AOP Trip Code

The Troubleshooting Guide is pertinent to Mentor II and Quantum III Drives. All Sizes

Problem

The drive displays ROP or a 126 code appears in the trip log. The trip log is located at #10.25 - #10.28. These are indications of the drive detecting an Armature Open Circuit condition. The ROP trip indicates that the SCR firing angle had advanced to a high level for a period of time but no current feedback had been detected.

**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!

Possible Causes and Resolutions

The #1 cause for ROP is not an actual open within the Armature circuit but rather lack of a current feedback signal to the MDA1 CPU. The first thing to check is the interconnecting ribbon cable that brings signals from the Power Board to the CPU. Specifically check each end to ensure that the ends are fully seated in their receiving connectors.

Quantum III Size 1

Mentor II Size 1

34 Pin Ribbon cable
P/N # 3471-0207-06
The 34-pin ribbon cable connection to the MDA 1 control board or the units power board. To correct this problem one will need a means of pushing the ribbon cable properly back into place with a wooden paint stir stick or a long screwdriver.
Another possible reason for AOP, is the motor armature circuit is actually open. Check the armature resistance at the Drive A+ and A- terminals. The armature circuit should read like a short when the motor is connected.

Mentor II Armature Connections

Quantum III Armature Connections

The QIII drive has a built-in armature contactor. If you read the motor armature resistance at the A+ and A- lugs the contactor inside the drive will be bypassed and the reading will be accurate. The MII does not come with a contactor but it is common to have an external assembly installed. If this is the case you must close the power pole on the armature contactor before the armature resistance reading is taken. This will ensure continuity between the drive and the motor. You can measure directly across the contactor to make sure there is not additional resistance entering the armature circuit from it.

In rare cases, AOP, can occur if the Current Loop is very unstable due to improper current loop gains. If the drive is using V4.10 or greater software (see parameter #11.15) try to see if the Static Auto Tune can help consult by keying CTTN135 into Google or – click the following link:

If the AOP trip is disabled at # 10.37 or the AOP trip is not triggered then it is possible you could have an open armature circuit with out any trip indications. The drive may appear to be running but there is no motor movement. This can be seen by viewing the relationship between #4.01 (current demand) and #4.02 (Current loop output). If there is a high value in #4.01 and #4.02 reads 0 then an AOP condition may exist. It is important to check your current limits at #4.04 through #4.07 to eliminate them as the limiting factor.

AOP can occur with large drives running small motors. Specifically if the drive has not been re-burdened or calibrated for lower armature currents similar to that of the motor being driven. The drive phases on quickly and with a lack of proper amounts of current feedback, the AOP can occur. We would recommend that the drive be re-burdened so that the drive not only has a better chance of properly controlling the motor but also will properly protect it.

If you have a Quantum III, call Technical Support for guidance at 716-774-0093

If you have a Mentor II, consult the following Technical Note via Google CTTN110 or clicking on the link below:

http://www.emersonct.com/download_usa/techNotesMisc/CTTN110.pdf
**ROP** can occur if there is a problem with the current feedback. If one has recently worked on the drive, it is possible that the leads from the current transformers are not correct. Ensure all Current Transformer (CT) leads come off the donut in the same direction- if they don’t that CT is installed backwards. That can be fixed by reversing those leads of that CT by turning the connector around.

**MII/QIII Size 1 CT Connection**

More information on installing current transformers can be found using Google by searching for: **CTRI200** or by clicking on the link below:


There could be a problem with one of the supply phases. One could view the waveform of the current feedback signal on terminal 11 with an oscilloscope and make sure that all six pulses are present and stable.

**ROP** can occur as a result of a problem with the firing of one or more of the thyristors. On units up to M210, if Eupec SCR’s are replaced or used for replacement, be aware that the gate leads are reversed to most other SCR’s used in these models of Mentors/Quantum’s ie IXYS, IR (International Rectifier), Semikron.
MII/QIII Size 1 SCR’s

The gating should be verified and all connections need to be checked for proper seating.

**Semikron**

The gate leads go to pins 4 and 7 while the cathode leads go to pins 5 and 6. The gates are the outside terminals and the cathodes are the inside terminals.

**Eupec**

The gate leads go to pins 4 and 6 while the cathode leads go to pins 5 and 7. The gate and cathode terminals alternate.

**International Rectifier**

The gate leads go to pins G1 and G2. The cathodes go to the unlabeled pins. These SCR blocks wire up the same as Semikron SCR’s.
The SCR gate leads connect to these points. The white lead is the gate while the red lead indicates the cathode. This picture shows an Issue 4 board. Issue 3 boards have the gate leads rotated 180 degrees.

The smaller gate lead connection to the right can also be used. There are two styles of leads that go from the SCR’s to the power board.

**CTRI 214** contains more information on the correct installation of SCR’s for Size 2 Quantum III and Mentor II drives. It can be viewed or downloaded by clicking on the link below.

Mentor II/Quantum III Size 3 SCR’s

Every SD1 PCB will have a gate and a cathode connection.

Note: Gates are yellow
      Cathodes are black

CTRI 240 contains more information on the correct installation of SCR’s for Size 2 Quantum III and Mentor II drives. It can be viewed or downloaded by clicking on the link below.

http://www.emersonct.com/download_usa/replacementInstructions/CTRI240.pdf

Complete SD1 boards with 2 fuses for 480/525/660VAC units:
P/N: 9292-0060

- 9 of these are used in Regen Drive Models
- 3 of these are used in Non-Regen Drives

FS1 & FS2: P/N 3537-3253
Qty 2 per board
Contact our Parts Dept at 1-800-367-8067.

Complete SD1 boards with 3 fuses (shown above) for 480/525/660VAC

P/N: 9290-0060

- 3 of these board are used in all Size 3 models

FS3: P/N 4347-0030
Qty 1 per board
Contact our Parts Dept at 1-800-367-8067.
Drive Programming

The **AOP** trip can also be caused if one programs a Non-Regenerative drive using MentorSoft with a Regenerative program. This normally occurs when replacing an existing drive with a spare unit -as mistakes can be made.

The program for the drive might be on file or in a laptop and in times of desperation the parameters were loaded to the wrong drive type. The drive will start up and run forward fine with no indication of any issue. But as soon as the command speed is reduced the reverse bridge would be commanded (of which there is none in a Non-Regen drive), the unit will trip out with an Armature Open detection- **AOP**.

No damage should occur to the Mentor II drive during this type of failure- an external Armature contactor could be damaged however. Unfortunately the same can not always be said with the Quantum III. The Quantum III unit has an internal armature contactor that is designed to open for safety reasons when a drive trip is detected. Damage may occur when the drive’s armature circuit (in a loaded condition) suddenly is requested to open due to the fault detection.

As with any inductive load, current in motion likes to stay in motion. Current flowing through an inductive circuit that opens unexpectedly will cause an arc to develop from the opening contactor. This can cause damage to the contactor poles.

One must examine the drive’s label on the side of the unit and verify that your system drawing matches that specific drive before installation.

For questions call Control Techniques Technical Support-USA at 716-774-1193
Grand Island, NY 14072