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General Information

Description

The Chandler Engineering Inline (Flow-Thru) Viscometer is a low pressure couette (cup/bob) viscometer for real time measurement of oilfield fluids during treatments. The instrument is connected in a sample line from the clean fluid delivery line.

The viscometer measures viscosity at the standard 511 sec\(^{-1}\) using the API standard R1 rotor, B1 bob, and F1 spring. The spring is calibrated to provide 1 degree of rotation per 1 centipoise of viscosity.

Clean fluid flows into the instrument, where a specially designed rotor (cup) pulls fluid into the gap between the rotor and the bob, when the rotor is turning. This design feature allows the instrument to measure continuously at a constant sample rate while being insensitive to flow rate through the instrument. Fluid in the gap is sheared producing a torque on the bob. This torque is transmitted to the resisting spring using a magnetic drive. The magnetic drive not only mechanically supports the bob but allows the torque to be transmitted without shaft seals. The bob rotation is measured with a high precision encoder. The encoder signal is then scaled to viscosity.

Optional filter system and pH measurement system are available.

Features and Benefits

- Based on API geometry.
- Standard analog 4-20mA signals for data acquisition.
- Easy to set-up, easy to operate, easy to clean and maintain.
- Broad range of sensitivity/scalability through the use of different rotor/bob and spring combinations to accommodate a wide variety of fluid types.
- 12 VDC power for field operation.
- Meets IP67 for outdoor environment.
Specifications

Pressure Range: 100 PSIG
Temperature Range: 32°F – 160°F
Flowrate: 1-5 gpm
Viscosity Range: 0-160 cP
Input Voltage: 12VDC
Power: 6 A @ 12VDC
Dimensions: 13.5” x 17” x 20”
Net Weight: 56 lbs. (36 kg)
Operating Speed: 300 RPM (511 sec⁻¹)
Connections: Quick couplings with ½” NPT threads
Signal: 4-20 mA @ 600 ohms max
Safety Requirements

READ BEFORE ATTEMPTING OPERATION OF INSTRUMENT

The Chandler Engineering Flow-Thru Viscometer is designed for operator safety. However, the instrument should be handled by personnel that have the appropriate safety training.

To ensure safety:

- Use appropriate Personal Protective Equipment such as safety glasses, latex gloves, etc.
- Use proper lifting techniques when moving instrument.
- Read and understand instructions before attempting instrument operation.
- Observe caution notes!
- Observe and follow the warning labels on the instrument.
- Never exceed the instrument maximum pressure and temperature ratings.
- Always disconnect main power to the instrument before attempting any repair.

Before attempting to operate the instrument, the operator should read and understand this manual.

Where to Find Help

In the event of problems, contact your local sales representative or Chandler Engineering:

- Telephone: 918-250-7200
- Fax: 918-459-0165
- E-mail: sales@chandlereng.com
- Website: www.chandlereng.com

Instrument training classes are also available.
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Section 1 – Installation

Unpacking the Instrument

Remove the instrument from the packing crate carefully. The unit comes fully equipped with all the necessary components and ordered spare parts. Make sure that no parts are lost when discarding the packing materials. Place the instrument on a firm table, close to the required service connections.

After the instrument is removed from the shipping crate, the equipment and spare parts should be checked against the packing list to ensure that all parts have been received and none are damaged.

*Note: File an insurance claim with your freight carrier if damage has occurred during shipping. Verify all parts shown on the enclosed packing list have been received. If items are missing, immediately notify Chandler Engineering.*

Utilities Required

12VDC @ 6 amps

Tools/Equipment Required

Pipe Wrench
Allen Wrench Set
#2 Phillips Head Screwdriver
Flat Blade Screwdriver
**Instrument Preparation**

1. The viscometer is configured for portable or permanent installation.
2. The electronics enclosure is provided with 6 feet of instrument cable for remote mounting the operator interface in a more convenient location.
3. The instrument is provided with 2 quick couplings with ½” NPT threads for fluid connections. Connect the fluid delivery line from a clean fluid pressure source (such as the clean side blender centrifugal) to the lower viscometer port (or the filter system if equipped). Connect the return line from the upper port fitting on the viscometer to the return gel tank or the suction side of the clean side centrifugal.
4. The instrument requires 12 VDC power at a maximum current of 6 amps. A bare wire lead cable is provided for wiring a power cable. Connect the power cable as indicated:
   - GRN (Chassis Ground)
   - Red/Blk (0 VDC)
   - Red/Wht (12 VDC)
5. The instrument provides (2) 4-20mA outputs, one for viscosity and one for temperature. The viscosity signal is a self-powered, single ended 4-20mA current source.

   **Warning:** *Do not connect the viscosity signal to a circuit which provide power over the current loop. The transmitter provides its own power.*

   The temperature signal is a DC loop powered 4-20ma current. The viscosity output is calibrated for 4mA (0 cP) and 20mA (160 cP). The temperature output is calibrated for 4mA (0°F) and 20ma (200°F).

<table>
<thead>
<tr>
<th>Wire</th>
<th>Signal Type</th>
<th>Signal Variable</th>
<th>Max Load</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wht</td>
<td>4-20 mA</td>
<td>Viscosity</td>
<td>600 ohms</td>
<td>0-160 cP</td>
</tr>
<tr>
<td>Blk</td>
<td>Gnd</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wht</td>
<td>+12-30 VDC</td>
<td>Temperature</td>
<td>600 ohms</td>
<td>0-200°F</td>
</tr>
<tr>
<td>Blk</td>
<td>4-20mA</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note:** *The instrument is tested and calibrated at the factory before shipment, but it is recommended that the calibration is checked before first use. See the Maintenance Section of this manual for calibration instructions.*
Section 2 – Operating Instructions

Test Preparation

1. Locate the Instrument on a level surface and make all fluid and power connections.

2. Turn the instrument ON (Green LED will be on).

   *Note: Turning ON the instrument power will automatically zero the encoder. Therefore, the fluid input valve should be closed and no fluid should be flowing through the instrument.*

3. When ready to take measurements, open fluid inlet valve and turn on motor switch.

   *Note: The red LED light, if on, indicates a fault with the motor controller.*

Test Completion and Clean-up

1. Circulate clean water through the viscometer to flush out treatment fluid.

2. Drain all fluid from the viscometer.

3. For good measurement practice, the viscometer should be hand cleaned after every use. First, disconnect the encoder cable and unthread the large coupling nut to remove the measurement head.

   *Note: The measurement head has an O-ring seal and will be tight during removal.*

4. Carefully remove the measurement head.
5. Carefully wipe dry the inside of the viscometer and the bob.
6. Reinstall measurement head onto viscometer.
Section 3 - Maintenance

Cleaning

1. Drain all fluid from the viscometer.

2. For good measurement practice, the viscometer should be hand cleaned periodically to remove fluid contamination. First, disconnect the encoder cable and unthread the large coupling nut to remove the measurement head.

3. Carefully remove the measurement head.

Note: The measurement head has an O-ring seal and will be tight during removal.

4. Carefully wipe dry the inside of the viscometer and the bob.
5. Unthread the retaining nut and pull bob assembly out of measurement head. The bob assembly is held magnetically.

*Caution: Do not place the bob assembly near magnetic materials because of the strong magnets.*

6. Clean and wipe any residue from the bob assembly. Be careful not to scratch the bob or shaft as this will cause measurement error. Flush the internal cavity of the assembly and use a nylon pipe cleaner, if necessary, to clean all residue.

7. Reinsert the bob assembly into the measurement head and tighten the plastic nut.

8. Before installing the measurement head back onto the viscometer, clean the vessel with a hose to remove any remaining fluid. Clean and wipe interior surface of rotor to remove any residue. If required, the rotor assembly can be removed for further cleaning. First unthread the coupling nut for the motor.
9. After cleaning rotor assembly, reinstall into viscometer using threaded nut.
10. Reinstall measurement head onto viscometer and connect encoder cable.

**Calibration**

*Checking Calibration*

1. Calibration should be checked prior to every use with a known clean calibration fluid, preferably, use a 100cP calibration oil.
2. First, plug or close off inlet to the viscometer. Fill viscometer with the calibration fluid from the outlet of the viscometer using a 6” standpipe to ensure that the instrument is completely full of fluid.
3. Connect instrument to 12 VDC power source and turn on power to instrument.
4. Turn motor on and check viscosity against the known value. Viscosity should read within 2cP of the known value. (Lightly tapping on the viscometer will improve the measurement.) Generally, a large error in reading may indicate something is mechanically wrong with the instrument.
5. Drain the calibration fluid from the viscometer and clean, if necessary.

*Mechanical Calibration*

1. Attach or clamp calibration bracket to viscometer frame or suitable support.
2. Check level and adjust as required.
3. Remove viscometer measuring head assembly and mount to calibration bracket.
4. Supply 12 VDC to viscometer electronics.
5. Using the 10 gram weight, insert the bead into the hole on the mag drive and hang the weight over the pulley, the string should run in the groove on the mag drive.
6. Record the reading.

7. Repeat the process using the 20 gram weight.

8. Refer to the tables below for the reading limits during spring calibration. Adjust spring tension using the following steps.
   a) Remove threaded cap from measuring head.
   b) Loosen the two set screws on the spring mandrel.
   c) Using a screwdriver turn the spring mandrel clockwise to decrease the reading or counterclockwise to increase the reading.
   d) Retighten set screws. Note that the mechanical stop is spaced slightly away from encoder reader when tightening set screws.

<table>
<thead>
<tr>
<th>Weight (grams)</th>
<th>Value</th>
<th>Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0.0±1.0</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>50.0±2.0</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>100.0±2.0</td>
<td></td>
</tr>
</tbody>
</table>
Torsion Spring Assembly

The Flow-Thru Viscometer uses a standard F1 spring assembly.

**Replacement of Spring Assembly**

1. Unthread top cap and loosen set screws at the top of the brass spring clamp.

2. Remove screws from spring housing and remove spring housing.

3. Loosen set screws along top row of spring holder and remove spring.

4. Install new spring and reassemble. Recalibrate.
Encoder Assembly

*Replacement of the Encoder/Bearings*

1. Remove screws at the top of the measurement head. Carefully, remove the encoder/spring assembly from the measurement head. The encoder/spring assembly is sealed with an O-ring.

2. With the encoder mechanism exposed, the assembly must be handled carefully to avoid damage to the components. Use caution when handling the assembly due to the strong magnets.

3. Remove the two screws holding the encoder reader to the underside of the cap. Caution, the mag drive will attract the screwdriver.
4. Unthread top cap and loosen set screws at top of spring assembly.
5. Remove screws from spring housing and remove spring housing.
6. Loosen set screws along the bottom of the spring holder and remove from shaft.

7. Remove the mag drive from the bearings.

8. Remove bearing retainers from each end of the housing and push out bearings. Check bearings for friction by lightly spinning by hand. The bearings should spin freely. Replace any bad bearings.

Caution: Bearings must be clean and dry. Do not oil or allow bearings to come into close contact with magnets, as this will magnetize the bearings, and ruin them.
9. The encoder can be removed from the mag drive shaft by loosening the 2 screws.
10. Reassemble and recalibrate.

**Rotor Assembly**

*Replacement of Rotor Seal/Bearings*

1. First unthread the large coupling nut for the motor.

2. Remove two screws which attach the rotor to the shaft.
3. Remove screws holder motor flange to the bearing housing.

4. Unthread bearing retainer and remove shaft and bearing assembly. Remove shaft seal.
5. Inspect bearings and seal and replace, if required. Reassemble.

Bob Assembly

Replacement of Bob Shaft Bearings

1. The bob shaft runs in two glass journal bearings. One is located at each end of the bob shaft. Carefully remove the measurement head.

Note: The measurement head has an O-ring seal and will be tight during removal.

2. Remove the bob assembly by unthreading the plastic retaining nut.
3. Pull the bob assembly out of the measurement head. The bob assembly is held magnetically.

_Caution: Do not place the bob assembly near magnetic materials because of the strong magnets._

4. Loosen the set screw on the bob and remove the bob from the shaft. Slide the retainer off the shaft.

5. Remove the threaded ring and push the glass bearing out of the retainer.

6. Remove screws at the top of the measurement head. Carefully, remove the encoder/spring assembly from the measurement head. The encoder/spring assembly is sealed with an O-ring.

7. Remove the threaded retaining nut in the top of the measurement head housing.

8. Remove the threaded ring and push the glass bearing out of the retainer.

9. Reassemble the instrument.
Maintenance Schedule

The Flow-Thru Viscometer is designed for infrequent and easy maintenance. Generally, maintenance is not required unless performance of the instrument indicates a problem such as large errors, large hysteresis values, or large offsets. Below is a list of items that are likely to require service over the life of the instrument. The frequency listed below is only intended as an initial guide. Service frequency and usable life of each component is highly dependent on the severity of testing and the frequency of use.

<table>
<thead>
<tr>
<th>COMPONENT</th>
<th>EACH TEST</th>
<th>MONTHLY</th>
<th>3 MONTHS</th>
<th>6 MONTHS</th>
<th>ANNUAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rotor</td>
<td>Clean</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bob</td>
<td>Clean</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rotary Seal</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Replace as needed</td>
</tr>
<tr>
<td>O-rings</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Replace as needed</td>
</tr>
<tr>
<td>Calibration</td>
<td>Check</td>
<td></td>
<td></td>
<td>Calibrate as required</td>
<td></td>
</tr>
<tr>
<td>Encoder Bearings</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Replace as needed</td>
</tr>
<tr>
<td>Rotor Bearings</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Replace</td>
</tr>
<tr>
<td>Thermocouples</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Calibrate</td>
</tr>
</tbody>
</table>
## Section 4 – Troubleshooting Guide

<table>
<thead>
<tr>
<th>Problem</th>
<th>Solution</th>
</tr>
</thead>
</table>
| **Instrument does not operate when power switch is ON.** | • Check utility circuit.  
• Check the fuses.  
• Bad 12/24VDC converter. |
| **Fluid leak at rotor nut.** | • Check the O-ring at the rotor housing.  
• Check the rotor shaft seal. |
| **No communication with the computer.** | • Check communication cables and verify that they are all plugged into the correct ports.  
• Be sure that the instrument is ON before the software is started.  
• Shut down and restart the PC with the instrument ON. |
| **Noise or grinding when rotating, that amplifies as the speed increases.** | • Grease or replace rotor bearings. Refer to drawing Replacement of Rotor Bearings section of this manual. |
| **Large viscosity errors.** | • Calibration.  
• Damaged bob shaft bearings or bob shaft.  
• Damaged torsion spring.  
• Contaminated encoder bearings.  
• Bad Encoder. |
| **No Viscosity reading.** | • Check that the encoder cable is connected.  
• Bad encoder. |
| **Motor fault light.** | • Read code from motor drive, fault codes are observed from the blinking LED located on the motor drive inside the electronics cabinet |

### Motor Controller Codes

<table>
<thead>
<tr>
<th>Code</th>
<th>Error</th>
<th>Cause</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 red, 1 green</td>
<td>Drive overheating</td>
<td></td>
</tr>
<tr>
<td>3 red, 2 green</td>
<td>Internal voltage bad</td>
<td>Bad motor drive</td>
</tr>
<tr>
<td>4 red, 1 green</td>
<td>Overvoltage</td>
<td>Check power supply</td>
</tr>
<tr>
<td>4 red, 2 green</td>
<td>Undervoltage</td>
<td>Check power supply, cables</td>
</tr>
<tr>
<td>5 red, 1 green</td>
<td>Short circuit</td>
<td>Check motor resistance</td>
</tr>
<tr>
<td>5 red, 2 green</td>
<td>Motor resistance out of range</td>
<td>Check motor, cable</td>
</tr>
<tr>
<td>6 red, 1 green</td>
<td>Open motor winding</td>
<td>Check motor, cable</td>
</tr>
</tbody>
</table>
This page is intentionally left blank.
## Section 5 – Replacement Parts

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>103823</td>
<td>Filter Assembly, Field Viscometer</td>
</tr>
<tr>
<td>104167</td>
<td>PH Probe Assy, Signet Inline</td>
</tr>
<tr>
<td>104213</td>
<td>Hose Kit, 3/4&quot; Inline Viscometer</td>
</tr>
<tr>
<td>188-07566</td>
<td>Screw, Set, 6-32 x 0.5, Dog</td>
</tr>
<tr>
<td>3330-0010</td>
<td>Viscometer Assembly</td>
</tr>
<tr>
<td>3330-0011</td>
<td>Rotor Assy, Visc, Flow-Thru</td>
</tr>
<tr>
<td>3330-0012</td>
<td>Head Assembly</td>
</tr>
<tr>
<td>3330-0013</td>
<td>Encoder/Spring Mechanism</td>
</tr>
<tr>
<td>3330-0017</td>
<td>Mag Drive, Outer</td>
</tr>
<tr>
<td>3330-0018</td>
<td>Mag Drive, Inner</td>
</tr>
<tr>
<td>3330-0101</td>
<td>Rotor, R1, Flow-Thru Viscometer</td>
</tr>
<tr>
<td>3330-0111</td>
<td>Housing, Jewel Bearing, Lower</td>
</tr>
<tr>
<td>3330-0112</td>
<td>Retainer, Jewel Bearing, Upper</td>
</tr>
<tr>
<td>3330-0145</td>
<td>Bob, B1</td>
</tr>
<tr>
<td>3330-0158</td>
<td>Gasket, Display Window</td>
</tr>
<tr>
<td>35-0166</td>
<td>Spring Assembly, F1</td>
</tr>
<tr>
<td>C07864</td>
<td>Retainer, Jewel Bearing</td>
</tr>
<tr>
<td>C09833</td>
<td>Oring, Viton, 2-137-V75</td>
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<tr>
<td>C10238</td>
<td>Oring, Viton, AS141-V75</td>
</tr>
<tr>
<td>C10534</td>
<td>Disk, Encoder, 2&quot; x 3/4 Hub</td>
</tr>
<tr>
<td>C10697</td>
<td>#12 Hose Clamp</td>
</tr>
<tr>
<td>C10874</td>
<td>Bal Seal</td>
</tr>
<tr>
<td>C11289</td>
<td>Bearing, 6x15x5 SS</td>
</tr>
<tr>
<td>C12407</td>
<td>Jewel Bearing, 0.25&quot; Olive Hole</td>
</tr>
<tr>
<td>C12524</td>
<td>Oring, Viton, AS248-V75</td>
</tr>
<tr>
<td>C13027</td>
<td>Indicator, Led, 24VDC, Green</td>
</tr>
<tr>
<td>C13068</td>
<td>Indicator, Led, 24VDC, Red</td>
</tr>
<tr>
<td>C13085</td>
<td>Oring, Viton, AS031-75D</td>
</tr>
<tr>
<td>C15752</td>
<td>Shaft, 6mm x 45mm, Ground</td>
</tr>
<tr>
<td>C15871</td>
<td>Chem Hose, 1/2&quot; ID, 500psi</td>
</tr>
<tr>
<td>C15893</td>
<td>Cable, 3-Cond, 16ga, Fem/Leads</td>
</tr>
<tr>
<td>H-10-107</td>
<td>Screw, SHCS, SS, 10-32 x 0.50</td>
</tr>
<tr>
<td>H-10-119</td>
<td>Screw, SHCS, SS, 10-32 x 1.000, Aln</td>
</tr>
<tr>
<td>H-10-125</td>
<td>Screw, SHCS, SS, 10-32 x 0.750, Al</td>
</tr>
<tr>
<td>H-6016</td>
<td>Screw, FH-Phillips, 6-32 x 3/8, SS</td>
</tr>
<tr>
<td>P-1845</td>
<td>Ring, Retaining, Ext, 1/2&quot; Shaft</td>
</tr>
<tr>
<td>ZC12333</td>
<td>Brg, Ball, Sealed 0.5 X 1.125</td>
</tr>
<tr>
<td>ZC12411</td>
<td>TC, K-Type, 1/4 mpt</td>
</tr>
</tbody>
</table>
## Section 6 - Drawings and Schematics

<table>
<thead>
<tr>
<th>Drawing Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>3330</td>
<td>Viscometer System</td>
</tr>
<tr>
<td>3330-0010</td>
<td>Viscometer Assembly</td>
</tr>
<tr>
<td>3330-0011</td>
<td>Rotor Assembly</td>
</tr>
<tr>
<td>3330-0012</td>
<td>Head Assembly</td>
</tr>
<tr>
<td>3330-0013</td>
<td>Encoder/Spring Assembly</td>
</tr>
<tr>
<td>3330-0030</td>
<td>Electronics Assembly</td>
</tr>
<tr>
<td>3330-0031</td>
<td>Wiring Diagram</td>
</tr>
</tbody>
</table>
NOTES:
1. APPLY TEFLON TAPE TO PIPE THREADS.
2. COMPLETE WIRING PER DRAWING 3330-0031.

REV DESCRIPTION DATE APPROVED

A ECN T5582; PRODUCT LAUNCH 10/30/2013 TC
B ECN T6887; ADD REF DOCS, ITEM 13,14,15 10/15/2015 PN

ITEM PART NUMBER DESCRIPTION QTY.
3330-OM MANUAL, OPERATOR REF 1
3330-TP PROC, TEST REF 1
3330-0009 FRAME ASSEMBLY 1
3330-0010 VISCOMETER ASSEMBLY 13
3330-0030 ELECTRONICS ASSEMBLY 14
ZC12411 TC, K-TYPE, 1/4MPT 1
C13639 NIPPLE, SS, 1/2MPX2LG, SCH40 4
P-1502 VALVE, BALL, SS, 1/2FNPTX1/2FNPT, 2WAY STR 1
C15050 ELBOW, SS, 1/2NPT, 316 1
103832 QUICK COUPLING 29
C15893 CABLE, 3-COND, 16GA, FEM/LEADS 1
3330-ACCESS ACCESSORIES, VISCOMETER 111
C11771 CABLE, 5-PIN, FEM W/ LEADS, 2M 112
H-10-107 SCREW, SHCS, SS, 10-32X0.50 4
3330-0032 CABLE ASSEM, SIGNAL, INLINE VISCOMETER 2
3330-0171 CASE, TRANSPORT, IN LINE VISCOMETER 1
C17049 HOSE, CHEM, 3/4, 500PSI, 1/2MPT, 25FT 2
NOTES:
1. APPLY ANTI-SEIZE COMPOUND TO THREADS
2. APPLY GREASE TO SHAFT SURFACE

SEE NOTE 1

SEE NOTE 2

APPLY ANTI-SEIZE COMPOUND TO THREADS
APPLY GREASE TO SHAFT SURFACE
NOTES:
1. CLEAN AND DEGREASE INTERIOR SURFACES OF HOUSING PRIOR TO INSTALLING ENCODER ASSEMBLY TO REMOVE CONTAMINATION.
2. SCREWS MUST BE BRASS TO AVOID MAGNETIC INTERFERENCE.

<table>
<thead>
<tr>
<th>ITEM</th>
<th>PART NUMBER</th>
<th>DESCRIPTION</th>
<th>QTY</th>
</tr>
</thead>
<tbody>
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<td>HOUSING, HEAD ASSEMBLY</td>
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<td>ENCODER/SPRING MECHANISM</td>
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<td>HOUSING, JEWEL BEARING, LOWER</td>
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<td>SCREW, SET, 6-32 X 0.5, DOG</td>
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<td>O-RING, AS018-70</td>
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<td>SCREW, SHCS, SS, 6-32X0.375 ALLEN</td>
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SEE NOTE 2

SECTION A-A

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NOTES:
1. CLEAN ALL METAL SURFACES PRIOR TO ASSEMBLY WITH DEGREASER TO REMOVE CONTAMINANTS.
2. INSTALL SHAFT INTO MAG DRIVE WITH SET SCREW.
3. INSTALL ENCODER DISK ONTO MAG DRIVE. REMOVE SET SCREWS AND USE MACHINE SCREWS TO LOCK DOWN ENCODER DISK.
4. INSTALL BEARINGS INTO BEARING HOUSING. BEARINGS MUST BE CLEAN AND SHOULD SPIN FREELY BY HAND.
5. KEEP BEARINGS AWAY FROM MAGNETS TO PREVENT MAGNETIZATION.
6. INSTALL BEARING RETAINERS AND INSTALL MAG DRIVE ASSEMBLY INTO BEARING HOUSING.
7. ASSEMBLE SPRING HOLDER TO SPRING ASSEMBLY AND MAG DRIVE SHAFT USING SET SCREWS.
8. INSTALL SPRING HOUSING AND SPRING CLAMP.
9. INSTALL OPTICAL ENCODER. INSTALL CONNECTOR AND ROUTE WIRES AS SHOWN.
10. FOLLOW CALIBRATION PROCEDURE 3330-TP TO SET FINAL POSITION OF SPRING.
11. INSTALL O-RING AND SPRING HOUSING CAP.

ITEM PART NUMBER DESCRIPTION QTY
1. 3330-0115 MOUNT, ENCODER 1
2. 35-0166 SPRING ASSEMBLY, F1 1
3. 3330-0133 HOLDER, SPRING ASSEMBLY 1
4. 3330-0134 HOUSING, SPRING ASSEMBLY 1
5. 3330-0135 CAP, SPRING ASSEMBLY 1
6. 3330-0017 MAG DRIVE, OUTER 1
7. C10534 DISK, ENCODER, 2" X 3/4 HUB, 2048 CPR 1
8. C10533 ENCODER, OPTICAL, 2 CH, 2" DISK 1
9. 3330-0144 SPACER, BEARING, ENCODER 1
10. H-3008 SCREW, FHMSSS, 3-48 X .625, PHIL 2
11. 3330-0132 CLAMP, ADJ, TORSION SPRING 1
12. C11304 SCREW, RHMS, SS, 3-48X0.62 2
13. C11289 BEARING, 6X15X5 SS 2
14. 3330-0168 RETAINER, ENCODER BEARING 2
15. C10722 CONNECTOR, AMP, 5-PIN LOCKING 1
16. 70612-09 SCREW, SHCS, SS, 4-40X0.250, ALLEN 4
17. C12316 RCPT, TURCK, FS4.5-05/14.5 1
18. C15752 SHAFT, 6MMX45MM, GROUND 1
19. 71-125-1500 SCREW, SKHSS, SS, 8-32X0.187, CUP 10
20. H-4107 SCREW, FHMS, SS, 4-40 X .375, PHIL 4
21. C13085 ORING, VITON, AS031-75D 1
22. C12524 ORING, VITON, AS248-V75 1
23. H-6009 SCREW, BHMS, SS, 6-32 X 0.25 2
24. C10723 PIN, CRIMP, 22-26AWG, AMP 5

REV DESCRIPTION DATE APPROVED
A ECN T5582; PRODUCT LAUNCH 11/1/2013 TC
NOTES:
1. MOUNT PANEL TO INSIDE OF ENCLOSURE WITH HARDWARE SUPPLIED.
2. KEEP REMAINING HARDWARE FOR FINAL ASSEMBLY.
3. MATCH DRILL .1360 (#29) AND TAP 8-32UNC THROUGH PANEL TO ATTACH MOUNTING RAIL.
4. LEAVE 5 FT FREE CABLE LENGTH MINIMUM.
5. REFER TO 3330-0031 FOR WIRING DIAGRAM.
6. APPLY RTV TO BACK OF PLATE.

SEE NOTE 4

SEE NOTE 3

REFERENCE 3330-0031 FOR WIRING DIAGRAM.

APPLY RTV TO BACK OF PLATE.