

Rheometrics RDA2 Motor Control Systems

Warning: the following information is intended as a guide to help the user understand the operation of the instrument. Maple Instruments does not assume responsibility for the accuracy of the information contained herein. Danger: This instrument contains high voltage systems that could result in personal injury or death. Do not attempt work on this equipment unless you are properly trained.

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System Overview

The motor control system includes the servo motor, MFM DC servo controller, servo board and user interface with the C.A.T forming the feedback between the motor and the Servo board. What follows is an overview of each part of the system as well as a guide to troubleshooting problems.

Servo motor

The servo motor moves to the desired position based on a DC input applied to it from the MFM DC Servo controller.

C.A.T.

C.A.T stands for **Capacitive Angular Transducer** and is attached to the bottom of the servo motor. The CAT works using two plates both covering 180 degrees of a circle one fixed to the body and the other attached to the motor shaft. As the plates change position relative to each other their capacitive value change. A sine wave is fed from a function generator on the CAT board to one of the plates. A low pass filter gives a DC voltage value per unit of rotation. This output is fed to the servo board. The CAT is powered with +/-15V DC from Power Supply 1 (PS1 found in the test station of the RDA2).

MFM DC Servo controller

The MFM DC Servo controller's function is to take a control signal from the servo board (703-00409) and amplify the signal so it is sufficient for the motor to operate. The MFM is located in the **System control tower** {RDA2}.

Servo Board 703-00409 (and other derivatives)

The servo board takes the set point from the user interface, compares it to the actual position of the servo motor shaft and calculates the needed force to move the shaft to the commanded position. The servo board is powered by a +/-15v DC from Power Supply 2 (PS1)

Troubleshooting **WARNING: Disconnect all power to instrument before servicing!**

1. If the motor does not turn to its **NULL** position and can be rotated by hand after the motor power switch on the left top panel of the test station has been pressed check the following:
2. Verify that the test Station power switch is on. The Test Station Power Switch is found on the front left of the Test Station behind the cabinet door.
3. Verify that all connectors are firmly in place and tightened down with their holding screws where applicable. Check those connections within the left and right panels on the test station. These two panels are hinged and can be pulled open.
- 4: Verify that the fuses found in Test station bottom left are not blown. To get to these fuses you must first remove the circular indexing plate held down by 4 screws. The top **stainless steel deck** than needs to be removed, to do this remove the 4 covered screws at the back of the plate and the two thumb screws located on top front edge of the test station chassis behind the cabinet door. Lift the stainless steel deck off and away. To get at the fuses remove the acrylic cover marked “HIGH VOLTAGE” on the left side. **Be sure the power line voltage is disconnected before opening this cover.** The fuses are mounted on the PCB at the bottom of the box.
5. Verify that the fuses found in **MFM DC Servo Controller** (3 total) in System Control tower are not blown. One 2.5A/250V 3AG SLO BLO found in the fuse holder of the Servo Controller, one 250V BUSS AGX1/4A (F1) and one 12A/65V (F2) found inside the cavity of the Servo Controller on the right side. The Motor spinning out of control is a sign that one of these fuses is blown. To get to the MFM DC Servo Controller, open the System Control tower side panel by removing the three screws, remove the acrylic cover marked “HIGH VOLTAGE.” **Be sure the power line voltage is disconnected before opening this cover.** The MFM DC Servo Controller is the large black unit on the bottom of the tower.
6. Verify that there is voltage across the 3 prong, 2 wire connector going to the motor. This connector is located behind the Test Station cabinet door. Disconnect the connector and test the half that is going to the inside of the Test Station with the voltmeter while the instrument and motor are both powered up.
7. Check the Stepper Motor power supply in the System Control tower for 24V. Access this as described above in check 5. The stepper motor supply is located in the bottom of the System Control tower beside the black MDM DC Servo Controller. The two large screw terminals contain the 24V { this can vary depending on the power supply manufacturer}. The three smaller screw terminals contain the line voltage. This test must be done when the unit is on. **To do this safely have the System Control Tower unplugged first.** Attach each lead of the DC voltmeter to each of the large screw terminals **so it can be done hands free!** Plug in and power up the unit. The DC voltmeter should read 24V.