This document pertains to all sizes of the 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!**

CONTROL TECHNIQUES STRONGLY URGES THAT ALL PERSONEL WORKING WITH OUR MOTOR CONTROLLERS RECEIVE FULL TRAINING ON ELECTRICAL SAFETY PRACTICES AND PROCEDURES.

An **FbL - Feedback Loss Trip** (or 119 in parameter #10.25 trip log) occurs when the drive senses a loss in the speed feedback signal. The Mentor II and Quantum III drives support AVF (Armature Voltage Feedback – inherent), tachometer, and encoder feedback.
1) Spin the motor manually and monitor #3.26
   - It should increase with motor speed increasing

2) Use a Volt Meter to read the voltage from the tachometer
   - Make sure it is in accordance with the name plate data
   - Make sure the polarity is not reversed (Pin 10 Pos. / Pin 9 Neg.)
   - Do not use an AC tachometer with a MII, regen, or reversing drive

3) Set the drive to Armature Voltage Feedback (AVF) to eliminate the tachometer as the speed feedback source.

Prior to setting the drive to AVF record the values in #3.09 and #3.10. These are the speed loop proportional and integral gains. Set #3.09 to 80 and #3.10 to 40. Typically higher gains are used when in AVF and lower gains are optimal when in encoder or tachometer feedback.

#3.15 should be set equal to or less than the motors Armature voltage taken from the nameplate. Never set #3.15 higher than the motor rated armature voltage.
- Setting the drive to AVF
  1) Set \#3.12 = 0 and \#3.13 = 1
  2) Set \#3.15 to your armature rated voltage
  3) Set \#6.07 = 1000, this will ensure the drive does not field weaken
- Run the drive up in speed.
  1) Measure the tach voltage with a DMM
     o Check if the amplitude is accurate

Example:
A motor with a 500VDC armature, 1750 RPM Base speed, and a DC tach with a 50V/1000RPM constant would yield the following while running in AVF.

If \#3.04 reads 200VDC then the DC tach voltage will read:

Finding motor speed while in AVF
RPM = \(\frac{1750 \text{ RPM} \times 200 \text{ VDC}}{500 \text{ VDC}}\) = 700 RPM

Finding DC Tach voltage while in AVF
Tach Voltage = \(\frac{50 \text{ VDC} \times 700 \text{ RPM}}{1000 \text{ RPM}}\) = 35VDC

  - Check if the polarity is correct. DC only
  2) Observe the tach signal with an oscilloscope
     - A DC tach should be flat with little to no noise
     - An AC tach should be sinusoidal with little to no noise
  3) Look at \#3.26
     - It should increase with motor speed
     - Check to see if it follows \#3.02

⇒ **FbL** when running in **Encoder Feedback**

  1) Check \#3.14 is calculated correctly
     - \#3.14 = \(\frac{1,000,000}{\text{PPR}}\) \times (750/\text{Max RPM})
  2) The maximum encoder frequency should not exceed 100KHz
  3) Check the encoder wiring
4) Use an oscilloscope to check the channel signals coming back to the drive. They should look like the signals pictured below.

<table>
<thead>
<tr>
<th>Pin #Sk3</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0v Supply</td>
</tr>
<tr>
<td>2</td>
<td>+Supply</td>
</tr>
<tr>
<td>3</td>
<td>ChA</td>
</tr>
<tr>
<td>4</td>
<td>/ChA</td>
</tr>
<tr>
<td>5</td>
<td>ChB</td>
</tr>
<tr>
<td>6</td>
<td>/ChB</td>
</tr>
<tr>
<td>7</td>
<td>No conn</td>
</tr>
<tr>
<td>8*</td>
<td>ChC</td>
</tr>
<tr>
<td>9*</td>
<td>/ChC</td>
</tr>
</tbody>
</table>

Encoders with Open collector channel outputs (or single ended outputs) are not directly usable.

Illustration of 90° quadrature for direction sensing
CHA leads CHB for CW rotation facing shaft end

Test the encoder power supply at this point. Reference it to common at pin 10, 20 or 40.
5) If you had a 1024PPR encoder on a motor that you intended to run at 1675 RPM you could calculate the following frequency.

- Frequency = (Encoder PPR/60) x (Motor Speed)
- Frequency = (1024/60) x (1675)
- Frequency = 28.59 KHz

6) #13.04 reads the encoder input. If the motor is rotated by hand the values in this parameter should change. If they do not there could be an encoder problem. The value in parameter #13.04 is calculated by the formula below shown on the next page.

\[
#13.04 = \frac{\text{Motor RPM} \times \text{Encoder PPR} \times 4 \times 2.56}{(60 \times 1000)}
\]

**Example:** A motor rotating at 1675 RPM with a 1024PPR encoder wired to the drive would yield the following value at #13.04

\[
#13.04 = \frac{1675 \text{rpm} \times 1024 \text{ppr} \times 4 \times 2.56}{(60 \times 1000)} = \frac{175,636,648}{60000} = 293
\]

7) The drive could be put into AVF as discussed on page 1 of this document. #13.04 will still read the encoder input even if the drive is in voltage regulation (AVF). Using the examples from 5 and 6 above when the motor is at 1675 RPM your encoder signal should be at 25.6 KHz and #13.04 should read 293. Check these values using your encoder/motor nameplate data.

**Americas Service Center 1-800-367-8067**

**Questions ?? Ask the Author:**

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