occurs, replace Drive Control board
Cube ID Fault	The identification number for the drive is invalid.	**Hardware Problem** ➲ Power cycle the drive. ➲ If re-occurs, replace Drive Control board ➲ If re-occurs, the drive needs to be replaced
Curr Reg Flt *[closed-loop]*	Actual current does not match the command current. The drive is commanding more motor voltage then is available on the input.	**Current Regulation problem** ➲ Check for a low input line ➲ Check if drive accurately reading the dc bus • Measure the dc bus with a meter • Compare that with the value on the digital operator, DC BUS VOLTAGE (D2) ➲ Complete Adaptive Tune and Inertia procedure. ➲ Check for a possible motor open phase ➲ Check if contactor is closing. ➲ Check for accurate motor parameters (A5) • Verify motor nameplate values are entered correctly • Complete Adaptive Tune and Inertia procedure. • As a last step, calculate motor parameters from motor's equivalent circuit. ➲ Otherwise, replace the drive
DB VOLTAGE or **DB VOLTAGE** *(alarm)*	Dynamic braking IGBT is still on ten seconds after the drive stops running	**Too High of Braking Resistor Value** ➲ Check for no braking resistor ➲ Possible Brake IGBT Failure ➲ Possible brake resistor is open **Dynamic Braking Wiring Problem** ➲ check dynamic brake hardware wiring **High Input Voltage** ➲ Decrease input AC voltage with the proper range (see specifications in technical manual) ➲ Use reactor to minimize voltage spikes **Drive Accurately Reading the DC Bus** ➲ Measure the dc bus with a meter ➲ Compare that with the value on the digital operator, DC BUS VOLTAGE (D2) **Hardware Problem** ➲ Replace Drive Control board ➲ Replace Drive

Name	Description	Possible Causes & Corrective Action
DCU data Flt	The DCU parameters checksum is invalid.	**Parameters Corrupted** • Check & re-enter parameters and power cycle the drive • If re-occurs, replace Drive Control board
Dir Conflict *(alarm)*	Declared when the speed command is held at zero due conflict with the analog speed command polarity and the run up / run down logic DIR CONFIRM (C1) must be enabled.	**Check Parameter Settings** • Sensitivity determined by the ZERO SPEED LEVEL (A1) **Confirm Speed Command Polarity** • Check polarity of the analog speed command on analog channel #1 • Compare that with the RUN UP (positive) and RUN DOWN (negative) logic input status If nuisance, the function can be disabled by DIR CONFIRM (C1) parameter.
Drive Ovrload	The drive has exceeded the drive overload curve.	**Excessive Field Weakening** • Decrease FLUX WKN FACTOR (A1) parameter • Decrease both MTR TORQUE LIMIT (A1) and REGEN TORQ LIMIT (A1) parameters • Watch for the "**Hit Torque Limit" alarm message**, if message appears the torque limits or the flux weakening factor parameters were decreased too much. **Accurate Motor Parameters** • Verify motor nameplate values are entered correctly • Complete Adaptive Tune and Inertia procedure. • As a last step, calculate motor parameters from motor's equivalent circuit. **Excessive Current Draw** • Decrease accel/decel rate • Is elevator car being held in position? (i.e. mechanical brake not releasing) • Mechanical brake may not have properly released **Encoder Problem** ***(closed-loop only)*** • Check encoder coupling: align or replace • Encoder failure (replace encoder) • Check encoder count parameter ENCODER PULSES (A1) **Motor Problem** • Check for motor failure **Drive Sizing** • Verify drive sizing. May need a larger capacity HPV 600

Name	Description	Possible Causes & Corrective Action
Encoder Flt	The drive is in a run condition and the encoder is: • not functioning or • not connected. or • phasing is not proper with the motor.	**Encoder Should Match Motor Phasing** • Usually drive's "HIT TORQUE LIMIT" alarm message is displayed (depending on setting of TRQ LIM MSG DLY (A1) parameter) • Switch either two motor phases or swap two encoder wires (A and /A) **Encoder Power Supply Loss** • Check 12 or 5 volt supply on terminal strip **Accurate Motor Parameters** • Verify motor nameplate values are entered correctly • Complete Adaptive Tune and Inertia procedure • As a last step, calculate motor parameters from motor's equivalent circuit. **Response of Speed Regulator** • Enter accurate INERTIA (A1) parameter, *see section **0** for procedure.* • Increase RESPONSE (A1) parameter **Encoder Coupling Sloppy or Broken** • Check encoder to motor coupling **Excessive Noise on Encoder Lines** • Check encoder connections. Separate encoder leads from power wiring (cross power lead at 90°) **Other Conditions Causing Fault** • Check encoder count parameter ENCODER PULSES (A1) • Possible motor phase loss • Possible bad Brake IGBT **Hardware Problem** • Replace Drive Control board.
EncoderFault OFF *(alarm)* *[closed-loop]*	When the Encoder Fault is disabled (ENCODER FAULT (C1) = disabled), the drive will display the warning message "EncoderFault OFF", every time the RUN command is removed.	**Check Parameter Settings** • Check the setting of parameter ENCODER FAULT (C1)
Extrn Fault 1	User defined external logic fault input *...Closure of this contact will cause the drive to declare the fault*	**Check Parameter Settings and External Fault Signal Wiring** • Check the correct logic input is configured for the correct TB1 terminal and set to EXTRN FAULT 1 (C2) • Check external fault is on the correct terminal on TB1.
Extrn Fault 2	User defined external logic fault input *...Closure of this contact will cause the drive to declare the fault*	**Check Parameter Settings and External Fault Signal Wiring** • Check the correct logic input is configured for the correct TB1 terminal and set to EXTRN FAULT 2 (C2) • Check external fault is on the correct terminal on TB1.

Name	Description	Possible Causes & Corrective Action
Extrn Fault 3	User defined external logic fault input *...Closure of this contact will cause the drive to declare the fault*	**Check Parameter Settings and External Fault Signal Wiring** ◆ Check the correct logic input is configured for the correct TB1 terminal and set to EXTRN FAULT 3 (C2) ◆ Check external fault is on the correct terminal on TB1.
Extrn /Fault 4	User defined external logic fault input *...Opening of this contact will cause the drive to declare the fault*	**Check Parameter Settings and External Fault Signal Wiring** ◆ Check the correct logic input is configured for the correct TB1 terminal and set to EXTRN /FLT 4 (C2) ◆ Check external fault is on the correct terminal on TB1.
Fan Alarm *(alarm)*	The heatsink cooling fan on the drive is not functioning.	**Excessive Heat** ◆ Reduce Ambient Temperature ◆ Clean heat sink ◆ Check for cooling fan failure
Fuse Fault	The DC bus fuse on the drive is open.	**Hardware Problem** ◆ Check if motor is faulty ◆ Check if any output phases shorted to ground. ◆ The drive may need to be replaced.
Ground Fault	The sum of all phase currents has exceeded 50% of the rated amps of the drive.	**Improper Wiring** ◆ Reset drive faults. Retry. If cleared, reconnect motor and control. If problem continues possible short between the motor windings and chassis ◆ If problem continues, check system grounding ◆ Also, the drive may need to be replaced.
HIT TORQUE LIMIT *(alarm)*	The drive has reached its torque limit.	**Incorrect Wiring** ◆ Motor phasing should match the encoder feedback phasing. If the phasing is not correct, the motor will not accelerate up to speed. It will typically oscillate back and forth at zero speed, and the current will be at the torque limit. ◆ Switch either two motor phases or swap two encoder wires (A and /A). **Drive and/or Motor is Undersized** ◆ Verify drive and/or motor sizing. May need a larger capacity HPV 600 and or motor. **Check Parameter Settings** ◆ Check the torque limit parameters MTR TORQUE LIMIT and REGEN TORQ LIMIT (A1) ◆ Check speed regulator parameters RESPONSE and INERTIA (A1) ◆ Alarm sensitivity - TRQ LIM MSG DELAY (A1) parameter determines the amount of time the drive is in torque limit before the alarm message is displayed.

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

Name	Description	Possible Causes & Corrective Action
Overcurr Flt	The phase current exceeded 250% of rated current.	**Motor Problem** ◐ Possible motor lead short ◐ Check for motor failure **Excessive Load** ◐ Verify motor and drive sizing. May need a larger capacity HPV 600 **Accurate Motor Parameters** ◐ Verify motor nameplate values are entered correctly ◐ Complete Adaptive Tune and Inertia procedure. ◐ As a last step, calculate motor parameters from motor's equivalent circuit. **Hardware Problem** ◐ The drive may need to be replaced.
Overspeed Flt *[closed-loop]*	Generated when the motor has gone beyond the user defined percentage contract speed for a specified amount of time.	**Check Parameter Settings** ◐ Check OVERSPEED LEVEL (A1) parameter for the correct level. ◐ Check OVERSPEED TIME (A1) parameter for the correct time. Note: This fault is defined by Overspeed Level parameter and Overspeed Time parameter.
Ovrtemp Alarm *(alarm)*	The heatsink on the drive has exceeded 80°C (176°F). *(only A-cubes)*	**Excessive Heat** ◐ Reduce Ambient Temperature ◐ Clean heat sink ◐ Check for cooling fan failure
Overtemp Flt	The heatsink on the drive has exceeded 90°C (194°F). *(only A-cubes)*	**Excessive Heat** ◐ Reduce Ambient Temperature ◐ Clean heat sink ◐ Check for cooling fan failure
Overvolt Flt	The DC bus voltage of the drive exceeded: • 850 Volts for a 460/400V class drives • 425 Volts for a 230V class drives.	**Too High of Braking Resistor Value** ◐ Check for no braking resistor ◐ Possible Brake IGBT Failure ◐ Possible brake resistor is open **Dynamic Braking Wiring Problem** ◐ check dynamic brake hardware wiring **High Input Voltage** ◐ Decrease input AC voltage with the proper range ◐ Use reactor to minimize voltage spikes **Drive Accurately Reading the Dc Bus** ◐ Measure the dc bus with a meter ◐ Compare that with the value on the digital operator, DC BUS VOLTAGE (D2) **Hardware Problem** ◐ Replace Drive Control board
PCU data Flt	PCU parameters checksum is invalid.	**Parameters Corrupted** ◐ Check parameters and power cycle ◐ If re-occurs, replace Drive Control board
Phase Flt	The drive senses an open motor phase. The drive senses more than one motor phase crossing zero at the same time.	**Motor Problem** ◐ Check motor wiring ◐ Check for motor failure ◐ Check for bad contactor or contactor timing issue.

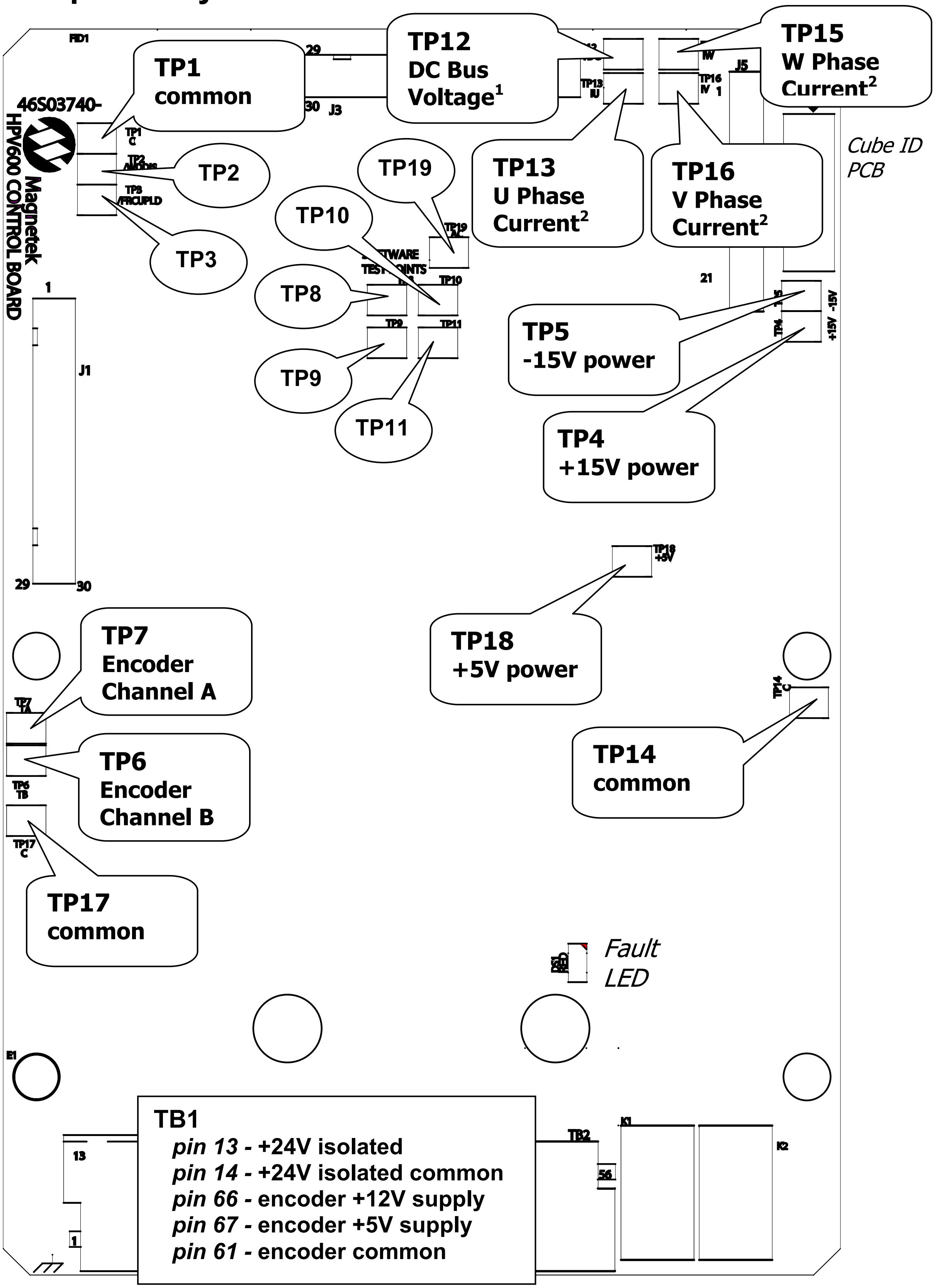
Name	**Description**	**Possible Causes & Corrective Action**
Ready, Waiting For Drive *(operator)*	The operator is waiting to establish communications with the drive's control board.	**Normal, if displayed momentarily** ⮚ No action is required, if the message disappears shortly after power-up of the operator. **Bad Connector Connection** ⮚ Remove and re-seat the operator in its cradle. ⮚ If re-seating of the operator does not work, the operator or the drive's control board may need to be replaced.
Ser2 Spd Flt *[closed-loop]*	This fault is declared if the SER2 INSP SPD (A1) or SER2 RS CRP SPD (A1) parameters have exceeded contract speed (CONTRACT CAR SPD (A1) parameter).	**Check Parameters Settings:** ⮚ Check SER2 INSP SPD (A1) parameter, if greater than CONTRACT CAR SPD (A1) parameter. ⮚ Check SER2 RS CRP SPD (A1) parameter, if greater than CONTRACT CAR SPD (A1) parameter.
Setup Fault 1	This fault is declared if the rated motor speed and excitation frequency do not satisfy: $9.6 < \left[120\begin{pmatrix}rated\\ excitation\\ frequency\end{pmatrix}\right] - \left[\begin{pmatrix}\#\\ poles\end{pmatrix}\begin{pmatrix}rated\\ motor\\ speed\end{pmatrix}\right] < 1222.3$ *…checks for too low or too high value of slip*	**Check Parameters Settings:** ⮚ Check RATED EXCIT FREQ (A5) parameter for correct setting ⮚ Check RATED MTR SPEED (A5) parameter for correct setting ⮚ Check MOTOR POLES (A5) parameter for correct setting
Setup Fault 2 *[closed-loop]*	This fault is declared if the number of poles and encoder pulses per revolution do not satisfy: $\dfrac{\begin{pmatrix}encoder\\ pulses\end{pmatrix}}{\begin{pmatrix}\#\\ poles\end{pmatrix}} > 64$	**Check Parameters Settings:** ⮚ Check ENCODER PULSES (A1) parameter for correct setting ⮚ Check MOTOR POLES (A5) parameter for correct setting
Setup Fault 3	This fault is declared if the number of poles is not an even number.	**Check Parameters Settings:** ⮚ Check MOTOR POLES (A5) parameter for correct setting
Setup Fault 4 *[closed-loop]*	This fault is declared if the contract motor speed (in rpm) and encoder pulses/revolution do not satisfy: $300,000 < \begin{pmatrix}contract\\ motor\\ speed\end{pmatrix}\begin{pmatrix}encoder\\ pulses\end{pmatrix} < 18,000,000$	**Check Parameters Settings:** ⮚ Check ENCODER PULSES (A1) parameter for correct setting ⮚ Check CONTRACT MTR SPD (A1) parameter for correct setting
Setup Fault 5	This fault is declared if the rated motor power (in watts) and rated motor voltage do not satisfy: $(0.07184)\left[\dfrac{\begin{pmatrix}rated\\ motor\\ power\end{pmatrix}}{\begin{pmatrix}rated\\ motor\\ voltage\end{pmatrix}}\right] < \begin{matrix}general\\ purpose\\ current\\ rating\\ of\\ drive\end{matrix}$	**Check Parameters Settings:** ⮚ Check RATED MOTOR PWR (A5) parameter for correct setting ⮚ Check RATED MTR VOLTS (A5) parameter for correct setting

Name	Description	Possible Causes & Corrective Action
Setup Fault 6	This fault is declared if the multi-step speed references have exceeded a defined limit, which is defined in terms of a percentage of contract speed (CONTRACT CAR SPD parameter).	**Check Parameters Settings:** • Check SPEED COMMAND1-16 (A3) parameters, if greater than 110% of CONTRACT CAR SPD (A1) parameter
Setup Fault 7	This fault is declared if the run logic inputs are defined incorrectly. You can either choose group #1 (RUN and UP/DWN) or group #2 (RUN UP and RUN DOWN). But you cannot mix and match or this fault will be declared.	**Check Parameters Settings:** • Check configurations of logic inputs (C2) – either RUN & UP/DWN or RUN UP & RUN DOWN
Setup Fault 8	This fault is declared if the DIR CONFIRM (C1) parameter is enabled and any of the following conditions are not met: • A logic input (C2) must be assigned to RUN UP. • A logic input (C2) must be assigned to RUN DOWN. • The SPD COMMAND SRC (C1) parameter must be set to ANALOG INPUT *... Confirms proper set-up of Analog Speed Command direction confirm function*	**Check Parameters Settings:** • Check configurations of logic inputs (C2) for two logic input defined as RUN UP & RUN DOWN • Verify SPD COMMAND SRC (C1) is set to ANALOG INPUT If nuisance fault and not using Up-Down Confirm function disabled by setting the DIR CONFIRM (C1) parameter to DISABLED
Setup Fault 9 *[open-loop]*	This fault is following two formulas are not satisfied: $\begin{pmatrix} MOTOR \\ MIN \\ VOLTS \end{pmatrix} < \begin{pmatrix} MOTOR \\ MID \\ VOLTS \end{pmatrix} < \begin{pmatrix} RATED \\ MTR \\ VOLTS \end{pmatrix}$ $\begin{pmatrix} MOTOR \\ MIN \\ FREQ \end{pmatrix} < \begin{pmatrix} MOTOR \\ MID \\ FREQ \end{pmatrix} < \begin{pmatrix} RATED \\ EXCIT \\ FREQ \end{pmatrix}$ *... Checks the V/Hz pattern*	**Check Parameters Settings:** • Check RATED MTR VOLTS (A5) parameter for correct setting • Check MOTOR MID VOLTS (A5) parameter for correct setting • Check MOTOR MIN VOLTS (A5) parameter for correct setting • Check RATED EXCIT FREQ (A5) parameter for correct setting • Check MOTOR MID FREQ (A5) parameter for correct setting • Check MOTOR MIN FREQ (A5) parameter for correct setting
Speed Dev *(alarm)* *[closed-loop]*	The speed feedback is failing to properly track the speed reference. • Sensitivity determined by SPD DEV HI LEVEL (A1) parameter.	**Any active faults?** • Check if any active faults in F1 sub-menu **Check Parameters Settings:** • Verify SPD DEV HI LEVEL (A1) is set to the proper level. **Does "Hit Torque Limit" message appear?** • If message appears during running, verify a fault has not occurred. • Then, increase the torque limit parameters MTR TORQUE LIMIT and REGEN TORQ LIMIT (A1) – maximum 250%

Name	Description	Possible Causes & Corrective Action
Stall Test Fault	Generated when the motor current goes at or above a percentage (defined by STALL TEST LVL) for defined amount of time (defined by STALL FAULT TIME).	**Check Parameter Settings** • Check STALL TEST LVL (A1) parameter for the correct percentage of motor current • Check CONTACT FLT TIME (A1) parameter for the correct time. • If nuisance fault, the fault can be disabled by STALL TEST ENA (C1) parameter (set to disabled). **Excessive Current Draw** • Decrease accel/decel rate • Is elevator car being held in position? (i.e. mechanical brake not releasing) • Mechanical brake may not have properly released **Motor Problem** • Check for motor failure **Accurate Motor Parameters** • Verify motor nameplate values are entered correctly • Complete Adaptive Tune and Inertia procedure. • As a last step, calculate motor parameters from motor's equivalent circuit.
Tq Lim **2Hi 4cube** *[closed-loop]*	The torque limits (based on the defined motor) exceed the cube's capacity	**Check Parameters Settings** • Verify motor nameplate values are entered correctly in the A5 sub-menu • Decrease both MTR TORQUE LIMIT (A1) and REGEN TORQ LIMIT (A1) parameters **Drive Sizing** • Verify drive sizing. May need a larger capacity HPV 600
Undervolt Flt	Generated during a run condition when the DC bus voltage drops below the user specified percent of the input line-to-line voltage. The input line-to-line voltage is specified by the Input L-L Volts parameter and the fault level is specified by the Undervoltage Fault Level parameter.	**Low Input Voltage** • Check INPUT L-L VOLTS (A4) and UV FAULT LEVEL (A4) parameters • Disconnect Dynamic Braking resistor and re-try. • Verify proper input voltage and increase, if necessary, the input AC voltage within the proper range • Check for a missing input phase • Check power line disturbances due to starting of other equipment **Drive Accurately Reading the Dc Bus** • Measure the dc bus with a meter • Compare that with the value on the digital operator, DC BUS VOLTAGE (D2) **Hardware Problem** • The drive may need to be replaced.

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

Testpoint Layout



Testpoints

Checking Power Supplies

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

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

Other Useful Testpoints

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

- **TP12 DC Bus Voltage**

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

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

[2]Scaling:

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

- **TP2, TP3, TP8, TP9, TP10, TP11, TP19** – no function (at this time)

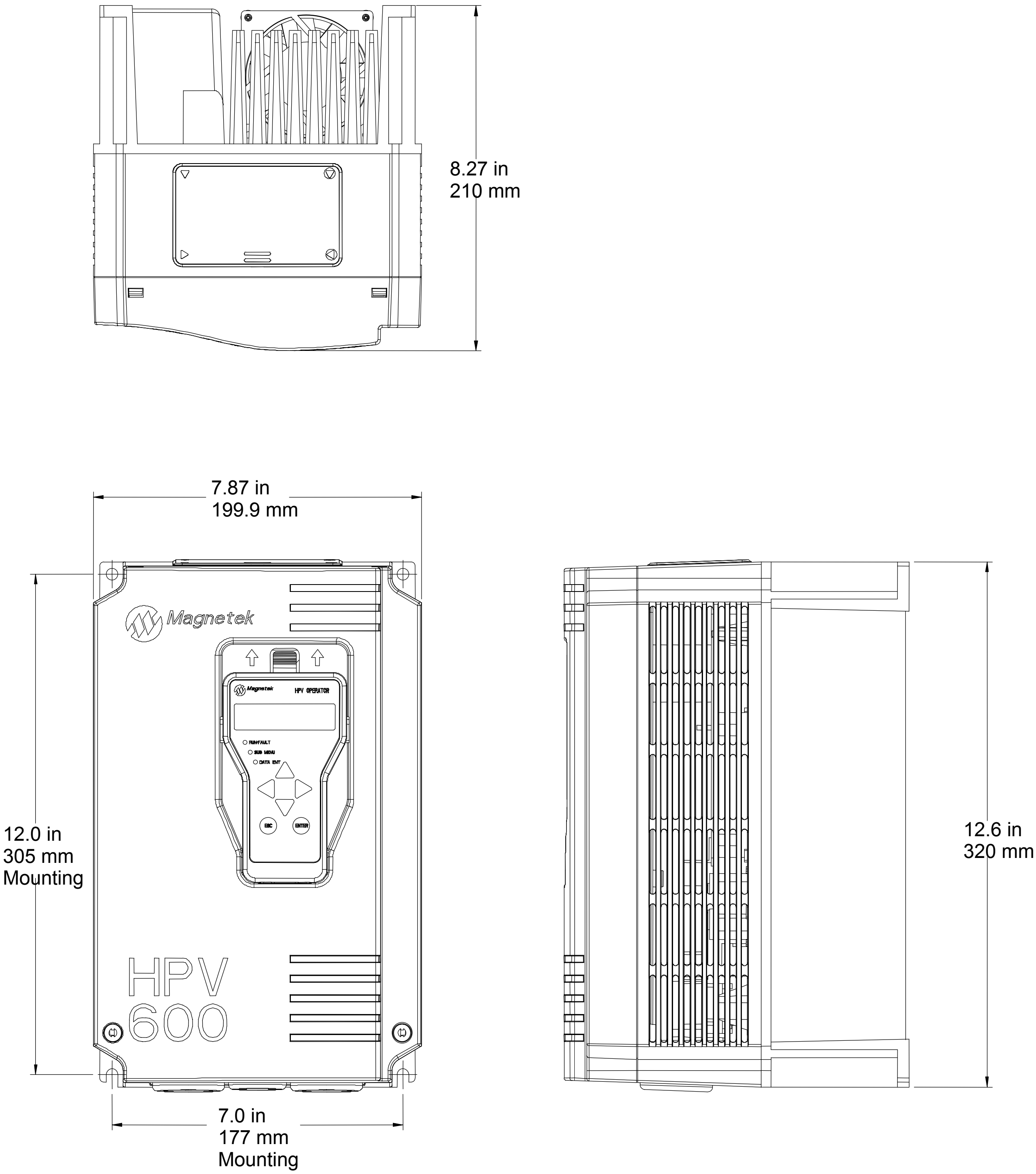
Dimensions / Weights

North America

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

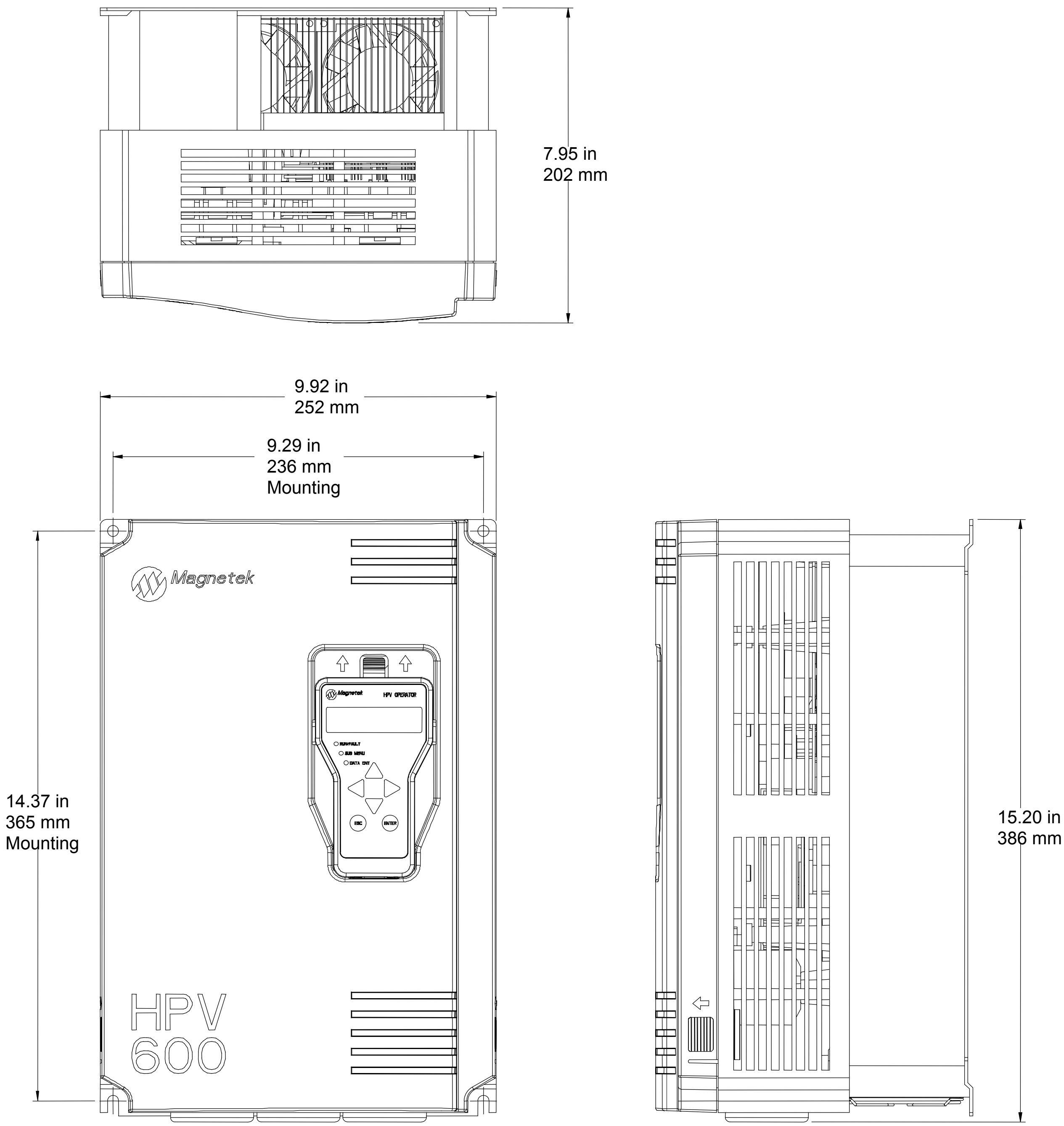
European

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

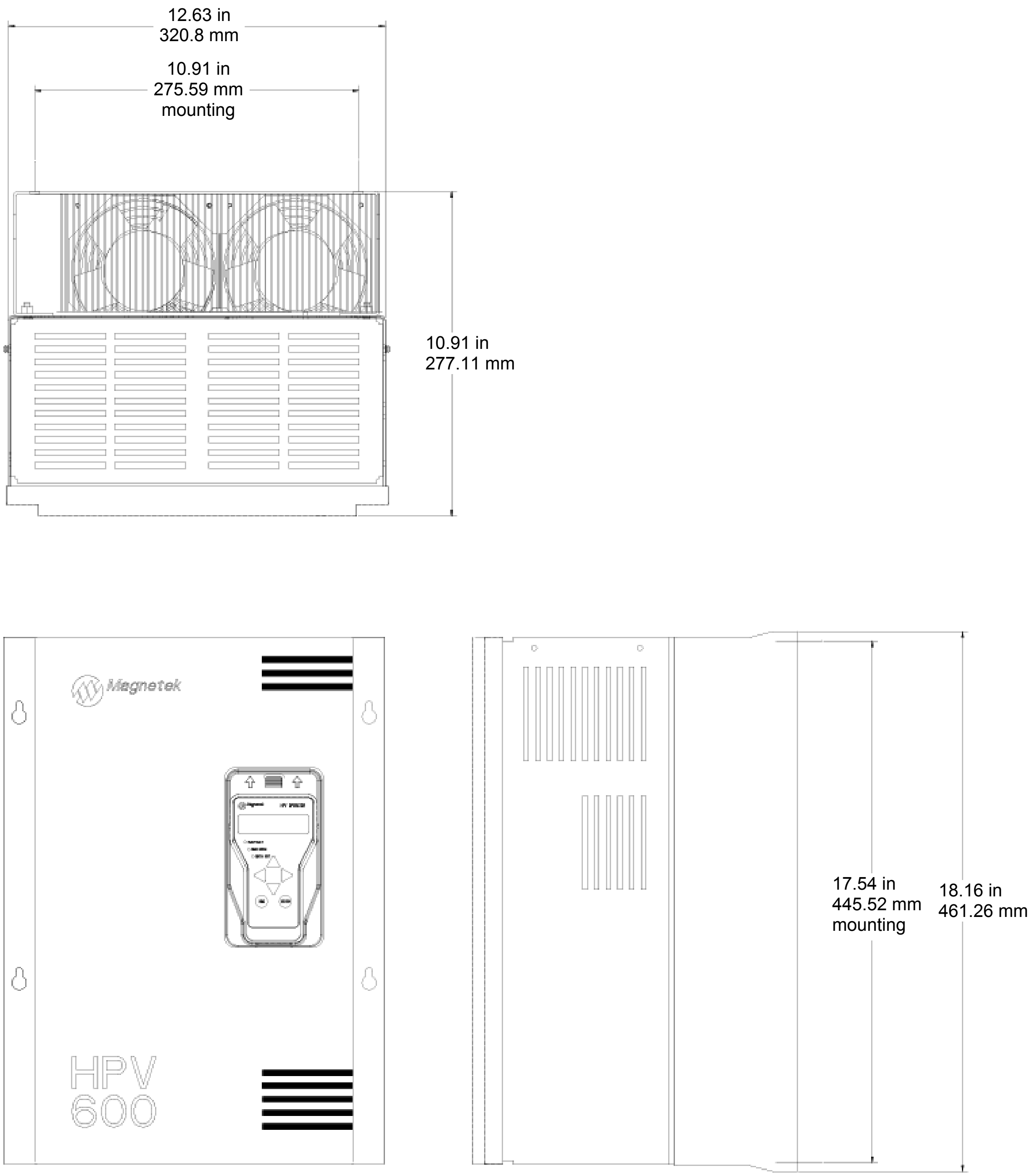


A-cube Dimensions and Mounting Holes

Dimensions / Weights



B-cube Dimensions and Mounting Holes



C-cube Dimensions and Mounting Holes

Dynamic Braking Resistor Selection

North America

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

European

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

Assumptions for Brake Resistor Recommendations

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

Three-Phase AC Input Reactor Selection

North America

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

* DC choke internal to drive

European

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

* DC choke internal to drive

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

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

DC Choke Selection

North America

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

* DC choke internal to drive

European

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

* DC choke internal to drive

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

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

AC Input Fusing Selection

North America

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

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

European

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

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

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

Dynamic Braking Resistor Fusing Selection

North America

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

European

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

IMPORTANT: Dynamic Braking Resistor Fusing:

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

Watts Loss

North America

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

European

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

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

Line Filter Selection

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

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

Note: also see page 37 for addtional installation guidelines

European

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

HPV 600

Data subject to change without notice. HPV 600 is a trademark of Magnetek, Inc.

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