Magnus VLF MCU

Multi-Cassette Unit Braked Motor Upgrade

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Revision History

Revision	Date	Author	Comments
1	1 Aug 2006	A.Blignaut / P.Hawes	First draft.
2	23 Aug 2006	A.Blignaut / P.Hawes	Location of relay moved to MCU power plate
3	15 Sep 2006	A.Blignaut / P.Hawes	Info added on override jumper cable
4	15 Jan 2007	A.Blignaut	Added estimated installation time
5	26 Mar 2007	A.Blignaut	Removed jumper installation information
6	17 Apr 2007	A.Blignaut / C.Bradley	Updated the motor installation procedure

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1. OVERVIEW

This upgrade is to install a MCU jackscrew motor with a mechanical brake to prevent the MCU forks from lowering on their own when the friction on the jackscrew is very low. The brake is normally engaged, and needs power to allow the motor to turn.

If the motor being replaced is an old type motor (part #184-00016), the motor shaft coupling and the bracket on top of the motor will need to be replaced. If the motor being replaced is a new type motor (part # 184-00074), then the existing coupling and bracket can be used.

The coupling provided in the kit is a step type coupling to accommodate the different sizes between the jackscrew shaft and the motor shaft.

Estimated installation time is 2 Hrs.

1.1 Operational Overview

The brake is controlled by the safety interlock door loop as intended for the safety of the operator and service personnel (brake is on when access panels are opened). The firmware applies the motor brake when the forks/cassettes are at the correct position with the panels closed; this prevents back-driving that would cause machine damage.

2. PARTS/TOOLS REQUIRED

Motor upgrade kit - 512-00375A

7 mm nut drive

Drill and 4.2 mm drill bit

Automatic punch

3. PREREQUISITES

Controlled Release (CR) 4.0 or later must be installed on the device for this upgrade. The braked motor needs firmware control that is only provided in CR 4.0.

The use of earlier versions of firmware with the braked motor will result in the inability of the MCU motor to move.

4. MOTOR UPGRADE PROCEDURE

4.1 Removing the Motor

1. Open the MCU rear doors and turn the safety interlock override switch to **Safety Interlock Override** .
2. Turn the manual jog panel switch to **Manual Jog Mode**.
3. Using the manual jog panel, lower the forks onto wooden blocks.
4. Turn the device power to **OFF** and use the approved lockout procedure to secure the device. Disconnect the voltage supply connector from the wall supply.
5. Remove the cable clamp that fastens the motor cable to the MCU frame.

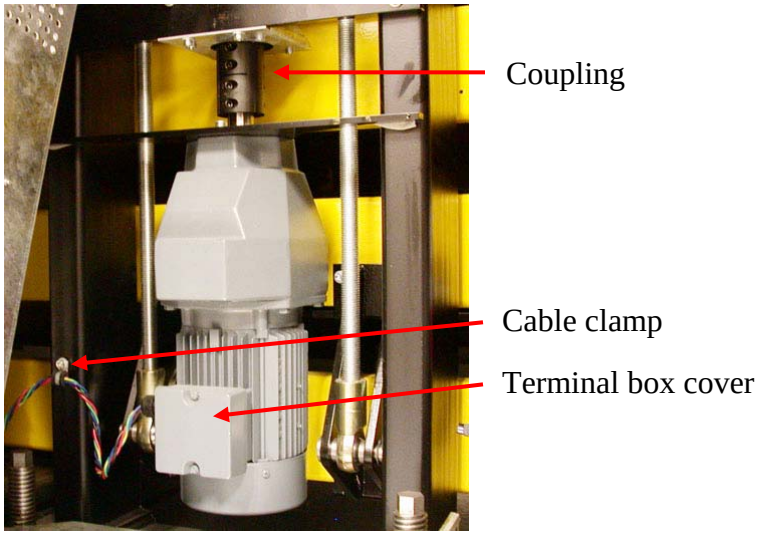


Figure 1: MCU motor components

6. Put a piece of foam or wood under the motor to support it when the coupling screws are loosened.

WARNING: Take care not to get your hands or fingers pinched between the motor and MCU frame when removing the motor.

7. Loosen the lower four coupling screws that attach the coupling to the motor shaft. When the shaft becomes loose in the coupling, the motor will drop under its own weight onto the foam or wood.

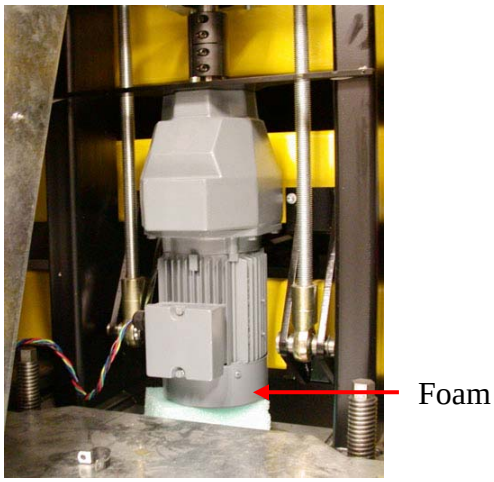


Figure 2: Removing the MCU motor

8. Move the motor closer so that the wires and top bracket can be removed.
9. Remove the bracket on top of the motor—four screws.
10. Remove the terminal box cover on the motor—two screws. Take note of the wire connections inside the terminal box.

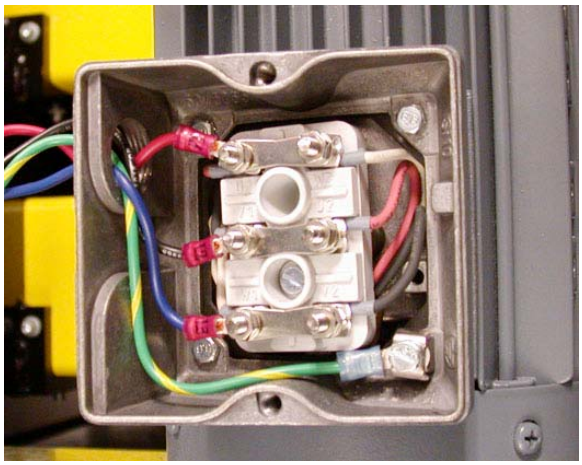


Figure 3: MCU motor power connections

11. Remove the motor completely. To do this:
    a. disconnect the four wires from the terminal box,
    b. screw out the strain relief,
    c. pull the wires out of the terminal box.
12. Remove the coupling from the jackscrew shaft—two screws.

4.2 Installing the Braked Motor

Determine which coupling is the correct size to connect the braked motor shaft to the jackscrew shaft—either the step-type coupling included in the kit, or the coupling removed from the jackscrew shaft.

1. Attach the top bracket supplied with the kit to the braked motor using the four screws and washers provided.
2. Place the correct coupling onto the braked motor shaft, but do not tighten the coupling screws yet.
3. Install the braked motor:
    a. Angle the motor shaft and coupling in underneath the jackscrew shaft so that the jackscrew shaft is in the coupling.
    Because the braked motor is longer than the old motors, the coupling must be loose to be able to get the motor in underneath the jackscrew shaft.
    b. Slide the coupling up so that the jackscrew shaft is centered in the coupling and tighten the top two screws that hold the coupling to the jackscrew shaft.
    c. Use a piece of wood and a suitable bar to lever the motor upwards until the bottom of the jackscrew and the top of the motor shaft are 1 mm apart inside the coupling. Use your other hand to guide the motor shaft into the coupling.



Figure 4: Installing the MCU motor

d. While holding the motor up with the lever, tighten two of the screws on the jackscrew coupling with the other hand. Rotate the jackscrew, and tighten the other two screws. The screws must be tightened to 19 N m.

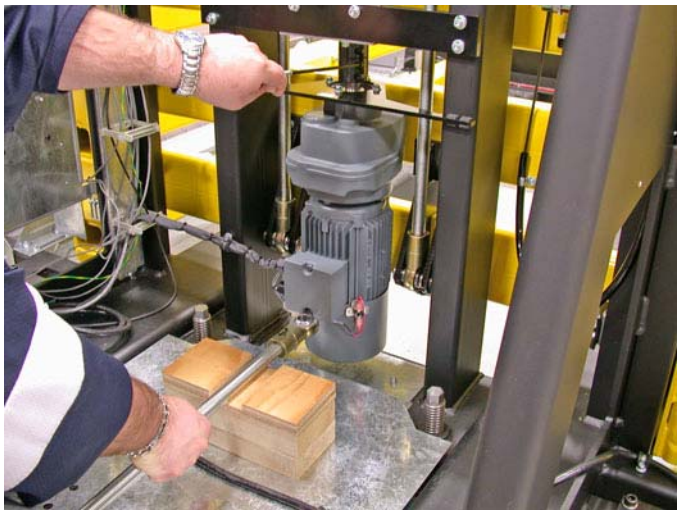


Figure 5: Tightening the coupling screws

4.3 Installing the New Relay and Cables

1. On the power plate located on the left side of the MCU power box, remove the MCU motor driver box to give you access to the power plate's lower ledge when drilling holes for the black solid-state relay. Loosen the two screws securing the motor driver, slide the driver up and off, and move it to one side.

Note: Take care not to put too much strain on the motor driver cables or wires when moving it aside. It may be necessary to disconnect the cables or wires from the motor driver.

2. Mount the relay to the MCU power plate:

   a. Mark the location of the holes on the power plate according to the diagram below.

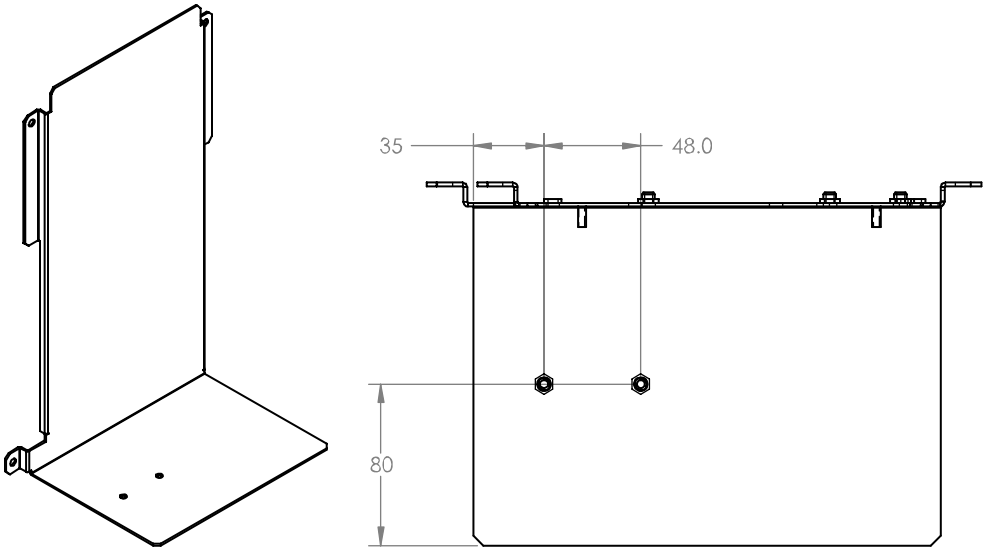


Figure 6: Relay hole locations

   b. Punch the hole locations and drill the two holes using a 4.2 mm drill bit.

   c. Deburr the holes by hand with a larger drill bit.

   d. Mount the relay to the power plate with two M4 bolts, nuts and washers.

   e. Install the MCU motor driver box.



Figure 7: Relay mounting

3. Disconnect cable 220-00294A from the manifold interface board (J4) and from the safety board and remove this cable.

4. Connect cable 220-00294B in its place and route the new cable the same way that version A was routed. This cable also has a new jacketed cable with two ring terminals. Connect the ring terminals to input terminals 3 & 4 of the solid-state relay.

5. Remove the three jog panel mounting screws and tilt the panel to get access to the rear of the switches.

6. Install a new switch to the backs of each of the jog panel push-buttons—**Semi-Auto** (SW2), **Up** (SW3), and **Down** (SW4). These new switches will be referred to as the "B" switches. Their terminals are marked "3" and "4" and are referred to by the cable labels and schematics as **3B** and **4B**.

7. On the new cable 220-01799A, connect the forked ends to the switches indicated on the cable labels as follows:

   a. The brown wires go to the three **4B** terminals

   b. The black wires go to the three **3B** terminals

   c. The last fork marked "3A" doubles up on SW4 terminal **3A**.

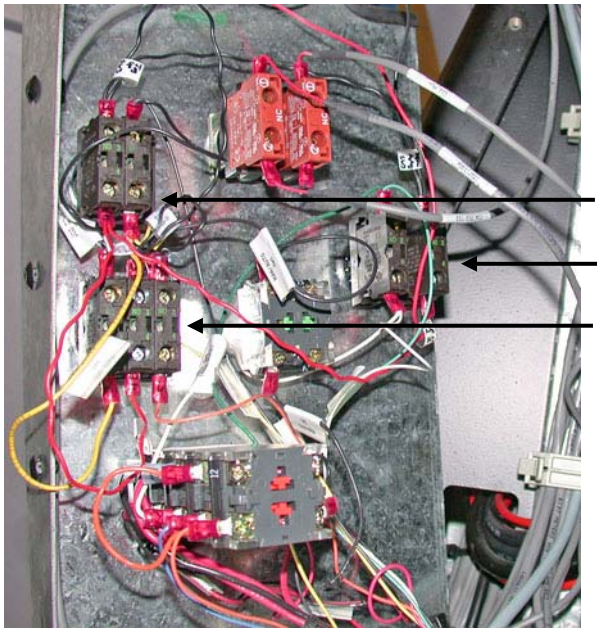


Figure 8: Jog panel switches

8. Run cable 220-01799A around the perimeter of the jog panel and down into the cable clamps behind the power box. Run the cable to the solid-state relay on the power plate and connect it to the relay terminals as marked (terminal 3 will be doubled-up at this point, as it already has a terminal from 220-00294B on it).

9. Open the braked motor terminal box cover.

10. On the terminal box, screw the power cable strain relief into the upper port and run the four power wires through that strain relief.

11. Connect the motor power cables in the exact same configuration that they were in on the old motor. See Figure 3: MCU motor power connections.

Note: Ensure that the metal links that connect the incoming power wires with the internal motor wires are installed.

12. Screw the brake cable strain relief into the lower port and run cable 220-01799A through that strain relief.

13. Connect the two ferrules from cable 220-01799A to the brake terminal block inside the terminal box—ensure they are inserted as far as possible and use a screwdriver to tighten the terminal block connectors. Polarity does not matter for this connection.

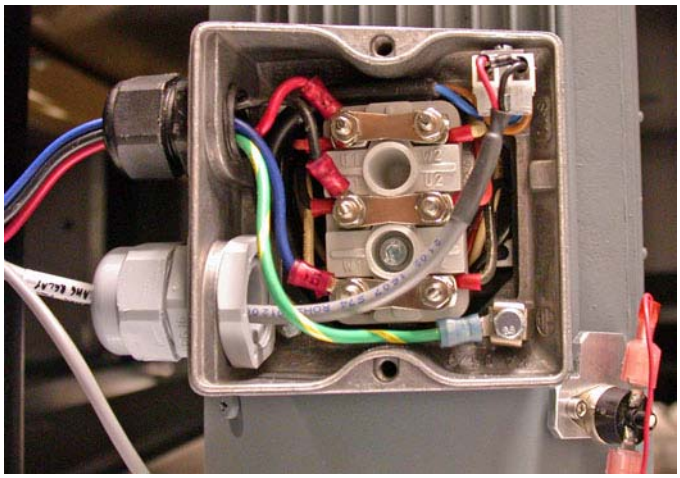


Figure 9: Terminal box connections

Note: The two strain relief fittings may look different to those shown in the photo above.

14. Install the terminal box cover.

15. Install the cable clamp to fasten the motor cables to the MCU frame.

16. Use cable ties to secure all new cables and wires where necessary.

17. Install the manual jog panel back in place—three screws.

4.4 Testing the Motor Brake

Double-check all wiring before powering on the device and running the motor brake tests.

CAUTION: If the motor is driven with a locked rotor for more than a few seconds, you may blow a fuse on the power distribution board. Use the E-Stop button to stop the power to the motor if the brake is not operating.

1. Connect the voltage supply connector to the wall supply and turn the device power to **ON**.
2. On the manual jog panel, turn the switch to and press the **Semi-Auto** button. You should hear a sharp click as the motor brake is activated whenever the button is down.
3. Turn the switch to **Manual Jog Mode** and press the manual jog **Up** button. You should hear a whine as the motor is powered, as well as a "click" as the brake is released. The forks should move upwards.
   If the forks move in the wrong direction, see the next section. If you hear a whining noise but the motor is not turning, then the brake is not getting power (check all wiring).
4. Press the manual jog **Down** button. The forks should move downwards.
5. Turn the safety interlock override switch to **Normal Operation** and close the MCU rear doors.
6. In Service Shell, type `>>cassette move X` (where X represents cassettes 0, 1, 2, 3, or 4 and ensure that the brake is functioning through firmware control.

4.4.1 Fixing the motor direction of travel

If the MCU forks move in the wrong direction, then the wiring at the MCU motor must be changed.

1. Turn the device power to **OFF** and use the approved lockout procedure to secure the device.
2. Remove the motor terminal block cover and switch the red and black wires around.
3. Install the motor terminal block cover and turn the device power to **ON**.
4. Using the manual jog panel, check if the MCU forks are now moving in the correct direction.