



Clutch Diagnosis - Causes of Failure



**Guide Tube wear, Spline wear,
Mainshaft Bearing wear**



**Worn Flywheel Bearing, ridged
or heat damaged Flywheel surface**



**Worn/siezed Release Arm pivots,
friction lining dust contamination
to greased components**



**Transmission and engine
oil leaks
(contaminating Friction Linings)**



**Incorrect alignment of clutch Disc
or damage caused during incorrect
fitment of transmission**



**Damage or removal of
Transmission Dowels**



**Worn drive train components or
engine misfire.
(e.g.Engine mounts, CV Joints.)**



**Incorrect or insufficient clutch
adjustment, worn clutch cables,
faulty hydraulic systems**



Clutch Diagnosis - Clutch Cover



1) UNEVEN FINGER HEIGHT



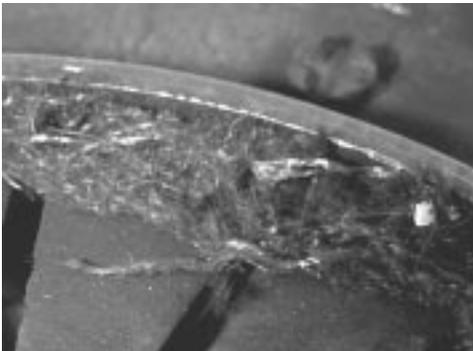
2) DIAPHRAGM CLIP MISPLACEMENT



3) BENT DRIVE STRAP



4) NORMAL DRIVE STRAP



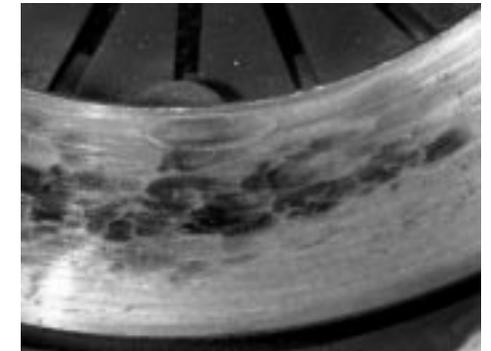
5) FRICTION LINING DEBRIS



6) MISALIGNED FLYWHEEL DOWEL



7) & 8) CLUTCH COVER PRESSURE PLATE HEAT DAMAGE



Please refer to text boxes below for further details



Clutch Diagnosis - Clutch Cover

1) Uneven Finger Height

The cover finger heights are uneven and can only be measured when bolted to the flywheel. Uneven bearing witness marks may indicate the symptom.

This is normally caused by:

Incorrect bolting sequence used during cover fitment.

Damage caused during improper alignment of the disc.

Dropping the cover prior to fitment.

Symptoms will include clutch Drag, Judder, Release Bearing wear, Pulsating clutch pedal, etc.

2) Diaphragm Clip Misplacement

This clip should sit on top of the diaphragm spring.

Problems will be clutch Drag from fitment.

This will be caused by:

Dropping the cover prior to fitment.

Incorrect bolting sequence used during cover fitment.

Damage caused during improper alignment of the disc.

3) & 4) Bent and normal Drive Strap

The drive strap should be an even 'S' shape. It is designed to transmit power from the cover to the pressure plate and subsequently the clutch disc. Distortion will cause clutch Drag, harsh clutch operation and clutch Judder.

This is normally caused by:

Incorrect bolting sequence used during cover fitment, damage caused during improper alignment of the disc, or dropping the cover prior to fitment.

If all the drive straps have a similar degree of distortion, the cover may have suffered a severe shock during operation from poor driver technique.

(e.g. Selecting the wrong gear at speed, towing heavy loads, driving with severe clutch Judder or with loose engine mountings.)

5) Friction Lining Debris

6) Misaligned Flywheel Dowel

If a clutch cover has been fitted to a flywheel in an incorrect position, one or more of the flywheel dowels may not align correctly with the holes in the cover.

This will distort the cover and cause Drag or Judder. The cover finger heights will normally become uneven, and drive strap damage may occur.

7) & 8) Clutch cover pressure plate heat damage

When a clutch has suffered severe overheating, the friction lining will have been permanently damaged and be prone to Judder, Slip or Failure. In severe instances sufficient temperature will have been reached to cause heat damage to the cover pressure plate and possibly flywheel surfaces. This heat damage will often cause localised case hardening of the metal surface, affecting the friction coefficients and the subsequent operating temperatures of the clutch assembly.

The marks shown above indicate that the clutch has suffered from sustained clutch Judder, (Picture 7.) and severe localised overheating.(Picture 8.)

In both cases the friction linings had suffered permanent damage before the surface of the pressure plate was visibly marked.



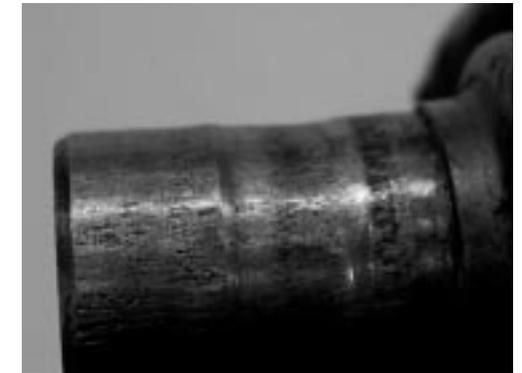
Clutch Diagnosis - Clutch Release Bearing



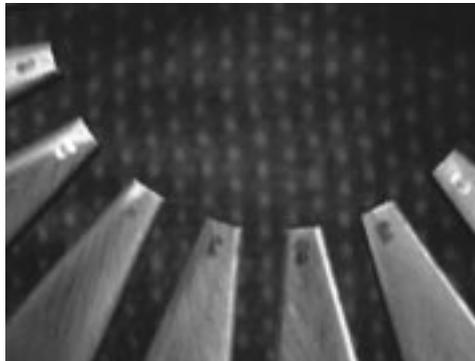
**1) SCORED SURFACE INSIDE
RELEASE BEARING**



**2) DEEP RELEASE FORK
WITNESS MARKS**



**3) WORN TRANSMISSION
GUIDE TUBE**



**4) LIGHT BEARING WITNESS
MARKS ON COVER FINGERS**



**5) HEAVY RELEASE BEARING
WITNESS MARKS**

Please refer to text boxes below for further details



Clutch Diagnosis - Clutch Release Bearing

1) Scored Surface Inside Release Bearing

This indicates that the bearing has been binding on a worn or unlubricated transmission guide tube. The recess in the inner surface is designed to retain grease through out the clutch life.

Severe cases may cause damage to the Clutch Cable, Operating arm or Clutch Pedal Box assembly.

Common problems will be;

- Stiff Clutch Pedal Operation**
- Rapid Release Bearing Race Wear**
- Clutch held in a state of slip**
- Restricted bearing travel (ie Clutch Drag)**
- Broken bearing lugs**

2) Deep Release Fork Witness Marks

Excessive wear has taken place between the release fork and the bearing. This would normally occur near the end of the clutch service life.

Excessive wear at lower mileages would indicate that the clutch has been engaged against the cover for considerable periods of time or that the bearing has been resisting movement on the guide tube.

Other areas to check are;

- Worn or unlubricated transmission guide tube**
- Worn clutch cable**
- Infrequent or Incorrect clutch adjustment**

3) Worn Transmission Guide Tube

Guide Tube wear is normally inherited from the original clutch, and can cause the bearing to bind or 'tilt' when moving over the guide tube surface.

It is imperative that this surface is cleaned thoroughly, inspected for wear and correctly lubricated during the clutch replacement.

If the guide tube is found to be worn or ridged, it will need to be repaired or replaced to prevent future clutch problems.

4) Light Bearing Witness Marks on Cover Fingers

These types of marks would be typical for a clutch that had covered over 6,000 miles.

If these marks were found on a clutch under 3,000 miles, it would indicate that there has been a problem (see 'Heavy Witness Marks' text for examples).

5) Heavy Release Bearing Witness Marks

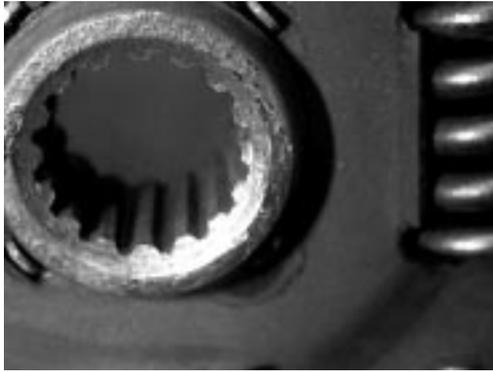
These marks would normally be made towards the end of a clutch service life through normal use of the clutch (e.g. Over 60,000 miles).

These witness marks should be viewed with the mileage covered in mind, allowing basic assumptions to be made (e.g. These marks at 3,000 indicates the bearing has been permanently engaged against the cover fingers).

Common reasons for excessive wear could be; Incorrect adjustment, release mechanism sticking, worn clutch cable, constant clutch pedal pressure by driver etc.)



Clutch Diagnosis - Clutch Disc Hub



**1) DAMAGED INPUT AND
TAPER SPLINE ENDS**



2) DRIVE PLATE FRACTURE



3) DRIVE PLATE FRACTURE



**4) AXIAL WEAR OF THE SPLINE BOSS IN
THE CLUTCH DISC HUB ASSEMBLY**



5) HUB RETAINING RIVET WEAR



6) BROKEN DAMPER SPRING

Please refer to text below for further details



Clutch Diagnosis - Clutch Disc Hub

1) Damaged Input Taper & Spline Ends

The spline ends have been damaged & burred by the mainshaft during fitment of the transmission to the engine.

This will restrict the disc movement along the mainshaft splines, and cause clutch Drag or drive plate fracture (between Hub & Linings).

Severe damage will distort the disc hub noticeably.

Damage should not occur if the clutch is correctly aligned when fitted and the transmission offered up squarely to the engine.

4) Axial Wear of the Spline Boss in the Clutch Disc Hub Assembly

The spline boss and drive cage assembly have worn laterally in the disc hub assembly.

This wear (at low mileages) is normally caused by the clutch operating in a misaligned condition, or at higher mileages as a result of severe wear to the damper spring assemblies.

When diagnosing a fault, all of the areas of disc wear should be considered together

2) & 3) Drive Plate Fracture

The steel drive plates that connect the clutch disc hub to the linings have fractured due to metal fatigue. The fatigue is a direct result of repeated lateral 'flexing' of the drive plates during operation.

Lateral flexing can be caused by the following:

Restricted movement of the clutch disc on the mainshaft splines. (e.g. Spline damage.)

Lateral distortion of the disc during fitment. (e.g. The Transmission has been 'hung on the splines.'

Clutch operating in a state of misalignment. (i.e. Mainshaft axis not in line with crankshaft axis.)

This may occur where the transmission has not seated against the engine correctly or if the flywheel bearing is faulty.

5) Hub Retaining Rivet Wear

The spline boss drive cage has been impacting and wearing against the Disc retaining rivet. This will occur at lower mileage's (EG less than 3,000 miles) where the damper spring assemblies and hub has suffered severe and rapid wear from operating in a misaligned condition.

This wear over 3,000 miles may be from continuous drive shocks (e.g. Towing), severe clutch judder or a milder condition of misalignment.

The disc may lose its damper springs or fail completely through wear if driven to destruction.

6) Broken Damper Spring

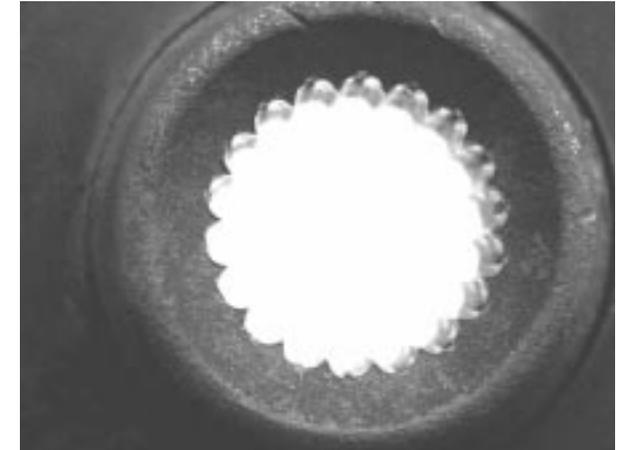
The damper spring has suffered severe wear (see spring seat), and has subsequently failed.

This is typically from severe clutch judder over a long period, hub wear from misalignment or repeated drive shocks (e.g. towing heavy loads, aggressive driving etc).

This is normally mistaken as the cause of a failure, when it is normally a symptom of severe disc hub wear.



Clutch Diagnosis - Clutch Disc Hub



Spline Grease Contamination of Friction Linings

Spline grease has spun across the clutch disc hub to the friction linings, contaminating them and causing them to become permanently damaged.

The correct grade and quantity of grease must be used to withstand the high temperatures and centrifugal forces in the clutch area.

Contaminated linings will cause Clutch Slip, Judder and sometimes Drag.

Clutch Cover Side Lining Disintegration

Because the clutch cover is less efficient as a 'heat sink' than the flywheel, the cover side lining operating temperatures will be greater and that lining will be more likely to carbonise, become brittle and 'burst' from excessive heat damage.

Most vehicle, driver, clutch and fitting problems will cause the clutch to operate with excessively high temperatures and damage the linings.

Disc Hub Splines Worn (Tapered Wear)

The splines have become worn into a 'tapered' shape.

This wear between the Transmission shaft and spline boss is normally caused by;
Fitment to a Worn transmission Main Shaft
Severe clutch judder over a considerable period
Clutch operating in a state of misalignment

Severe wear to the clutch disc hub assembly will normally be found with spline wear.



Clutch Disc Linings



New Lining



Used Lining (Normal)



Burnt Lining- Prone to Judder



Burnt & Glazed Lining – Prone to Judder, Slip & Aggressive Wear.



Carbonised lining – Resin Content vapourised. Prone to Rapid/Aggressive wear, Burst, Slip, Judder



Cover Side Lining Disintegrated – A result of becoming carbonised.