

**A HILLIARD CORPORATION  
FIELD INSPECTION PROCEDURE  
FOR OVERRUNNING CLUTCH  
FOR HYDRAULIC STARTER DRIVE**



**Hilliard**

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## 1.0 FOREWARD

Hilliard recommends periodic inspection and overhaul of the special overrunning clutch. Inspection is recommended every 8,000 to 10,000 hours of turbine operation without clutch condition monitoring\*\*. An inspection overhaul should be performed every 20,000 to 25,000 hours of turbine operation. It is recommended that the unit be returned to the factory for inspection overhaul and test. However the following instructions will serve as a guide for inspection of the unit on site. Refer to the clutch drive assembly and outline drawings.

(\*\* Clutch Condition Monitoring – a speed probe and/or RTD is used on the overrunning clutch to monitor clutch. Speed probe and/or RTD is incorporated into turbine control system with appropriate alarms and shutdowns.

## 2.0 INSPECTION PROCEDURE

Attachment A is a Clutch Inspection/Return Questionnaire. This form should be filled out completely at the time of inspection/return.

See the section on Seal Inspection for recommended inspection procedure prior to removing clutch from the engine.

### 2.1 PIPING AND CONNECTIONS:

Disconnect all piping and remove the clutch drive from engine and move the clutch to a clean work area. The strainer in the oil drain line should be inspected for any signs of debris. The presence of debris may be an indication of internal problems with the clutch drive.

Note: In removing the oil inlet/outlet piping from the clutch drive it is important to look for any indications of debris in the clutch ports and piping.

### 2.2 CLUTCH DRIVE CASING:

Visually inspect the external appearance of the clutch drive. The paint should be inspected for blistering and discoloration due to heat deterioration. These could be signs of improper oil flow in the clutch resulting in clutch damage.

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### 2.3 SHAFT ROTATION CHECK:

Once the clutch drive has been moved to a clean work area the clutch drive input (motor side – figure 1) and output (AGB side – figure 2) shafts should be rotated by hand in both directions. The shafts should spin freely. No bearing roughness should be evident. A dial indicator can be used to check for excessive radial and axial movement of the shafts. Radial movement larger than .005" (0.13 mm) and axial movement greater than .060" (1.52mm) may be an indication of internal problems with the clutch drive.



Figure 1  
Clutch Drive Input Shaft



Figure 2  
Clutch Drive Output Shaft

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## 2.4 SHAFT ENGAGEMENT CHECK:

Hold the input shaft of the clutch drive and rotate the output shaft by hand. The output shaft should rotate freely in the counter-clockwise direction (see figure 3) as viewed from the AGB side. Any roughness encountered may indicate internal clutch problems. The output shaft should engage when rotated by hand in the clockwise direction. Failure of the clutch to engage indicates internal clutch problems.

Hold the output shaft of the clutch drive and rotate the input shaft by hand. The input shaft should engage in the clockwise direction (see figure 4) as viewed from the hydraulic motor side. Failure of the clutch to engage indicates internal clutch problems.



Figure 3

Free rotation of the output shaft in the CCW direction. (Input shaft held tight)



Figure 4

Engaging direction of the input shaft in the CW direction. (Output shaft held tight)

### NOTE:

On model 6601-01-118-D, directions of rotation are opposite what is listed above. I.e. the output side should rotate freely in the CLOCKWISE direction when the input shaft if held, and engage when rotated COUNTERCLOCKWISE.

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## 2.5 SPLINE CHECK:

The input (figure 5) and output (figure 6) spline should be checked for damage. Splines should be checked for fretting, wear, corrosion, and impact damage. Damage to the splines may indicate installation problems that could result in internal clutch damage.

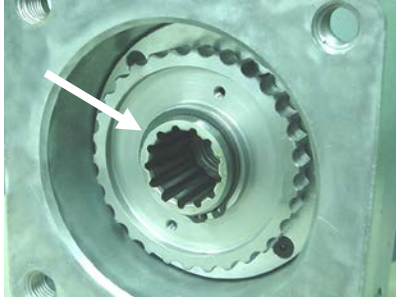


Figure 5  
Internal input spline.  
(Hydraulic motor side)



Figure 6  
External output spline.  
(AGB side)

## 2.6 CASING CONNECTIONS:

Refer to figure 7. Inspect casing for signs of oil leakage from any of the connections (oil inlet, purge air, oil drain, and optional connections). There should be no evidence of leakage from these connections.

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## 2.7 ORIFICE INSPECTION:

Refer to figure 7. The oil orifice (figure 7a) and the purge air orifice (figure 7b) should be inspected. Both orifices should be free of any signs of dirt or obstruction. Obstruction to the orifice will result in abnormal oil flow in the clutch drive and result in clutch damage.

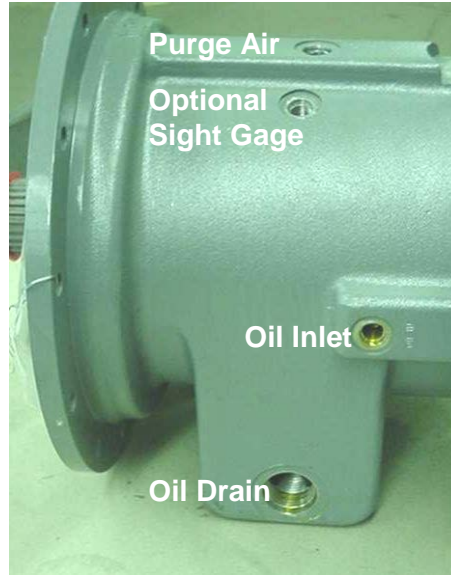


Figure 7  
Clutch connections



Figure 7a  
Oil Inlet orifice



Figure 7b  
Purge air orifice

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## 2.8 SEAL INSPECTION:

Prior to removal (while turbine is running) the AGB and motor side cavity drain should be inspected for leaking oil. If oil flow is present, measurements should be taken to determine the rate.

Check the input (hydraulic motor side) seal for signs of oil leakage (figure 8). There should be no signs of oil in the cavity between the clutch drive and hydraulic motor. The presence of oil is an indication of failure of the lip seal.

The output (AGB side) of the clutch drive can be equipped with two types of seals: Lip seal (figure 9) or labyrinth seal (figure 10). Check the seal for signs of oil leakage. The lip seal design should show no signs of leakage. Visually inspect the lip seal for tearing and signs of high temperatures. The labyrinth seal design can display signs of minimal leakage. Inspect the labyrinth for missing material.



Figure 8  
Input end



Figure 9  
Output End Lip Seal



Figure 10  
Output End Labyrinth Seal

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## 2.9 OIL SUMP:

View the inside of the clutch housing through the oil drain connection. Inspect oil sump for debris such as metal particles. Inspect the inside of the casing for signs of oil coking.



Figure 11  
Oil Drain Connection

## 3.0 CONCLUSION:

Hilliard recommends that the starter be removed from service if any of the above inspection items indicate possible internal clutch problems. It is recommended that the unit be returned to the factory for complete inspection and over haul of the clutch drive assembly.

## 4.0 INSTALLATION:

Follow installation instruction for appropriate hydraulic drive model.

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