**ROC Fault Code**

This document pertains to all sizes of Mentor II and Quantum III drives.

**WARNING**

DO NOT ASSUME POWER IS OFF BECAUSE THE DRIVE DISPLAY APPEARS DEAD OR NO FANS ARE HEARD. THE VOLTAGE APPLIED TO THIS DRIVE CAN BE LETHAL IF TOUCHED!

The ROC (Armature Over Current) trip is an instantaneous protection fault activated by excessive current in the armature circuit. The trip is activated when the current reaches about 300% of the full load rating. There are several causes for this trip as well as several troubleshooting techniques to isolate the problem.

- The motor could be the cause for the trip. Check the following to eliminate motor problems. Consult the Technical Note CTTN121 for details.

  http://www.emersonct.com/download_usa/techNotesMisc/CTTN121.pdf

  - Use a megger to check for shorts or insulation breakdown in the motor. The field as well as the armature circuits should be checked. **Disconnect the armature and field wires from the drive before using the megger- Failing to do so can result in drive damage which will not be covered under warranty!**
  - All of the readings should be open.
    - Check A+ to Earth, F+, and F-
    - Check A- to Earth, F+, and F-
    - Check F+ to Earth
    - Check F- to Earth

- The SCR's in the drive may have failed short. Check the following on the drive with an Analog Ohmmeter such as a Simpson 260. A digital meter will not work well due to their high input impedance.

- List on the next page are some common readings. The DMM was a Fluke 73 and the Analog meter was a Simpson 260. These readings may vary from drive to drive as well as with different meters.
ENSURE POWER IS OFF PRIOR TO TAKING THESE MEASUREMENTS

Disconnect all line and motor wires from the drive then proceed with the tests. The chart below shows expected readings only. A resistance reading using a VOM (volt-Ohm meter) can not be used as a definitive diagnosis but only as an indication of a potential SCR type fault. Any reading that is reasonably greater than a short has the potential to be a good SCR.

### STANDARD D.C. EXPECTED RESISTANCE READINGS

<table>
<thead>
<tr>
<th></th>
<th>MII Digital Meter</th>
<th>MII Analog Meter</th>
<th>QIII Digital Meter</th>
<th>QIII Analog Meter</th>
</tr>
</thead>
<tbody>
<tr>
<td>L2 to L3</td>
<td>3 Meg Ohm</td>
<td>2 Meg Ohm</td>
<td>2 Meg Ohm</td>
<td>2 Meg Ohm</td>
</tr>
<tr>
<td>L1 to L2</td>
<td>3 Meg Ohm</td>
<td>2 Meg Ohm</td>
<td>3 Meg Ohm</td>
<td>2 Meg Ohm</td>
</tr>
<tr>
<td>L1 to L3</td>
<td>3 Meg Ohm</td>
<td>2 Meg Ohm</td>
<td>80 Ohms</td>
<td>100 Ohms</td>
</tr>
<tr>
<td>Input Phase to Ground</td>
<td>O.L</td>
<td>O.L</td>
<td>O.L</td>
<td>O.L</td>
</tr>
<tr>
<td>A+ TO A-</td>
<td>2 Meg Ohm</td>
<td>3 Meg Ohm</td>
<td>2 Meg Ohm</td>
<td>3 Meg Ohm</td>
</tr>
<tr>
<td>A+ TO GND</td>
<td>O.L</td>
<td>O.L</td>
<td>O.L</td>
<td>O.L</td>
</tr>
<tr>
<td>A- TO GND</td>
<td>O.L</td>
<td>O.L</td>
<td>O.L</td>
<td>O.L</td>
</tr>
<tr>
<td>A+ TO L1</td>
<td>1 Meg Ohm</td>
<td>2 Meg Ohm</td>
<td>1 Meg Ohm</td>
<td>2 Meg Ohm</td>
</tr>
<tr>
<td>A+ TO L2</td>
<td>2 Meg Ohm</td>
<td>3 Meg Ohm</td>
<td>3 Meg Ohm</td>
<td>3 Meg Ohm</td>
</tr>
<tr>
<td>A+ TO L3</td>
<td>3 Meg Ohm</td>
<td>2 Meg Ohm</td>
<td>1 Meg Ohm</td>
<td>2 Meg Ohm</td>
</tr>
<tr>
<td>A- TO L1</td>
<td>2 Meg Ohm</td>
<td>2 Meg Ohm</td>
<td>1.5 Meg Ohm</td>
<td>2 Meg Ohm</td>
</tr>
<tr>
<td>A- TO L2</td>
<td>3 Meg Ohm</td>
<td>3 Meg Ohm</td>
<td>3 Meg Ohm</td>
<td>3 Meg Ohm</td>
</tr>
<tr>
<td>A- TO L3</td>
<td>3 Meg Ohm</td>
<td>2 Meg Ohm</td>
<td>1.5 Meg Ohm</td>
<td>2 Meg Ohm</td>
</tr>
<tr>
<td>F1 TO F2</td>
<td>O.L</td>
<td>20 Meg Ohm</td>
<td>O.L</td>
<td>20 Meg Ohm</td>
</tr>
<tr>
<td>F1 TO L1,L2,L3</td>
<td>O.L</td>
<td>O.L</td>
<td>1 - 4 Meg Ohm</td>
<td>O.L</td>
</tr>
<tr>
<td>F2 TO L1,L2,L3</td>
<td>All 8-10 Meg Ohm</td>
<td>20 Meg Ohm</td>
<td>O.L</td>
<td>20 Meg Ohm</td>
</tr>
<tr>
<td>F1 TO GND</td>
<td>O.L</td>
<td>O.L</td>
<td>O.L</td>
<td>O.L</td>
</tr>
<tr>
<td>F2 TO GND</td>
<td>O.L</td>
<td>O.L</td>
<td>O.L</td>
<td>O.L</td>
</tr>
<tr>
<td>0V TO GND</td>
<td>O.L</td>
<td>O.L</td>
<td>O.L</td>
<td>O.L</td>
</tr>
</tbody>
</table>

Remove line wires prior to testing

Remove motor wires prior to testing

Armature Connection

Mentor II Size 1 Test Points

Field connections F1+ and F2-.
Remove prior to testing.
Measure from the armature connections on the side. This is necessary to bypass the open contactor inside the drive.

Quantum III Size 1
Control Transformer

Lift one side of the control transformer fuses. This will allow you to read across the SCR’s without seeing the primary of the control transformer. L1 to L3 on the QIII should now read 2 Meg or greater.
Quantum III Size 2
Power Terminal Test Points

Field Connections

Read the armature test points from this point

Lift one side of the control transformer fuses. This will allow you to read across the SCR's without seeing the primary of the control transformer. L1 to L3 on the QIII should now read 2 Meg or greater.

MII Size 2
Test Points

Armature test points are here
The SCR gate to cathode ohmic reading can also be used to indicate a potential SCR type fault. Typical SCR’s read from 10 to 30 ohms but this can vary between SCR manufacturers. A short circuit or open reading indicates a bad SCR. QIII size 1 SCR Gate leads unfortunately are not accessable.

The gate resistance reading can be taken from the white Molex connector. Remove the connector from the board prior to the measurement.
If the motor megged ok, one should inspect the brush and brush rigging. If the drives SCR's tested good there could be some mechanical binding causing excessive current draw. Inspect the machinery for free movement. Check for cracked bearings, jammed gears, bad belts, etc...

The drive could have current instability in the armature circuit causing the trip. If an autotune has never been done it may be beneficial to do so on new installations. Follow the directions cited in the following Technical Note CTTN135.


Run the drive again after the autotune. The drive should run more stable at this point and possibly resolve the AOC trip. See the following link for more information on current loop tuning:

http://www.emersonct.com/download_usa/appNotes/CTAN123.pdf

Parameters in the drive can also provide information toward the possible cause of the AOC trip. There are certain parameters in the drive that remain frozen when a trip occurs until the fault is cleared. You can read these parameters to see the state of the drive when the AOC condition occurred if you do not depress RESET. The pertinent parameters are below. They should be within drive rating specifications.

- #4.01 = Current Demand
- #5.01 = Current Feedback
- #5.02 = Displayed Feedback Amps

A weak field current can cause the armature currents to run high. If the torque is to remain constant and the field current drops then armature current must increase. This is shown by the formula below.

\[ \text{Torque} = k \times \text{Field Current} \times \text{Armature Current} \]

Confirm your field circuits are good. Check menu 6 for correct configuration.

Measure your field current with a DC clamp-on ammeter and compare it to the motor nameplate data. This should be done with the drive in run but set for zero speed.

Page 60-62 in the Rev.A1 QIII manual has the information for Field Configuration. It can be downloaded at:

http://www.emersonct.com/download_usa/manuals/quantum/Drive_Start_up.pdf

Questions ?? Ask the Author:

Author: Josh Kibler  
e-mail: josh.kibler@emersonct.com
(716)-774-0093