DESCRIPTION

Horton VMaster Ultra (Stratis) Viscous Fan Drive Troubleshooting Guide
Engine feature code 12THX

GENERAL OPERATION (ALL ENGINES)

- Horton VMaster is a variable speed drive. It does not function like an on/off drive. Even when the drive is off the fan will spin between 50-300 rpm.
- When drive is commanded off by ECU, fan speed should be 50 to 300 rpm.
- When drive is commanded on by ECU, fan speed should be approximately 125% of the engine speed.
  - Example: At 2100 engine rpm x 1.25 fan drive ratio, the fully engaged fan speed should be approximately between 2490 and 2600 rpm
- After first start of the day (A/C in off position) Time for fan to disengage
  - At high idle (2100 engine rpm), disengagement may take up to 2 minutes after disengagement command, depending on the ambient temperature
  - At low idle (600 engine rpm), disengagement occurs approximately 25 to 30 minutes after disengagement command.
- Warm truck (A/C in off position) Time for fan to disengage
  - At high idle (2100 engine rpm), disengagement occurs approximately 20 seconds after disengagement command.
  - At low idle (600 engine rpm), disengagement occurs approximately 25 to 30 minutes after disengagement command.
- Caution: This fan clutch has left hand threads.

TROUBLESHOOTING

1. Visual Inspection
   - Check for rubbing on wire.
   - If rubbing is present and inside wires are visible, but no copper is visible apply heat shrink over the harness.
   - If copper can be seen, check to see if it is only one single wire, or multiple wires.
     - If it is one wire, place electrical tape over the wire.
     - Using 4:1 heat shrink will allow the heat shrink tubing to pass over the connector as shown. P/N: ZBJE849565 or equivalent
- If multiple wires are showing copper, remove and replace the fan hub assembly.
  - Reroute the wiring harness as outlined in [IK0900071](#).
    - Check to see if ARB is touching the target wheel. Refer to Picture 1 and Picture 2.
      - If it is touching, reposition ARB to clear the target wheel as shown in Picture 1.
    - Check to see if the target wheel is loose, moves, or spins freely.
      - If it is loose, moves, or spins freely replace the fan hub assembly.
    - An improperly positioned ARB or loose target wheel can cause the damage in Picture 4.
  - Pull / Push on fan - refer to Picture 5.
    - Rotating the fan by hand, the hub should provide a smooth and consistent resistance.
      - If it rotates freely approximately 1" or more before resistance is felt, replace the fan hub assembly.
    - If you have any questions on this process, call Horton customer service at 1 (800) 621-1320 for assistance.

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![Picture 1](image1.png)

**Bracket Not Rubbing**

![Picture 2](image2.png)

**Bracket Rubbing**

![Picture 3](image3.png)

![Picture 4](image4.png)
2. Electrical Inspection
   - Ensure the truck is turned off and the key is removed from the ignition.
   - Unplug the fan hub from the chassis connector.
   - Using a digital multimeter, measure the resistance between pins on the fan hub Deutsch connector.
     - Terminal 1 to Terminal 2 (1-2) Spec ( >1MΩ )
     - If it fails this test, use In Line Device (ILD) shown in photo. This failure is usually associated with a 3512 code.
     - Terminal 1 to Terminal 3 (1-3) Spec ( 6Ω to 16Ω )
     - Terminal 2 to Terminal 5 (2-5) Spec ( 2.5KΩ to 4KΩ )
     - If it fails this test, replace the fan hub assembly.
   - Double check any resistance that are out of spec to ensure an accurate reading.

<table>
<thead>
<tr>
<th>SPN</th>
<th>FMI</th>
<th>DESCRIPTION</th>
<th>REPAIR PROCEDURE</th>
</tr>
</thead>
<tbody>
<tr>
<td>647</td>
<td>3</td>
<td>EFC Short to PWR</td>
<td>Check coil resistance.</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>EFC Short to GND</td>
<td>Spec 6Ω to 16Ω.</td>
</tr>
<tr>
<td>1639</td>
<td>5</td>
<td>EFC Open Load / Circuit</td>
<td>Replace fan hub assembly if out of spec.</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>EFS Unrealistically HIGH</td>
<td>Do not replace the fan hub assembly.</td>
</tr>
<tr>
<td>1639</td>
<td>4</td>
<td>EFS Unrealistically LOW</td>
<td>Update ECM calibration to 3.5.4 or later.</td>
</tr>
<tr>
<td>3512</td>
<td>8</td>
<td>EFS Frequency Signal Error</td>
<td>Install Horton ILD (In Line Device) PIN 800922R91</td>
</tr>
<tr>
<td></td>
<td>14</td>
<td>VREF4 Voltage Deviation</td>
<td>Replace fan hub assembly if both codes 647 and 647 are present. EPA10 only.</td>
</tr>
</tbody>
</table>

3. Functional Test
   - Manually apply 12 volts to Pin 3 and Ground to Pin 1, checking fan operation. It should be disengaged. Some surging may be normal depending on the temperature of the fan hub.
   - Bring engine to operating temperature. 175°F-180°F.
   - Connect with ServiceMaxx and perform "Engine Fan Test".
   - The entire test (5 test points) must be recorded and submitted with the warranty claim.
   - If the visual, electrical and functional tests all check OK, the fan hub is not the cause of the customer complaint. Do NOT replace the fan hub.

OPERATION
   - The default state of the fan is ON. Ground is required to turn the fan OFF.
   - ECM C1-18 controls the fan by supplying a Ground PWM signal.
   - ECM C1-58 is feedback for the fan speed.
This fan hub is controlled by the EIM using a Pulse Width Modulated (PWM) control. 100% duty cycle indicates the fan is off. The lower the duty cycle the faster the fan operates.

- Desired Fan Speed and Actual Fan Speed may not always match due to the fan speed to engine ratio and normal viscous delays.
- The fan hub may seem to surge or operate erratically. This may be normal operation.
- The fan may be commanded on for a data link message from other modules, such as A/C demand or Transmission temperature.
- Any engine temperature sensor input to the ECM can cause the EIM to turn the fan on.

**TROUBLESHOOTING**

- Perform the visual inspection on the harness as shown in the section above.
- The "Engine Fan Test" is not available for the EPA07 engine.
- Manually apply 12 volts to Pin 3 and Ground to Pin 1, checking fan operation. It should be disengaged. Some surging may be normal depending on the temperature of the fan hub.
- Open a Programming session in ServiceMaxx and view the Engine Fan tab to monitor signals.
OPERATION

- The default state of the fan is ON. B+ is needed to turn the fan OFF.
- EIM X1-18 controls the fan by supplying a B+ PWM signal.
- EIM X2-2 is feedback for the fan speed.
International® MAXXFORCE® 11 and 13
2008 Model Year

EIM Connector
X1-X4

X1-14
X1-18
X2-2
X1-6

Variable Electronic Fan Control

VREF
EFAN
EFANS
SIG GND

Horton Fan

NOTE: Schematic was taken from EGED430 - 09/17/2013

EPA07 Chassis Connector 6420 Backside
EPA07 Chassis Connector 6420 Front side
Fan Hub Assembly Connector