

Authorized Field Change

AFC G-07905

Date: June, 2007

Subject File: ENGINE

Subject: Replace Power Steering Gear Train Gears in International® VT 365 Engines in 1652, 3200, 3300, 4200, CE and RE Bus Models Built Between July 1, 2003 and December 31, 2003

Model: 1652
Start Date: 07/01/2003 End Date: 12/31/2003

Model: 3200
Start Date: 07/01/2003 End Date: 12/31/2003

Model: 3300
Start Date: 07/01/2003 End Date: 12/31/2003

Model: 4200
Start Date: 07/01/2003 End Date: 12/31/2003

Model: CE Bus
Start Date: 07/01/2003 End Date: 12/31/2003

Model: RE Bus
Start Date: 07/01/2003 End Date: 12/31/2003

DESCRIPTION

NOTE – Do a thorough search of the warranty history to make certain this repair has not already been completed.

NOTE – Before ordering parts, make arrangement with the customer to have all applicable VT 365 engine Authorized Field Campaigns (AFC) completed during a single visit. Only order parts for vehicles that have been scheduled with the customer.

NOTE – Should a unit involved in this AFC come in for a major engine repair, before proceeding with this AFC, verify that the engine does not require replacement and is viable for this and any other open AFC's.

During AFC repairs perform the “Replace Power Steering Gear Train Gears” first.

The International® VT 365 engine may have power steering / fuel pump gear train gears that have insufficient hardness, resulting in gear tooth pitting, premature wear and possible gear tooth separation.

PARTS INFORMATION

Refer to Figure 1 and determine the brake type used on the vehicle and fuel fitting configuration of the existing system. Match those two items in Table to determine the replacement pump and the kit to be ordered.

PARTS INFORMATION (CONT.)

Table 1 Power Steering and Fuel Pump Replacement Information

Replacement Pump (For Reference Only- See note)	Power Steering Pressure Bar (Max)	Brake Type	Fuel Fitting Configuration, (See Figure 1, page 2)	Order Kit Number
2589430C91	165	Air	2 Quick connect	8000854R91
2589431C91	175	Hydraulic	2 Quick connect	8000855R91
3606194C91	165	Air	1 Quick connect and 1 face seal O-ring	8000856R91
3606195C91	175	Hydraulic	1 Quick connect and 1 face seal O-ring	8000857R91

NOTE: The replacement pump will be part of the kit ordered.

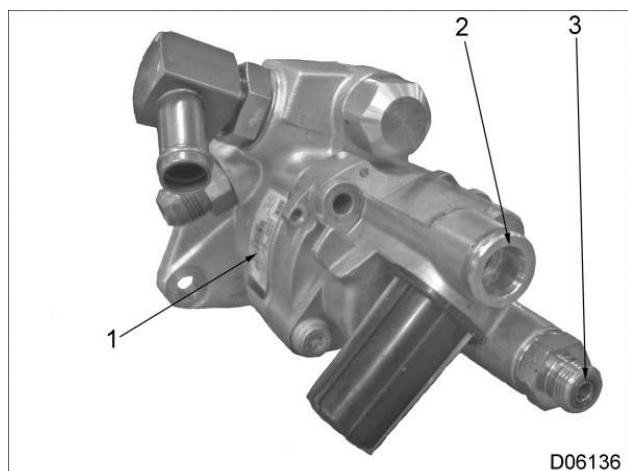


Figure 1 Illustration of Part Number Location and Two Types of Fuel Fittings

1. Part Number and Pump Description Location
2. Quick Disconnect Fuel Fitting
3. Face Seal O-ring Fuel Fitting

Table 2 Kit Contents

Description	Quantity
Instruction Sheet	1
Loctite® sealant 290, 0.5 ml (0.02 oz.) tube	1
Power steering and fuel pump assembly, consisting of:	
Pump, see Table 1(See Table 1, page 2)	1
New hardened pump gear	
O-ring seal	

PARTS INFORMATION (CONT.)

Table 2 Kit Contents (cont.)

Description	Quantity
Rear oil seal retainer assembly, consisting of:	
Rear oil seal retainer carrier	
O-ring seal (press-in gasket)	1
Seal assembly	
Plastic installation tool	
Power steering idler and shaft kit, consisting of:	
Power steering idler gear assembly	
Power steering idler shaft	1
Retaining rings, external, standard	
Crankshaft secondary flange kit, consisting of:	
Secondary crankshaft flange	1
Dowel pin	
Plastic cap (or plug)	6
Flywheel or Flexplate mounting bolts	10

PROCEDURE



WARNING – To avoid property damage, personal injury, or death, park the vehicle on a flat level surface, set the parking brake, turn the engine off, and chock the wheels.



WARNING – To avoid serious personal injury or possible death, wear safety glasses with side shields when performing the following procedures, see safety information.

NOTE – When the power steering and fuel pump is removed, all fluid openings should be plugged with the caps (or plugs) supplied in the kit. The pump assembly must be returned using the same box and return label supplied in the kit.

Remove Driveline and Transmission Components

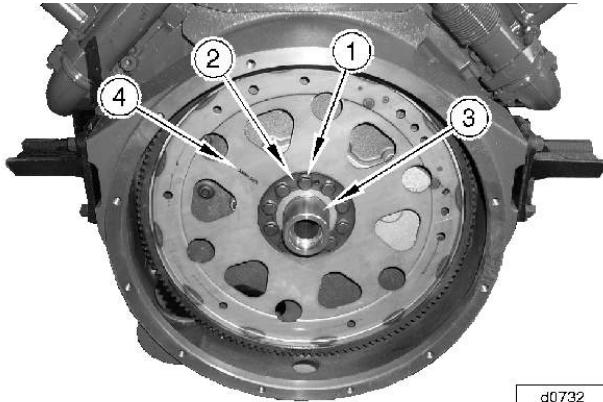
1. Remove the driveline and transmission.

PROCEDURE (CONT.)

Remove Automatic Transmission



WARNING – To avoid serious personal injury, possible death, or damage to the engine or vehicle, always install new flexplate or flywheel mounting bolts when installing the flexplate or flywheel.



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Figure 2 Flexplate Related Hardware

1. Flexplate Mounting Bolts (10)
 2. Reinforcement Ring
 3. Flexplate Adapter Hub
 4. Transmission Side Stamp (XMSN-SIDE)
2. Remove ten M10 x 77 flexplate mounting bolts and remove the reinforcement ring, flexplate and the adapter hub (Figure 2). The ten flexplate mounting bolts are not reusable. Retain four of the old mounting bolts for use during re-installation of the secondary flange gear.

Remove Manual Transmission



WARNING – To avoid serious personal injury, possible death, or damage to the engine or vehicle, always install new flexplate or flywheel mounting bolts when installing the flexplate or flywheel.

PROCEDURE (CONT.)

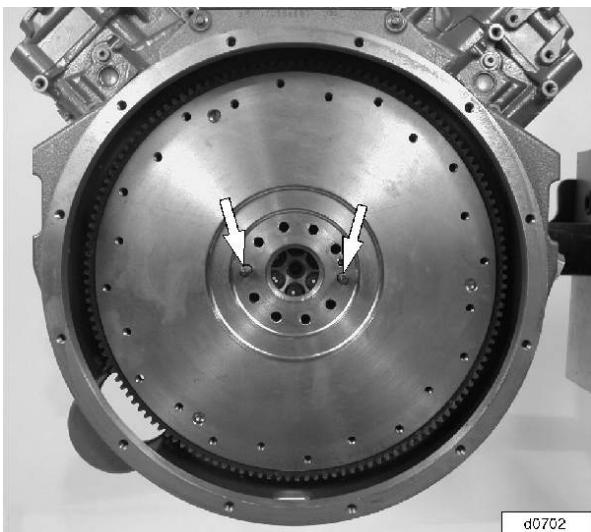


Figure 3 Flywheel Guides Installed

3. Remove two M10 x 77 flywheel mounting bolts at approximately the 3 o'clock and 9 o'clock positions. Install two guide pins (make locally) as shown in Figure 3. Remove remaining eight flywheel mounting bolts. The ten flywheel mounting bolts are not reusable. Retain four of the old mounting bolts for use during re-installation of the secondary flange gear.



Figure 4 Remove Flywheel Using Guide Pins

4. Remove the flywheel from the housing and off guide pins (Figure 4). With flywheel removed, guide pins can be removed from secondary flange.

PROCEDURE (CONT.)

Remove Power Steering Gear Train Gears

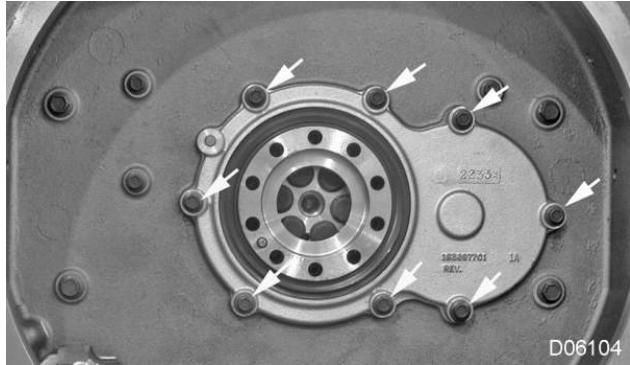


Figure 5 Remove Rear Oil Seal Retainer Bolts

5. Remove eight rear oil seal retainer bolts (Figure 5).

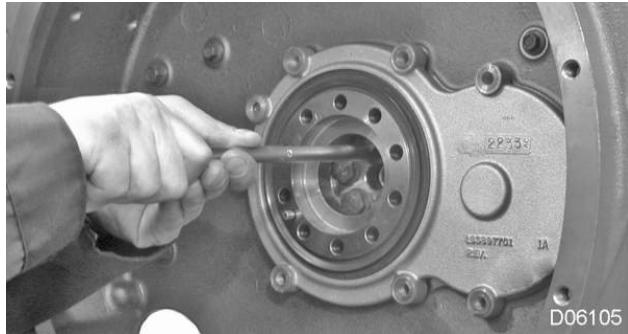


Figure 6 Use Heel Bar to Loosen Secondary Flange Gear

6. Use a heel bar to loosen the secondary flange (Figure 6). NOTE: A gear puller may also be used.

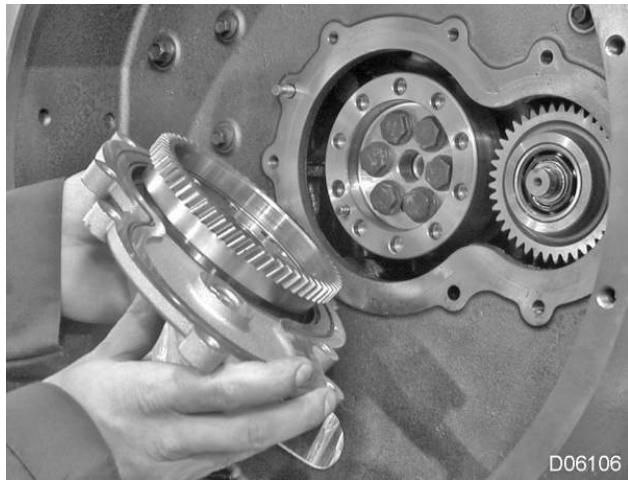


Figure 7 Remove Secondary Flange Gear and Rear Oil Seal Retainer

7. Remove the secondary flange and the rear oil seal retainer as a unit (Figure 7).

PROCEDURE (CONT.)



Figure 8 Use Slide Hammer to Remove Idler Gear and Shaft

8. Install M6 x 1 slide hammer adapter in the idler gear shaft (Figure 8). Use the slide hammer to remove idler gear and idler shaft as a unit.
9. As an alternate, remove the outer retaining ring and the idler gear.

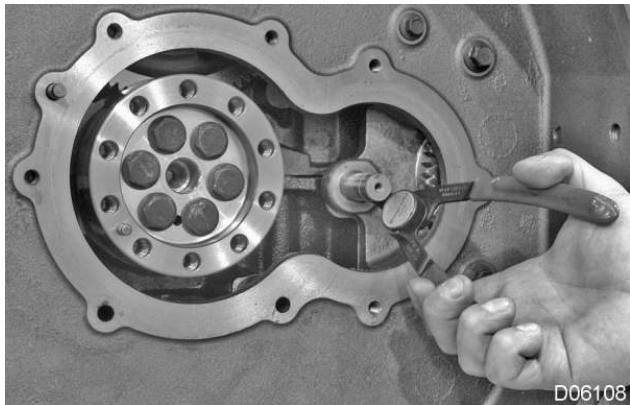


Figure 9 Remove Idler Gear Shaft Inner Retaining Ring (alternate method)

10. Remove the inner retaining ring (Figure 9).

PROCEDURE (CONT.)

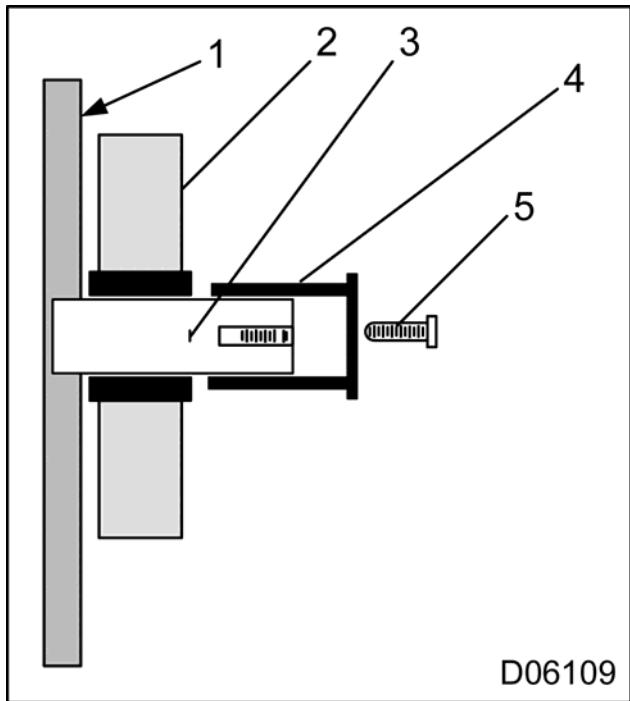


Figure 10 Stack Order Idler Shaft Removal

1. Rear Cover
2. Idler Gear and Bearing (old)
3. Idler Gear Shaft
4. Spacer
5. M6 Jacking Bolt

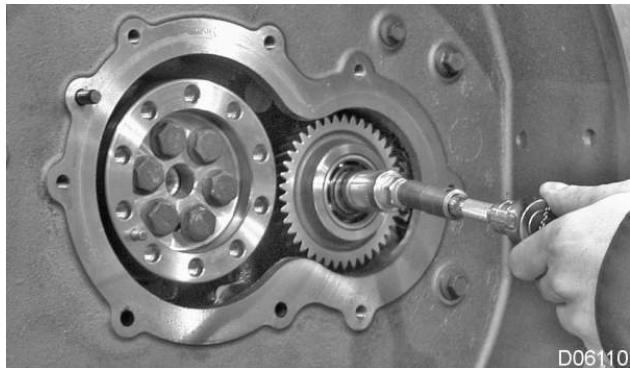


Figure 11 Remove Idler Gear Shaft (alternate method)

11. Using the old idler gear, a spacer, and a M6 bolt, remove the idler gear shaft (Figure 11).
12. Disconnect the power steering and fuel lines from the pump. Cap off the open end of the power steering and fuel lines.

PROCEDURE (CONT.)

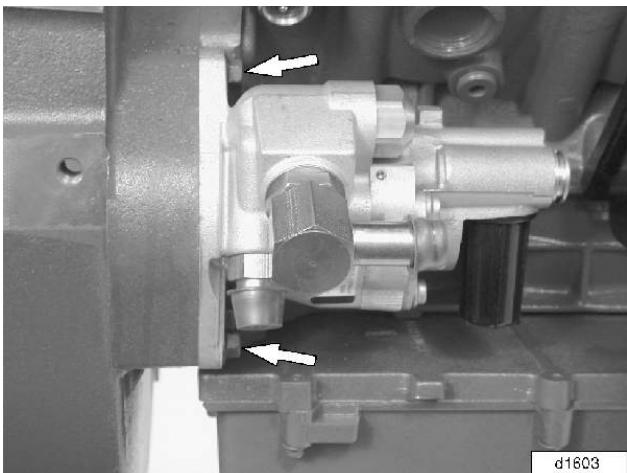


Figure 12 Power Steering and Fuel Pump Assembly Mounting Bolt Location

13. Remove two M10 x 30 power steering and fuel pump assembly mounting bolts (Figure 12).

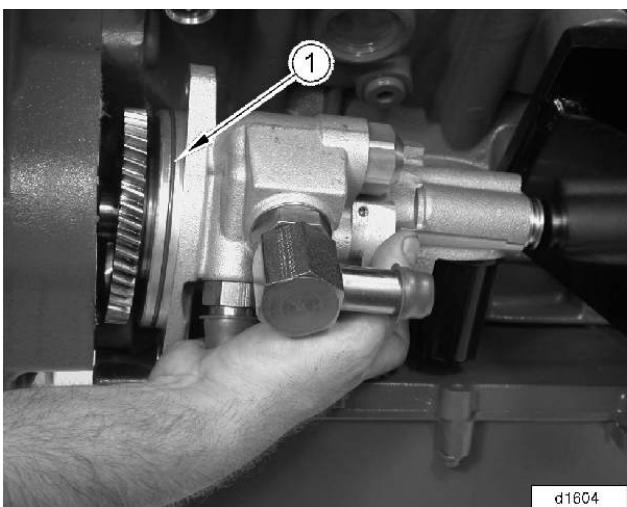


Figure 13 Remove Power Steering and Fuel Pump Assembly

1. O-ring

14. Remove power steering and fuel pump assembly from rear cover (Figure 13).

15. Cap off all open ports with caps (or plugs) provided with kit.

PROCEDURE (CONT.)

Clean and Inspect

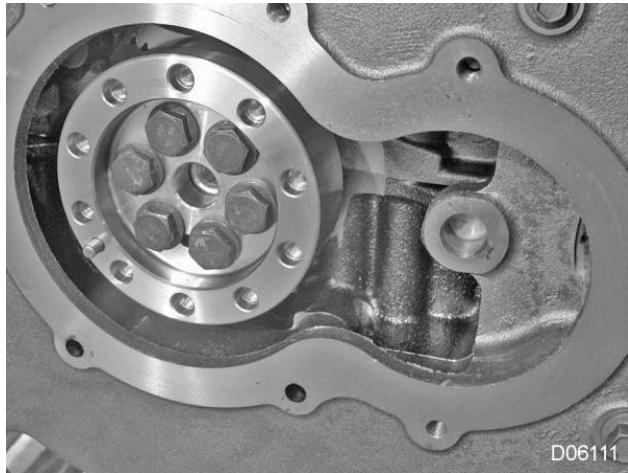


Figure 14 Inspect Cavity

16. Inspect the oil drain cavity (Figure 14) under the crankshaft and under the power steering and fuel pump assembly. Inspect the three drain holes (Figure 15, Figure 16, Figure 17). If an accumulation of metal or gear debris is found, or if drain holes are clogged with a heavy accumulation of metal or gear debris, contact International Tech Service for a case file.

If there is no accumulation of metal or gear debris found in the cavity and the drain holes are not clogged, clean and dry the area.

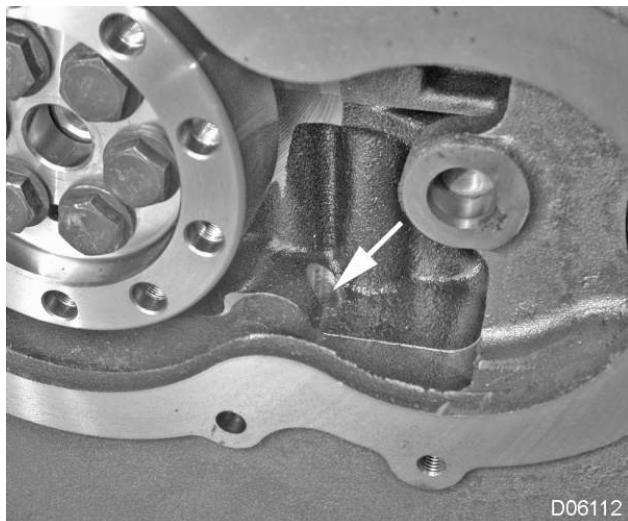


Figure 15 Inspect Oil Drain Hole Under Idler Gear

PROCEDURE (CONT.)



Figure 16 Inspect Oil Drain Hole Under Outside of Crankshaft Flange



Figure 17 Inspect Oil Drain Hole Under Crankshaft Flange

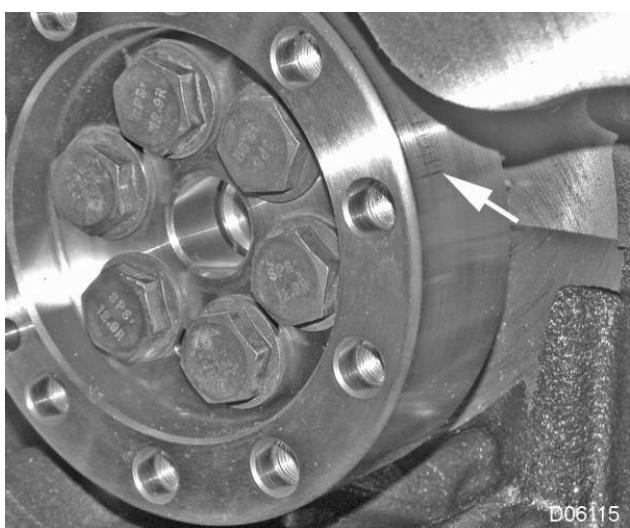


Figure 18 Inspect Primary Crankshaft Flange

PROCEDURE (CONT.)

17. Clean the primary crankshaft flange with a commercial cleaner and dry with compressed air. Inspect the primary crankshaft flange sides and face (Figure 18). The flange sides should be smooth with no gouges. The flange face should be clean with no raised surfaces or wear products to interfere with the secondary flange fit.

Assemble Power Steering Gear Train Gears

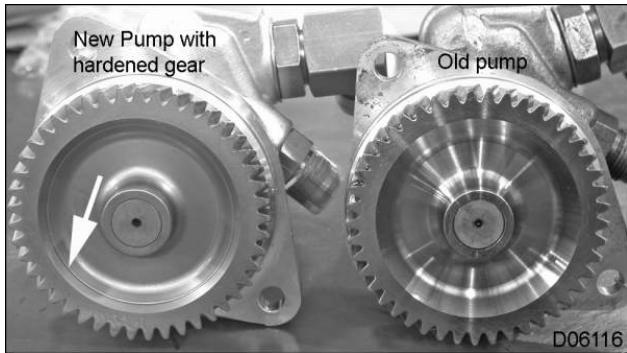


Figure 19 Verify Witness Marks on New Gear

18. Verify witness mark on the gear face. If there is no witness mark and the part number matches the improved pump assembly, the hardened gear should have a dull appearance due to hardening (Figure 19).

If neither the witness mark or the dull surface appearance is visible on the new pump gears, contact International Tech Services.

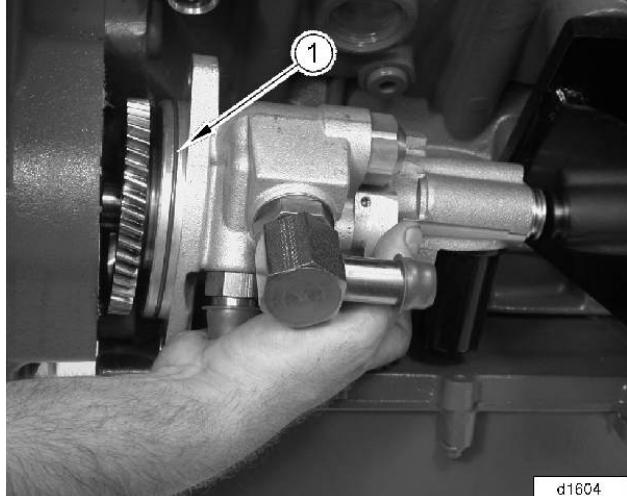
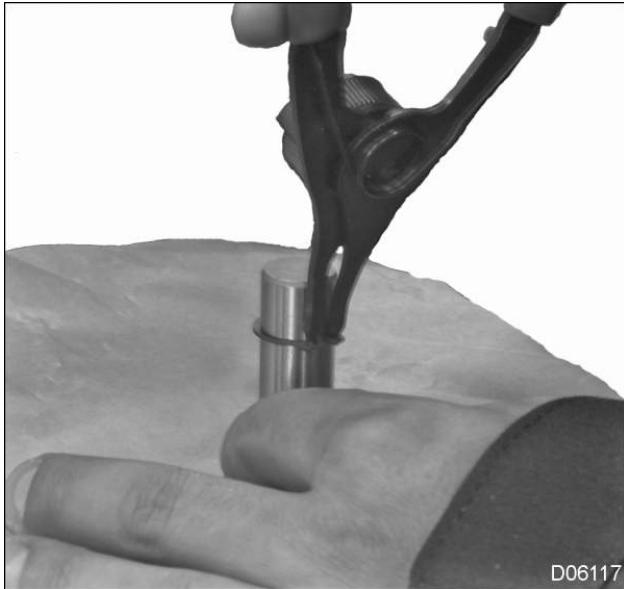


Figure 20 Lubricate O-ring and Install Power Steering and Fuel Pump Assembly

1. O-ring
19. Lubricate the O-ring with clean engine oil and install power steering and fuel pump in rear cover (Figure 20).
20. Install two M10 x 30 power steering and fuel pump assembly mounting bolts. Tighten bolts to the standard torque of 56 to 68 N·m (41 to 50 lbf·ft).

PROCEDURE (CONT.)

21. Reconnect the power steering and fuel lines to the pump.
22. Make sure the idler shaft bore in the rear cover assembly is clean.



D06117

Figure 21 Install Retaining Ring on Idler Shaft

23. Place a retaining ring (Figure 21) on the end of the shaft that does not have the threaded hole.

PROCEDURE (CONT.)



Figure 22 Power Steering Idler Shaft Installation Tool (ZTSE4719)



Figure 23 Put Idler Shaft and Retaining Ring in Installation Tool

PROCEDURE (CONT.)



WARNING – To avoid personal injury, wear safety glasses with side shields when performing the following procedure.

CAUTION – To avoid damage to the engine, do not install the shaft to the point where the retaining ring contacts the rear cover. Distortion of the ring may adversely affect its performance as a gear thrust surface.

24. Place the idler shaft in the installation tool (Figure 23). Place the end with the threaded hole in the tool first. This tool is designed to install the idler shaft in the rear cover at the proper depth.



D06120

Figure 24 Install Idler Shaft in Rear Cover Assembly

25. Align the idler shaft in the rear cover at the proper location. Using the installation tool, drive the idler shaft into the idler shaft bore in the transmission side of the rear cover (Figure 24) until the installation tool bottoms out. NOTE — do not tap the tool too hard as doing so may cause damage to the rear cover.

PROCEDURE (CONT.)

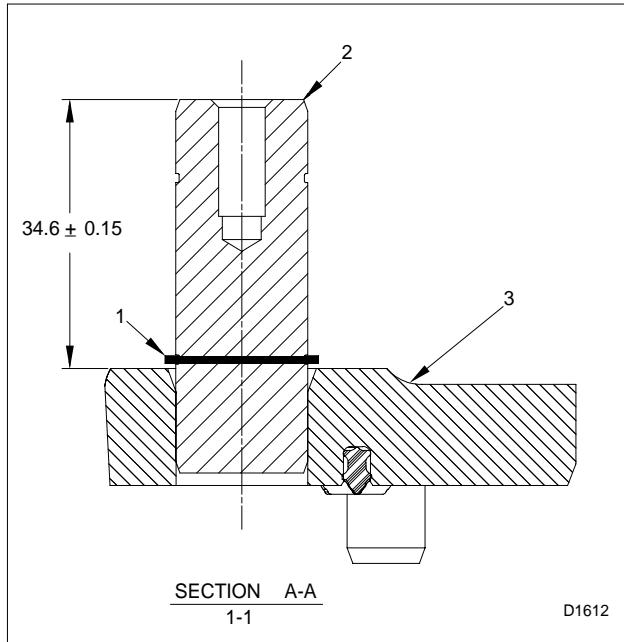


Figure 25 Power Steering Idler Shaft Installation Depth

1. Retaining Ring
2. Power Steering Idler Shaft
3. Rear Cover Assembly

26. If installation tool is not available, use brass drift to install the idler shaft in the rear cover to the correct depth.

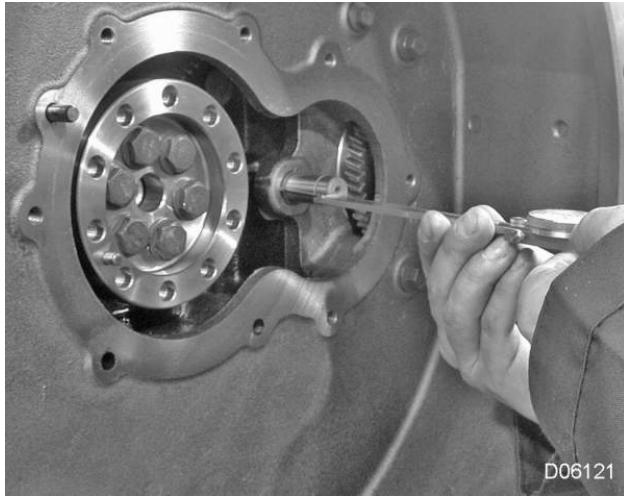


Figure 26 Verify Idler Shaft Height

27. Verify idler shaft protrusion, using a dial caliper (Figure 26). Idler shaft should extend 34.6 ± 0.15 mm (1.362 ± 0.006 in) beyond the surface of the rear cover (Figure 25).

PROCEDURE (CONT.)



Figure 27 Verify Secondary Flange Witness Mark

28. Identify improved secondary flange gear. Verify circular witness groove on inner surface (Figure 27).
NOTE — do not install a secondary flange gear that does not have a circular witness groove.



Figure 28 Install Dowel Pin in Secondary Flange Gear

CAUTION – To avoid possible damage to the engine, transmission, or truck, the dowel pin protrusion is critical to aligning the flywheel or flexplate and the reinforcement ring.

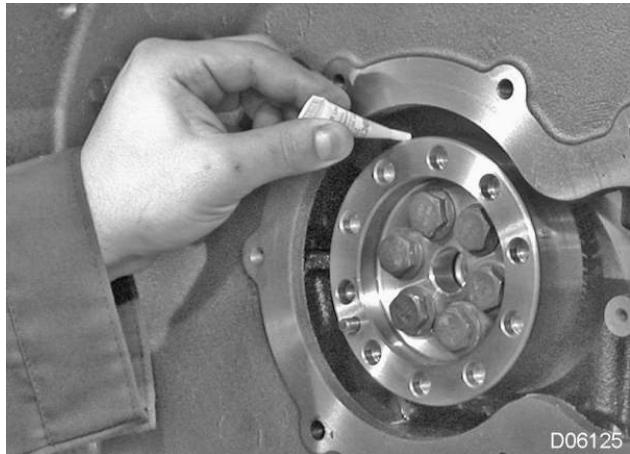
29. Install the dowel pin in the secondary flange gear (Figure 28).
30. Verify the protrusion height using a dial caliper. Dowel pin protrusion height should be 8.0 ± 0.25 mm (0.315 ± 0.01 in).
31. Clean the inside surfaces and the inner face surface of the secondary flange gear. Obtain the 4 old mounting bolts and obtain spacers of at least 3/4 inch for each bolt, and have them ready at the crankshaft flange.

PROCEDURE (CONT.)



D06124

Figure 29 Loctite®



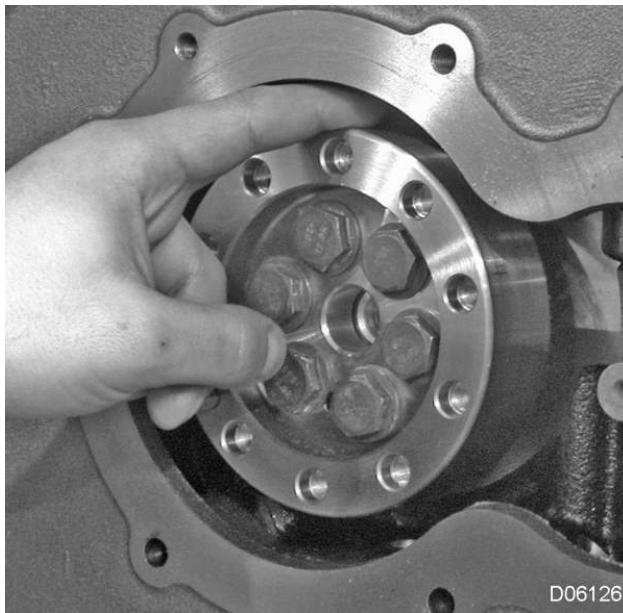
D06125

Figure 30 Put Loctite® on Primary Crankshaft Flange

CAUTION – To avoid possible damage to the engine or truck, do not place sealant on the face of the primary flange or the inner mounting surface of the secondary flange.

32. Put Loctite® 290 on the outside diameter of the primary crankshaft flange (Figure 30).

PROCEDURE (CONT.)

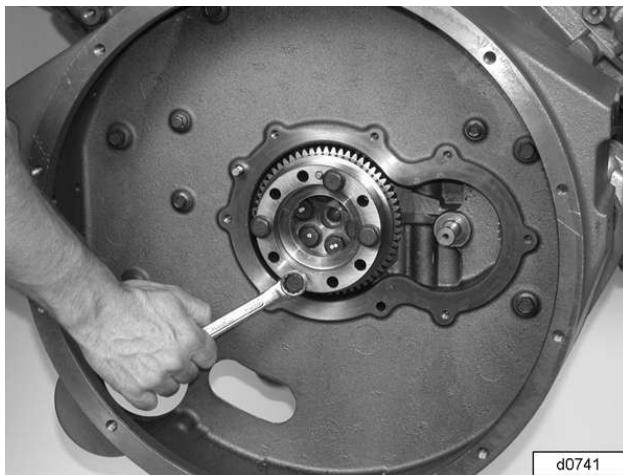


D06126

Figure 31 Wipe Loctite® Around Primary Crankshaft Flange to Insure Complete Coverage

33. Use your finger to spread the Loctite® around ensuring complete coverage on the flange (Figure 31). Do not get any Loctite® on the face of the crankshaft flange.

CAUTION – To avoid damage to the engine, transmission, or vehicle, the secondary flange must be fully seated on the crankshaft flange in one step. The Loctite® sets up within 5 minutes after air has been removed (the two surfaces have been mated). Attempting to complete installation after the Loctite® has set will break the seal between the crankshaft flange and the secondary flange and leakage may occur.



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Figure 32 Install Secondary Flange

PROCEDURE (CONT.)

CAUTION – To avoid damage to the engine, transmission, or vehicle, the secondary flange must be fully seated on the crankshaft flange in one step. Adjust the spacer height to ensure the secondary flange is fully seated. Attempting to complete installation after a period of time will violate the seal between the crankshaft flange and the secondary flange.

34. Install the secondary flange (Figure 32) by aligning the dowel pin hole with the crankshaft dowel pin. Install four old flexplate or flywheel mounting bolts with at least a 3/4 inch spacer evenly spaced around the flange. Pull the flange in place by tightening alternating bolts. Remove bolts and spacers after flange has been seated.

NOTE – You may have to adjust the spacer height in order to get the bolts started and to fully seat the secondary flange gear.

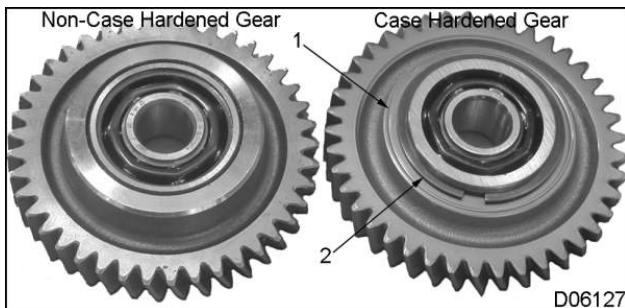


Figure 33 Note Witness Mark and Retaining Ring On Front of Idler Gear

1. Witness Mark
2. Retaining Ring

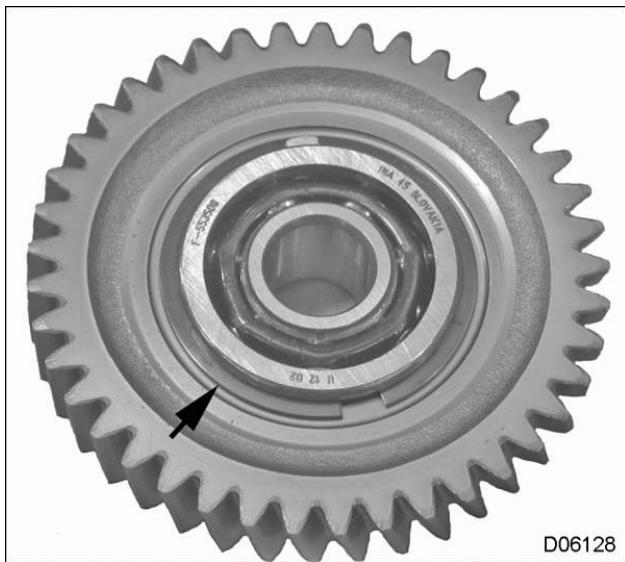


Figure 34 Note Retaining Ring on Back of Idler Gear

PROCEDURE (CONT.)

35. Identify improved power steering idler gear. Verify witness mark on inner surface (Figure 33). Verify inner and outer retaining rings (Figure 34) are in place holding the bearing in the gear. NOTE — **do not** install an idler gear that **does not** have a circular witness groove or both of the retaining rings.



Figure 35 Install Idler Gear

CAUTION – To avoid possible engine or vehicle damage, do not drive the idler gear on the shaft. Rotate power steering and fuel pump assembly gear to obtain a proper fit. Driving the gear on the shaft could damage the gear and gear teeth.

CAUTION – To avoid possible engine or vehicle damage, helical gears can be installed either direction, insure the witness mark is facing you. Placing the gear on backwards will cause abnormal wear and damage to the gear.

36. Install the power steering idler gear on the shaft (Figure 35). The gear of the power steering and fuel pump assembly may have to be rotated for proper fit of the gears. Do not drive the gear on the shaft.

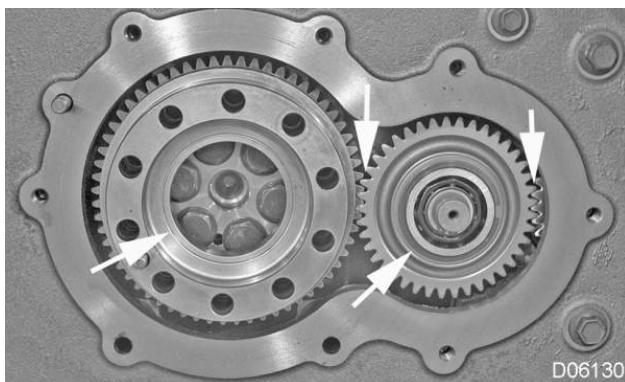


Figure 36 Verify Witness Marks Facing Out and All Gears Are Aligned

37. Verify witness marks on the idler gear and secondary flange gear are facing the transmission end of the engine, and the gears are all aligned (Figure 36).

PROCEDURE (CONT.)

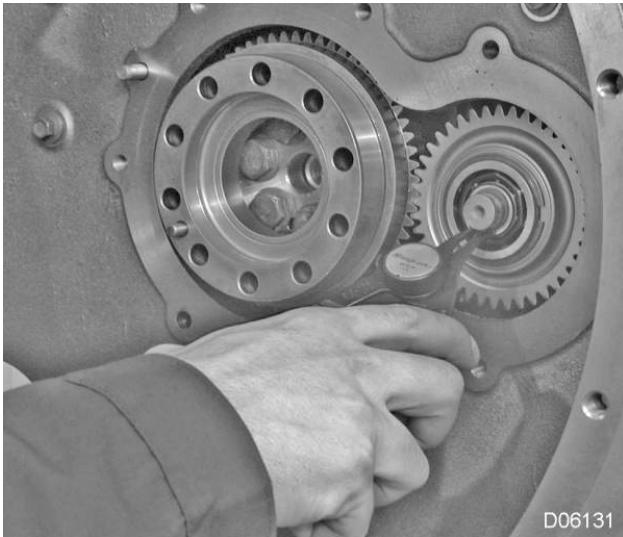


Figure 37 Install Retaining Ring

38. Install the power steering idler gear retaining ring on the idler shaft (Figure 37).
39. Make sure the secondary flange is clean and dry. The secondary flange should be free of oil and debris. The seal will not provide a proper seal if the surface of the secondary flange is oily or dirty. Clean and inspect the rear oil seal carrier sealing surface on the rear cover.

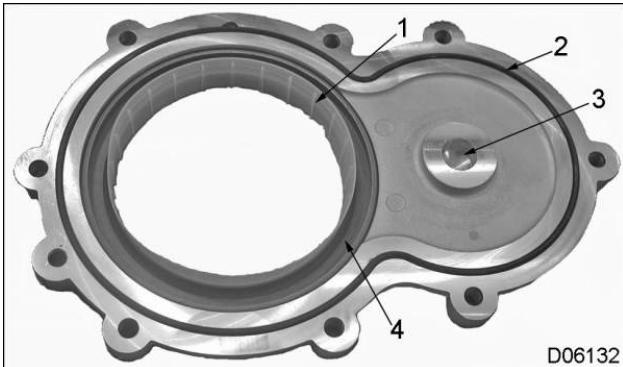


Figure 38 Rear Oil Seal Retainer and Seal

1. Rear Oil Seal Installation Tool (Do not remove until after installation)
2. Rear Oil Seal Retainer Seal
3. Power Steering Idler Gear Shaft Bore
4. Rear Oil Seal

CAUTION – To avoid damage to the seal and the engine, do not remove the plastic installation tool from the inner diameter of the oil seal prior to cover seal installation.

PROCEDURE (CONT.)

40. Identify the new rear oil seal retainer and seal (Figure 38). Verify the plastic installation tool is installed in the inner diameter of the seal. Do not remove the plastic installation tool from the inner diameter of the seal or damage to the seal and engine will occur.

41. Verify the carrier gasket is present in the oil seal carrier before installation.

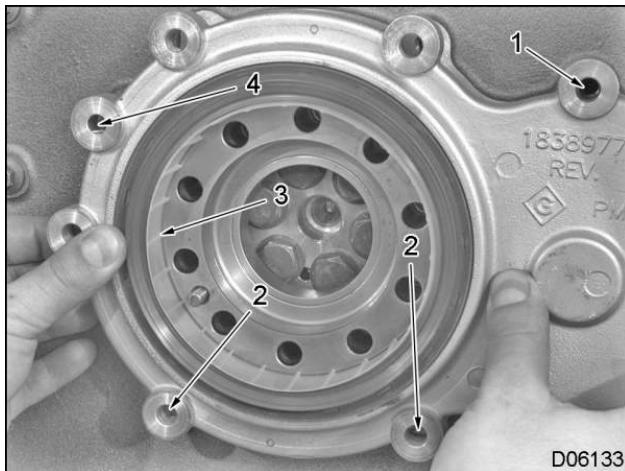


Figure 39 Place Rear Oil Seal Retainer on Secondary Flange Gear

1. Bolt Hole
2. M8 x 70 Bolt Holes
3. Plastic Installation Tool Stiffeners
4. Dowel Pin Hole

42. Place the retainer and seal assembly over the secondary flange, verify the stiffeners rest on the outer face of the secondary flange gear (Figure 39). Align bolt holes, dowel pin and dowel pin hole and idler gear shaft boss.

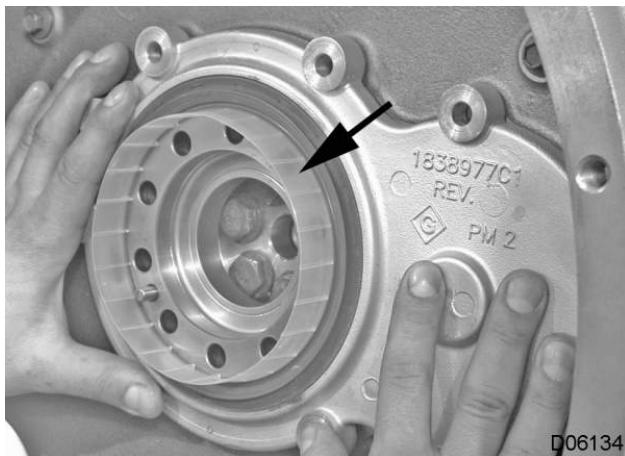


Figure 40 Press Rear Oil Seal Retainer and Seal Over Secondary Flange Gear

PROCEDURE (CONT.)

43. Press the rear oil seal retainer and seal onto the secondary flange (Figure 40) maintaining alignment of mounting bolt holes in the rear cover. As the retainer and seal assembly slide over the secondary flange, the plastic installation tool will slowly move out of the seal.
44. Install two M8 x 70 rear oil seal carrier bolts in lower holes. Install six remaining M8 x 25 rear oil seal carrier bolts to secure the rear oil seal carrier to the rear cover. Tighten all bolts to 29 to 35 N·m (21 to 26 lbf·ft).

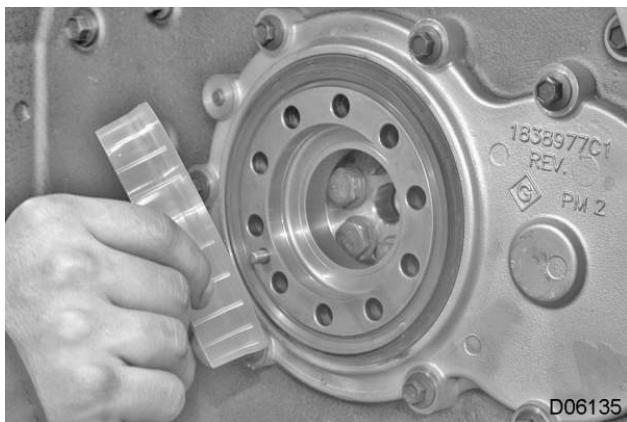


Figure 41 Remove Plastic Installation Tool

45. Remove the plastic installation tool (Figure 41) when the seal is fully installed.

Install Automatic Transmission

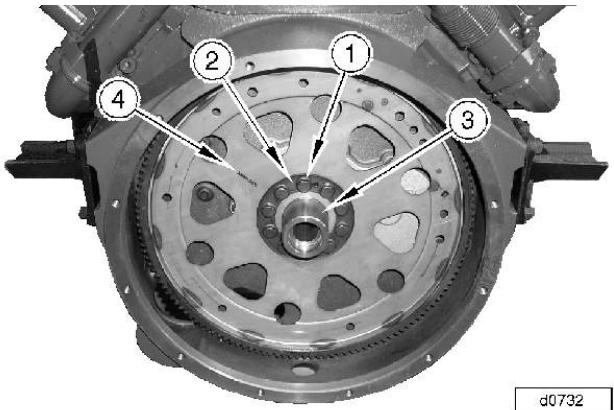


Figure 42 Install Flexplate

1. Flexplate bolts, new, M10 x 77 (10)
2. Reinforcement Ring
3. Flexplate Adapter Hub
4. Transmission Side Stamp (XMSN-SIDE)

PROCEDURE (CONT.)



WARNING – To avoid serious personal injury, possible death, or damage to the engine or vehicle, always install new flexplate or flywheel mounting bolts when installing the flexplate or flywheel.

CAUTION – To avoid damage to the engine or vehicle, do not use anti-seize compounds, grease, or any lubricants. Lubricants have an adverse effect on torque results.

NOTE – New bolts that are phosphate coated do not require oil before torquing. Used bolts elsewhere in this instruction do require oil per general torquing guidelines. Always avoid using any other compounds or lubricants unless specifically told to do so for specific applications.

Refer to Figure 42 for Steps 46 to 49.

46. For flexplate (automatic transmission) installation. Position the flexplate on adapter hub and align hub over the crankshaft secondary flange dowel. Make sure the XMSN-SIDE stamp is facing the transmission.
47. Put two new M10 x 77 flexplate mounting bolts 180° apart through reinforcement ring, flexplate, and adapter hub.
48. Place entire flexplate assembly on crankshaft. Hand tighten two bolts to hold assembly in place.
49. Install eight new M10 x 77 flexplate mounting bolts.

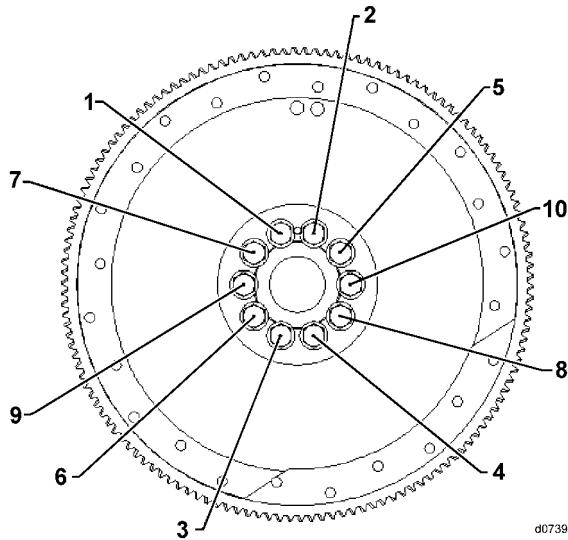


Figure 43 Typical Flexplate and Flywheel Torque Sequence

50. Snug all bolts in sequence, as shown in Figure 43, to 1 to 7 N·m (12 to 60 lbf·in).

PROCEDURE (CONT.)

51. Torque all bolts in sequence as shown in Figure 43, to 85 to 103 N·m (63 to 76 lbf·ft).

Install Manual Transmission



WARNING – To avoid serious personal injury, possible death, or damage to the engine or vehicle, always install new flexplate or flywheel mounting bolts when installing the flexplate or flywheel.

CAUTION – To avoid damage to the engine or vehicle, do not use anti-seize compounds, grease, or any lubricants in the flexplate or flywheel mounting joint with new phosphate coated bolts.

NOTE – New bolts that are phosphate coated do not require oil before torquing. Used bolts elsewhere in this instruction do require oil per general torquing guidelines. Always avoid using any other compounds or lubricants unless specifically told to do so for specific applications.

52. Install two flywheel guide pins (made locally) in crankshaft at approximately 3 o'clock and 9 o'clock positions (Figure 44).

NOTE – The Crankshaft Secondary Flange Installation Studs (ZTSE4720) may be used in place of the guide pins, but use care so the threads on the studs are not damaged.



Figure 44 Install Flywheel on Guide Pins

53. Align reinforcement ring with dowel pins (Figure 44) and slide over guide pins. Make sure lip on outer circumference of ring is facing the transmission.
54. Align flywheel dowel hole with crankshaft secondary flange dowel pin and slide flywheel on guide pins.

PROCEDURE (CONT.)

55. Install two new M10 x 77 flywheel mounting bolts to secure flywheel to crankshaft. Remove both guide pins.
56. Install eight remaining new M10 x 77 flywheel mounting bolts.
57. Snug all bolts in sequence as shown in Figure 43 (See Figure 43, page 25) to 1 to 7 N·m (12 to 60 lbf-in).
58. Torque all bolts in sequence as shown in Figure 43 (See Figure 43, page 25) to 85 to 103 N·m (63 to 76 lbf·ft).

Install Transmission and Driveline Components

59. Re-install transmission and driveline.

Operation number must appear on all claims.

Table 3 Labor Information

Operation No.	Description	Time
A40-07905-1	Remove and Replace Power Steering / Fuel Pump Gears and Pump with Automatic Transmission	5.0 Hrs.
A40-07905-2	Remove and Replace Power Steering / Fuel Pump Gears and Pump with Manual Transmission	5.3 Hrs.
A40-07905-3	Add on for Rear Gear Replacement with a PTO	0.5 Hr.

ADMINISTRATIVE PROCEDURE

Expense is to be charged to Warranty. Claims are to be submitted in the normal manner, making reference to Authorized Field Change Number G-07905.

It is important that the coding be completed properly to assist in processing the warranty claim. Complete instructions will be found in the Warranty Manual, Section 7-1. Special attention should be given to Items 39 through 44.

To assure this important improvement is made in a timely manner, all claims for G-07905 activity must be submitted by May 31, 2008 or within the normal warranty period for the vehicle, if after May 31, 2008.

GROUP	NOUN	C	WARR.	TP	PAD
GROUP Enter number G—	_____				
NOUN Leave blank	_____				
C (CAUSE) Enter either 1, 2, 3. (see below)	_____				
1. Inspected (No repair required).	_____				
2. Inspected and repaired.	_____				
3. Defective part from parts stock.	_____				
WARRANTY (Warranty Code) Enter 40.	_____				
TYPE PART Enter P for type part causing failure.	_____				
PAD Enter 100	_____				

Distribution: All except J-81

Reproduction: Not required.