

# C4

DRIVE STARTUP MANUAL  
DSD412

VERSION 6.1





## Document History

| Date              | Version | Summary of Changes   |
|-------------------|---------|--|
| January 13, 2021  | 6.1     | Added Car Stalling troubleshooting procedure   |
| November 2, 2020  | 6.0     | Changed header name from NTS Slowdown to Construction Speed<br>Updated description and procedure to reference the car running in Construction mode.<br>Delete LOTO |
| March 12, 2020    | 5.0     | Added LOTO to Construction procedure<br>Added NTS procedure  |
| March 5, 2020     | 4.0     | Updated Construction procedure to include the run box must be set to ON  |
| December 12, 2019 | 3.0     | Updated Accucoder encoder wiring   |
| August 23, 2019   | 2.0     | Changed cover page<br>New document format<br>Added secondary brake wiring  |
| October 23, 2018  | 1.0     | Initial Submittal  |

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# DSD412 Drive

The DSD412 drive is a DC drive.



Figure 1: DSD412 Drive

## Equipment/Settings Verification

Set and verify the equipment matches the job specific parameters for proper operation. See the *C4 Controller sheet 01 Getting Started Parameter Table* for more information.

| Job Specifications: |         |              |                |        |          |                   |             |          |           |         |                 |                   |                   |            |                               |
|---------------------|---------|--------------|----------------|--------|----------|-------------------|-------------|----------|-----------|---------|-----------------|-------------------|-------------------|------------|-------------------------------|
| Car                 | Group # | Group Car ID | Contract Speed | Floors | Capacity | Main Line Voltage | Motor Volts | Motor HP | Motor FLA | ISO kVA | Minimum ISO AMG | Minimum Drive AMG | Minimum Motor AMG | Disc. Size | Drive Ripple Filter           |
| 1                   | 1       | 1            | 500            | 18     | 3500     | 460               | 225         | 40       | 150       | 52      | 3               | 1/0               | 1/0               | 110        | S1ST1259-3A00<br>300-S043-101 |

| Car | Doors | DR Brake Voltage | Brake Pick | Brake Hold | Brake Ohm | Brake Amp | M. Cont. P/N | B.1 Cont. P/N | Encoder PPR | EBrake | DBR Ohm | DBR Watts |
|-----|-------|------------------|------------|------------|-----------|-----------|--------------|---------------|-------------|--------|---------|-----------|
| 1   | 1     | 240              | 54.5       | 35         | 9.2       | 10.5      | EHDB220C-1L  | CA7-12        | 10000       | DRAG   | 0.3416  | 1313      |

|                 |            |
|-----------------|------------|
| Motor Volts     | Motor Amps |
| Main Line Volts | Motor HP   |

|                       |             |
|-----------------------|-------------|
| Brake Volts Pick/Hold | Encoder PPR |
|-----------------------|-------------|

Figure 2: Example of Parameter Table

## Grounding Requirements

**NOTE:** A proper and effective building ground connection is required for the safe and successful operation of the controller.

Examples of a proper building-to-controller ground is as follows:

1. Attach the ground wire to the street side of a water main.
2. Attach the ground wire to a grounding rod in the pit.

The controller has a common ground bus terminal connection.



*Figure 3: Ground Bus Terminal*

- The building, motor, transformer, and filter(s) must all share a common ground. This removes ground loops, limits impedance, and routes noise into the ground.

## Wiring

A checklist must be completed during the drive wiring process. See Appendix for terminal locations.

## Power

Perform the following to connect power. See the *C4 Controller sheet 03 Machine Room* for job specific information.

- Connect main line power to terminal blocks L1/L2/L3.
- Connect the ground wire to the yellow/green terminal block next to L1-L3.

## Brake

Perform the following to connect the brakes. See the *C4 Controller* sheet *05 Brakes* for job specific information.

- Connect the main brake wiring to terminal K1 / K2 and the secondary brake wiring (if equipped) to terminals J1 / J2 located on the terminal block next to the M Contactor.
- Jump EB to the terminal listed in the construction box (see the *C4 Controller* sheet *01 Getting Started*) and connect either the rope gripper or sheave brake to the EBR (if installed).

## Motor / Encoder

Perform the following to connect the drive to the motor and encoder cable. See the *C4 Controller* sheet *04 Drive and Motor* for job specific information.

- Connect motor leads to the M contactor at T1/T2/T3.
- Connect the encoder cable to the TB1 encoder terminal block located under the lower cover.

The table below lists the Wiring References for Common Encoders.

*Table 1: Wiring References for Common Encoders*

| Encoder | Drive           | Imperial 35' | Imperial 50' / 75' | Accucoder | Wachendorff | IH740 / IH950 | Industrial |
|---------|-----------------|--------------|--------------------|-----------|-------------|---------------|------------|
| PWR     | IP              | Red          | White              | Brown     | Brown       | Brown         | Brown      |
| COM     | IG              | Black        | Black              | Blue      | White       | White         | White      |
| A       | A+              | White        | Purple             | White     | Green       | Green         | Green      |
| /A      | A-              | White/Black  | Gray               | Green     | Red         | Pink          | Pink       |
| B       | B+              | Blue         | Green              | Yellow    | Yellow      | Yellow        | Yellow     |
| /B      | B-              | Red/Black    | Blue               | Gray      | Black       | Blue          | Blue       |
| Z       |                 | Orange       |                    |           | Gray        | Gray          | Gray       |
| /Z      |                 | Green        |                    |           | Violet      | Red           | Red        |
| CLK+    | CK              |              |                    |           |             |               |            |
| CLK-    | $\overline{CK}$ |              |                    |           |             |               |            |
| DAT+    | DT              |              |                    |           |             |               |            |
| DAT-    | $\overline{DT}$ |              |                    |           |             |               |            |
| SHIELD  | FE              | Shield       | Shield             | Shield    | Shield      | Shield        | Shield     |

## Construction

All safety inputs are functional during Construction mode on the C4 product. When these safety devices are installed, they are connected per the *C4 Controller sheet 02 Machine Room I/O* of the prints, even if still on Construction mode. The following includes instructions for when none of these devices have been installed prior to beginning on Construction mode.

Perform the following to wire the Construction Box. See the *C4 Controller sheet 01 – Getting Started* for job specific information.

1. Turn off power to the controller.
2. On the MR board, connect a jumper from L120 to terminals LFT, LFM, and LFB.
3. Are there rear doors?
  - a. If there are rear doors, connect L120 to terminals LRT, LRM, and LRB. Go to step 4.
  - b. If there are no rear doors, go to step 4.
4. Connect a jumper from H120 to PIT, BUT, BFL, and TFL.
5. Is a secondary brake present?

**NOTE:** There will be two Brake boards.

- a. If a secondary Brake board is present, connect a jumper from M120 to SFM. Go to step 6.
- b. If no secondary Brake board is present, go to step 6.

**NOTE:** Rope gripper contact will make SFM.

6. Is a Run/Stop switch being used?
  - a. If a Run/Stop switch is used, go to step 7.
  - b. If a Run/Stop switch is not used, connect a jumper from H120 to SFH. Go to step 9.
7. Connect a wire from the MR board H120 to one side of the Construction Box Run/Stop switch.
8. Connect a wire from the MR Board SFH to the other side of the Construction Box Run/Stop switch.

**NOTE:** A closed switch indicates run and an open switch indicates stop.

9. Connect a jumper from 24 VDC to MM.

10. Is the run box being used?
  - a. If the run box is being used, perform the following:
    - Connect the UP button to the input of the CUP
    - Connect the DOWN button to the input of the CDN
    - Connect the Enable to CEN (jump high if not available)
    - Power up the controller by turning on main power, pressing in all push breakers, and turning on the L1/L2 breaker
    - Go to step 11
  - b. If the run box is not being used, power up the controller by turning on main power, pressing in all push breakers, and turning on the L1/L2 breaker. Go to step 12.
11. Press the right button to access the Main Menu and navigate to Setup | Miscellaneous | Enable Const. Box to On. Scroll right and press Save.

**NOTE:** When the Enable Construction Box is On, the onboard inspection buttons are disabled.
12. Verify the Car Door Bypass and Hoistway Bypass switches are in the OFF position.
13. Place the INSPECTION switch to INSPECTION.
14. Verify the mode of operation is Construction.

## Construction Speed

During installation, the Car Top (CT) and Car Operating Panel (COP) are not connected to the controller. The normal terminal stopping (NTS) may cause the car to run slow while moving on Construction mode.

If car runs slower than command speed, perform the following:

1. Turn off power to the controller.
2. Temporarily remove the NTS wire on the MR board.
3. Connect a jumper from NTS input on the drive to REF.
4. Power up the controller.
5. Leave the jumper on while on Construction mode.

When no longer on Construction mode, perform the following:

1. Turn off power to the controller.
2. Remove the jumper from NTS input on the drive to REF.
3. Reconnect the NTS wire to the MR board.
4. Power up the controller.

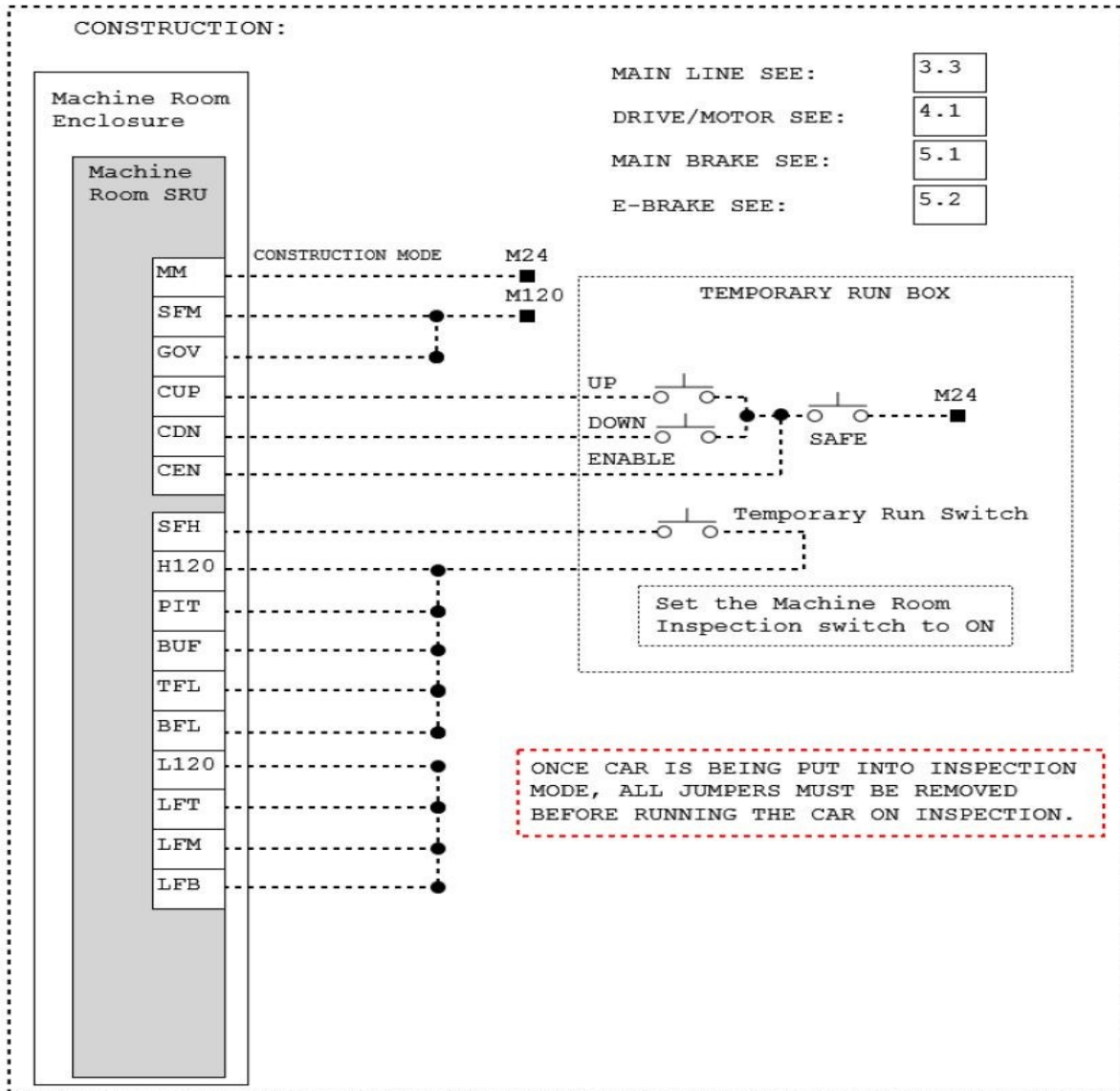


Figure 4: Example of Construction Wiring

## Powering Up

Perform the following to power-up the drive.

1. Apply external power by closing the main disconnect.
2. Close the two-pole breaker and all pushbutton breakers.
3. Verify the LCD on the Smartrise board and the drive powers up.

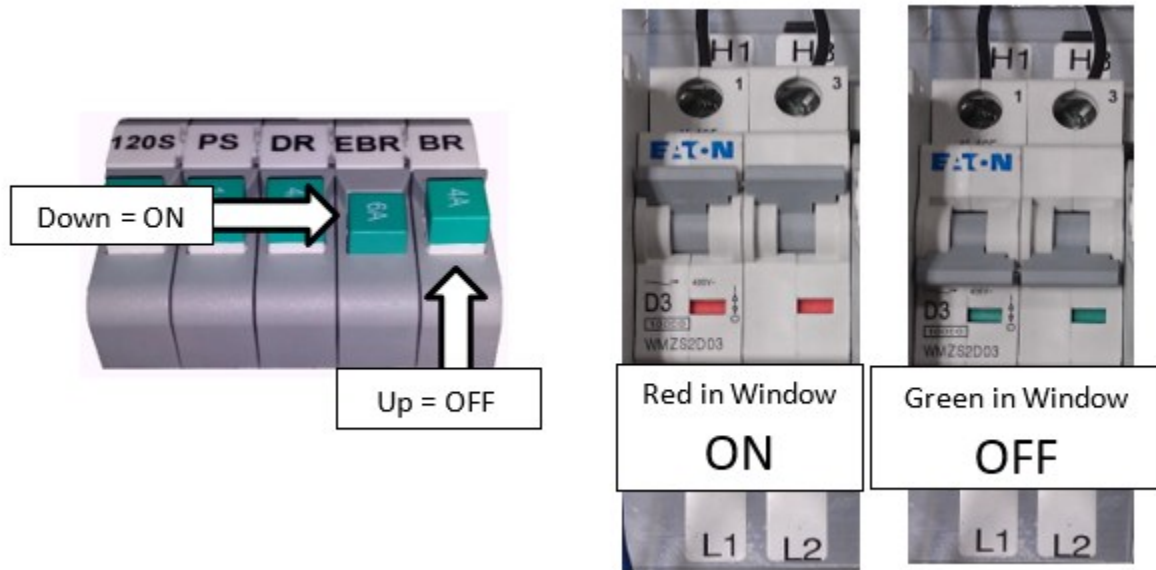


Figure 5: Breakers

## Setup

Perform the following connections as shown in the figures below. Attach a voltmeter across the 115 VAC source for the control power supply at A4TB3-1 & A4TB3-7.

1. Attach L1, L2, and L3 to the corresponding terminals on the drive.

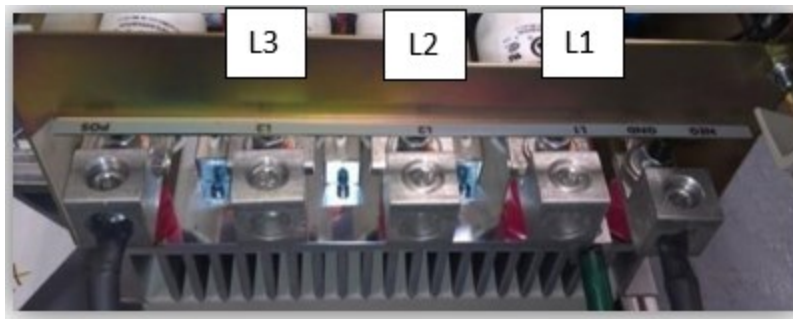


Figure 6: Terminal Connections



2. Connect the armature wiring to the terminal block according to the amperage rating listed on the motor. Make sure to set the DIP switch to the value that matches the amperage rating.



Figure 7: DIP Switch

3. If the encoder has not been connected, connect the encoder to TB1 using the color codes provided by the manufacturer or the reference tables in the manual.

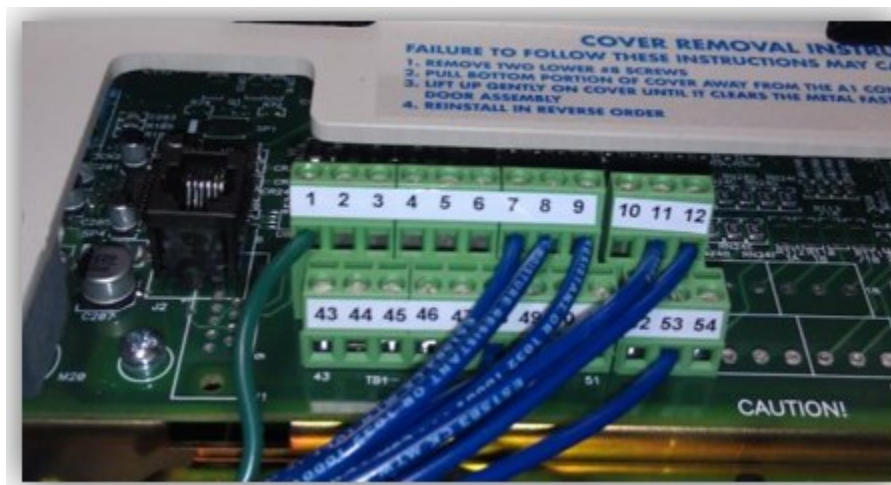


Figure 8: Encoder Connection

4. Apply the control and three-phase power. Verify that the control power is between 103 VAC and 126 VAC.
5. Press the RESET push button on the front of the power cube and observe the drive power-up sequence. See Drive Power-Up Sequence.

## Drive Power-Up Sequence

The power-up sequence can be observed by monitoring the Standard Control/Display Unit (SCDU) on the front of the power cube.

1. When power is initially applied, all segments on the digital LED display and all of the LEDs come on for about 1 second.
2. The LEDs and display should turn off. The drive performs internal checks. The SCDU displays tEst while a self-test is being performed.



3. If the drive passes the self-test, then the SCDU displays P-UP.
4. The READY LED comes on.

## Abnormal Display Conditions

If an error or fault has occurred, the display shows an abnormal condition.

The following is a list of Abnormal Display Conditions and Solutions.

*Table 2: Abnormal Display Conditions and Solutions*

| Condition   | Solution  |
|---|---|
| No digits or LEDs come on                             | Check for proper voltage between the 115 VAC control power lines.<br>Check for blown 115 VAC control power fuses.<br>Check for a defective Control Voltage Power Supply in the power cube.  |
| Horizontal segment(s) of the SCDU display are lit     | One or more phases of the three-phase power is missing.<br>Measure and verify three-phase power input at the drive terminals.<br>Check the three-phase power fuses.   |
| FAULT LED lights and a fault code appears on the SCDU | Refer to the Fault / Error Codes List to see what caused the fault and to find the correct solution. See <i>C4 Faults and Alarms</i> .<br>A fault code is displayed as the letter 'F' followed by a number representing the fault.  |
| SCDU displays Prot                                    | The initial checks found that the protected non-volatile RAM (NVRAM) has not been initialized.<br>Move the NVRAM PROTECTION switch to OFF in order to allow the microprocessor to initialize the NVRAM with preprogrammed default values.<br><b>Notice</b> that the NV RAM UNPROTECTED LED is now lit to indicate the NV RAM PROTECTION switch position.<br><br>Press the RESET push button. The drive goes through its power-up sequence again; however, this time it will initialize the unprotected NVRAM and load in factory supplied default parameter values. |

The figure below shows the location of the NVRAM Protection switch when troubleshooting a SCDU displays Prot fault.



Figure 9: NVRAM Protection Switch

## Fan Check

Verify fans are working if a blower motor (power bridge fan) is installed on a drive.

## Verify Parameters

When the READY LED on the SCDU is lit, all the selectable parameter data needs to be checked and/or verified to the proper values (see *C4 Controller sheet 04 Drive and Motor*) as follows:

- VERIFY OR CHANGE EACH PARAMETER VALUE for the particular application and motor involved.
- STORE PARAMETERS, Function # 994, so that power can be removed and reapplied without losing the entered parameters.
- Set the NVRAM PROTECTION switch to the protect position (UN PROT NV RAM light is off) to ensure that set up data cannot be corrupted.
- Run the controller to verify drive changes.

The table below lists the Magnetek DSD412 Parameters.

Table 3: Magnetek DSD412 Parameters

| Parameter | Description            | Recommended Value    | Additional Information   |
|-----------|------------------------|----------------------|--|
| 2         | Use Self-Tune Logic    | On                   | This parameter cannot be set to ON until performing the self-tune.   |
| 3         | Rated Armature Current | Motor Name Plate     |  |
| 7         | Rated Armature Voltage | Motor Name Plate     |  |
| 9         | Nominal AC Voltage     | Drive Supply Voltage | This is the voltage coming into the drive. Not necessarily the line voltage if a step-up or step-down transformer is being used. |
| 10        | Encoder PPR            | Per Encoder          |  |

| Parameter | Description           | Recommended Value     | Additional Information  |
|-----------|-----------------------|-----------------------|---|
| 11        | Motor RPM             | Motor Name Plate      |   |
| 17        | Rated Car Speed       | Per Job Specification |   |
| 49        | Weak Field Current    | Motor Name Plate      | If this value is greater than the rated field current, then the field will never weaken.  |
| 50        | Rated Field Current   | Motor Name Plate      | The drive must be configured for the correct field current range. See the <i>Magnetek DSD 412</i> Manual for DIP switch settings. |
| 52        | Rated Field Voltage   | Motor Name Plate      |   |
| 53        | Standby Field Current | 25%                   | This parameter cannot be set to ON until performing the self-tune.  |

## Magnetek DSD412 Drive Self-Tune Procedure

Perform the Magnetek DSD412 drive self-tune procedure as follows.

1. Place a jumper from LPR on the DIN rail to SAFE.
2. Put the NVRAM Protected switch in the Not Protected position.
3. Perform PCU DIAGNOSTICS Function 998 to verify armature and field circuitry.
4. Perform SELF-TUNE PARAMETER TEST Function # 997. The drive should display PASS after a few seconds. Set Parameter #2 to ON.
5. Remove the jumper and perform Function #994 to permanently save the changed values.
6. Verify the Smartrise MR board LCD is not showing an active fault as indicated by a flashing Red LED, and it displays Construction Mode.
7. Close the Run Box Stop switch.
8. Command the Car to move.
9. Verify the brake is picking/holding after a valid run command is given.
10. Verify the brake is dropping once the command is removed.
11. Verify the timing and operation of the brake to ensure the motor is not running through the brake prior to it picking.
12. Is the brake inoperative?
  - a. If the brake is operative, go to step 13.
  - b. If the brake is inoperative, check the following:
    - Check for DC voltage between points K1 and K2 on the Machine Room DIN rail.
    - Verify this voltage is also at the brake coil when commanded to pick.
    - Ensure this voltage corresponds to the voltage the brake coil is rated for.
    - If problems persist, contact Smartrise for assistance.

13. The encoder feedback may be out of phase upon first power-up. This may cause the motor to run faster than commanded and/or give drive fault 408/98. Is the encoder feedback out of phase?
  - a. If the encoder feedback is in phase upon first powering up, go to step 14.
  - b. If the encoder feedback is out of phase upon first powering up may be out of phase upon first power-up, remove line power and swap the encoder A and A- wires. Go to step 14.
14. Reapply line power and command the car to move. The car should now move at the programmed Inspection Speed.
15. Is the motor running in a reverse direction from what is commanded?
  - a. If the motor is running in the forward direction, the process is complete.
  - b. If the Motor is running in a reverse direction from what is commanded, swap the field (+) and (-) wires. It may be necessary to swap the encoder A and A- wires after changing the field wires. The process is complete.

## Shuddering at High Speed

At times, shuddering may occur. If shuddering at high speed occurs, verify the following conditions:

- Motor voltage vs. transformer secondary input voltage – Recommendation is that the transformer secondary voltage be at a minimum equal to the rated armature VDC. For best results that account for sagging utility, etc.,  $VAC = 1.05 \times VDC$  is a better number to use.
- Make sure that the motor weak field current is adjusted so that with full load up at rated speed yields the rated armature VDC used above.
- Rope resonance – Use the high speed / low speed bandwidth adjustments (#39 & 40). Reduce the setting of the high speed and width to maybe 50% of that for low speed. Set the gain change speed (#105) at 25-50% of rating. Elevator speeds of 350-500 with 2:1 roping can be problematic. Using the notch filter may help (#190, 191).
- Make sure there is no slop / backlash in the encoder coupling and that the encoder is not wobbling or vibrating.
  - Keep Tach Rate Gain (#107) at zero.
  - Verify the correct motor and encoder data, perform diagnostics (#998) and self-tune (#997), and use the values for self-tune (#4, 6, 51) by copying them from (#613, 614, 615) and then turning #2 to ON.
- Reduce motor armature response (#8) to 250 r/sec.
- Make sure there is a ground bonding wire from motor frame to drive chassis.
- Make sure the encoder is electrically insulated from the motor shaft and frame.
- If using a friction wheel encoder, make sure both surfaces are perfectly round.

## Operation

Run the car and complete the checklist during the verification process.

### No Faults

Make sure the car is moving without triggering a fault either on the Smartrise SRU Board or the drive. If the SRU Board displays a drive fault, look at the drive to see what the fault is. See Drive Fault / Encoder Fault for troubleshooting drive fault.

### Proper Direction

Make sure the car is moving in the same direction as the control switch on the Run Box. See Wrong Direction for troubleshooting proper direction faults.

### At Speed

Make sure the car is moving at the proper inspection speed (approximately 50 fpm). See Car Moving to Slow or Rough for troubleshooting at speed faults.

### Under Control

Make sure that the car is moving under full control. The car should stop when commanded from the Run Box. Verify that the car runs with no faults for 10 seconds or more. See Brake Not Lifting for troubleshooting under control faults.

### Continuous Run

Make sure that the car does not stall when using a geared motor. See Car Stalling for troubleshooting when the car stalls.

## Troubleshooting

The following sections list troubleshooting procedures.

### Drive Fault / Encoder Fault

The most common fault at startup with a Magnetek drive is the Encoder fault.

Perform the following checks to correct this fault:

- Check for a solid shield-to-ground connection at the motor and drive.
- Check for correct colored encoder wires to the terminals.
- Swap A+ / A- on terminal TB1.

### Brake Not Lifting

If the brake is not picking, make sure that the brake is wired according to *C4 Controller sheet 05 Brake Connection* and if there is a second brake installed, verify that the EB terminal is jumpered to the terminal. See the *C4 Controller sheet 01 – Getting Started* for more information.

If the brake has the proper voltage check the following:

- During a run command, check the DC voltage between points K1 / K2 and J1 / J2 if secondary brake is installed. Verify the voltages are also at the brake coil(s) when commanded to pick.
- Verify that the actual brake voltage matches the brake coil voltage shown on the *C4 Controller sheet 01 – Getting Started* Parameter table.

### Wrong Direction

If the car is moving in the wrong direction check the following:

- On the Smartrise Controller board, make sure that IO CUP comes on when commanding the **UP** direction and IO CDN comes on when commanding the **DOWN** direction.
- Swap two of the motor leads (T1 with T2).

### Car Moving to Slow or Rough

If the car is moving to slow or rough perform the following:

- Swap the encoder wires A+ and A- on drive TB1.
- Verify the brakes are lifting fully.

## Car Stalling

With a geared motor, if your car is on Construction and is stalling after an attempted run perform the following:

- Navigate to MAIN MENU | SETUP | SPEEDS | MIN ACCEL SPEED and increase the parameter from 1 to 5.

# Appendix

The figure below shows the terminal locations.

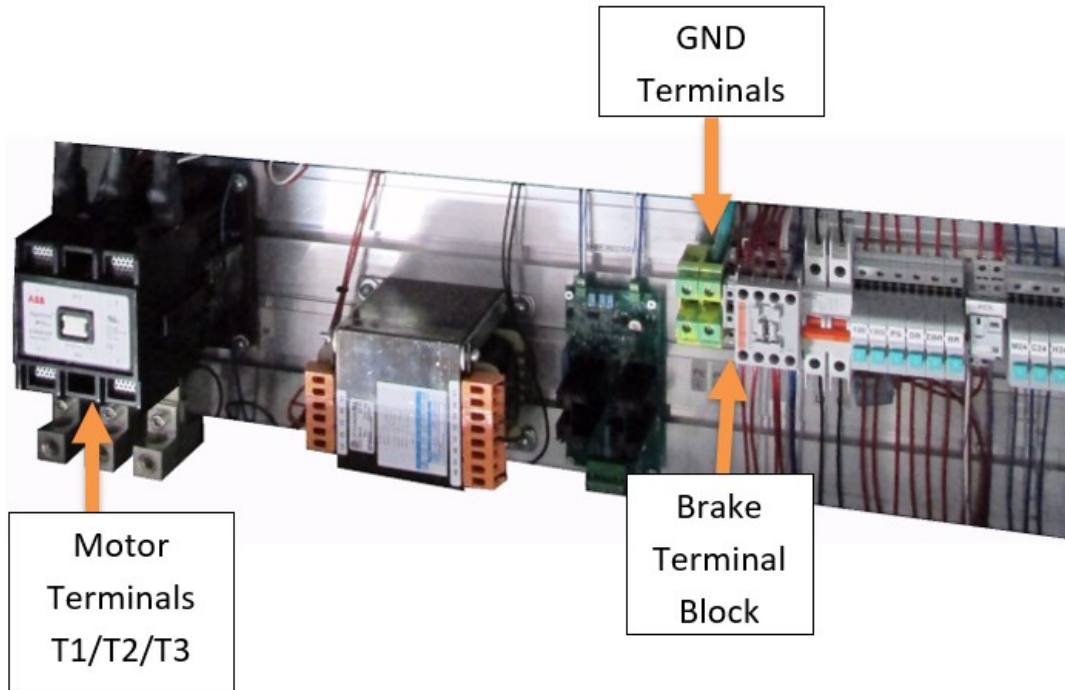


Figure 10: Terminal Locations