MAGNETEK
UNCOMMON POWER

HPV 600
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).

   Default V/f patterns are selectable via the MOTOR ID (A5) and are shown in Table 1. 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 - Sychronous Motor Speeds Reference

3) Use a default value of 2.5% (60Hz) and 3.5% (50Hz) for Stator Resistance (STATOR RESIST(A5) parameter)

   NOTE: if operational issues occur, the stator resistance can be measured, refer the procedure detailed on page 9.

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 3.

8) At Full-load, run the drive at 10% of contract speed and complete the Motor RPM Adjustment Procedure detailed on page 3.

High speed mode

9) Run the drive in high speed mode (Balanced, Full-load and Empty Car) and observe operation… if operational issues occur, please refer to the Performance Adjustments section on page 4.

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)

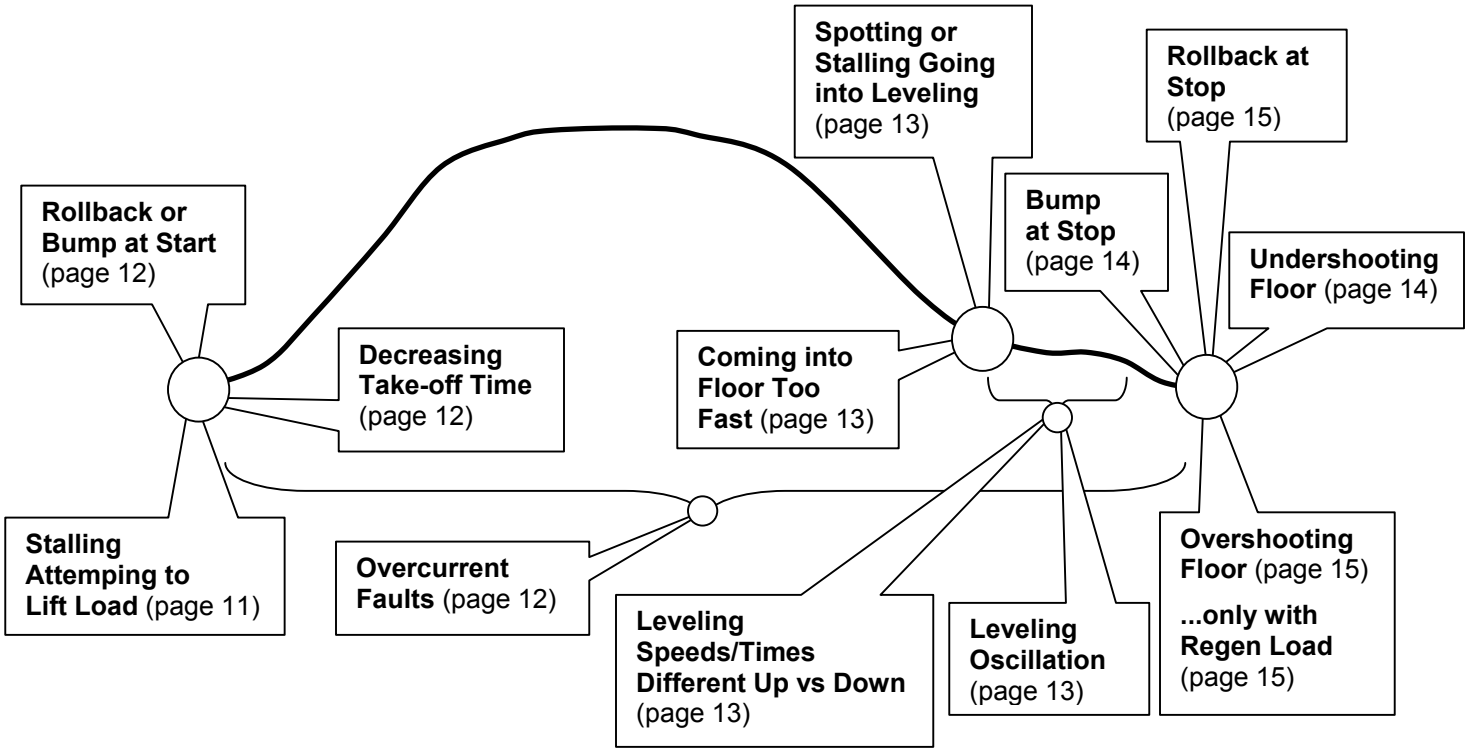
  OR
  - time one complete rotation of the sheave and record the time (in seconds) it takes for exactly one sheave rotation
- Run the car in the DOWN direction
  - measure and record the car speed using a hand tach on the sheave (wait for speed to stabilize)

  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 5)

Note: If stalling occurs when attempting to lift the load, refer to “Stalling Attemping to Lift Load” in the Performance Adjustments section (page 4). 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 Attemping 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.

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.

Adjust the Motor's Stator Resistance

- Measure the stator resistance by completing the procedure detailed on page 9.
- If still stalling after measuring stator resistance, additionally increase STATOR RESIST (A5) parameter (increase increments of 0.1 and observe performance)

Adjust the Motor Mid Voltage Parameter

- Complete the Mid-volts Adjustment Procedure detailed on page 9.
- 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.

Verify Mechanical Brake Timing

- The mechanical brake should be picked during the DC injection start time (DC START TIME (A1) parameter), see "Mechanical Brake Timing at Start" on page 9.

Increase DC Injection Start Level

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

Decreasing Take-off Time

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

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

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

Increase DC Injection Start Level

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

Increase the Accel S-curve parameters

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

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

Increase the Torque Boost Gain Parameter

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

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

Overcurrent Fault

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

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

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

Verify Torque Limits

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

Decrease the S-curve Parameters

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

Verify Motor Min/Mid Voltage Parameters

- MOTOR MID VOLTS (A5) and MOTOR MIN VOLTS (A5) parameters should usually be set at default, see Table 1 on page 1.
- These parameters would only be adjusted slightly with certain issues (see Stalling Attemping to Lift Load (page 4); Spotting or Stalling Going into Leveling(page 6); or Overshooting Floor only with Regen Load(page 8)).

Measuring the Stator Resistance

- Complete the procedure detailed on page 9.

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 9 and observe performance.

Adjust the Motor Mid Volts parameter

- Complete the Mid-volts Adjustment Procedure detailed on page 9 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 1.
- These parameters would only be adjusted slightly with certain issues (see Stalling Attemping to Lift Load (page 4); Spotting or Stalling Going into Leveling(page 6); or Overshooting Floor only with Regen Load(page 8)).
- 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 3.
- At Full-load, run the drive at 10% of contract speed and complete the Motor RPM Adjustment Procedure detailed on page 3.

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 9.

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 9.

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):

1. Verify Mechanical Brake Timing
2. Decrease Leveling Speed
3. Increase Decel Jerk Out and Decel Rates
4. 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 9.

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 8.
- 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. 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 9.

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):

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

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 mechnical 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 recieves a run command and a non-zero speed command.
  - Disabled - The drive will start DC injection phase when it recieves 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 additonal 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).