M0107105 (en-us)
September 2021

Disassembly and Assembly

TH408D Telehandler
Power Train

TH9 1-UP (Machine)

Scan to access the latest service information, purchase additional media, and buy genuine Cat® parts.

Important Safety Information

Most accidents that involve product operation, maintenance and repair are caused by failure to observe basic safety rules or precautions. An accident can often be avoided by recognizing potentially hazardous situations before an accident occurs. A person must be alert to potential hazards, including human factors that can affect safety. This person should also have the necessary training, skills and tools to perform these functions properly.

Improper operation, lubrication, maintenance or repair of this product can be dangerous and could result in injury or death.

Do not operate or perform any lubrication, maintenance or repair on this product, until you verify that you are authorized to perform this work, and have read and understood the operation, lubrication, maintenance and repair information.

Safety precautions and warnings are provided in this manual and on the product. If these hazard warnings are not heeded, bodily injury or death could occur to you or to other persons.

The hazards are identified by the “Safety Alert Symbol” and followed by a “Signal Word” such as “DANGER”, “WARNING” or “CAUTION”. The Safety Alert “WARNING” label is shown below.

The meaning of this safety alert symbol is as follows:

Attention! Become Alert! Your Safety is Involved.

The message that appears under the warning explains the hazard and can be either written or pictorially presented.

A non-exhaustive list of operations that may cause product damage are identified by “NOTICE” labels on the product and in this publication.

Caterpillar cannot anticipate every possible circumstance that might involve a potential hazard. The warnings in this publication and on the product are, therefore, not all inclusive. You must not use this product in any manner different from that considered by this manual without first satisfying yourself that you have considered all safety rules and precautions applicable to the operation of the product in the location of use, including site-specific rules and precautions applicable to the worksite. If a tool, procedure, work method or operating technique that is not specifically recommended by Caterpillar is used, you must satisfy yourself that it is safe for you and for others. You should also ensure that you are authorized to perform this work, and that the product will not be damaged or become unsafe by the operation, lubrication, maintenance or repair procedures that you intend to use.

The information, specifications, and illustrations in this publication are on the basis of information that was available at the time that the publication was written. The specifications, torques, pressures, measurements, adjustments, illustrations, and other items can change at any time. These changes can affect the service that is given to the product. Obtain the complete and most current information before you start any job. Cat dealers have the most current information available.

NOTICE

When replacement parts are required for this product Caterpillar recommends using original Caterpillar® replacement parts.

Other parts may not meet certain original equipment specifications.

When replacement parts are installed, the machine owner/user should ensure that the machine remains in compliance with all applicable requirements.

In the United States, the maintenance, replacement, or repair of the emission control devices and systems may be performed by any repair establishment or individual of the owner's choosing.

Table of Contents

Disassembly and Assembly Section

Index Section

⚠ WARNING

Accidental machine starting can cause injury or death to personnel working on the machine.

To avoid accidental machine starting, turn the battery disconnect switch to the OFF position and remove the key. If the machine is not equipped with a battery disconnect switch, disconnect the battery cables from the battery and tape the battery clamps.

Place a do not operate tag at the battery disconnect switch location to inform personnel that the machine is being worked on.

Disassembly and Assembly Section

i08228057

Transmission - Disassemble

SMCS Code: 3030-015

References

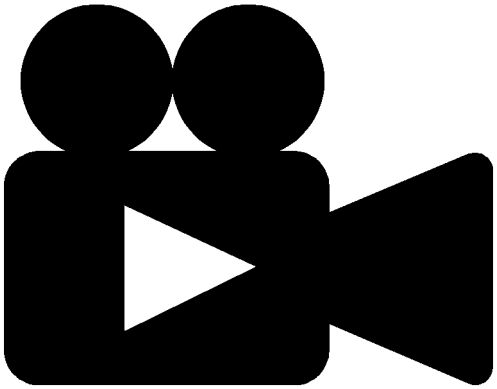

Illustration 1 g06471531

Reference: For more information, refer to supplemental video “TH408D AG Telehandler Transmission - Disassemble” on Caterpillar Channel1 (A CWS login is required to access Caterpillar Channel1).

Note: Click or copy the following link into a web browser (A CWS login is required to access Caterpillar Channel1), or scan the following QR code using a QR enabled device.

https://channel1.mediaspace.kaltura.com/media/1_56h4b9ui

Illustration 2 g06722223

Disassembly Procedure

Table 1

Required Tools			
Tool	**Part Number**	**Part Description**	**Qty**
A	439-3938	Link Bracket	3
B	422-5474	Lifting Eye Assembly	2
C	422-5473	Lifting Eye Assembly	1
D	1P-2420	Transmission Repair Stand	1
E	6V-5230	Bolt	4
	6V-5839	Washer	8
	2Y-5829	Nut	4
F	4C-8359	Eyebolt	1
G	156-7100	Slide Hammer Puller Gp	1
H	2P-8312	Retaining Ring Pliers	1
J	5P-5197	Retaining Ring Pliers As	1
K	1P-0510	Driver Gp	1
L	-	Guide stud (M10x1.5x145mm)	2
M	8H-0663	Bearing Puller As	1
N	1U-6400	Three Jaw Puller	1
P	4C-3652	Compressor As	1
R	8B-7554	Bearing Cup Puller Gp	1
S	6V-3009	Crossbar	1

(continued)

(Table 1, contd)

Required Tools			
Tool	**Part Number**	**Part Description**	**Qty**
	8S-6470	Pressure Screw	1
	126-7179	Puller Leg	1
	5P-8245	Hard Washer	1
	6B-6684	Full Nut	1

Start By:

a. Remove the transmission.

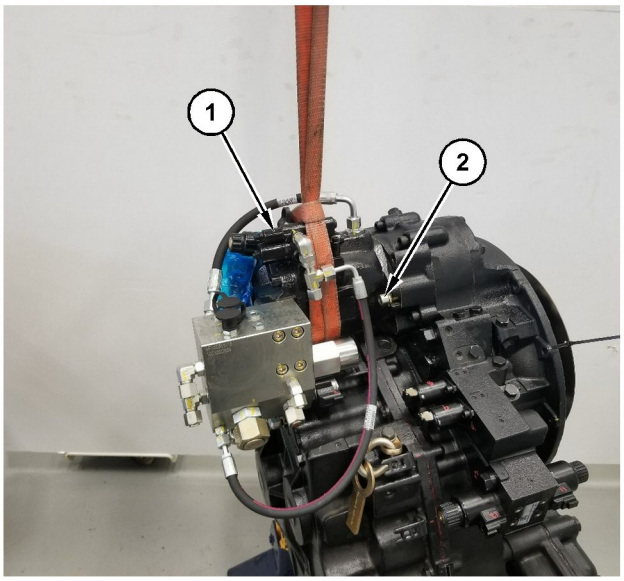

Illustration 3 g06693862

1. Attach a suitable lifting device to pump (1). The weight of pump (1) is approximately 41 kg (90 lb). Remove bolts (2), pump (1), and the O-ring seal.

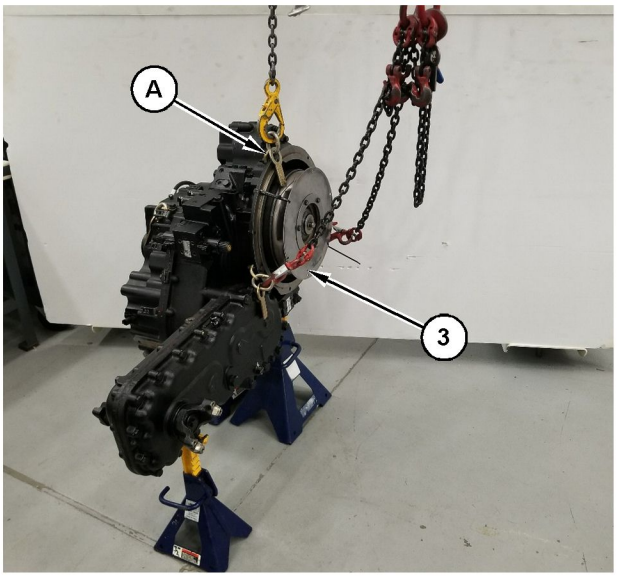

Illustration 4 g06693879

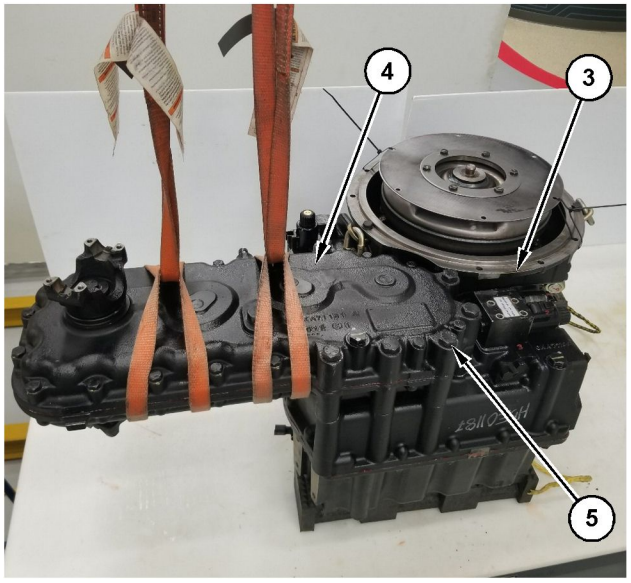

Illustration 5 g06693882

2. Attach Tooling (A) and a suitable lifting device to transmission assembly (3). The weight of transmission assembly (3) is approximately 338 kg (745 lb).

3. Position transmission assembly (3) and place on suitable cribbing as shown in Illustration 5 .

4. Attach a suitable lifting device to transfer case (4). The weight of transfer case (4) is approximately 73 kg (161 lb). Remove six bolts (5) and transfer case (4) from transmission assembly (3).

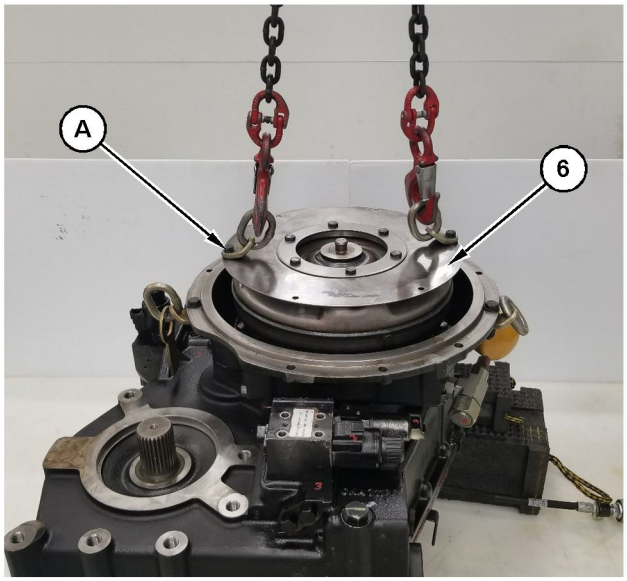

Illustration 6 g06693883

5. Attach Tooling (A) and a suitable lifting device to torque converter (6). The weight of torque converter (6) is approximately 20 kg (44 lb). Cut the cable straps (not shown) and remove torque converter (6).

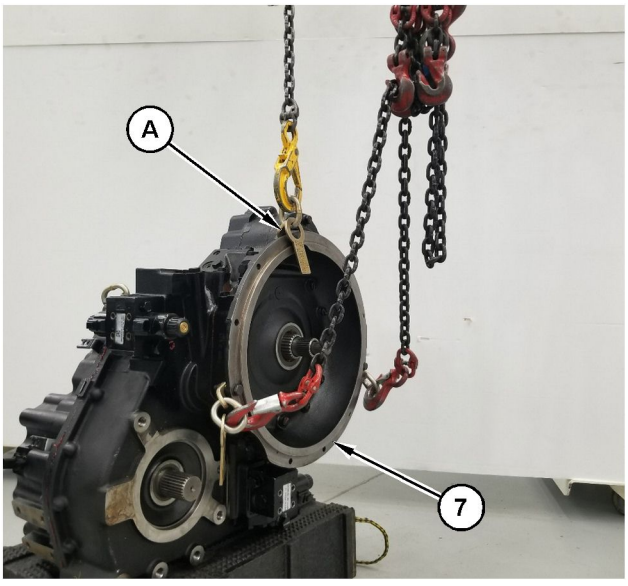

Illustration 7 g06693887

6. Attach Tooling (A) and a suitable lifting device to transmission (7). The weight of transmission (7) is approximately 245 kg (540 lb).

7. Position transmission (7) onto suitable cribbing. Remove Tooling (A) and the suitable lifting device from transmission (7).

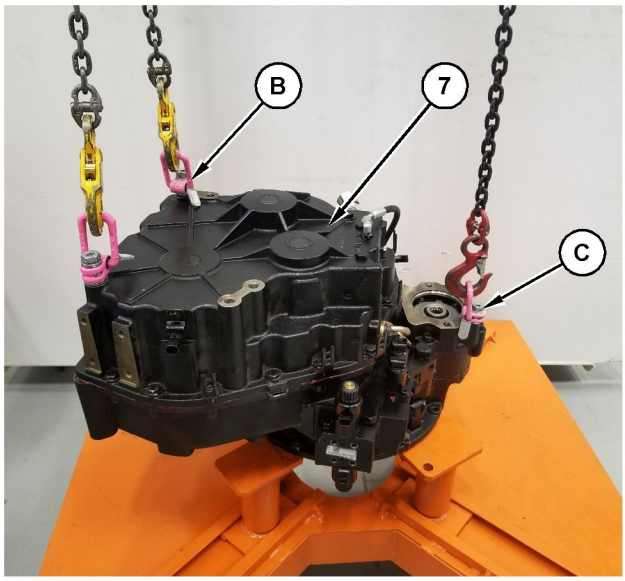

Illustration 8 g06693890

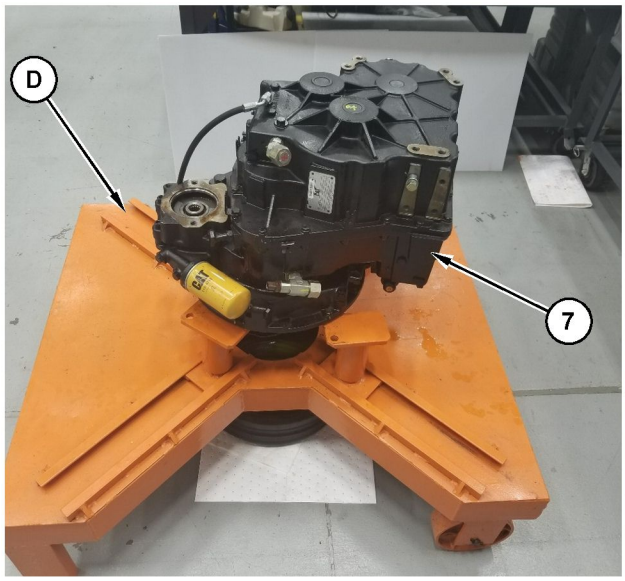

Illustration 9 g06693893

8. Attach Tooling (B), Tooling (C), and a suitable lifting device to transmission (7).

9. Position transmission (7) onto Tooling (D) as shown in Illustration 9 . Install Tooling (E) (not shown) to secure transmission (7).

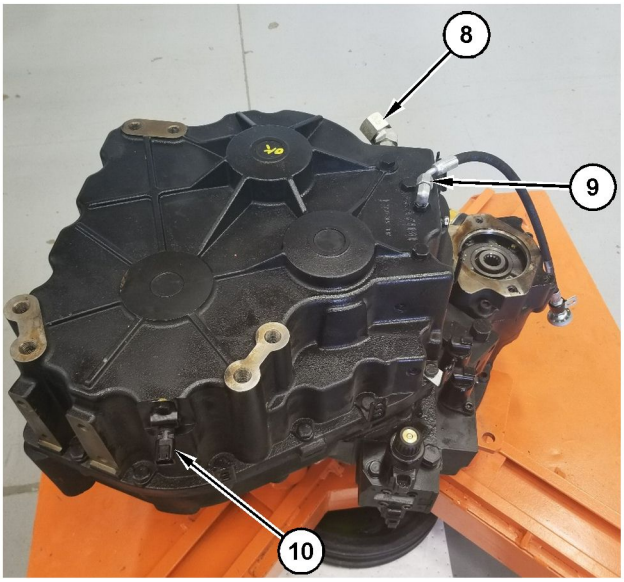

Illustration 10 g06693895

10. Remove the bolt, speed sensor (10), and the O-ring seal. Remove hose (9), adapter (8), and the O-ring seal.

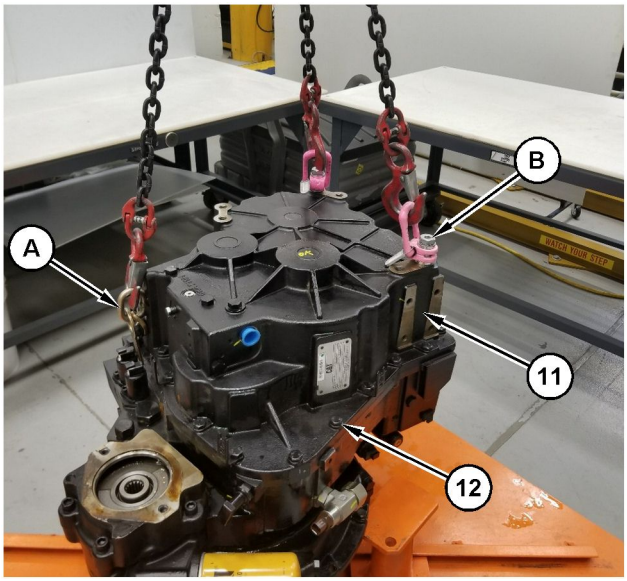

Illustration 11 g06693897

11. Attach Tooling (A), Tooling (B), and a suitable lifting device to rear case (11). The weight of rear case (11) is approximately 50 kg (110 lb). Remove bolts (12) and rear case (11).

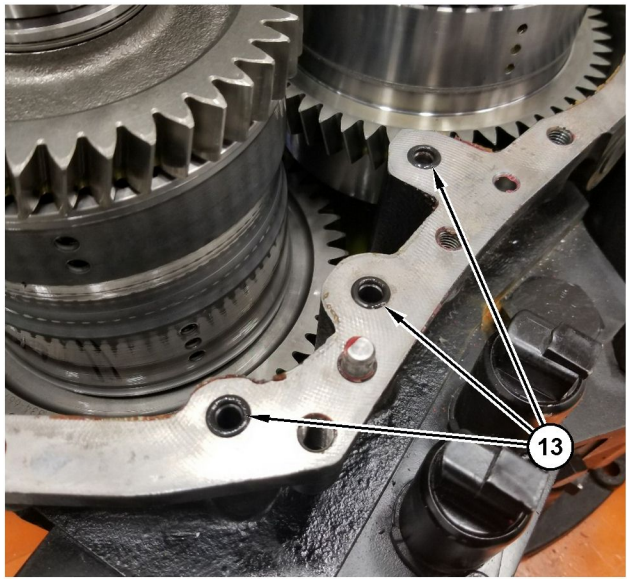

Illustration 12 g06693899

12. Remove O-ring seals (13).

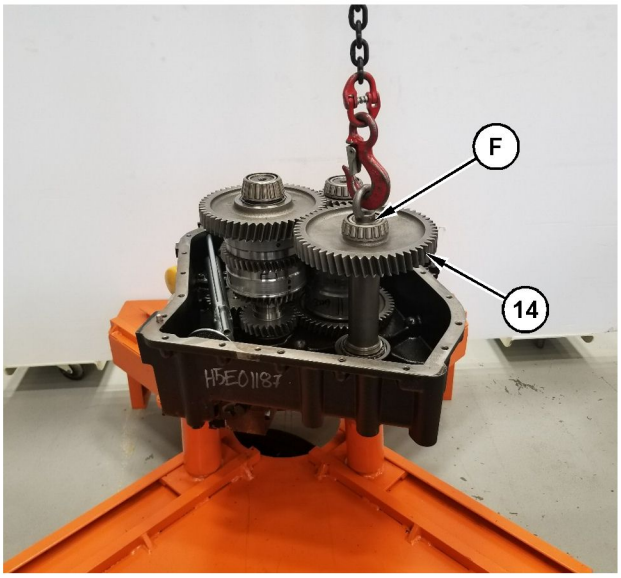

Illustration 13 g06693901

Output shaft

13. Attach Tooling (F) and a suitable lifting device to output shaft (14). Remove output shaft (14).

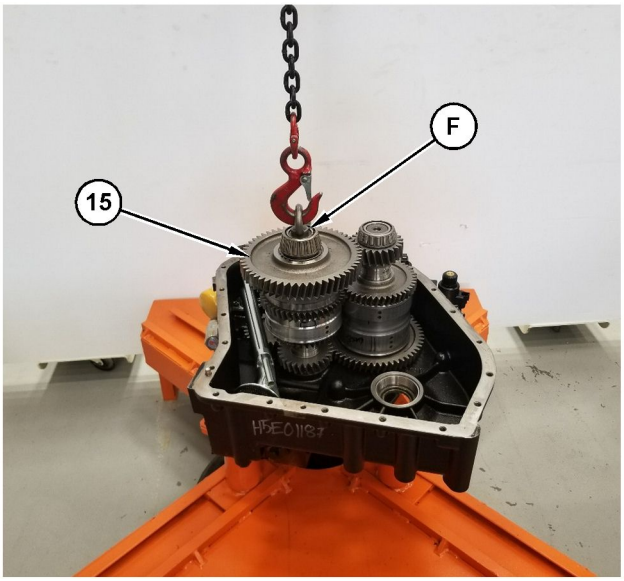

Illustration 14 g06693902

Forward high/third clutch assembly

14. Remove the bolt and the washer (not shown). Attach Tooling (F) and a suitable lifting device onto clutch assembly (15). The weight of clutch assembly is approximately 23 kg (51 lb). Remove clutch assembly (15).

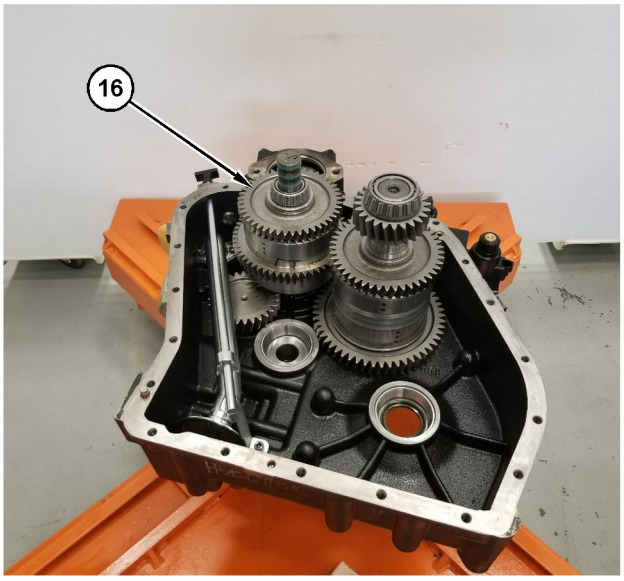

Illustration 15 g06693905

Forward low/reverse clutch assembly

Note: Be aware of potential pinch points during removal.

15. Remove clutch assembly (16).

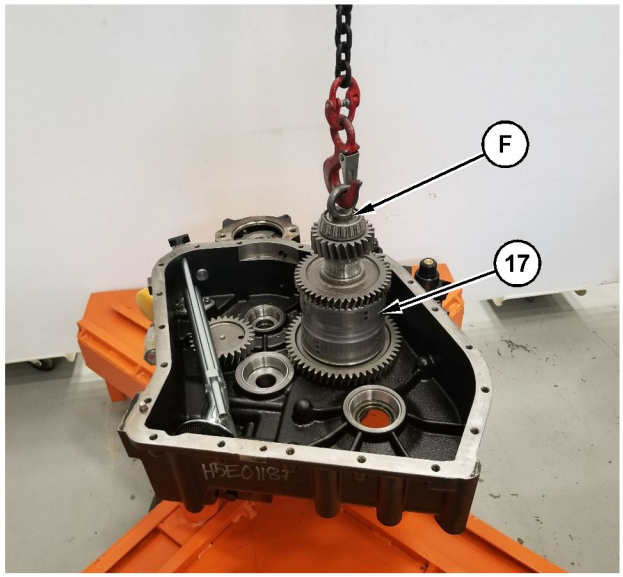

Illustration 16 g06693906

First/second clutch assembly

16. Remove the bolt and the washer (not shown). Attach Tooling (F) and a suitable lifting device onto clutch assembly (17). Remove clutch assembly (17).

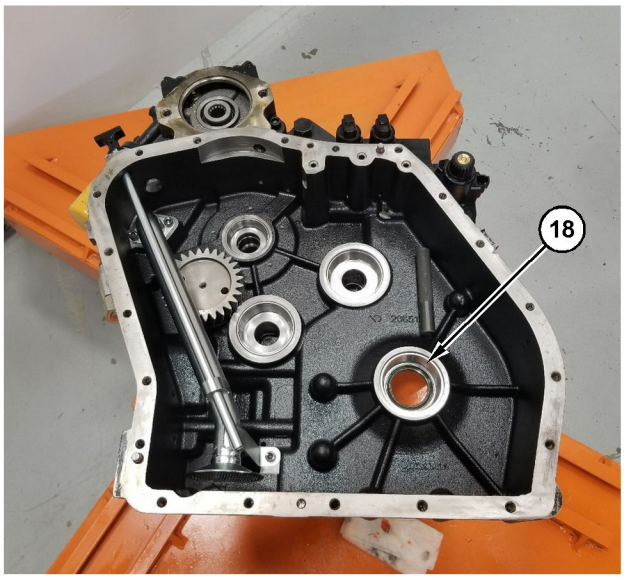

Illustration 17 g06693909

17. Remove four bearing cups (18).

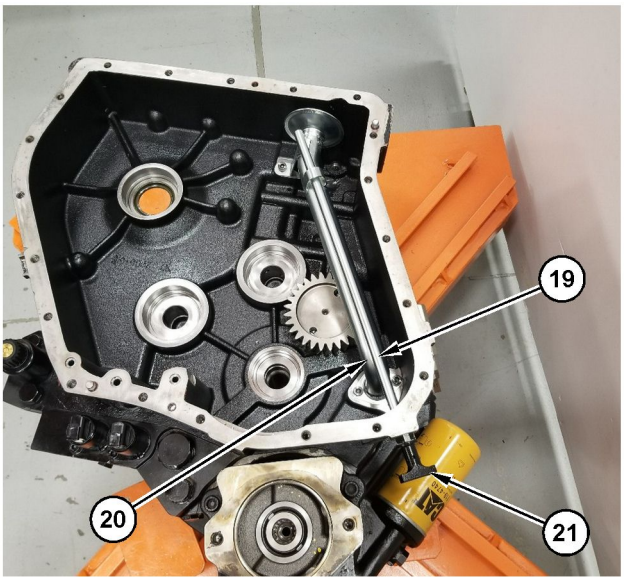

Illustration 18 g06693915

18. Remove gage assembly (21) and tube assembly (19). Remove the three bolts and suction strainer assembly (20).

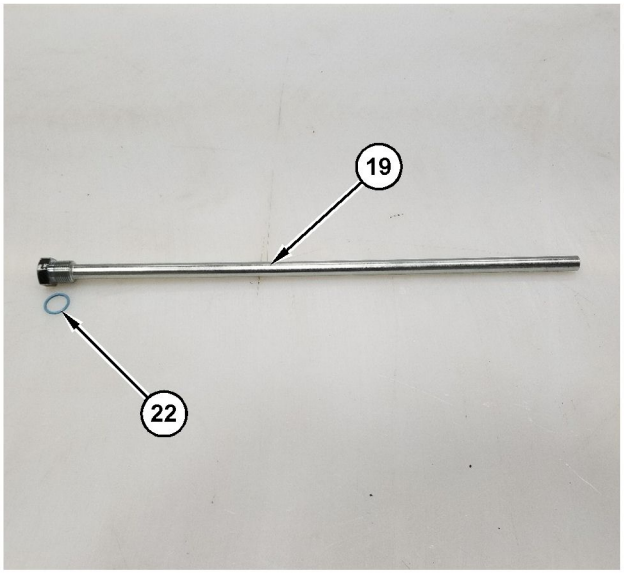

Illustration 19 g06693918

19. Remove O-ring seal (22) from tube assembly (19).

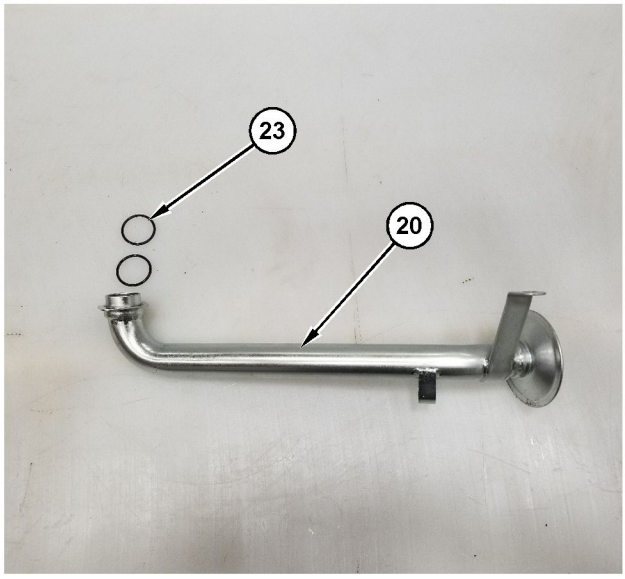

Illustration 20 g06693919

20. Remove O-ring seals (23) from suction strainer assembly (20).

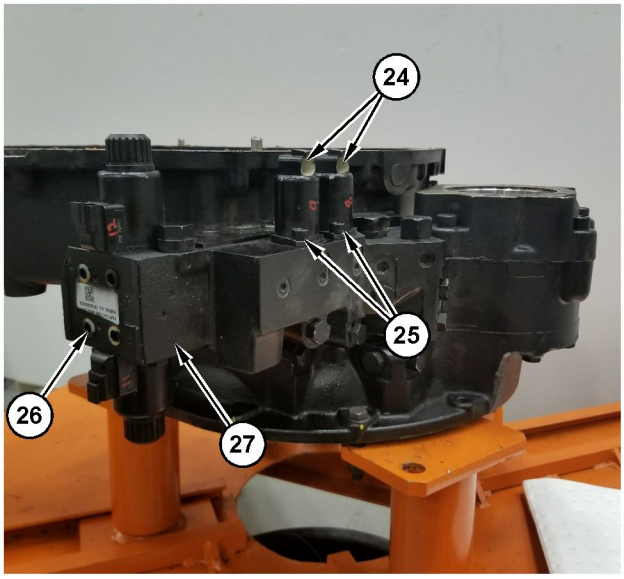

Illustration 21 g06693922

21. Remove four bolts (26) and solenoid valve assembly (27).

22. Remove two screws (25) and solenoid valves (24).

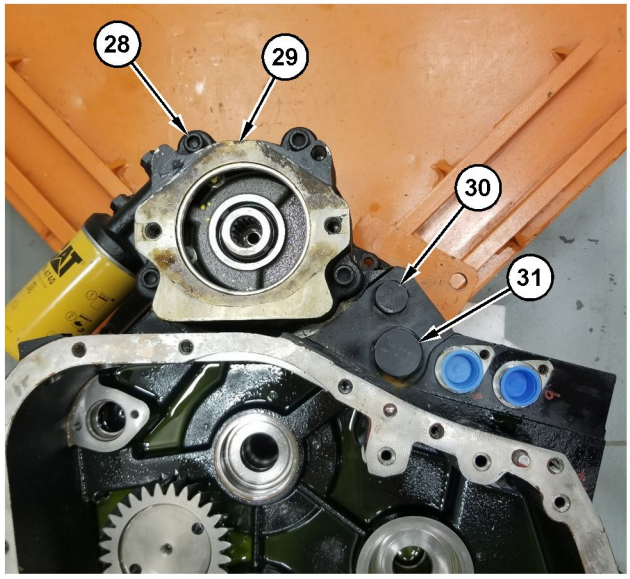

Illustration 22 g06693995

23. Remove four bolts (28) and pump housing (29).

24. Remove relief valves (30) and (31).

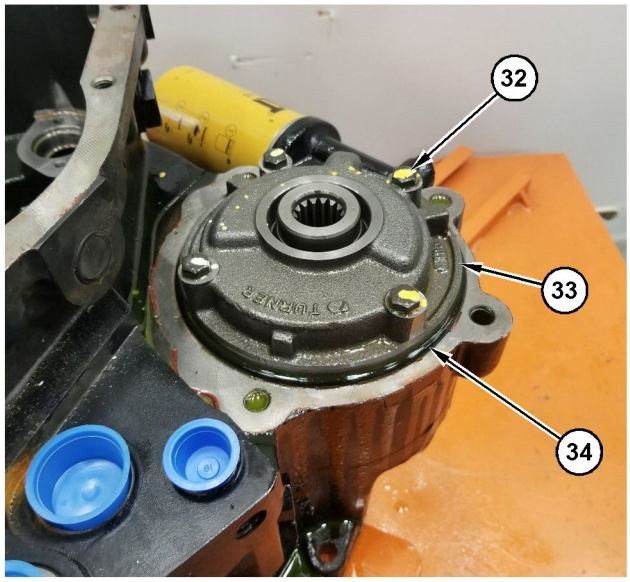

Illustration 23 g06693998

25. Remove O-ring seal (34).

26. Remove four bolts (32) and pump (33).

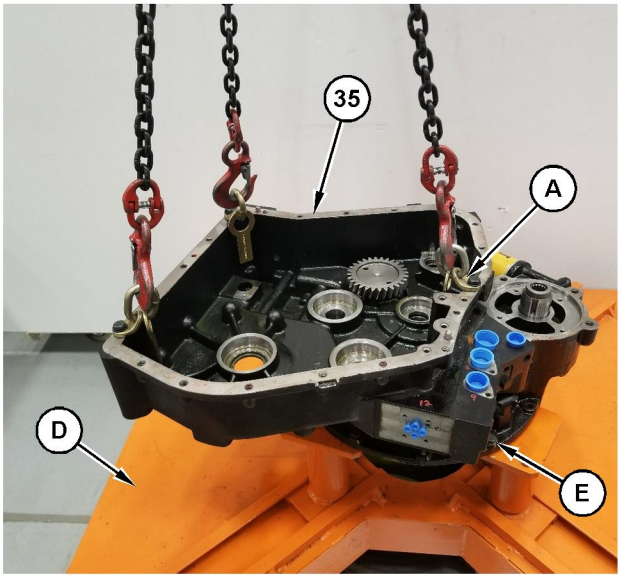

Illustration 24 g06693999

27. Attach Tooling (A) and a suitable lifting device to transmission intermediate case (35). The weight of transmission intermediate case (35) is approximately 108 kg (238 lb).

28. Remove Tooling (E) and transmission intermediate case (35) from Tooling (D).

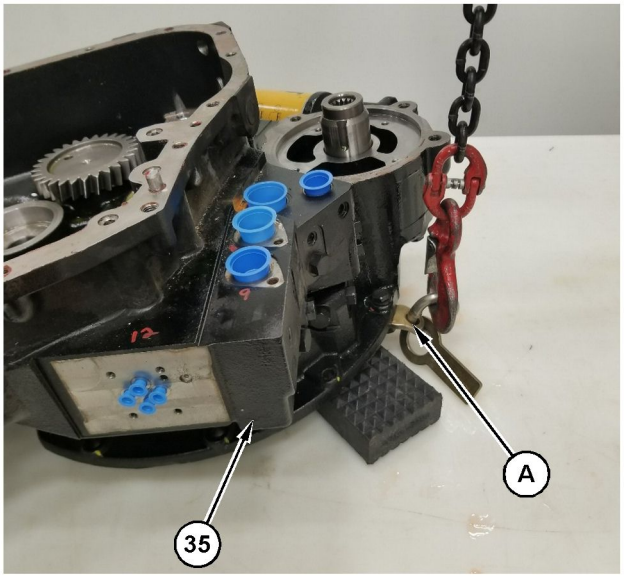

Illustration 25 g06694001

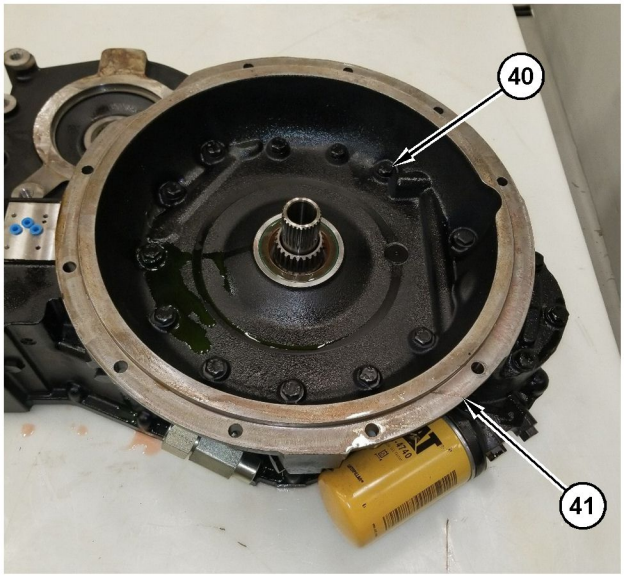

Illustration 27 g06694006

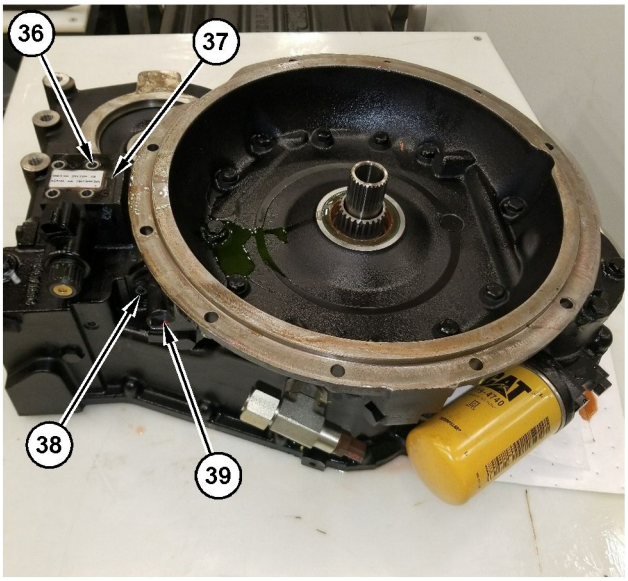

Illustration 26 g06694002

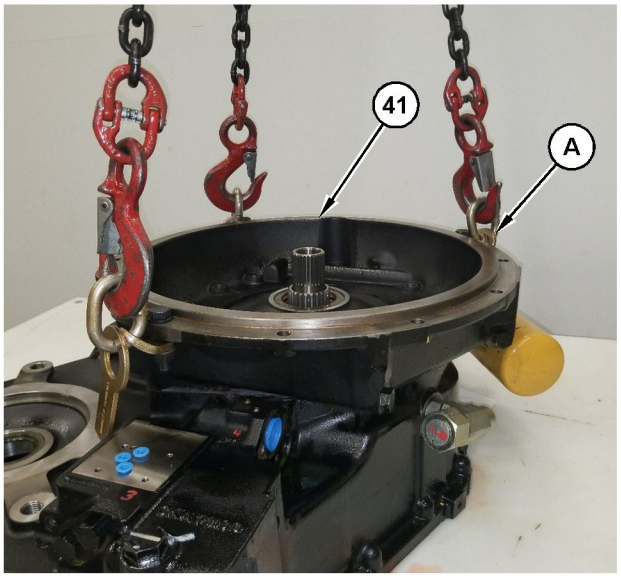

Illustration 28 g06694009

29. Position transmission intermediate case (35) on suitable cribbing. Attach Tooling (A) and a suitable lifting device to transmission intermediate case (35) and position transmission intermediate case (35) as shown in Illustration 26 .

30. Remove four bolts (36) and solenoid valve assembly (37). Remove screw (38) and solenoid valve (39).

31. Attach Tooling (A) and a suitable lifting device to torque converter housing (41). The weight of torque converter housing (41) is approximately 29 kg (64 lb). Remove 15 bolts (40) and torque converter housing (41).

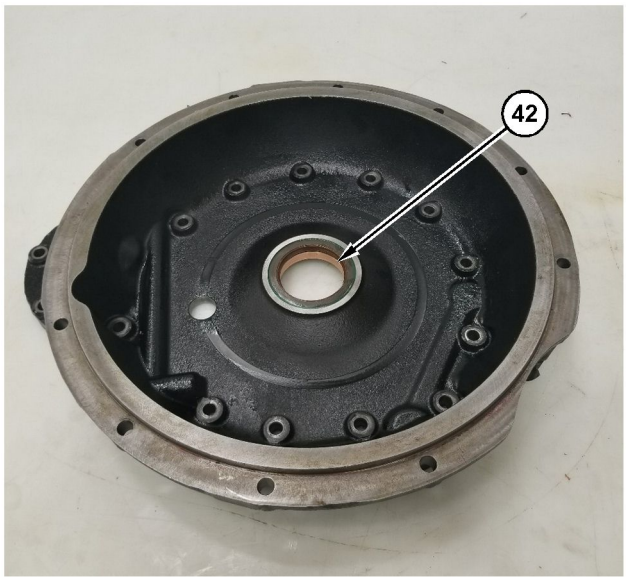

Illustration 29 g06694011

Note: Discard seal (42).

32. Remove seal (42).

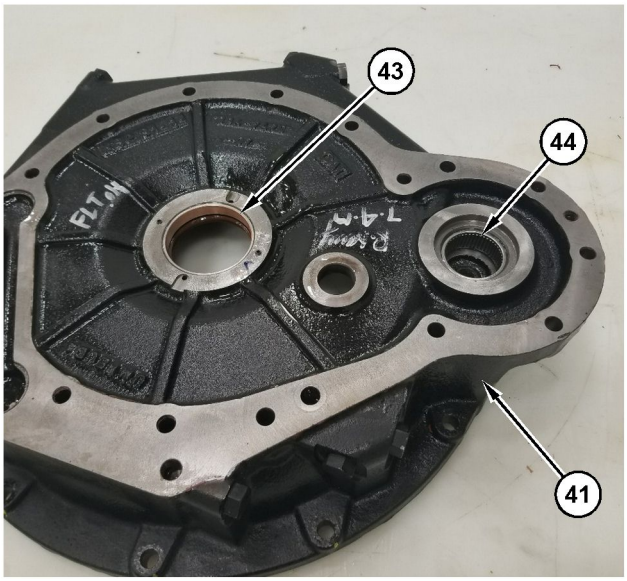

Illustration 30 g06694012

Note: Discard bushing (43) and needle bearing (44).

33. Position torque converter housing (41). Use Tooling (G) (not shown) to remove bushing (43) and needle bearing (44). Remove bushing (43) and needle bearing (44).

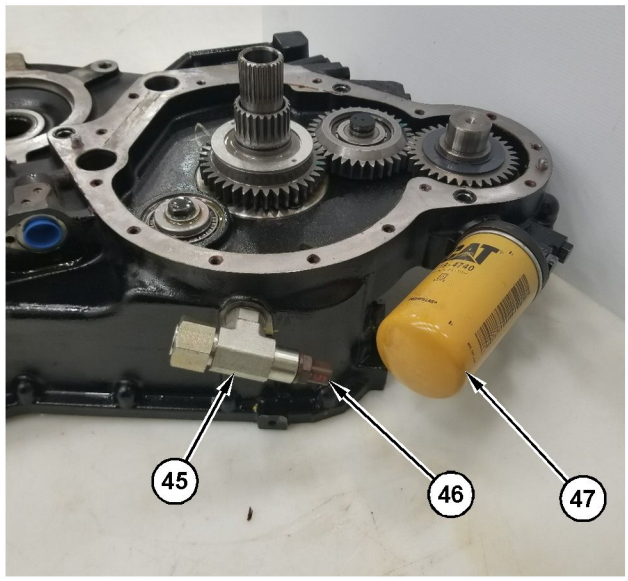

Illustration 31 g06694014

34. Remove sensor assembly (46), the O-ring seal, adapter (45), and the O-ring seal.

35. Remove transmission filter (47).

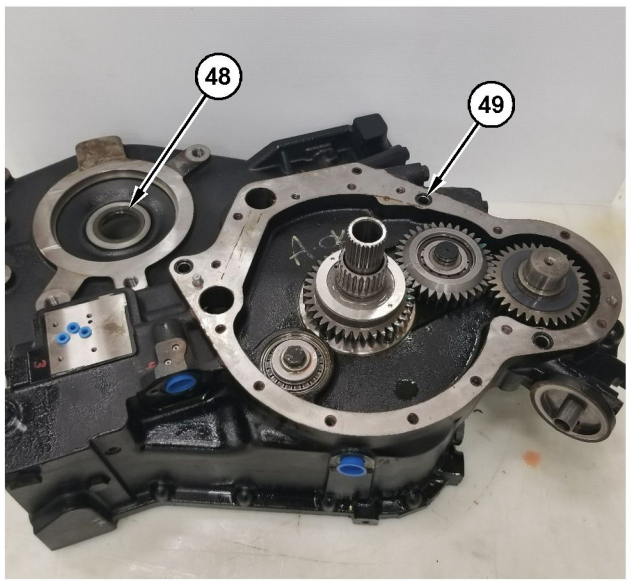

Illustration 32 g06694018

Note: Discard lip seal (48).

36. Mark the orientation of lip seal (48) for assembly purposes.

Remove lip seal (48) and four O-ring seals (49).

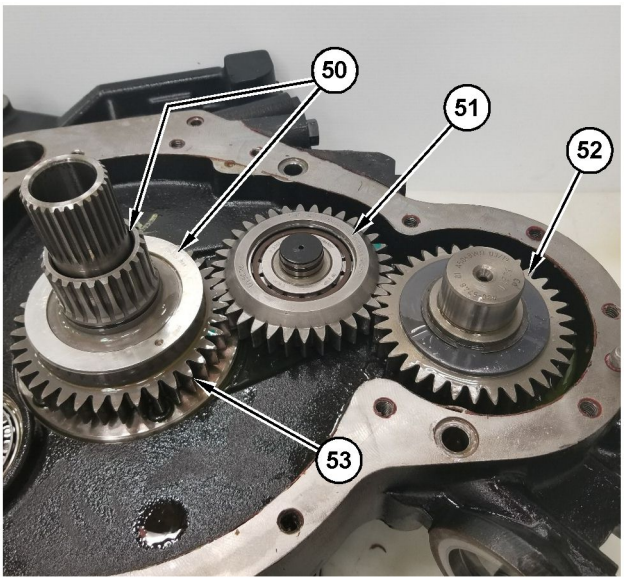

Illustration 33 g06694020

Note: Note the orientation of thrust washers (50) for assembly purposes.

37. Remove thrust washers (50) and gear assembly (53).

38. Remove the spacer and gear assembly (51).

39. Remove gear assembly (52).

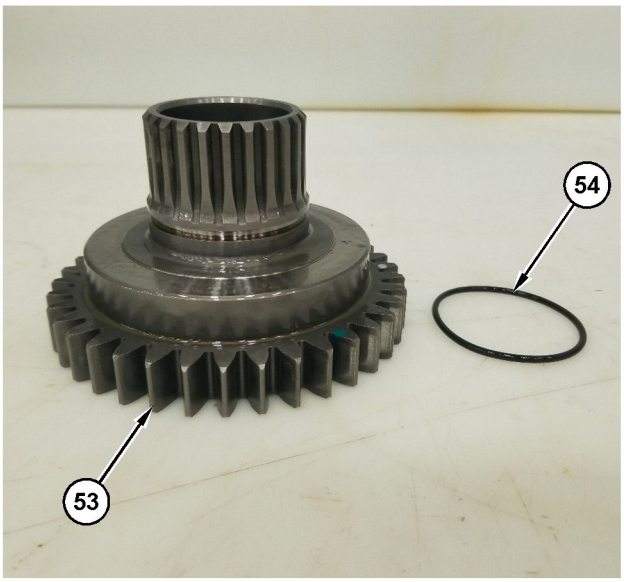

Illustration 34 g06694021

40. Remove O-ring seal (54) from gear assembly (53).

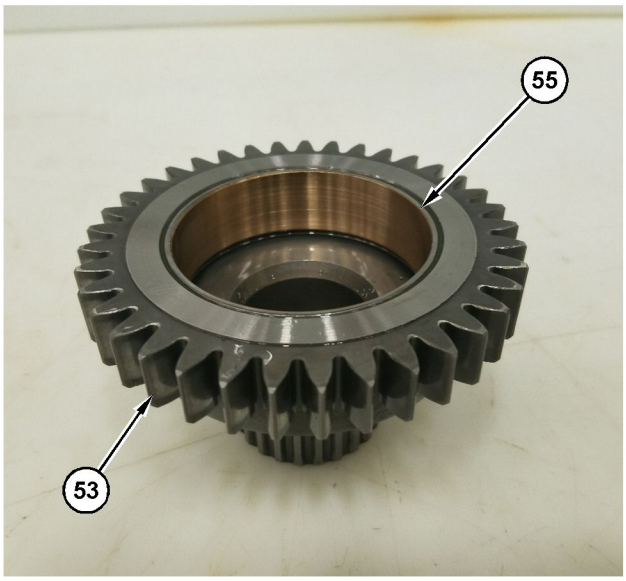

Illustration 35 g06694022

Note: Discard bushing (55).

41. Remove bushing (55) from gear assembly (53).

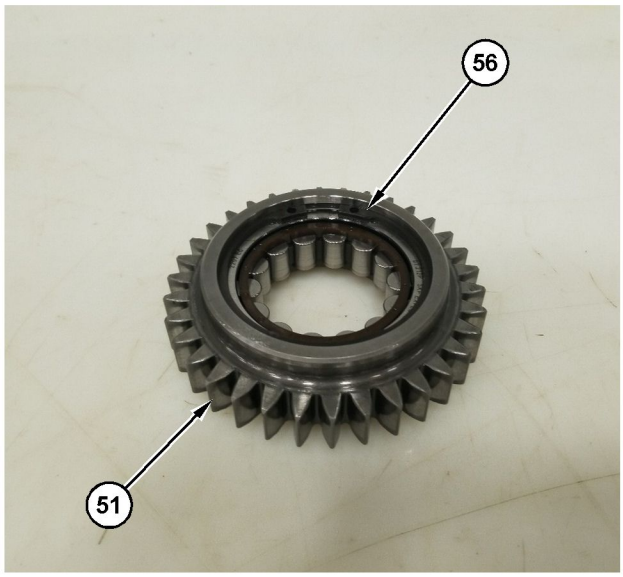

Illustration 36 g06694023

42. Use Tooling (J) (not shown) to remove retaining ring (56) from gear assembly (51). Remove retaining ring (56).

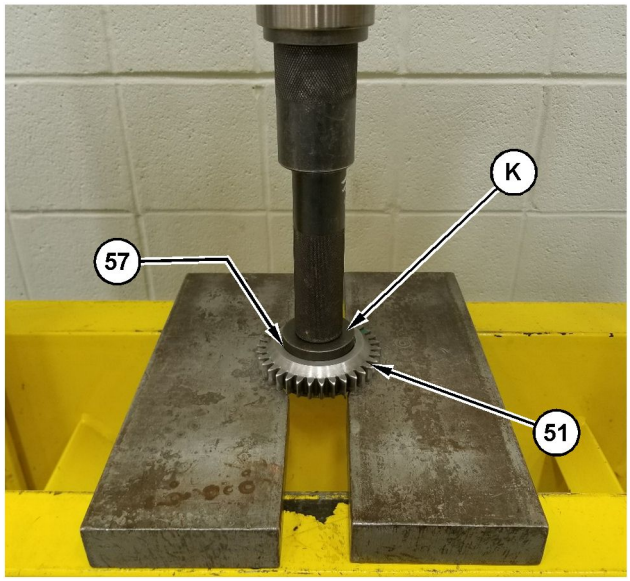

Illustration 37 g06694026

43. Use Tooling (K) and a suitable press to remove bearing (57). Remove bearing (57) from gear assembly (51).

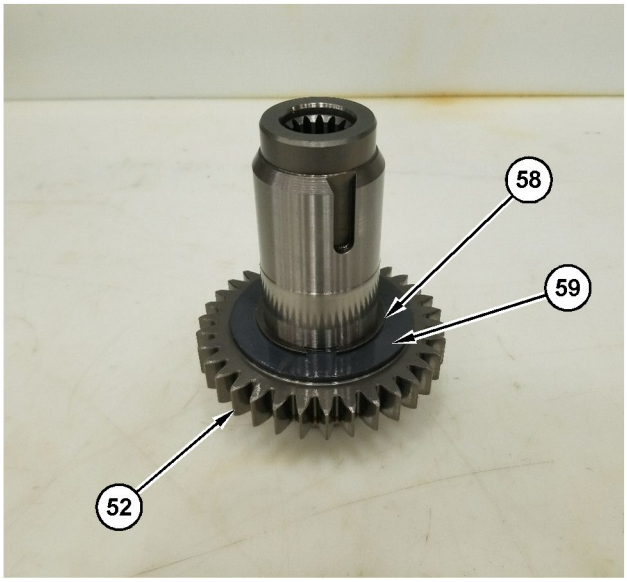

Illustration 38 g06694027

44. Use Tooling (H) (not shown) to remove retaining ring (58). Remove retaining ring (58) and thrust washer (59) from gear assembly (52). Repeat for the other side.

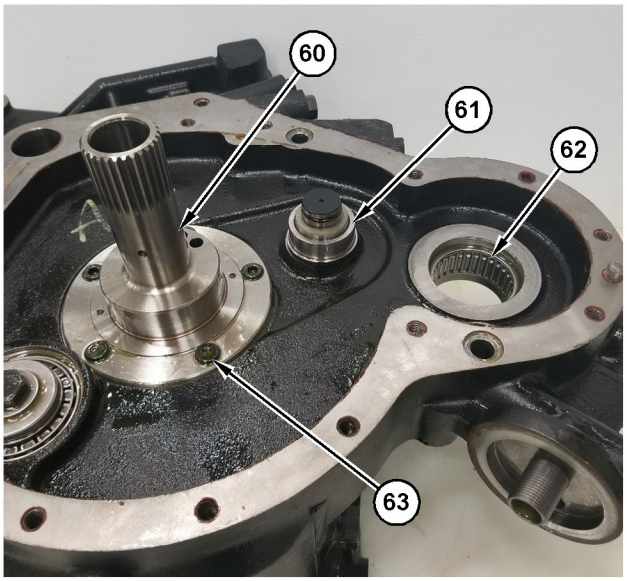

Illustration 39 g06694031

45. Remove five bolts (63) and stator support hub (60).

46. Remove support shaft assembly (61).

Note: Discard needle bearing (62).

47. Use Tooling (G) (not shown) to remove needle bearing (62). Remove needle bearing (62).

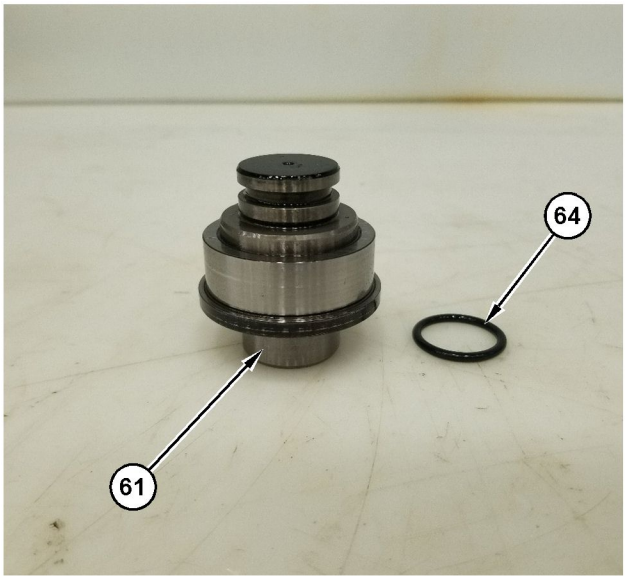

Illustration 40 g06694033

48. Remove O-ring seal (64) from support shaft assembly (61).

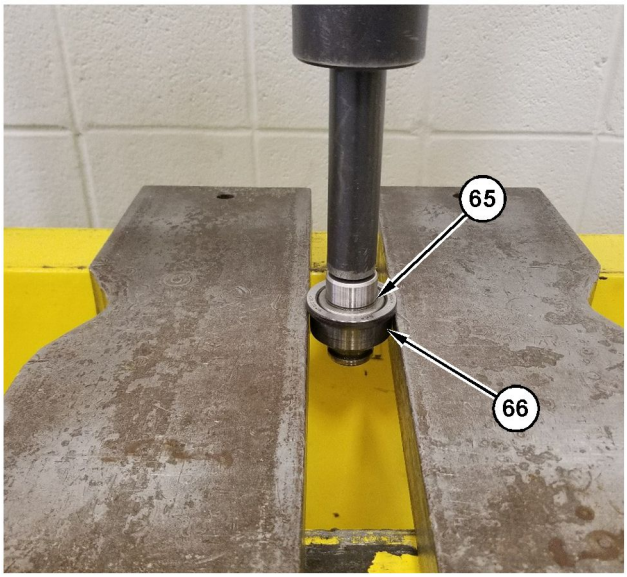

Illustration 41 g06694037

49. Use a suitable press to remove support shaft (65). Remove support shaft (65) from bearing race (66).

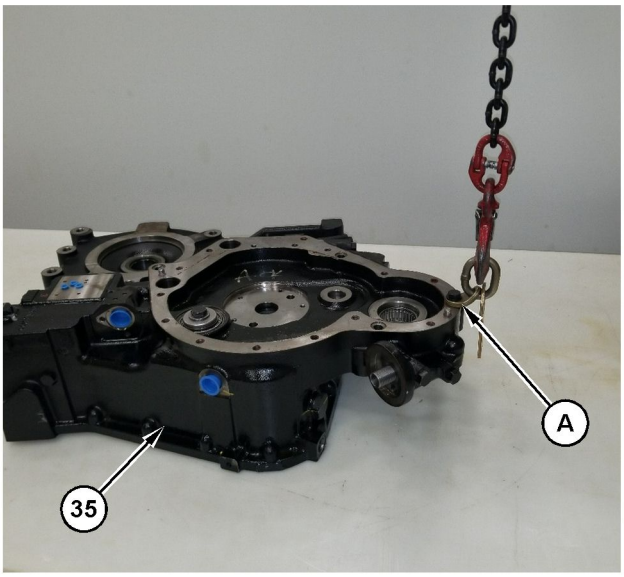

Illustration 42 g06694039

50. Attach Tooling (A) and a suitable lifting device to transmission intermediate case (35). The weight of transmission intermediate case (35) is approximately 68 kg (150 lb). Place transmission intermediate case (35) in VERTICAL position.

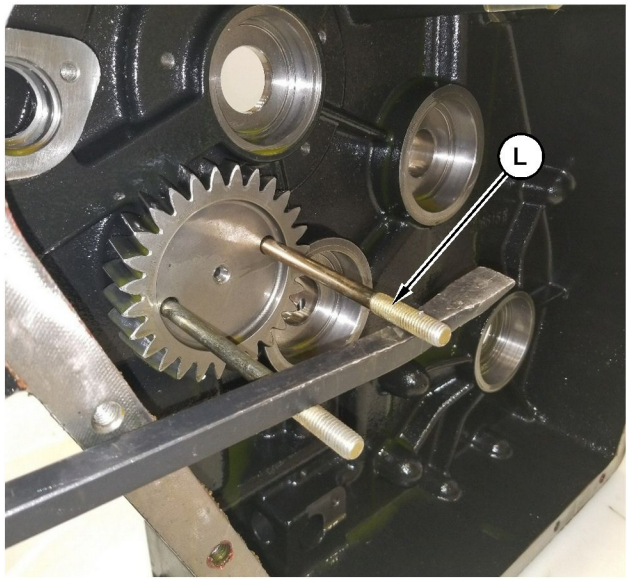

Illustration 43 g06694042

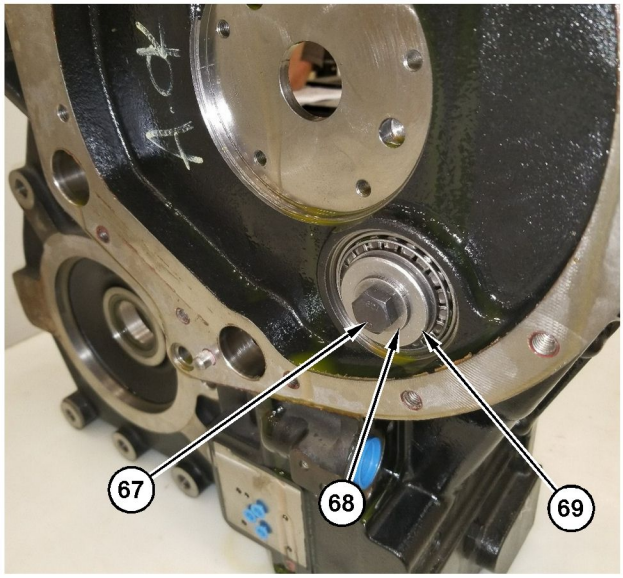

Illustration 44 g06694045

51. Use Tooling (L) and a suitable pry bar to hold the reverse idler gear.

52. Remove bolt (67), washers (68), and (69).

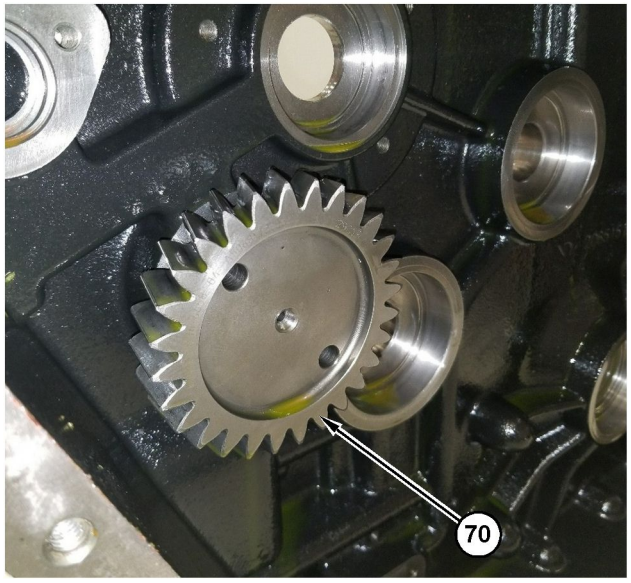

Illustration 45 g06694048

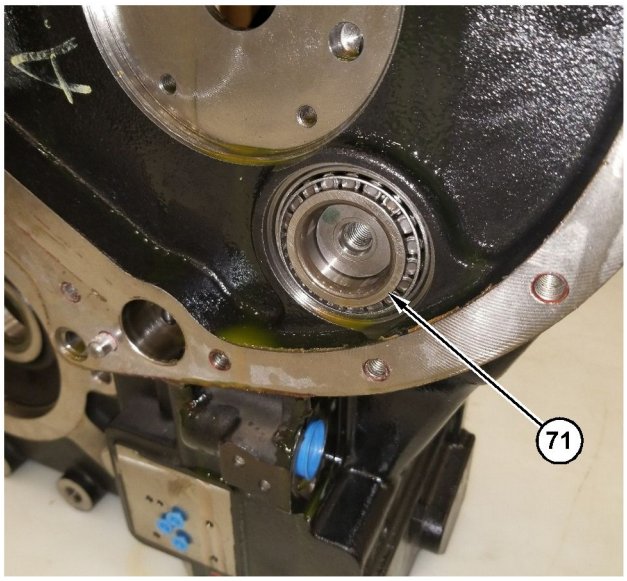

Illustration 46 g06694051

53. Remove reverse idler gear (70) and the spacer from rear of the case.

54. Remove bearing (71) from front of the case.

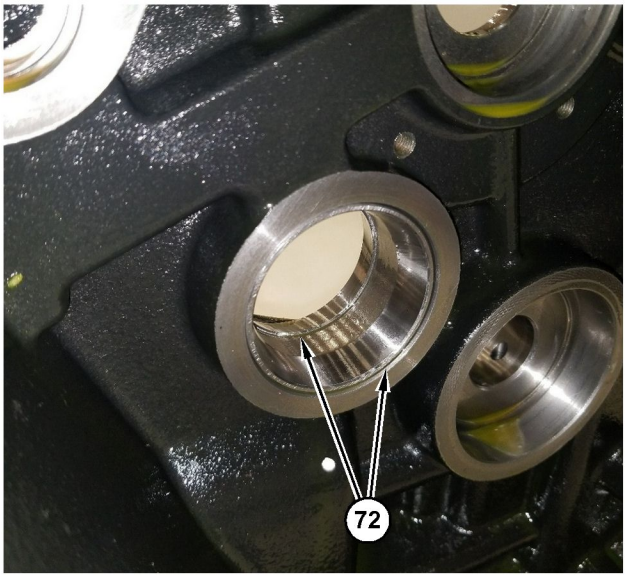

Illustration 47 g06694054

Note: Discard bearing cup (72).

55. Use Tooling (G) (not shown) to remove bearing cups (72). Remove bearing cups (72).

Output shaft disassembly

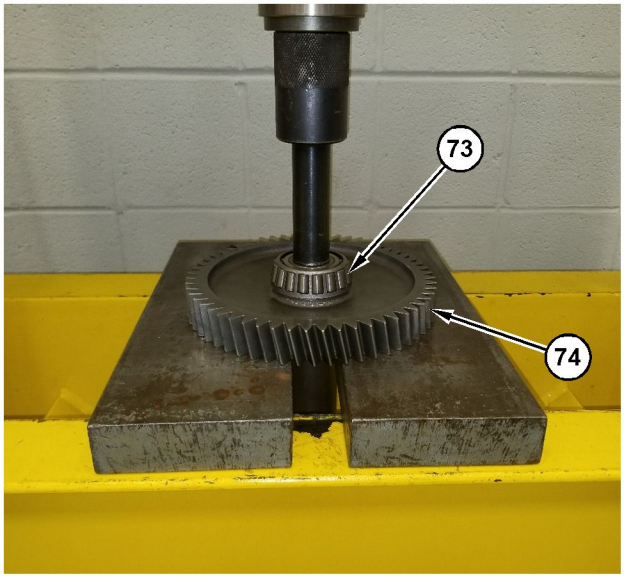

Illustration 48 g06694061

1. Use a suitable press to remove bearing cone (73) and gear (74). Remove bearing cone (73) and gear (74) from the output shaft.

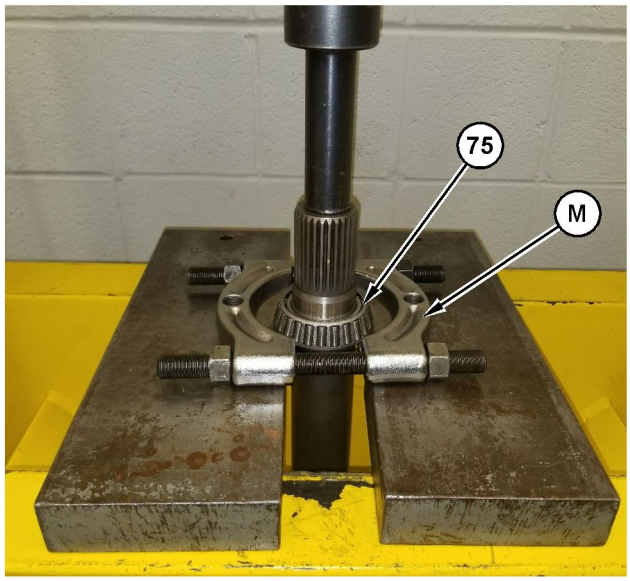

Illustration 49 g06694063

2. Use Tooling (M) and a suitable press to remove bearing cone (75). Remove bearing cone (75) from the output shaft.

Forward high/third clutch disassembly

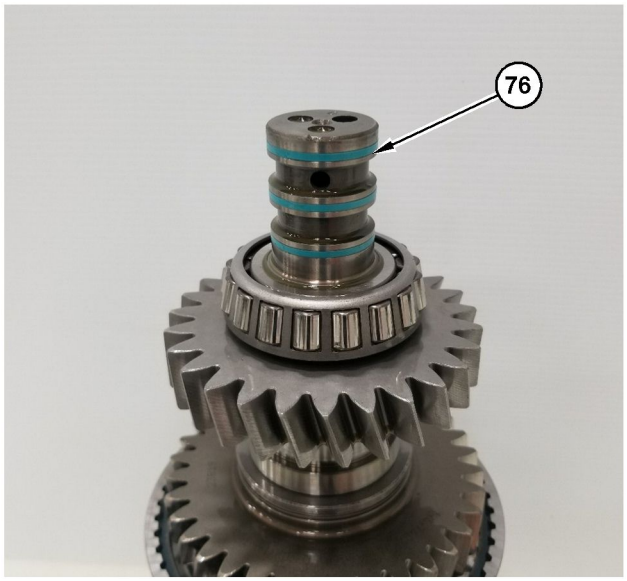

Illustration 50 g06694071

1. Remove three ring seals (76).

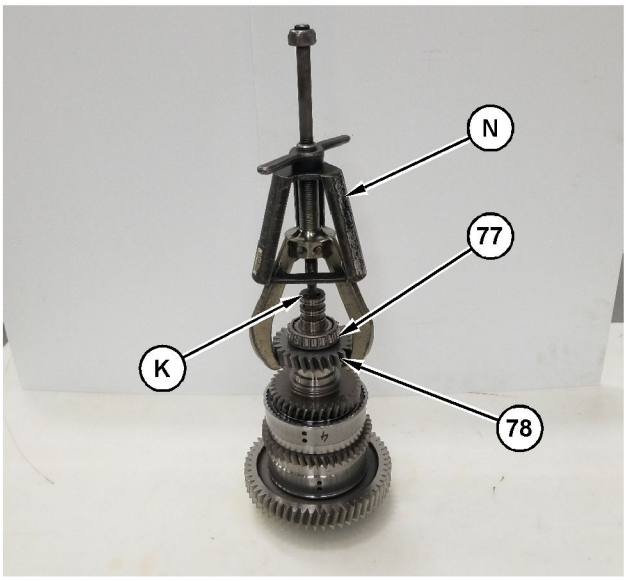

Illustration 51 g06694074

2. Use Tooling (K) and Tooling (N) to remove bearing cone (77) and gear (78). Remove bearing cone (77) and gear (78).

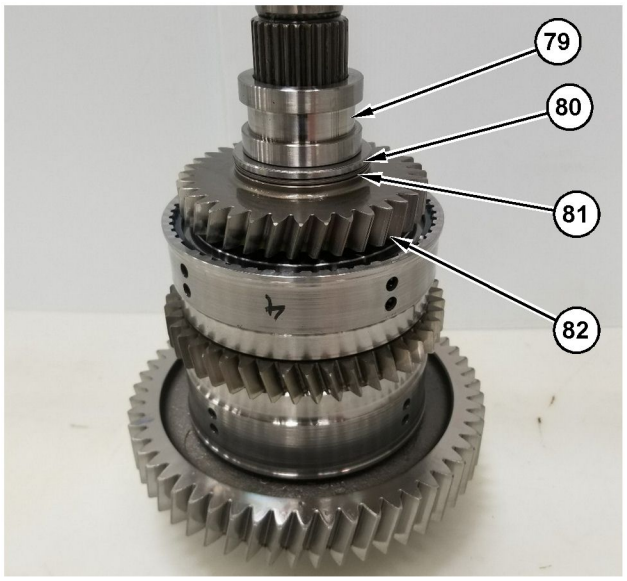

Illustration 52 g06694077

3. Remove spacer (79), thrust washer (80), thrust bearing (81), and gear (82).

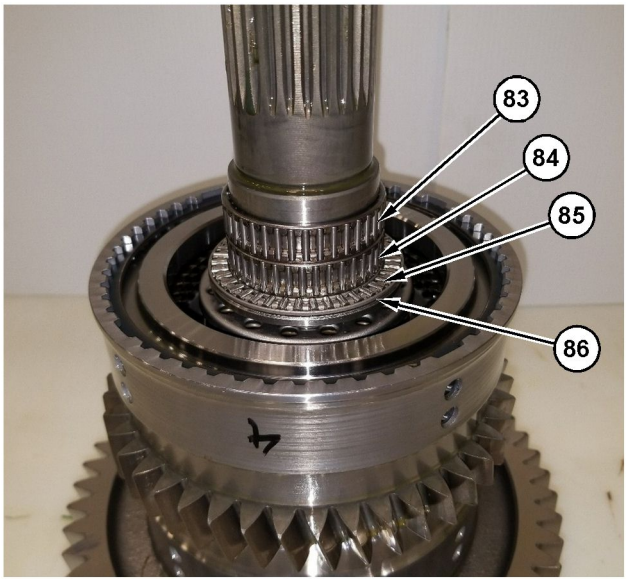

Illustration 53 g06694081

4. Remove needle bearings (83) and (84).

5. Remove thrust bearing (85) and thrust washer (86).

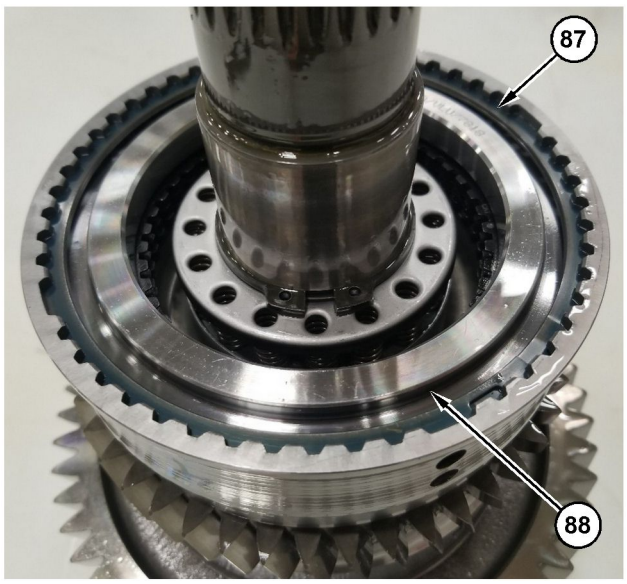

Illustration 54 g06694086

6. Use a suitable flat blade screw driver to remove retaining ring (87). Remove retaining ring (87) and retainer plate (88).

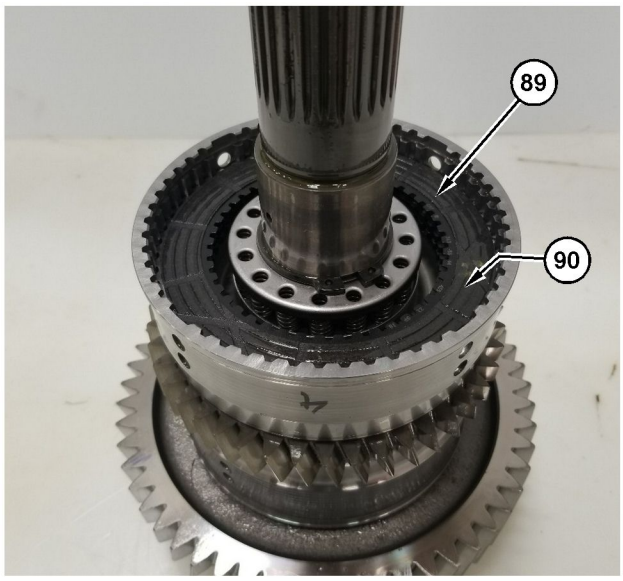

Illustration 55 g06694088

Note: Note the quantity and the location of friction discs (89) and clutch discs (90) for assembly purposes.

7. Remove friction discs (89) and clutch discs (90).

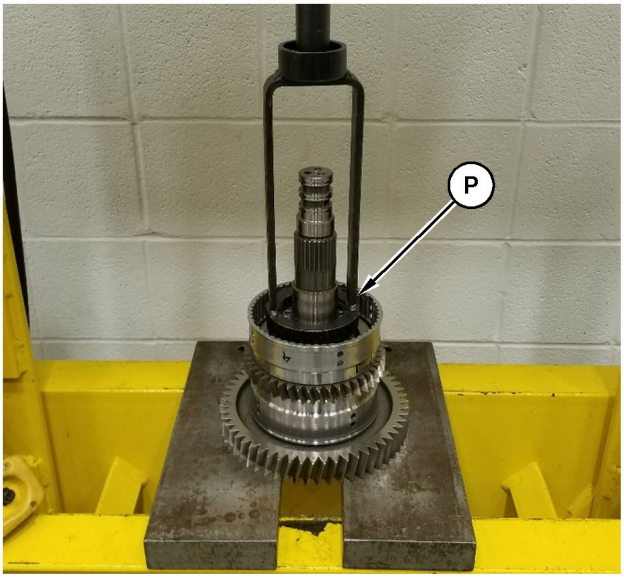

Illustration 56 g06694091

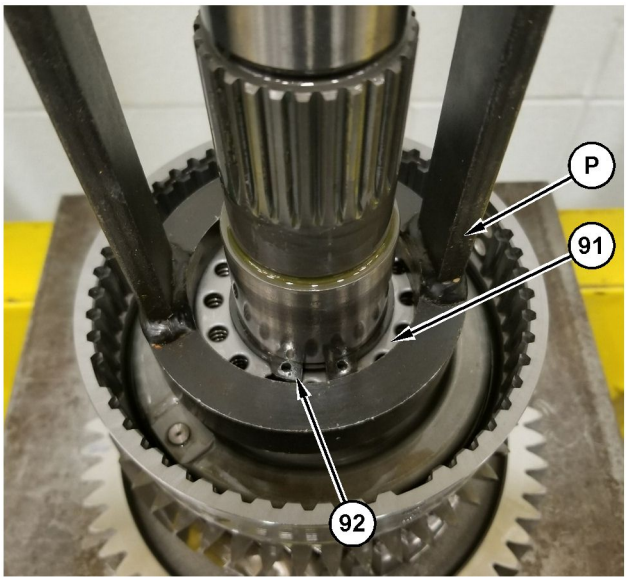

Illustration 57 g06694095

⚠ WARNING

Personal injury can result from being struck by parts propelled by a released spring force.

Make sure to wear all necessary protective equipment.

Follow the recommended procedure and use all recommended tooling to release the spring force.

8. Use Tooling (P) and a suitable press to compress spring assembly (91). Use Tooling (J) (not shown) to remove retaining ring (92).

9. Remove retaining ring (92), spring assembly (91), and the spring retainer.

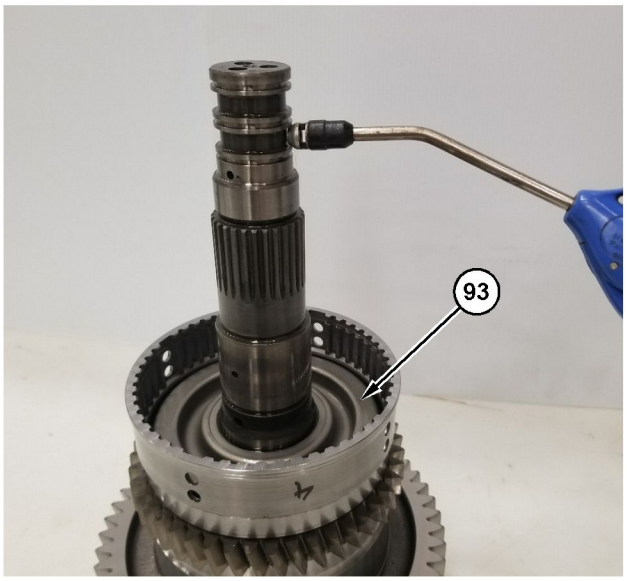

Illustration 58 g06694097

⚠ WARNING

Personal injury can result from air pressure against the piston.

The piston can come out of the housing assembly with force when air pressure is applied.

To prevent possible personal injury, the piston must be retained in the housing assembly when applying air pressure.

10. Using an air line with a low-pressure supply, pressurize the forward high clutch to remove piston (93). Remove piston (93).

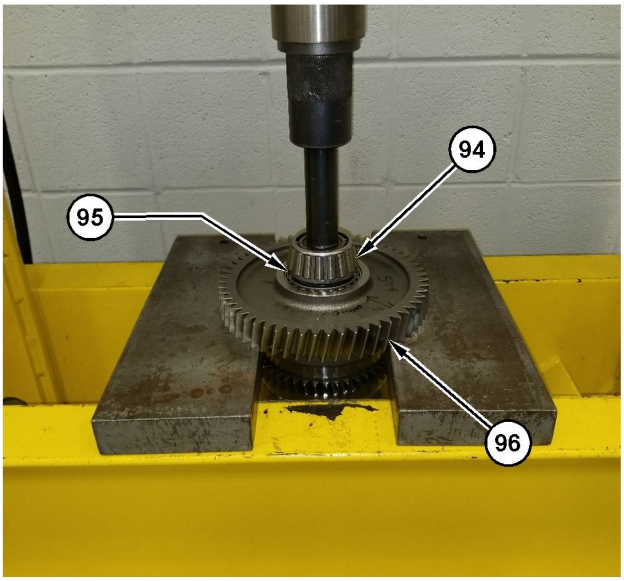

Illustration 59 g06694099

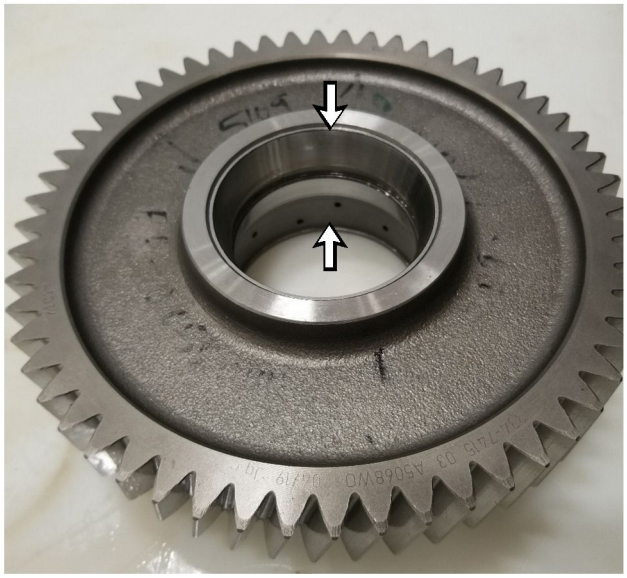

Illustration 60 g06694102

11. Use a suitable press to remove bearing cones (94), (95), and gear (96). Remove bearing cones (94), (95), and gear (96).

Note: Discard the bearing cups.

12. Use Tooling (G) (not shown) to remove the bearing cups. Remove the bearings cups from gear (96).

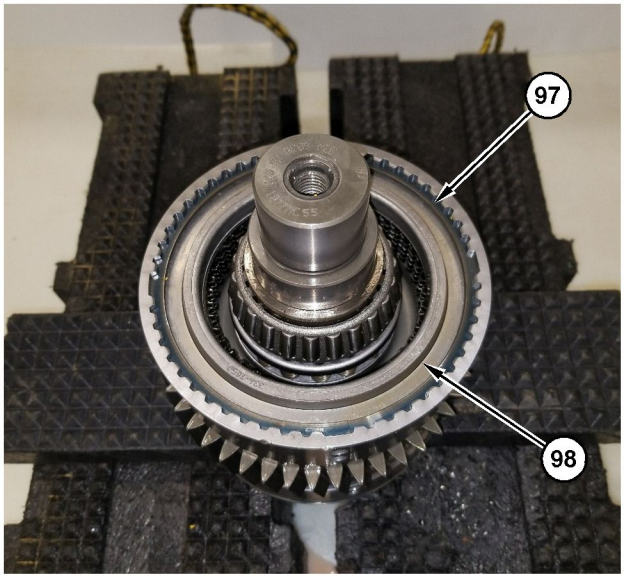

Illustration 61 g06694105

13. Use a suitable flat blade screw driver to remove retaining ring (97). Remove retaining ring (97) and retainer plate (98).

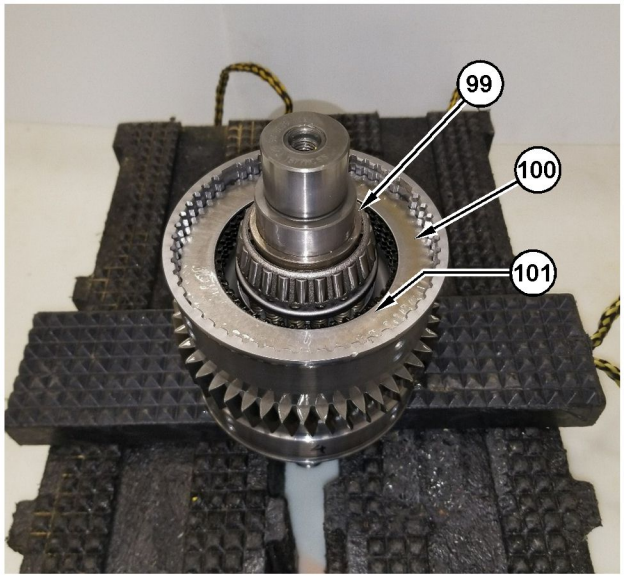

Illustration 62 g06694108

Note: Note the quantity and the location of clutch discs (100) and friction discs (101) for assembly purposes.

14. Remove spacer (99), clutch discs (100), and friction discs (101).

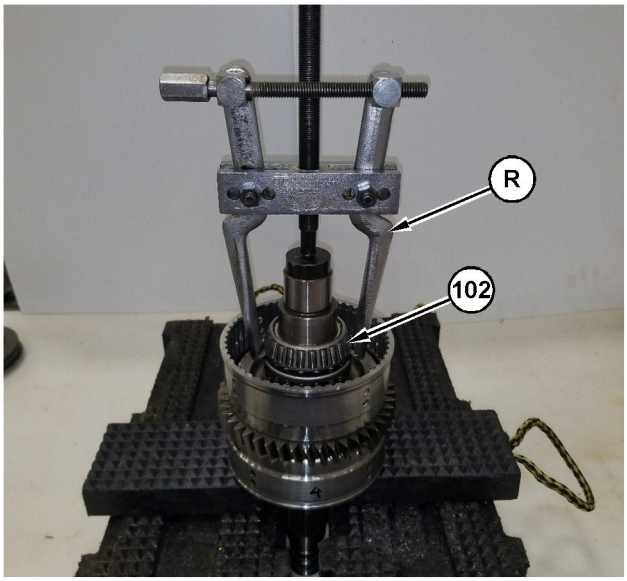

Illustration 63 g06694112

Note: Discard bearing cone (102).

15. Use Tooling (R) to remove bearing cone (102). Remove bearing cone (102).

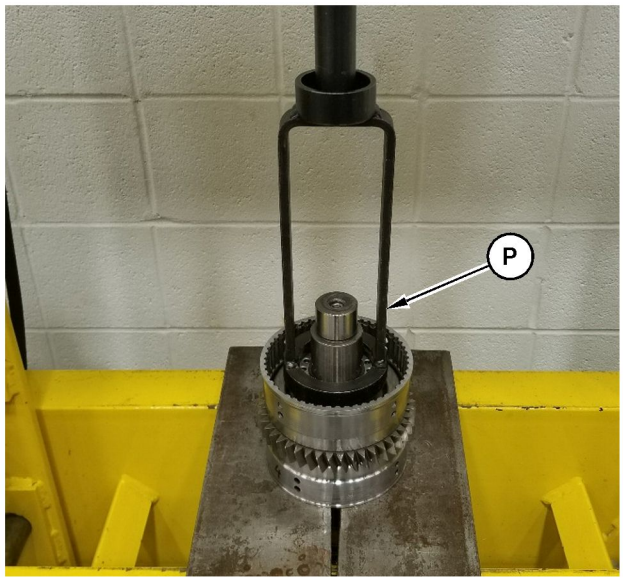

Illustration 64 g06694113

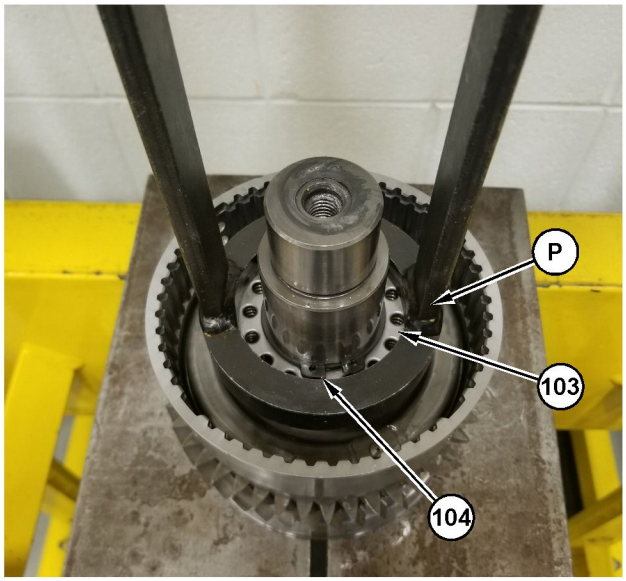

Illustration 65 g06694117

⚠ WARNING

Personal injury can result from being struck by parts propelled by a released spring force.

Make sure to wear all necessary protective equipment.

Follow the recommended procedure and use all recommended tooling to release the spring force.

16. Use Tooling (P) and a suitable press to compress spring assembly (103). Use Tooling (J) (not shown) to remove retaining ring (104).

17. Remove retaining ring (104), spring assembly (103), and the spring retainer.

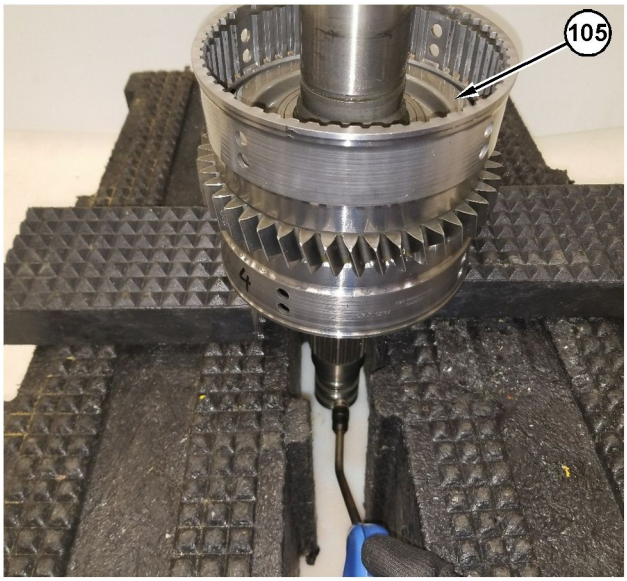

Illustration 66 g06694126

WARNING

Personal injury can result from air pressure against the piston.

The piston can come out of the housing assembly with force when air pressure is applied.

To prevent possible personal injury, the piston must be retained in the housing assembly when applying air pressure.

18. Using an air line with a low-pressure supply, pressurize the forward high clutch to remove piston (105). Remove piston (105).

Forward low/reverse clutch disassembly

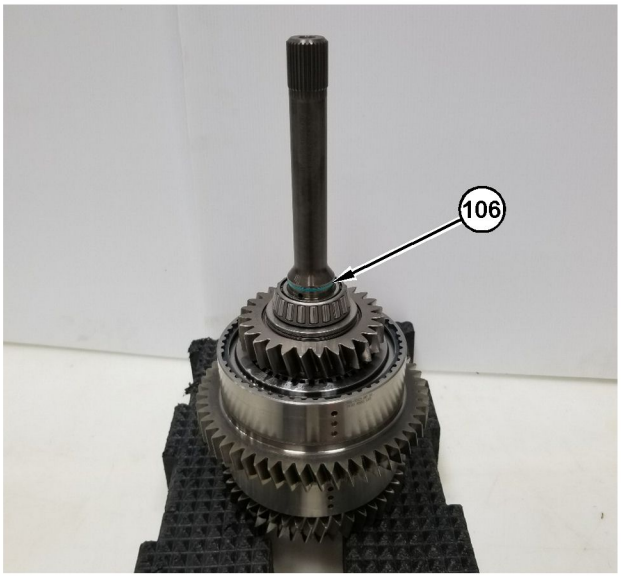

Illustration 67 g06694131

1. Remove ring seal (106).

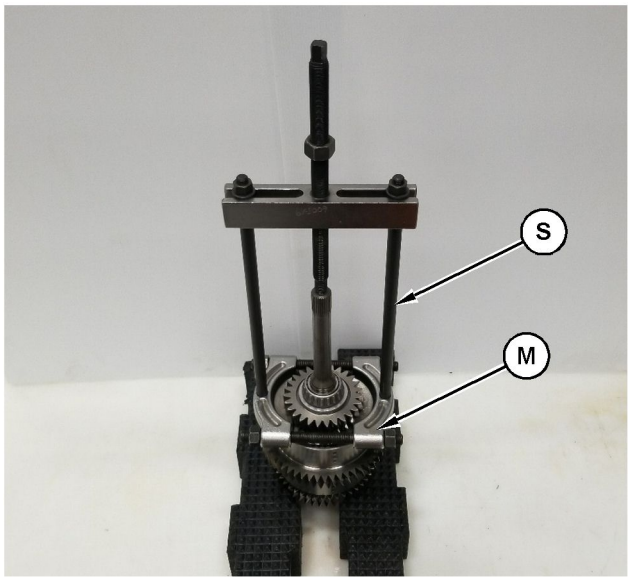

Illustration 68 g06694133

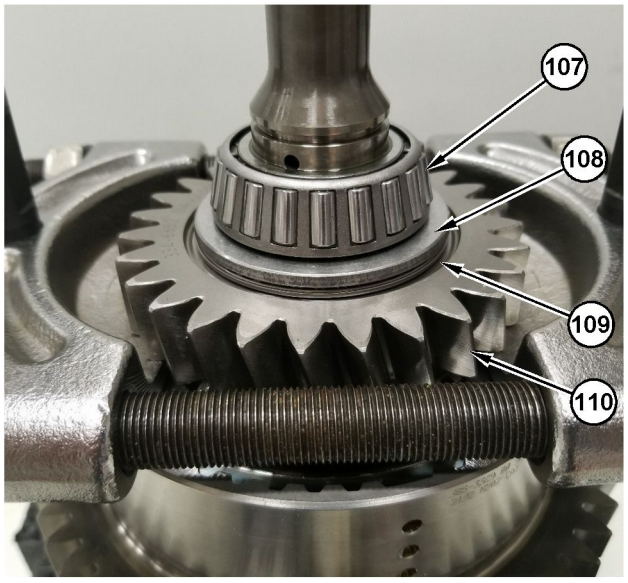

Illustration 69 g06694134

2. Use Tooling (M) and Tooling (S) to remove bearing cone (107), thrust washer (108), thrust bearing (109), and gear (110).

3. Remove bearing cone (107), thrust washer (108), thrust bearing (109), and gear (110).

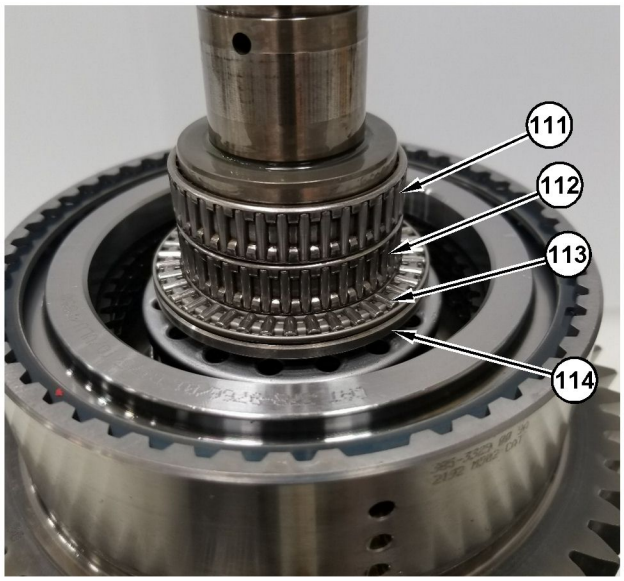

Illustration 70 g06694135

4. Remove needle bearings (111), (112), thrust bearing (113), and thrust washer (114).

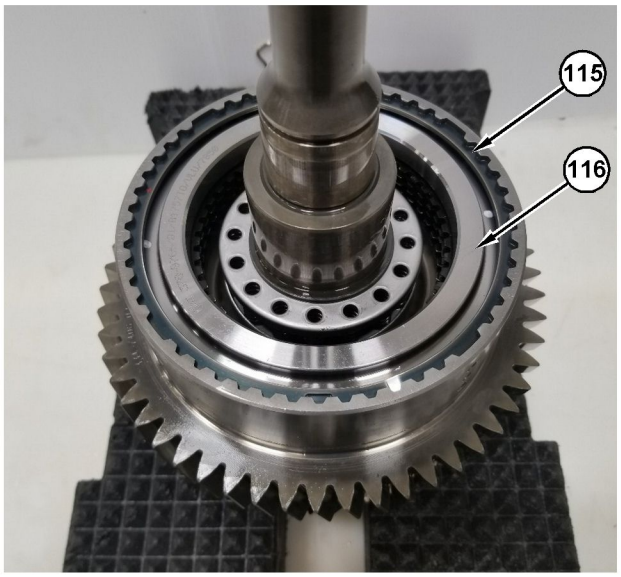

Illustration 71 g06694136

5. Use a suitable flat blade screw driver to remove the retaining ring (115). Remove retaining ring (115) and retainer plate (116).

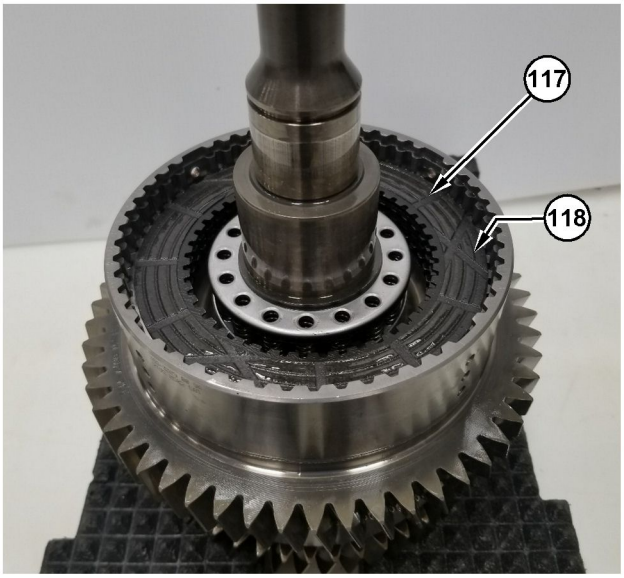

Illustration 72 g06694158

Note: Note the quantity and the location of friction discs (117) and clutch discs (118) for assembly purposes.

6. Remove friction discs (117) and clutch discs (118).

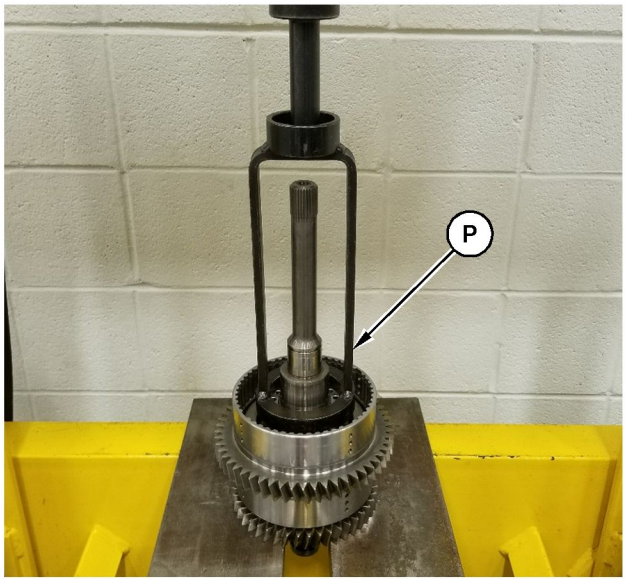

Illustration 73 g06694159

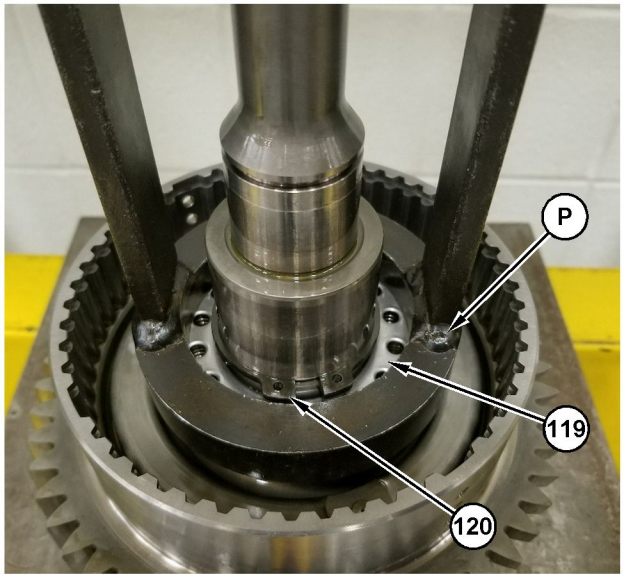

Illustration 74 g06694160

⚠ WARNING

Personal injury can result from being struck by parts propelled by a released spring force.

Make sure to wear all necessary protective equipment.

Follow the recommended procedure and use all recommended tooling to release the spring force.

7. Use Tooling (P) and a suitable press to compress spring assembly (119). Use Tooling (J) (not shown) to remove retaining ring (120).

8. Remove retaining ring (120), spring assembly (119), and the spring retainer.

Illustration 75 g06694161

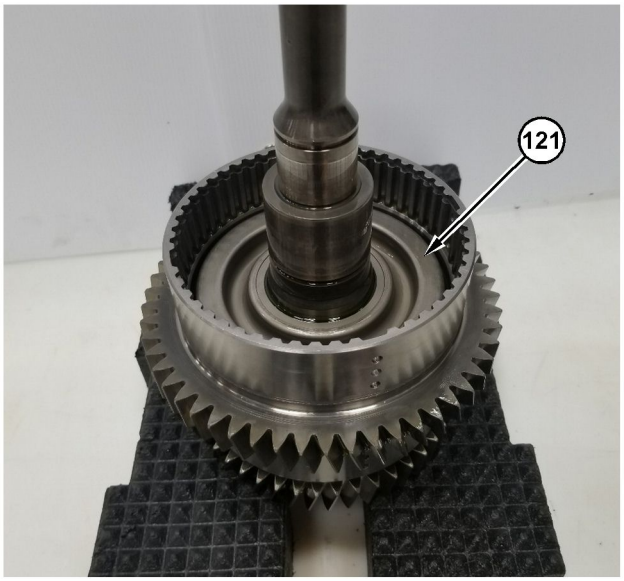

Illustration 76 g06694163

WARNING

Personal injury can result from air pressure against the piston.

The piston can come out of the housing assembly with force when air pressure is applied.

To prevent possible personal injury, the piston must be retained in the housing assembly when applying air pressure.

9. Using an air line with a low-pressure supply, pressurize the forward high clutch to remove piston (121). Remove piston (121).

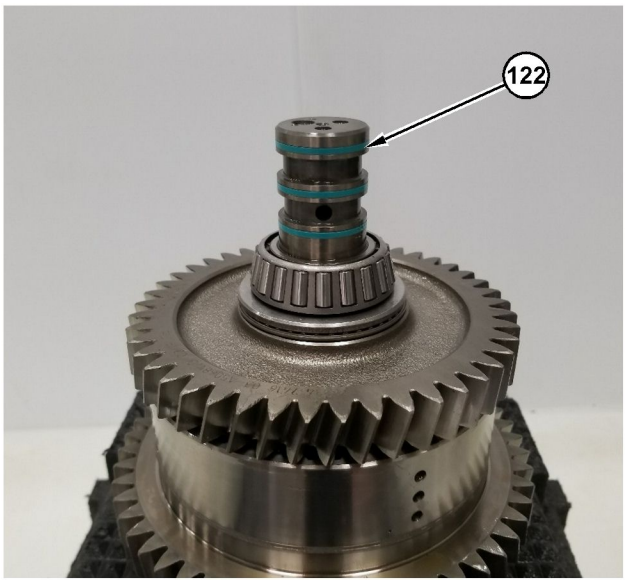

Illustration 77 g06694165

10. Remove three ring seals (122).

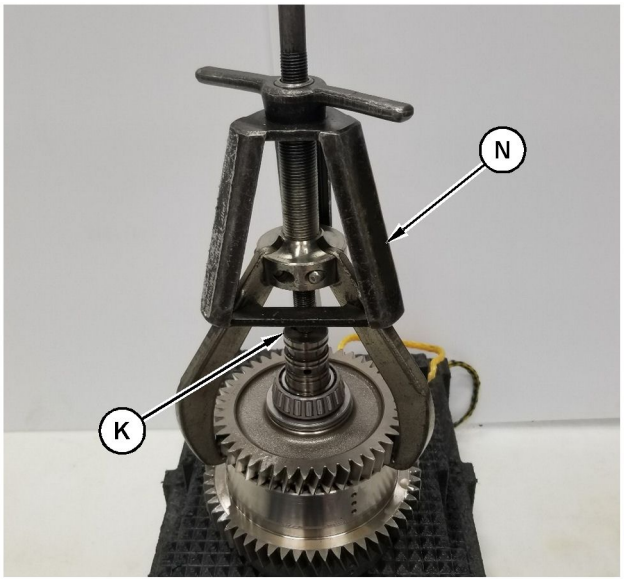

Illustration 78 g06694168

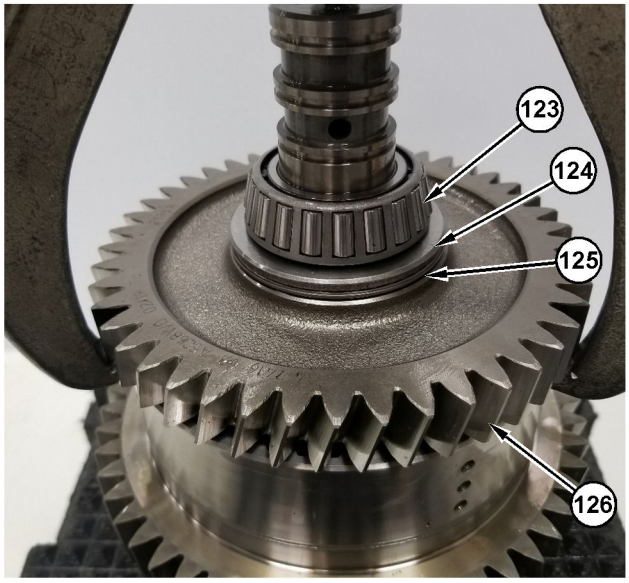

Illustration 79 g06694170

11. Use Tooling (K) and Tooling (N) to remove bearing cone (123), thrust washer (124), thrust bearing (125), and gear (126).

12. Remove bearing cone (123), thrust washer (124), thrust bearing (125), and gear (126).

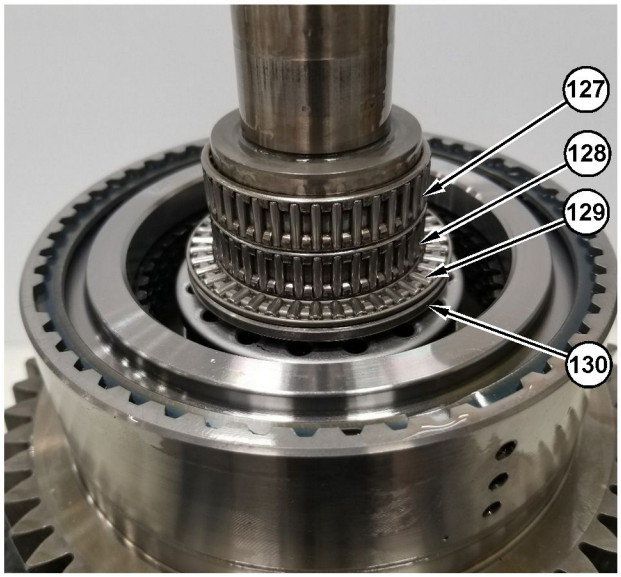

Illustration 80 g06694172

13. Remove needle bearings (127), (128), thrust bearing (129), and thrust washer (130).

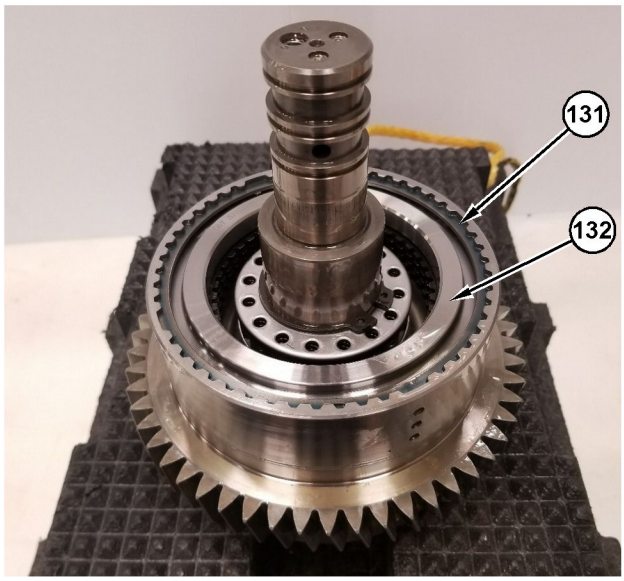

Illustration 81 g06694174

14. Use a suitable flat blade screw driver to remove the retaining ring (131). Remove retaining ring (131) and retainer plate (132).

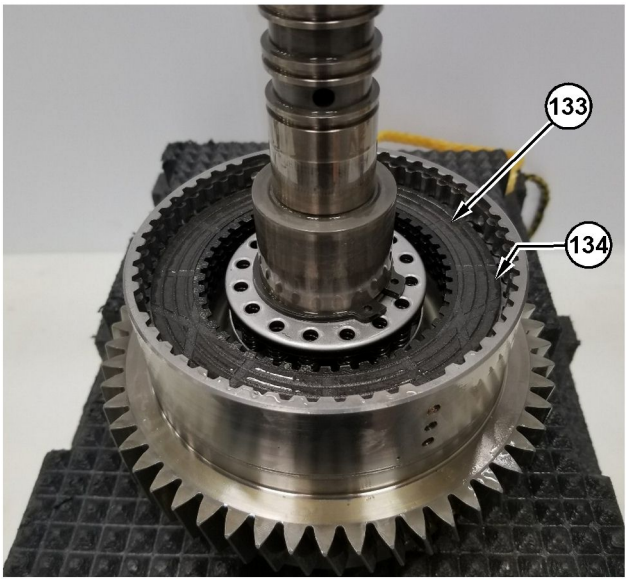

Illustration 82 g06694175

Note: Note the quantity and the location of friction discs (133) and clutch discs (134) for assembly purposes.

15. Remove friction discs (133) and clutch discs (134).

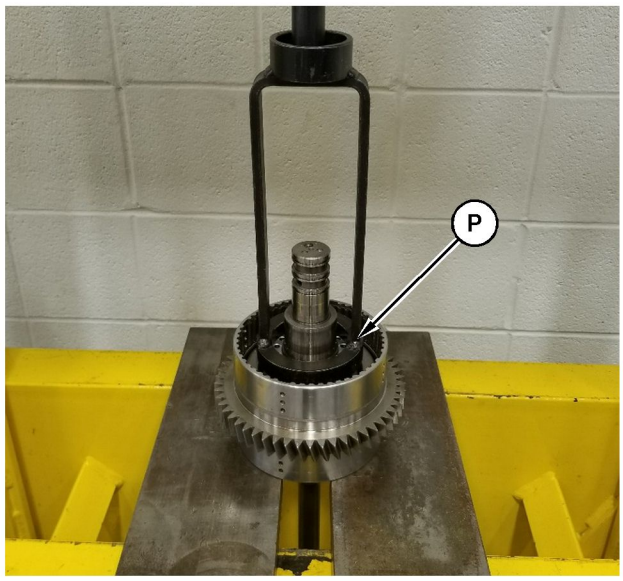

Illustration 83 g06694176

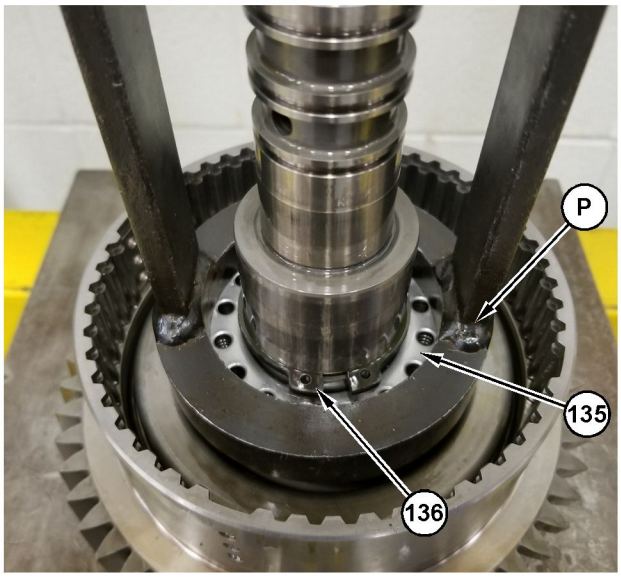

Illustration 84 g06694179

⚠ WARNING

Personal injury can result from being struck by parts propelled by a released spring force.

Make sure to wear all necessary protective equipment.

Follow the recommended procedure and use all recommended tooling to release the spring force.

16. Use Tooling (P) and a suitable press to compress spring assembly (135). Use Tooling (J) (not shown) to remove retaining ring (136).

17. Remove retaining ring (136), spring assembly (135), and the spring retainer.

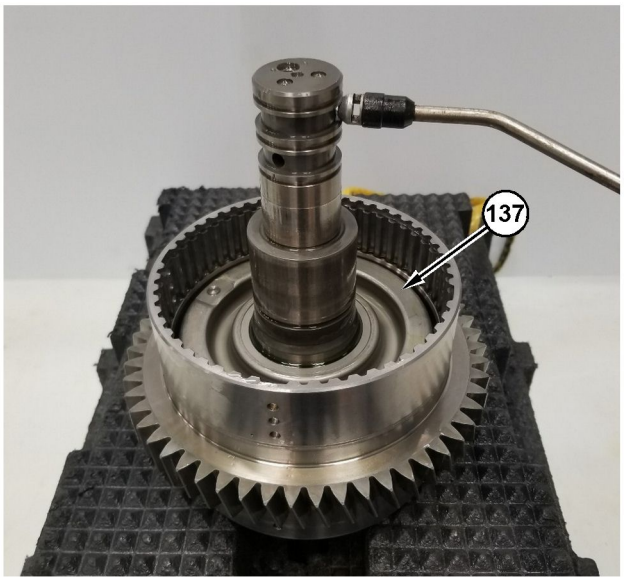

Illustration 85 g06694180

⚠ WARNING

Personal injury can result from air pressure against the piston.

The piston can come out of the housing assembly with force when air pressure is applied.

To prevent possible personal injury, the piston must be retained in the housing assembly when applying air pressure.

18. Using an air line with a low-pressure supply, pressurize the forward high clutch to remove piston (137). Remove piston (137).

Illustration 86 g06694182

19. Remove spacer (138).

First/second clutch disassembly

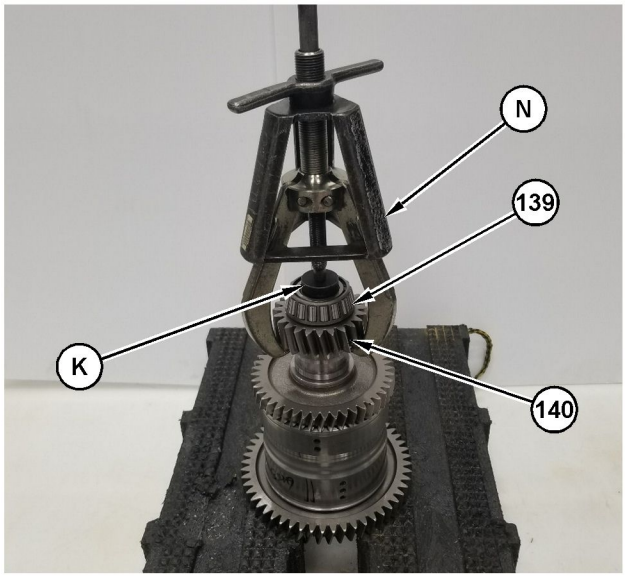

Illustration 87 g06694183

1. Use Tooling (K) and Tooling (N) to remove bearing cone (139) and gear (140). Remove bearing cone (139) and gear (140).

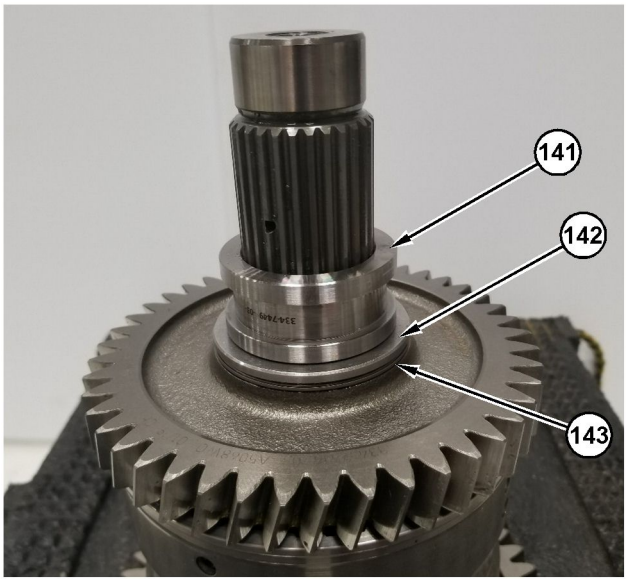

Illustration 88 g06694185

2. Remove spacer (141), thrust washer (142), and thrust bearing (143).

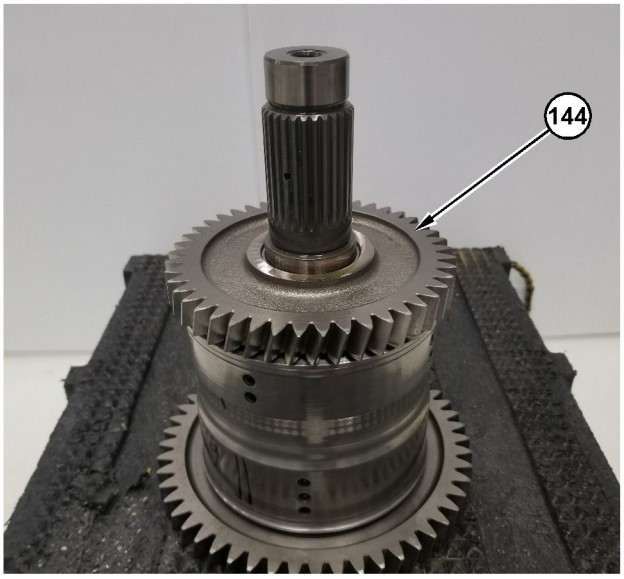

Illustration 89 g06694187

3. Remove gear assembly (144).

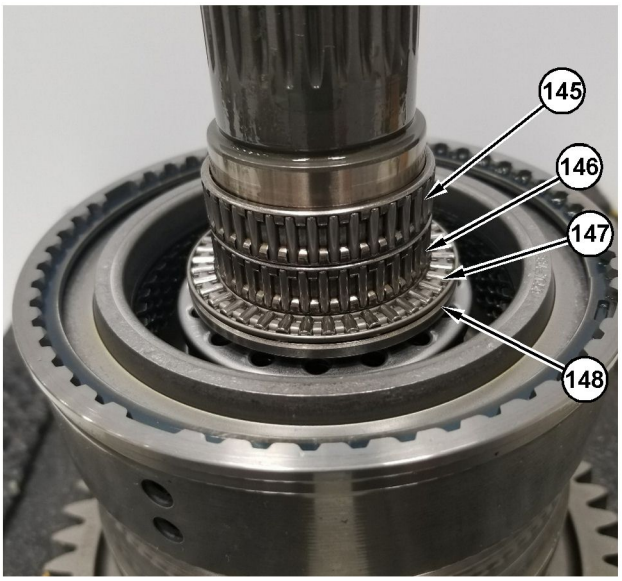

Illustration 90 g06694188

4. Remove needle bearings (145), (146), thrust bearing (147), and thrust washer (148).

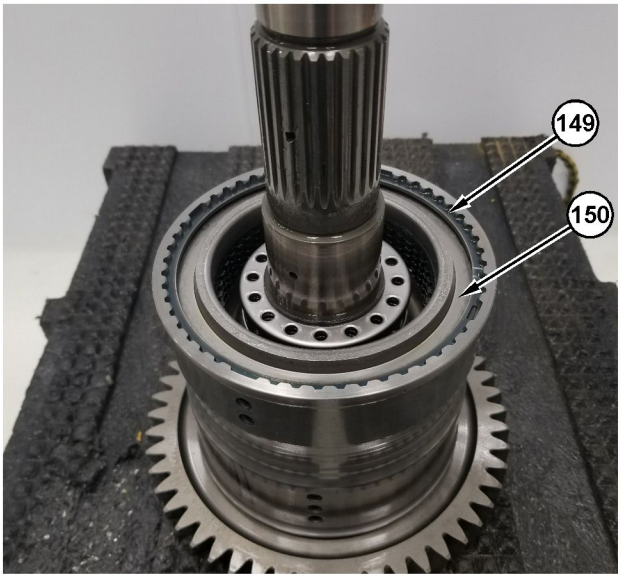

Illustration 91 g06694190

5. Use a suitable flat blade screw driver to remove the retaining ring (149). Remove retaining ring (149) and retainer plate (150).

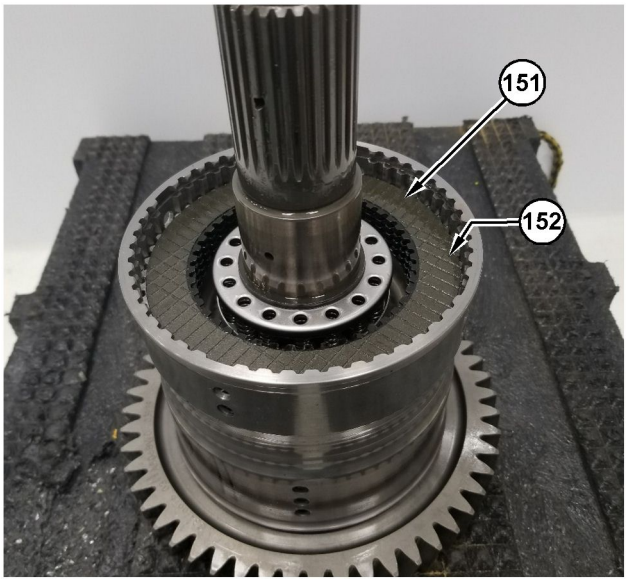

Illustration 92 g06694191

Note: Note the quantity and the location of friction discs (151) and clutch discs (152) for assembly purposes.

6. Remove friction discs (151) and clutch discs (152).

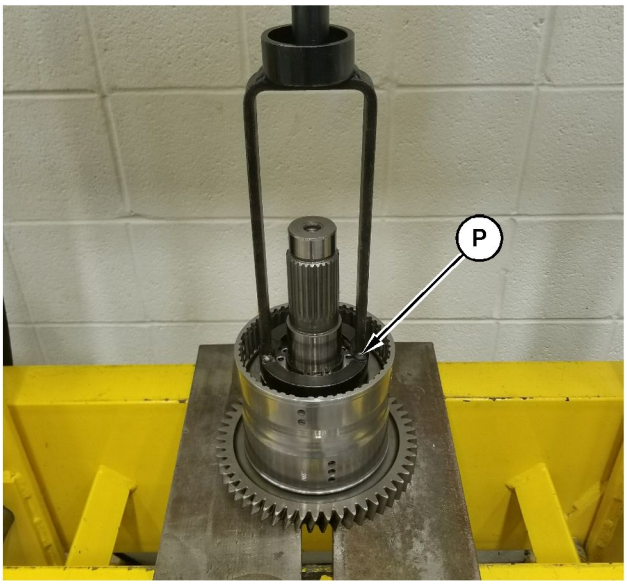

Illustration 93 g06694192

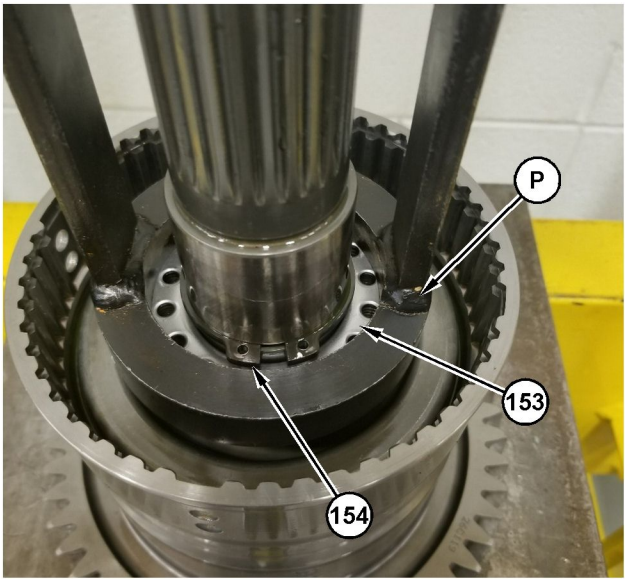

Illustration 94 g06694193

⚠ WARNING

Personal injury can result from being struck by parts propelled by a released spring force.

Make sure to wear all necessary protective equipment.

Follow the recommended procedure and use all recommended tooling to release the spring force.

7. Use Tooling (P) and a suitable press to compress spring assembly (153). Use Tooling (J) (not shown) to remove retaining ring (154).

8. Remove retaining ring (154), spring assembly (153), and the spring retainer.

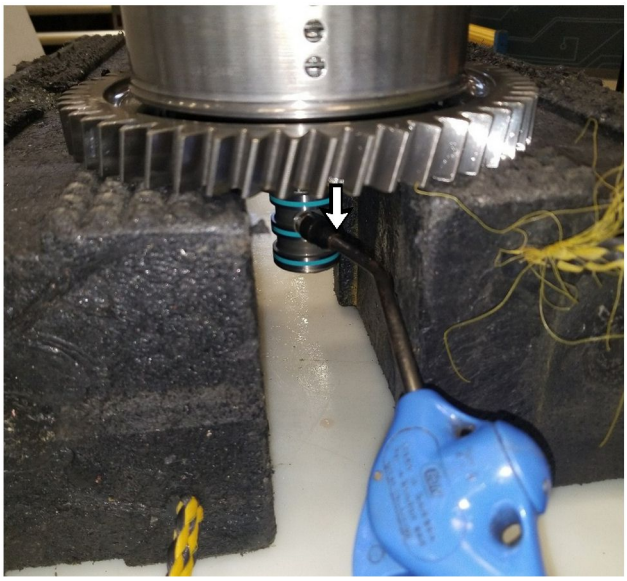

Illustration 95 g06694196

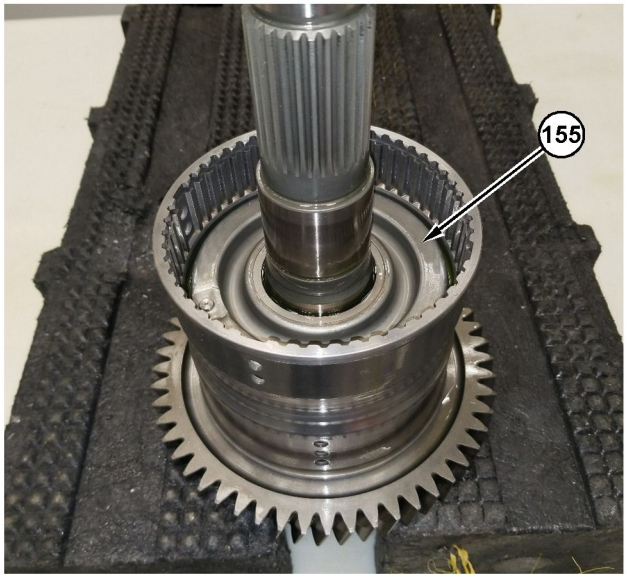

Illustration 96 g06694198

WARNING

Personal injury can result from air pressure against the piston.

The piston can come out of the housing assembly with force when air pressure is applied.

To prevent possible personal injury, the piston must be retained in the housing assembly when applying air pressure.

9. Using an air line with a low-pressure supply, pressurize the forward high clutch to remove piston (155). Remove piston (155).

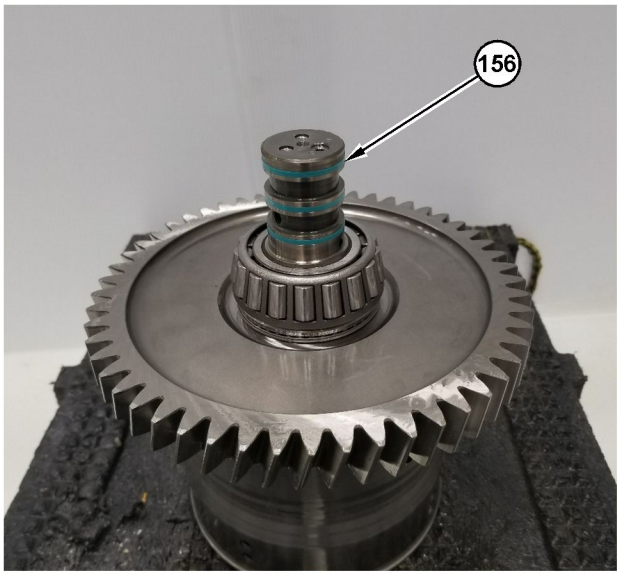

Illustration 97 g06694199

10. Remove three seal rings (156).

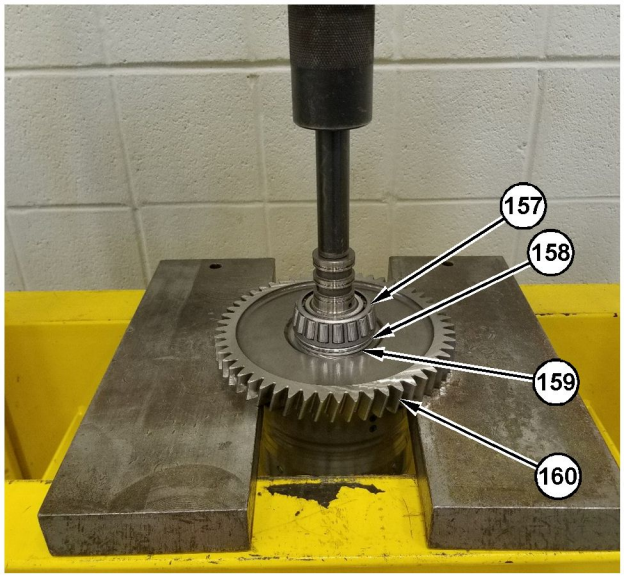

Illustration 98 g06694200

11. Use a suitable press to remove bearing cone (157), thrust washer (158), thrust bearing (159), and gear (160).

12. Remove bearing cone (157), thrust washer (158), thrust bearing (159), and gear (160).

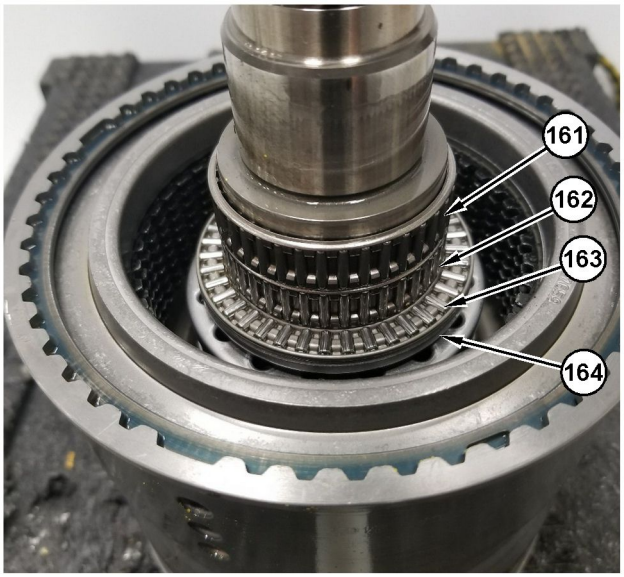

Illustration 99 g06694201

13. Remove needle bearings (161), (162), thrust bearing (163), and thrust washer (164).

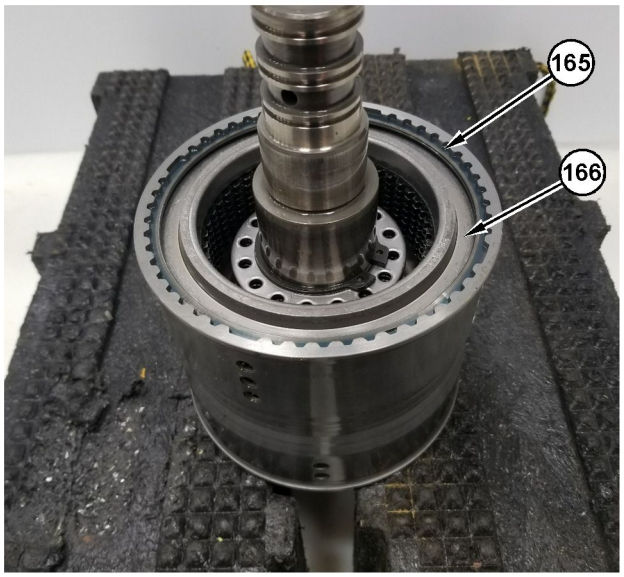

Illustration 100 g06694202

14. Use a suitable flat blade screw driver to remove the retaining ring (165). Remove retaining ring (165) and retainer plate (166).

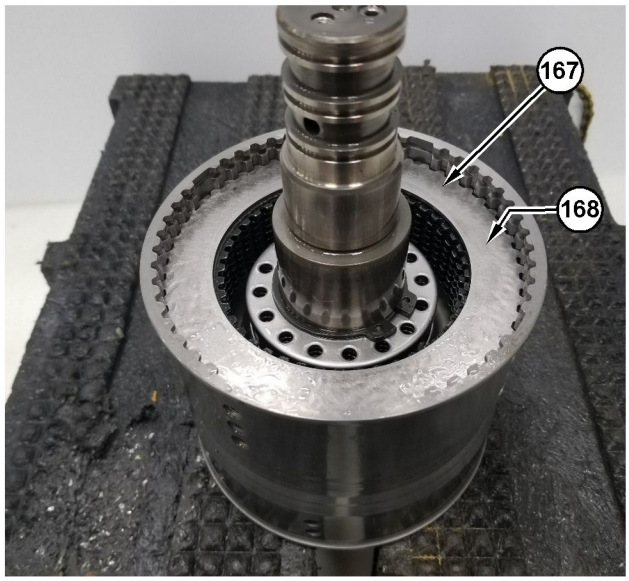

Illustration 101 g06694203

Note: Note the quantity and the location of clutch discs (167) and friction discs (168) for assembly purposes.

15. Remove clutch discs (167) and friction discs (168).

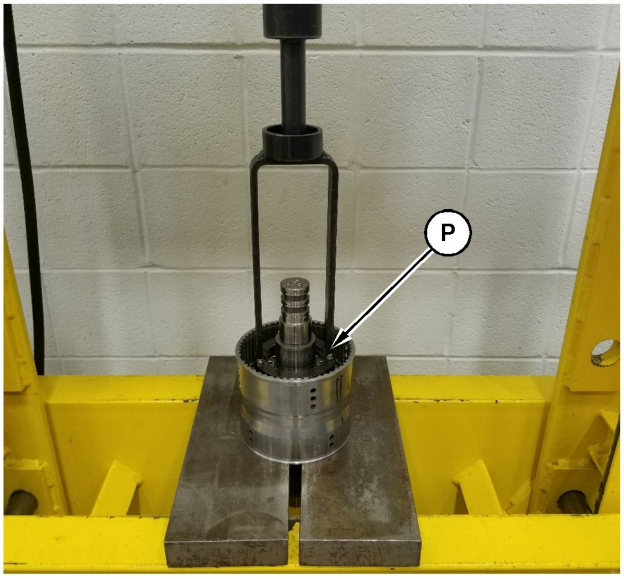

Illustration 102 g06694205

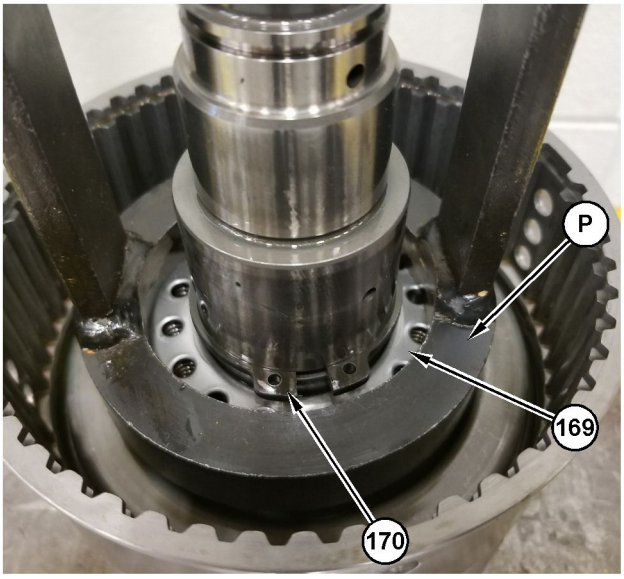

Illustration 103 g06694207

⚠ WARNING

Personal injury can result from being struck by parts propelled by a released spring force.

Make sure to wear all necessary protective equipment.

Follow the recommended procedure and use all recommended tooling to release the spring force.

16. Use Tooling (P) and a suitable press to compress spring assembly (169). Use Tooling (J) (not shown) to remove retaining ring (170).

17. Remove retaining ring (170), spring assembly (169), and the spring retainer.

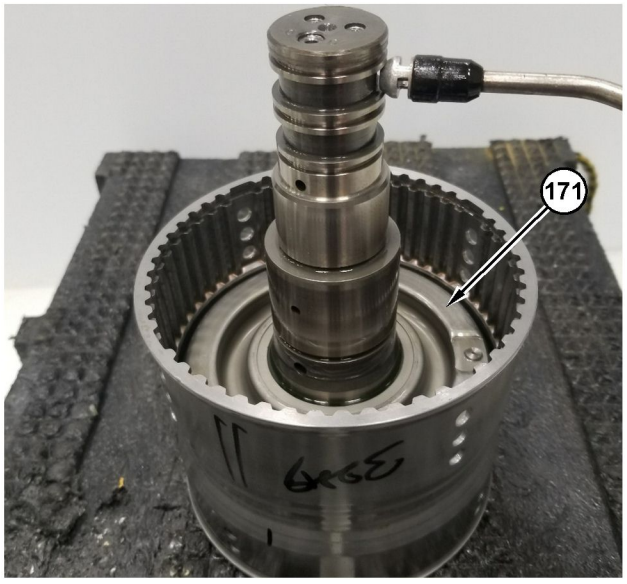

Illustration 104 g06694208

⚠ WARNING

Personal injury can result from air pressure against the piston.

The piston can come out of the housing assembly with force when air pressure is applied.

To prevent possible personal injury, the piston must be retained in the housing assembly when applying air pressure.

18. Using an air line with a low-pressure supply, pressurize the forward high clutch to remove piston (171). Remove piston (171).

Transfer case disassembly

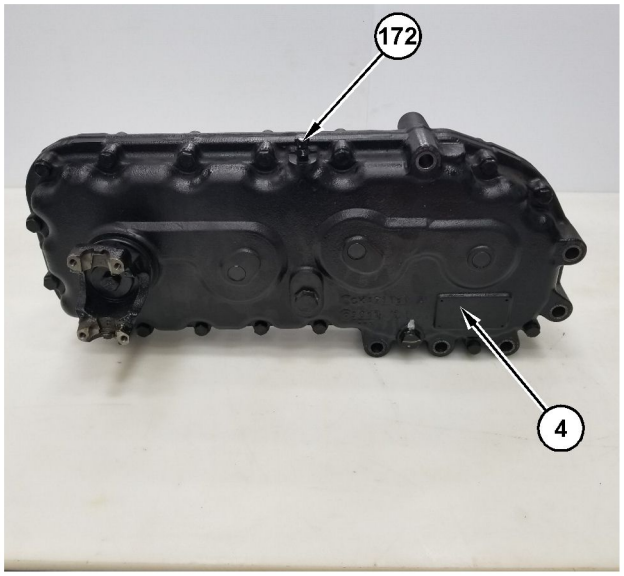

Illustration 105 g06694209

Transfer case

1. Remove vent (172) from transfer case (4).

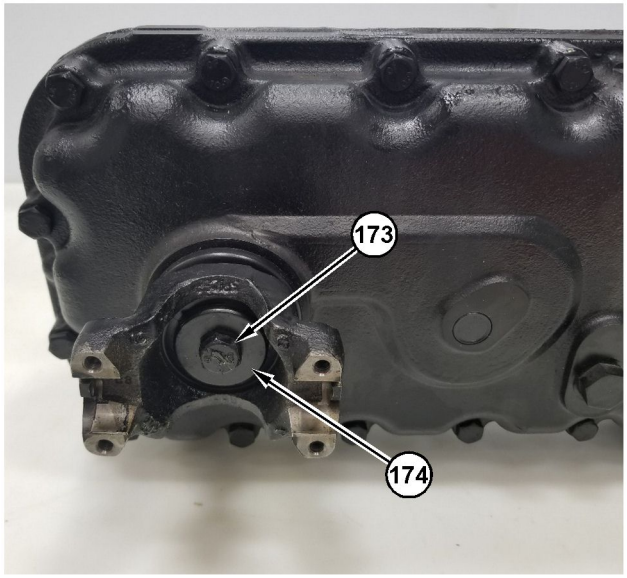

Illustration 106 g06694211

2. Remove bolt (173) and washer (174).

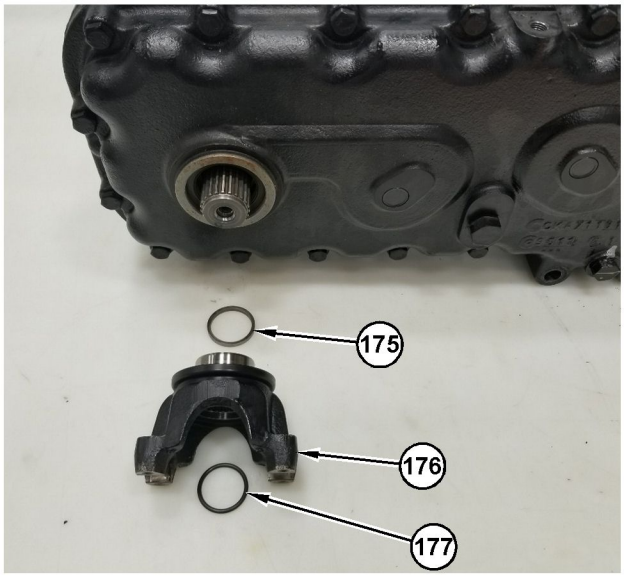

Illustration 107 g06694212

3. Remove O-ring seal (177), yoke assembly (176), and spacer (175). Repeat for the other side.

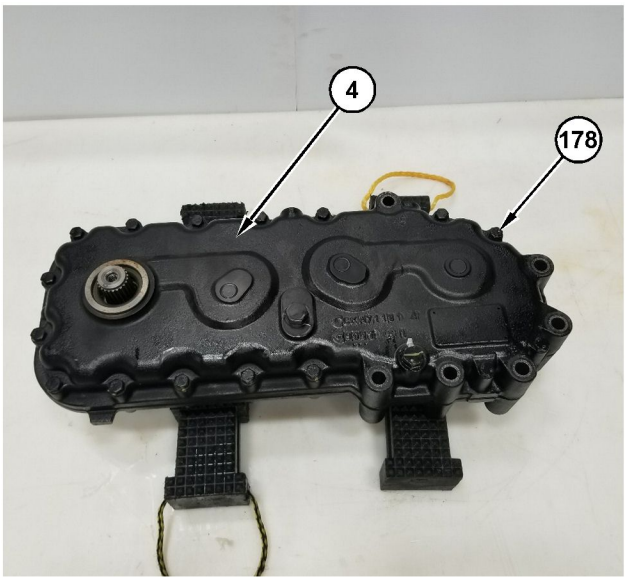

Illustration 108 g06694213

4. Place transfer case (4) onto suitable cribbing. Use two people to remove the front case assembly of transfer case (4). The weight of the front case assembly is approximately 25 kg (55 lb).

5. Remove bolts (178) and the front case assembly from transfer case (4).

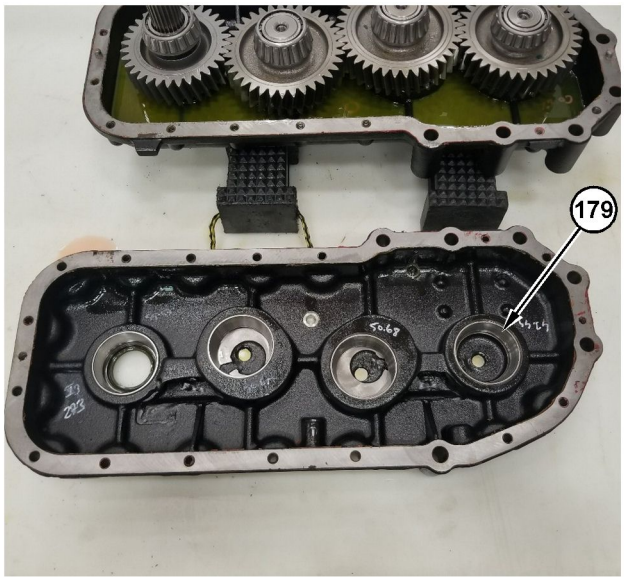

Illustration 109 g06694214

Note: Note the quantity of the shims for assembly purposes.

6. Remove four bearing cups (179) and the shims

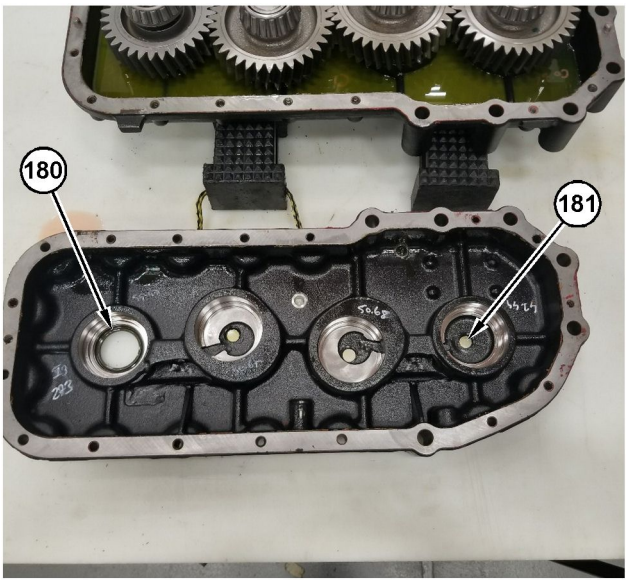

Illustration 110 g06694215

Note: Discard lip seal (180) and plugs (181).

Note: Mark the orientation of lip seal (180) for assembly purposes.

7. Use Tooling (K) (not shown) to remove lip seal (180). Remove lip seal (180) and plugs (181).

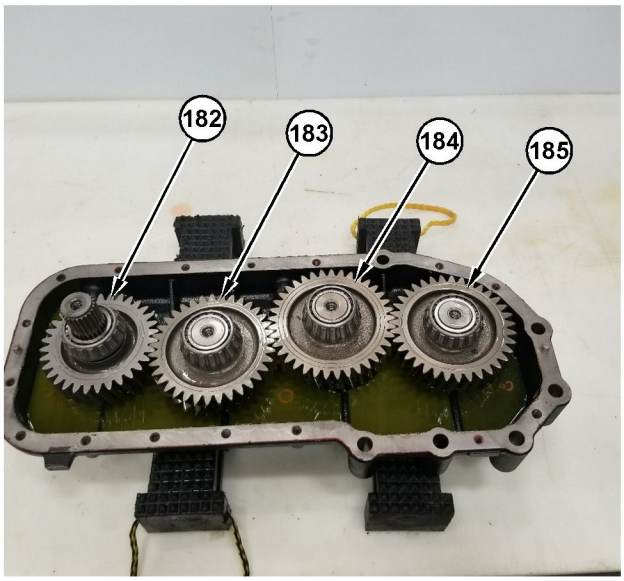

Illustration 111 g06694216

8. Remove the output gear assembly (182), idler gear assemblies (183), (184), and input gear assembly (185).

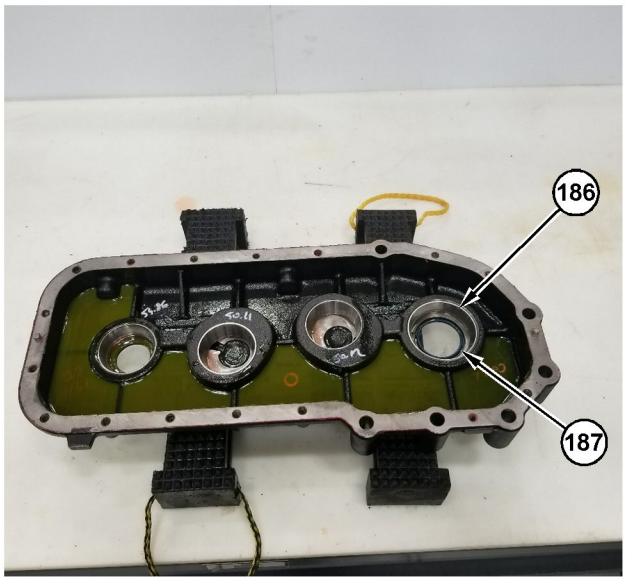

Illustration 112 g06694217

Note: Discard lip seals (187).

Note: Mark the orientation of lip seal (187) for assembly purposes.

9. Remove bearing cups (186). Use Tooling (K) (not shown) to remove lip seal (187). Remove two lip seals (187).

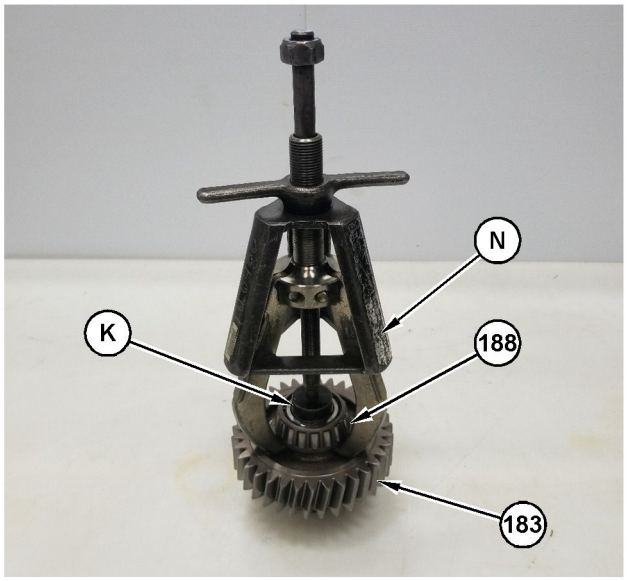

Illustration 113 g06694218

10. Use Tooling (K) and Tooling (N) to remove bearing cone (188). Remove bearing cone (188) from idler gear assembly (183). Repase for the other side.

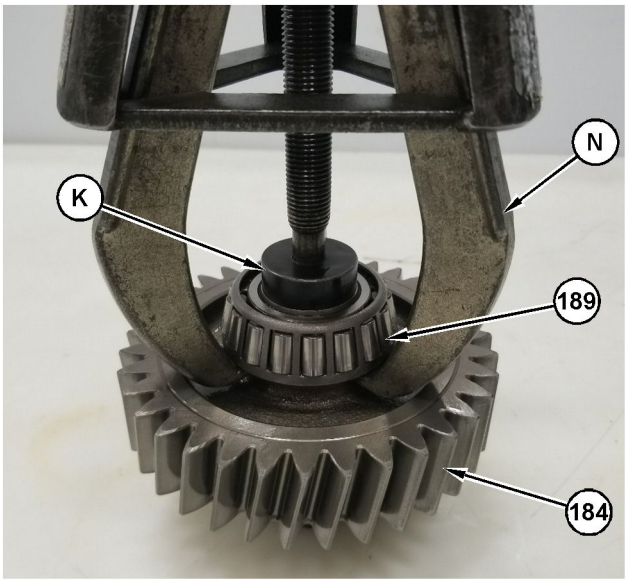

Illustration 114 g06694219

11. Use Tooling (K) and Tooling (N) to remove bearing cone (189). Remove bearing cone (189) from idler gear assembly (184). Repeat for the other side.

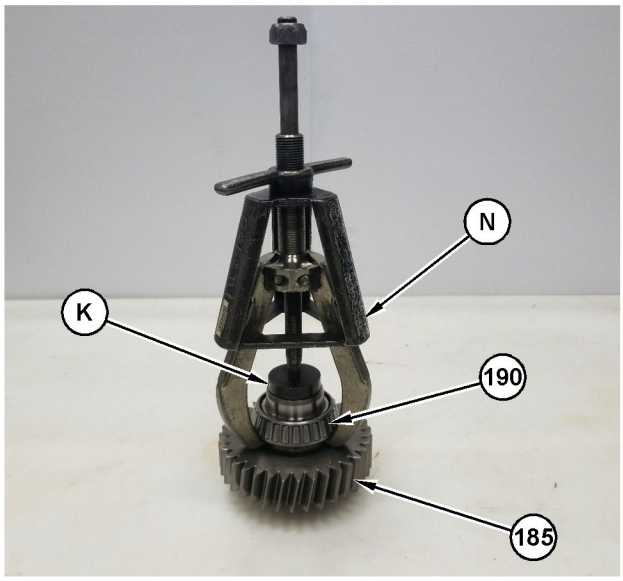

Illustration 115 g06694220

12. Use Tooling (K) and Tooling (N) to remove bearing cone (190). Remove bearing cone (190) from input gear assembly (185).

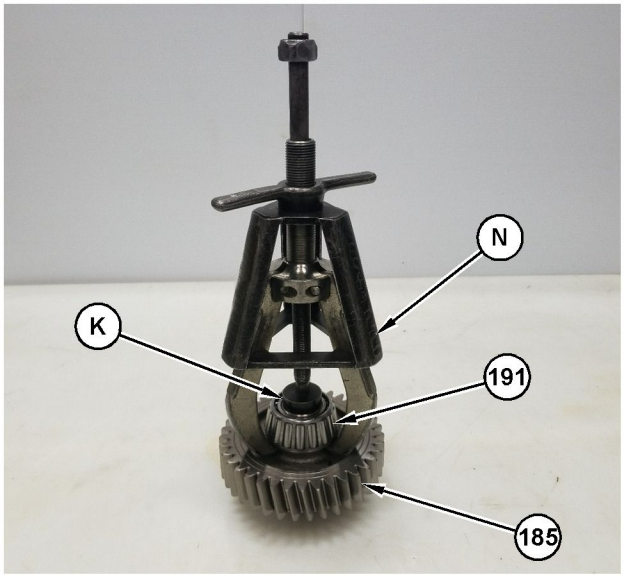

Illustration 116 g06694221

13. Use Tooling (K) and Tooling (N) to remove bearing cone (191). Remove bearing cone (191) from input gear assembly (185).

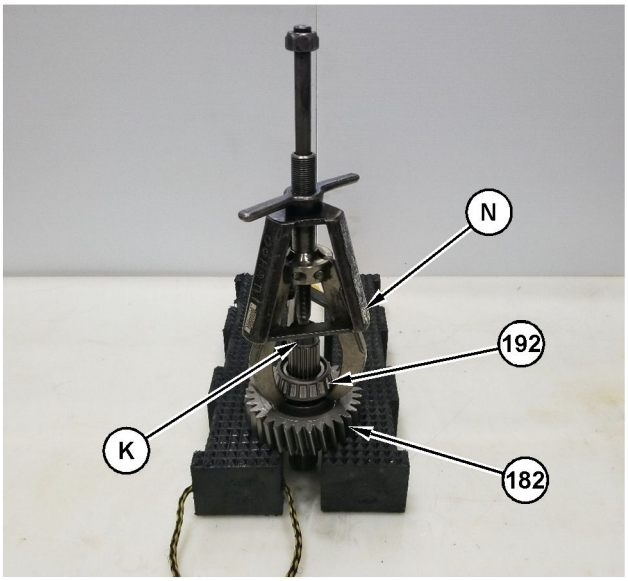

Illustration 117 g06694222

14. Use Tooling (K) and Tooling (N) to remove bearing cone (192). Remove bearing cone (192) from output gear assembly (182).

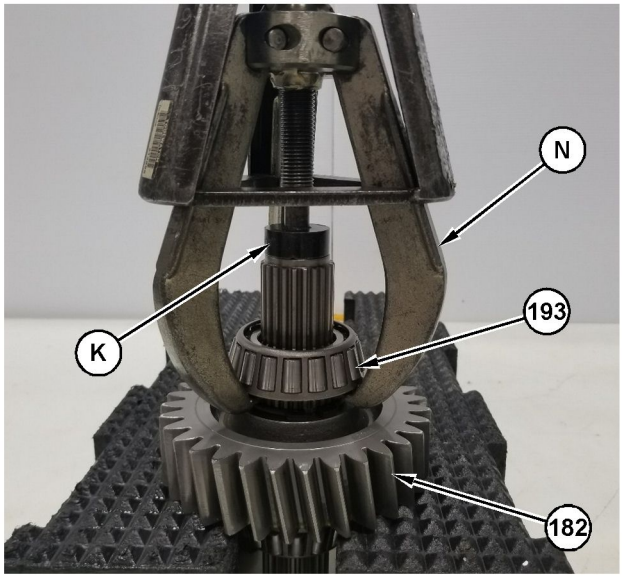

Illustration 118 g06694223

15. Use Tooling (K) and Tooling (N) to remove bearing cone (193). Remove bearing cone (193) from output gear assembly (182).

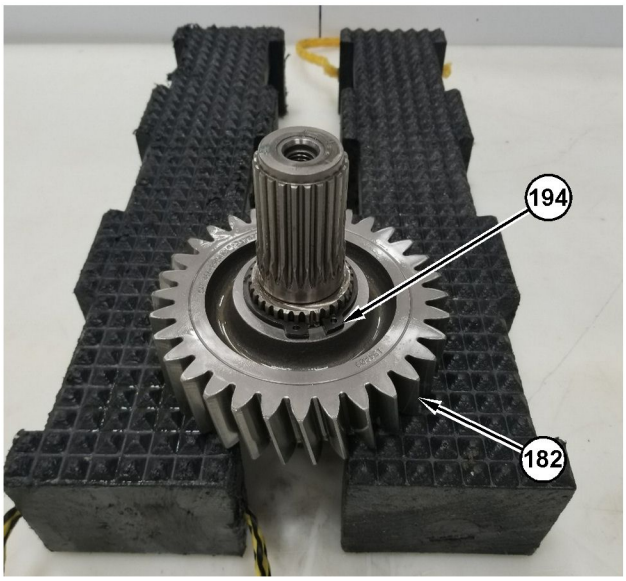

Illustration 119 g06694224

16. Use Tooling (J) (not shown) to remove retaining ring (194) from output gear assembly (182). Repeat for the other side.

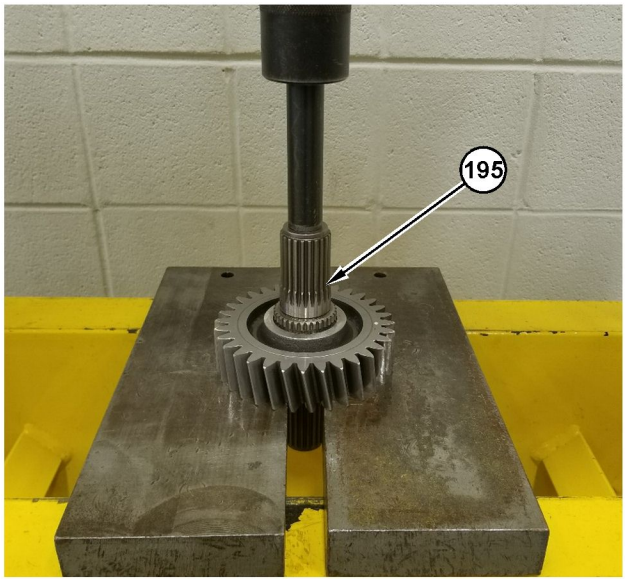

Illustration 120 g06694225

17. Use a suitable press to remove output shaft (195). Remove output shaft (195).

Modulating solenoid valve disassembly

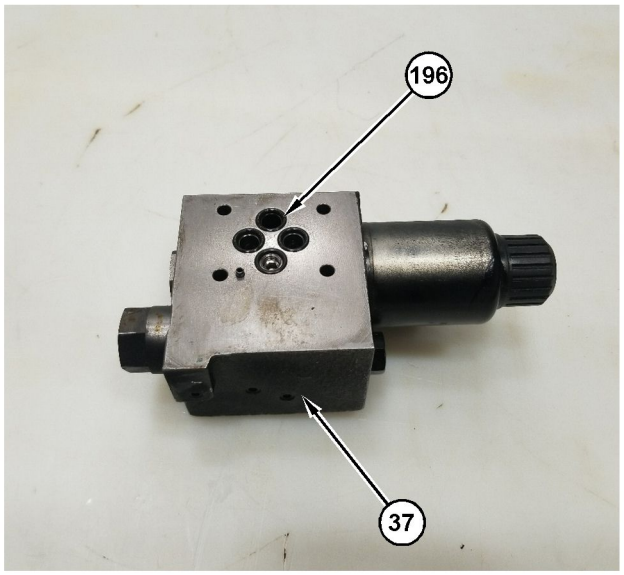

Illustration 121 g06694226

Modulating solenoid valve assembly

1. Remove four O-ring seals (196) from solenoid valve assembly (37).

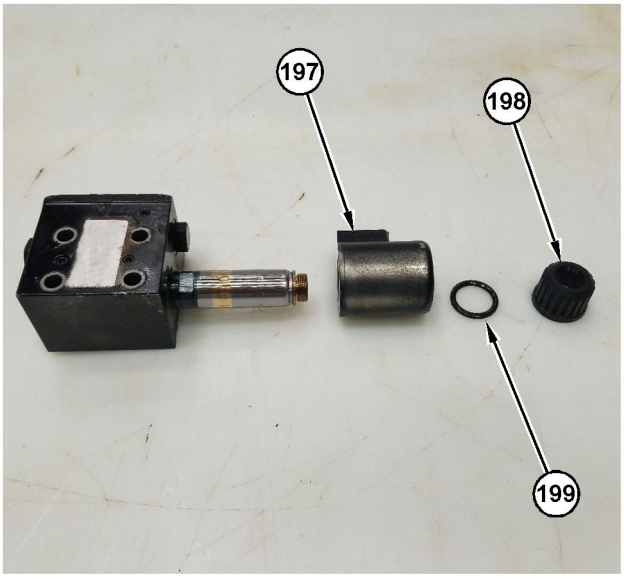

Illustration 122 g06694227

2. Remove locknut (198), O-ring seal (199), and coil assembly (197).

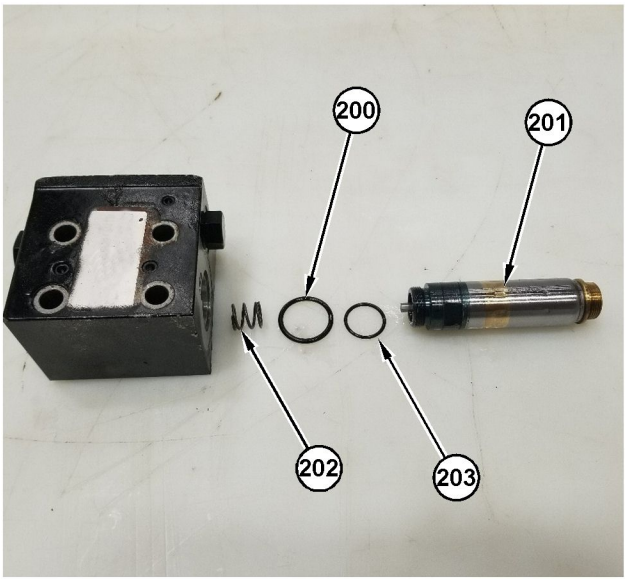

Illustration 123 g06694228

WARNING

Personal injury can result from being struck by parts propelled by a released spring force.

Make sure to wear all necessary protective equipment.

Follow the recommended procedure and use all recommended tooling to release the spring force.

3. Remove solenoid tube assembly (201), O-ring seals (203), (200), and spring (202).

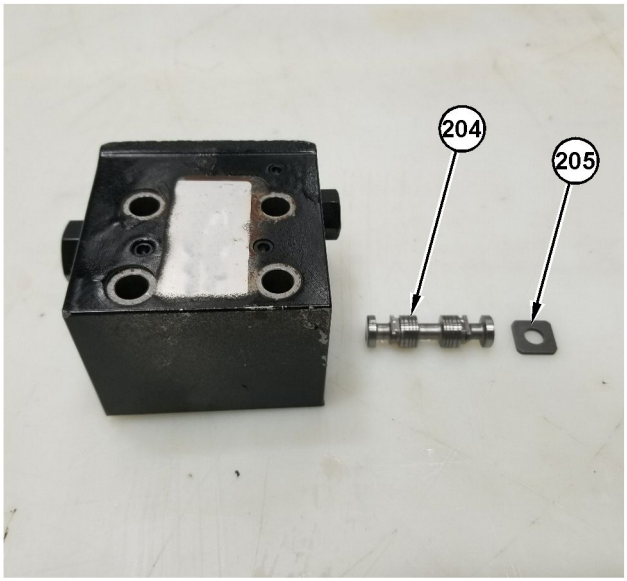

Illustration 124 g06694229

4. Use a suitable magnet to remove central washer (205) and spool (204). Remove central washer (205) and spool (204).

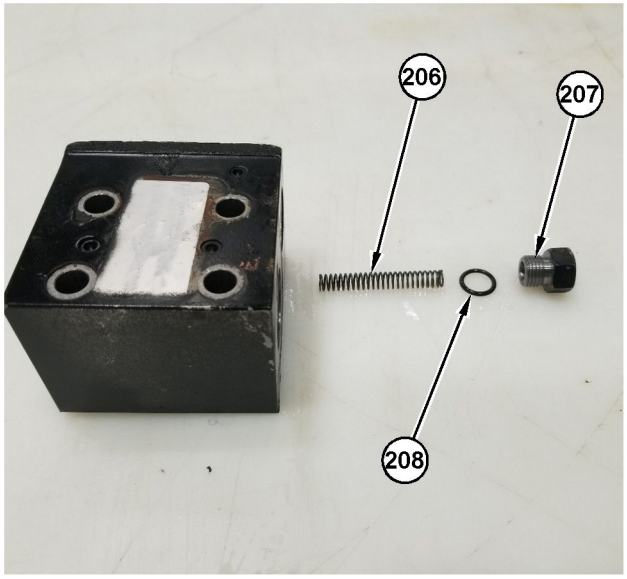

Illustration 125 g06694230

WARNING

Personal injury can result from being struck by parts propelled by a released spring force.

Make sure to wear all necessary protective equipment.

Follow the recommended procedure and use all recommended tooling to release the spring force.

5. Remove plug (207), O-ring seal (208), and spring (206).

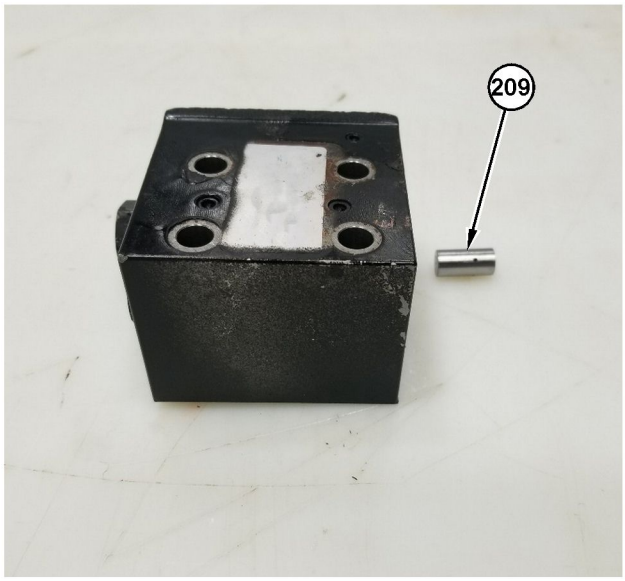

Illustration 126 g06694231

6. Use a suitable magnet to remove poppet (209). Remove poppet (209).

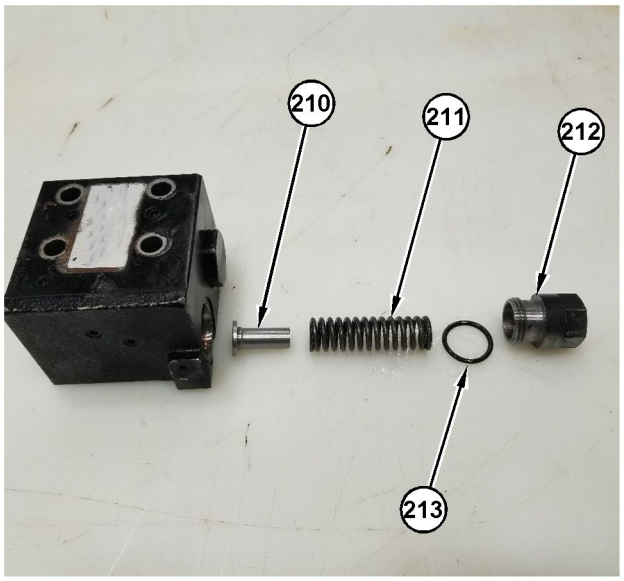

Illustration 127 g06694232

WARNING

Personal injury can result from being struck by parts propelled by a released spring force.

Make sure to wear all necessary protective equipment.

Follow the recommended procedure and use all recommended tooling to release the spring force.

7. Remove plug (212), O-ring seal (213), spring (211), and spring carrier (210).

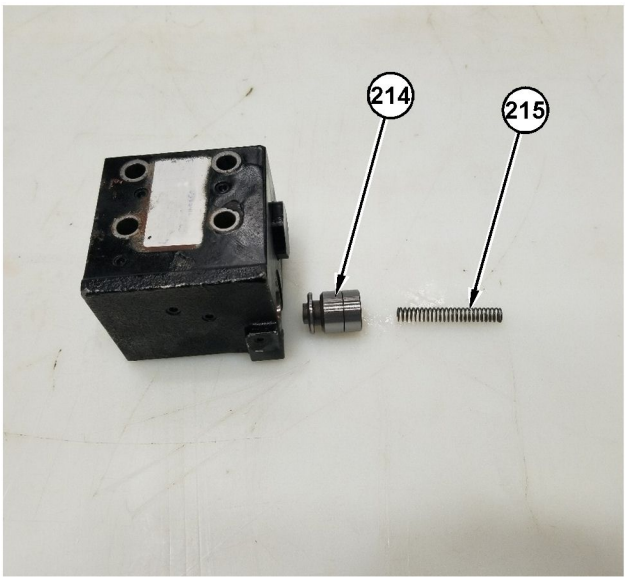

Illustration 128 g06694233

WARNING

Personal injury can result from being struck by parts propelled by a released spring force.

Make sure to wear all necessary protective equipment.

Follow the recommended procedure and use all recommended tooling to release the spring force.

8. Use a suitable magnet to remove spring (215) and piston (214). Remove spring (215) and piston (214).

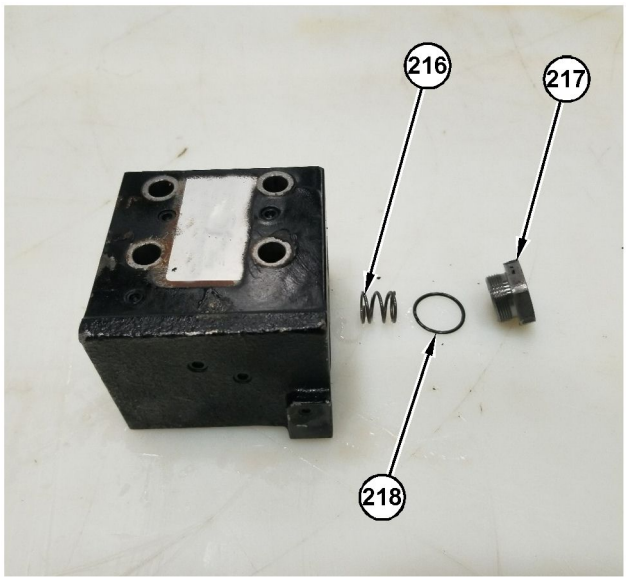

Illustration 129 g06694234

WARNING

Personal injury can result from being struck by parts propelled by a released spring force.

Make sure to wear all necessary protective equipment.

Follow the recommended procedure and use all recommended tooling to release the spring force.

9. Remove plug (217), O-ring seal (218), and spring (216).

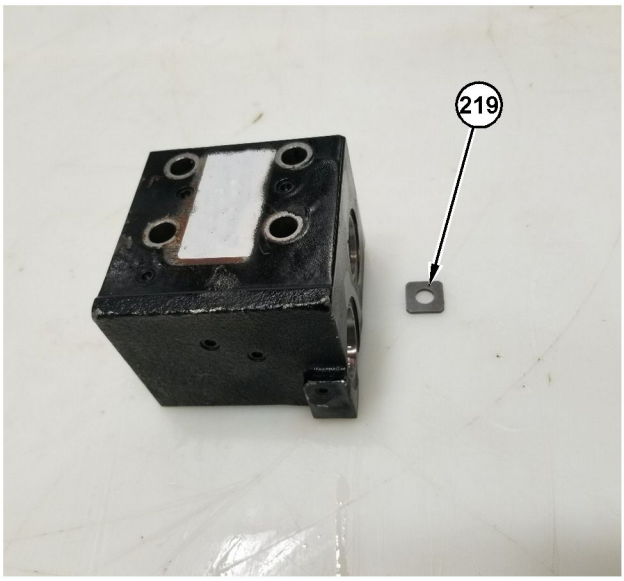

Illustration 130 g06694235

10. Use a suitable magnet to remove washer (219). Remove washer (219).

Dual modulating valve disassembly

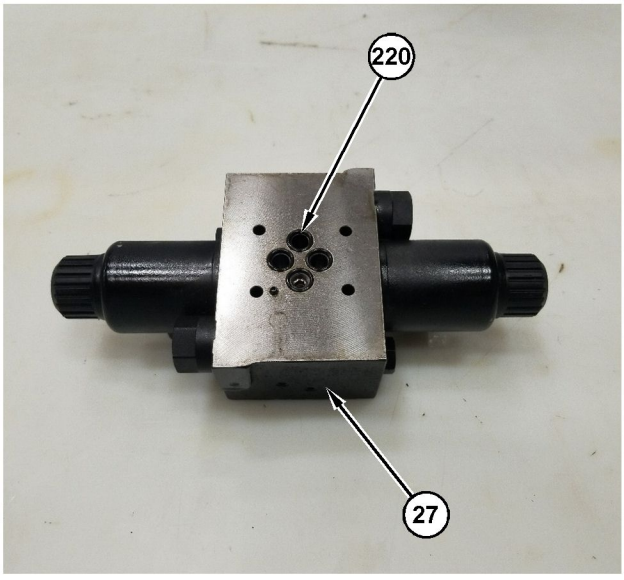

Illustration 131 g06694236

1. Remove four O-ring seals (220) from solenoid valve assembly (27).

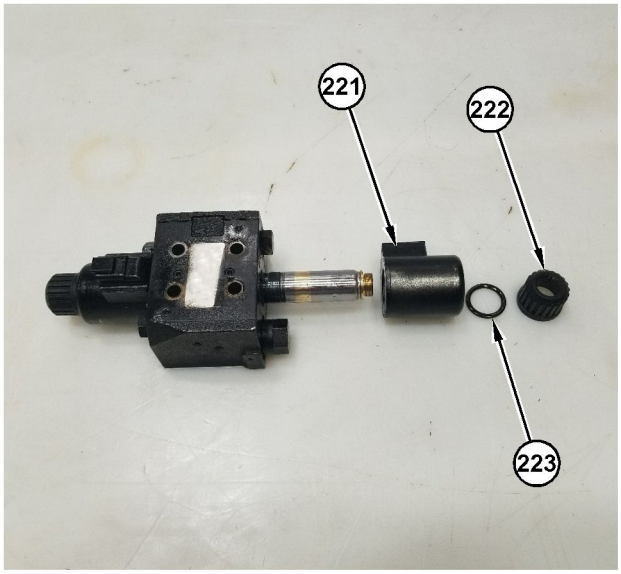

Illustration 132 g06694238

2. Remove locknut (222), O-ring seal (223), and coil assembly (221).

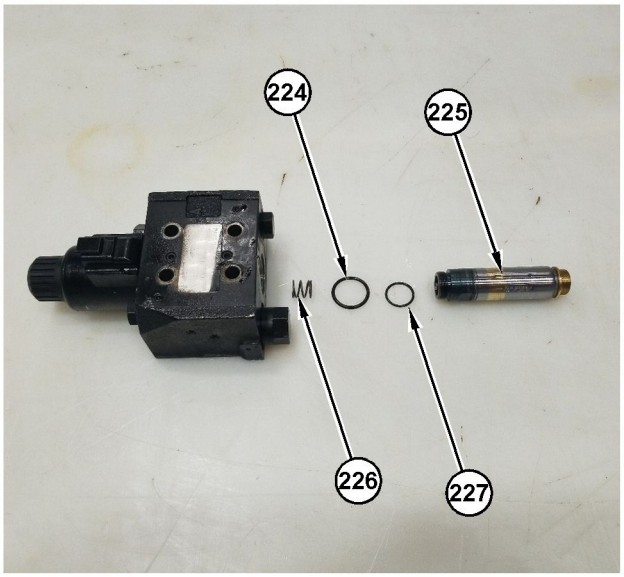

Illustration 133 g06694239

⚠ WARNING

Personal injury can result from being struck by parts propelled by a released spring force.

Make sure to wear all necessary protective equipment.

Follow the recommended procedure and use all recommended tooling to release the spring force.

3. Remove solenoid tube (225), O-ring seals (227), (224), and spring (226).

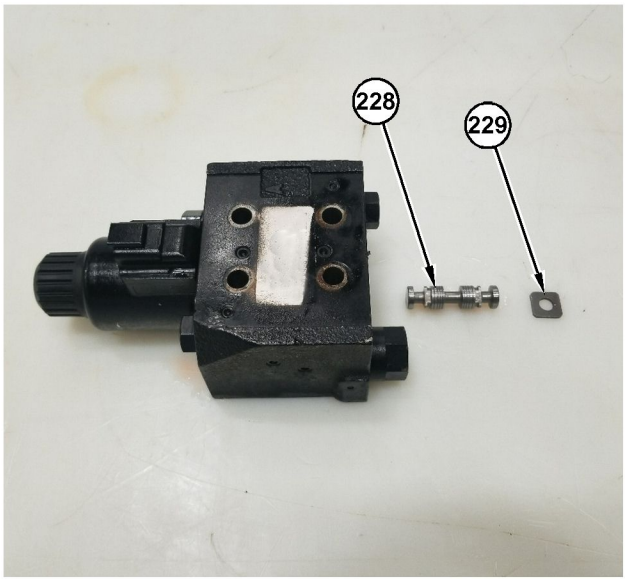

Illustration 134 g06694240

4. Use a suitable magnet to remove washer (229) and spool (228). Remove washer (229) and spool (228).

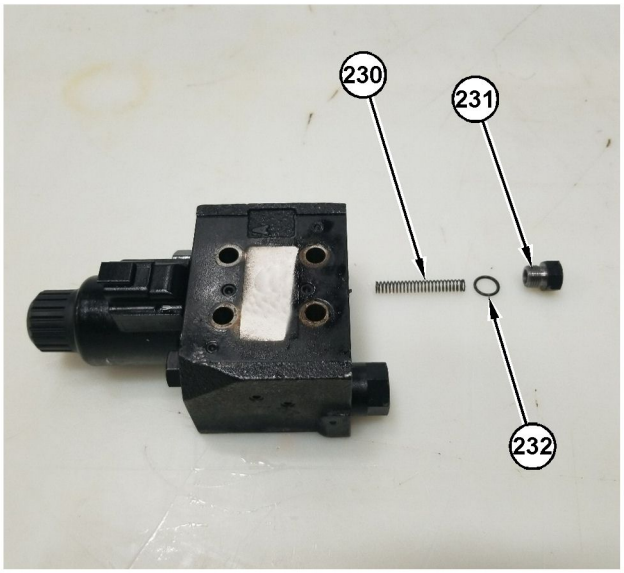

Illustration 135 g06694241

WARNING

Personal injury can result from being struck by parts propelled by a released spring force.

Make sure to wear all necessary protective equipment.

Follow the recommended procedure and use all recommended tooling to release the spring force.

5. Remove plug (231), O-ring seal (232), and spring (230).

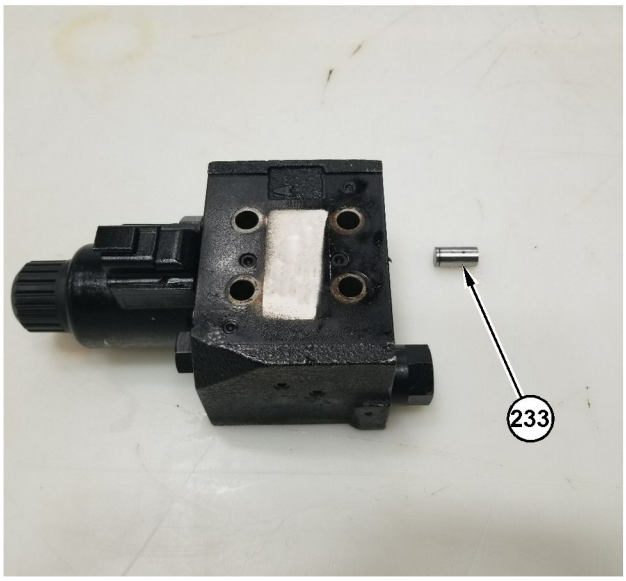

Illustration 136 g06694242

6. Use a suitable magnet to remove poppet (233). Remove poppet (233).

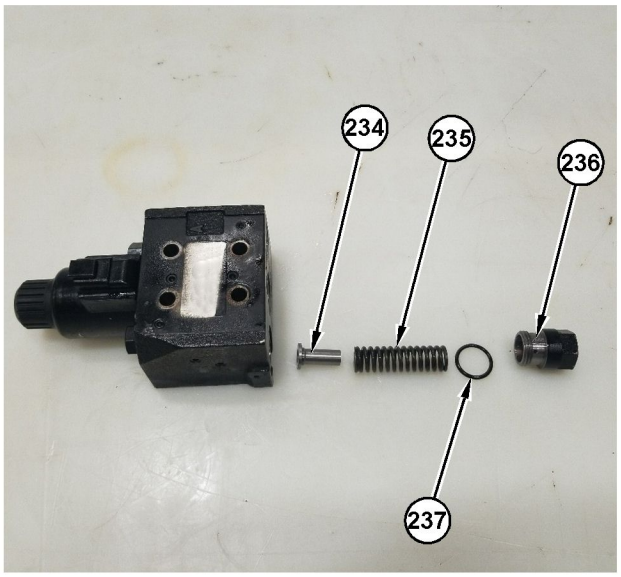

Illustration 137 g06694243

WARNING

Personal injury can result from being struck by parts propelled by a released spring force.

Make sure to wear all necessary protective equipment.

Follow the recommended procedure and use all recommended tooling to release the spring force.

7. Remove plug (236), O-ring seal (237), spring (235), and spring carrier (234).

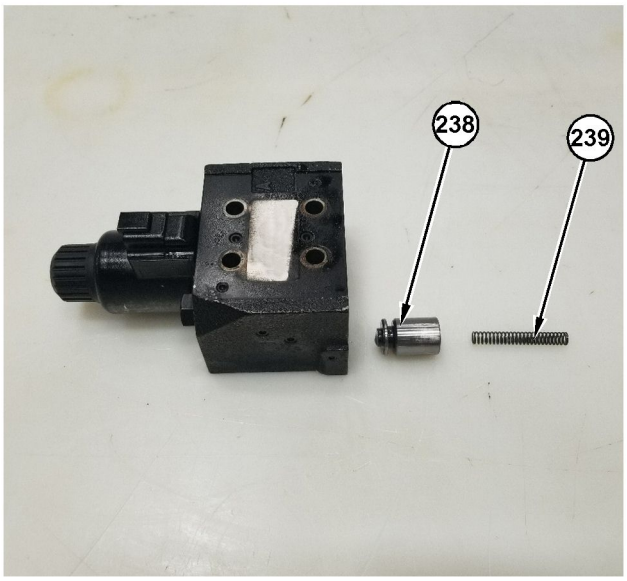

Illustration 138 g06694244

WARNING

Personal injury can result from being struck by parts propelled by a released spring force.

Make sure to wear all necessary protective equipment.

Follow the recommended procedure and use all recommended tooling to release the spring force.

8. Use a suitable magnet to remove spring (239) and piston (238). Remove spring (239) and piston (238).

9. Repeat Step 2 through Step 8 for the other side.

Relief valve disassembly

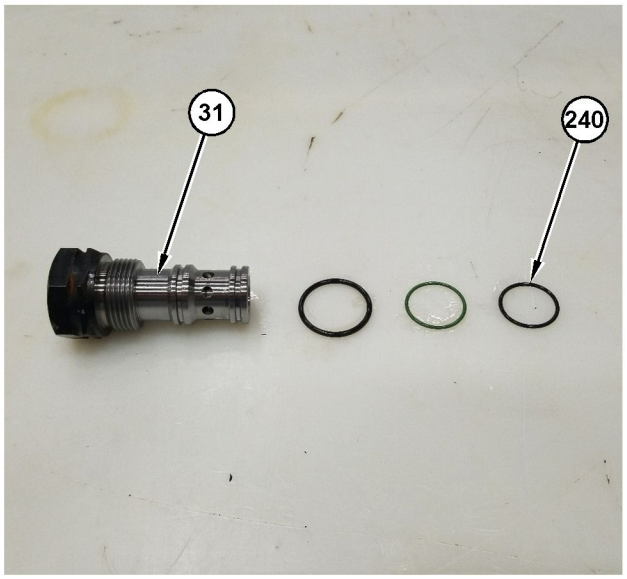

Illustration 139 g06694312

1. Remove three O-ring seals (240) from relief valve (31).

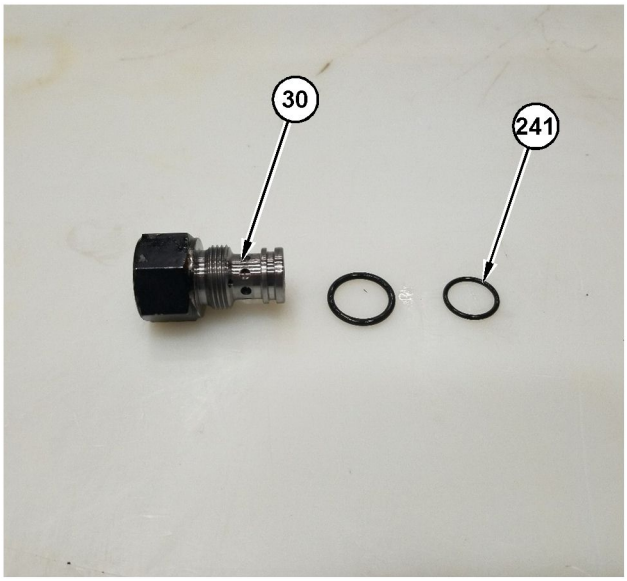

Illustration 140 g06694313

2. Remove two O-ring seals (241) from relief valve (30).

i08238485

Transmission - Assemble

SMCS Code: 3030-016

Assembly Procedure

Table 2

Required Tools			
Tool	**Part Number**	**Part Description**	**Qty**
A	439-3938	Link Bracket	3
B	422-5474	Lifting Eye Assembly	2
C	422-5473	Lifting Eye Assembly	1
D	1P-2420	Transmission Repair Stand	1
E	6V-5230	Bolt	4
	6V-5839	Washer	8
	2Y-5829	Nut	4
F	4C-8359	Eyebolt	1
H	2P-8312	Retaining Ring Pliers	1
J	5P-5197	Retaining Ring Pliers As	1
K	1P-0510	Driver Gp	1
L	-	Guide stud (M10x1.5x145mm)	2

(continued)

(Table 2, contd)

Required Tools			
Tool	**Part Number**	**Part Description**	**Qty**
P	4C-3652	Compressor As	1
T	-	Loctite 648	-
U	-	Petro gel grease	-
V	8T-5096	Tool Gp	1
W	-	Loctite 5188	-

NOTICE
Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.

Note: Apply a light film of clean transmission oil to all components before assembly.

Dual Modulating Valve Assembly

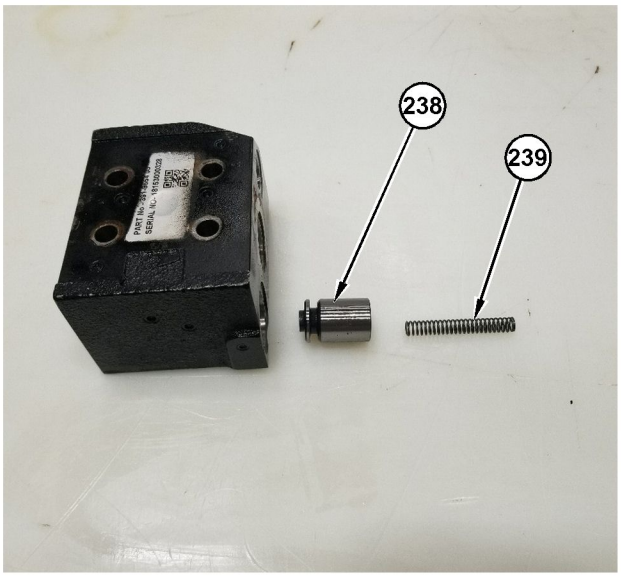

Illustration 141 g06697215

⚠ WARNING

Improper assembly of parts that are spring loaded can cause bodily injury.

To prevent possible injury, follow the established assembly procedure and wear protective equipment.

1. Install piston (238) and spring (239).

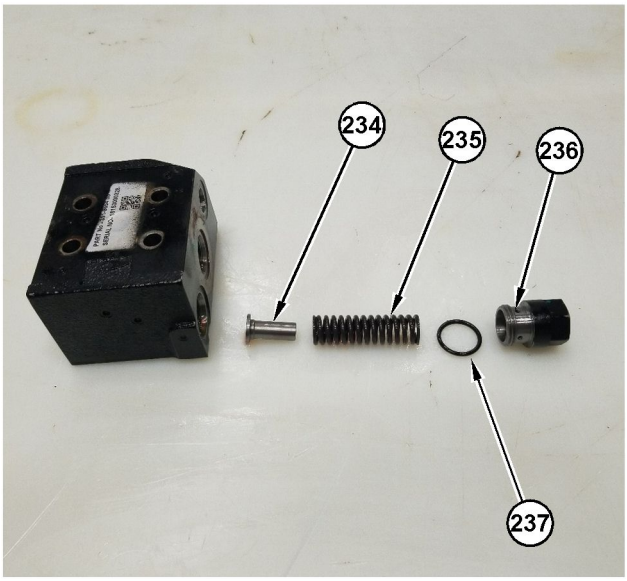

Illustration 142 g06697218

WARNING

Improper assembly of parts that are spring loaded can cause bodily injury.

To prevent possible injury, follow the established assembly procedure and wear protective equipment.

2. Install spring carrier (234), spring (235), O-ring seal (237), and plug (236). Tighten plug (236) to a torque of 25 to 35 N·m (18 to 26 lb ft).

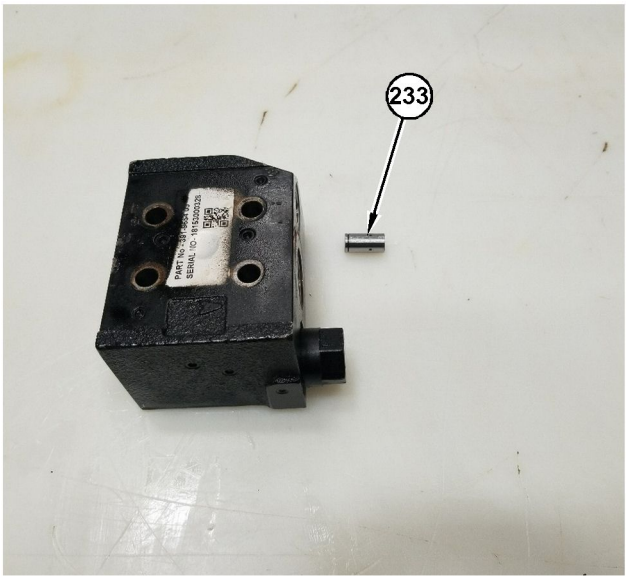

Illustration 143 g06697221

3. Install poppet (233).

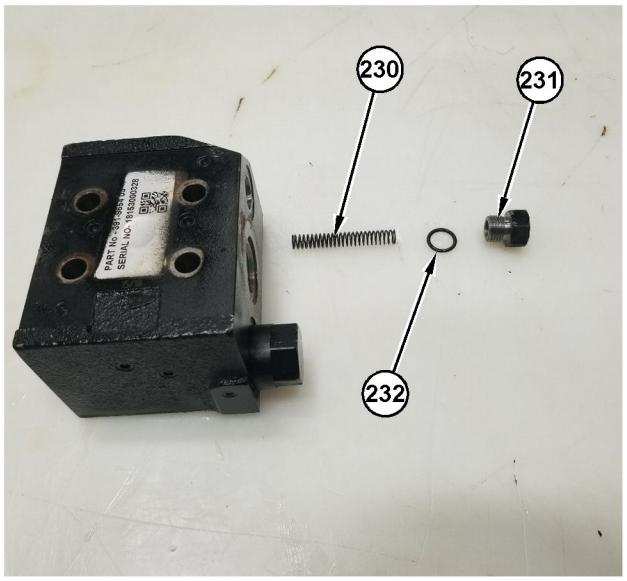

Illustration 144 g06697223

WARNING

Improper assembly of parts that are spring loaded can cause bodily injury.

To prevent possible injury, follow the established assembly procedure and wear protective equipment.

4. Install spring (230), O-ring seal (232), and plug (231). Tighten plug (231) to a torque of 10 to 20 N·m (89 to 177 lb in).

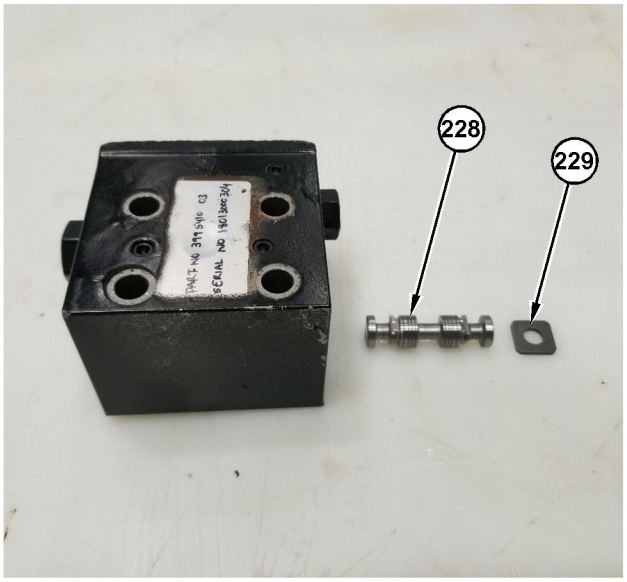

Illustration 145 g06697226

5. Install spool (228) and washer (229).

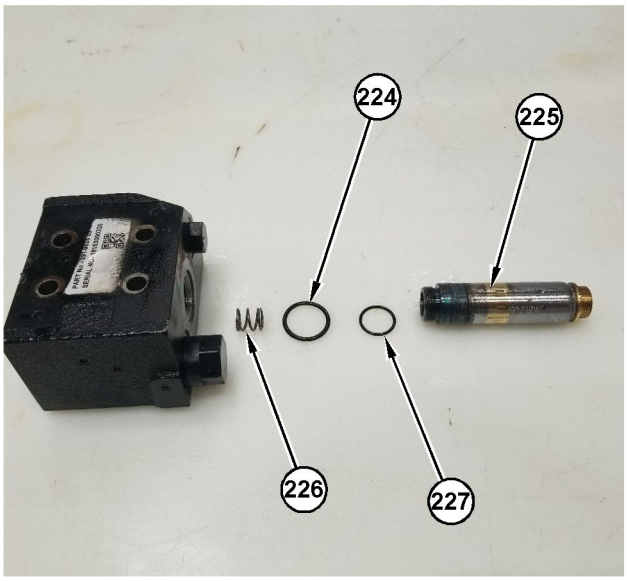

Illustration 146 g06697575

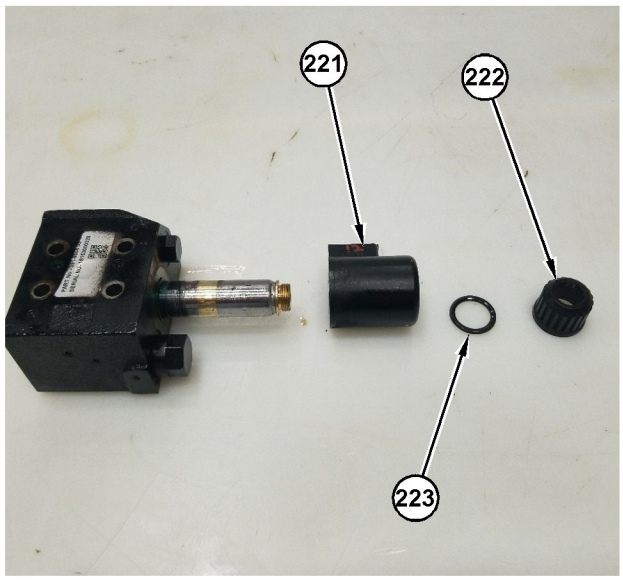

Illustration 147 g06697237

WARNING

Improper assembly of parts that are spring loaded can cause bodily injury.

To prevent possible injury, follow the established assembly procedure and wear protective equipment.

6. Install spring (226), O-ring seals (224), (227), and solenoid tube (225). Tighten solenoid tube (225) to a torque of 25 to 35 N·m (18 to 26 lb ft).

7. Install coil assembly (221), O-ring seal (223), and locknut (222). Tighten locknut (222) to a torque of 2.5 to 3.5 N·m (22 to 31 lb in).

8. Repeat Step 1 through Step 7 for the other side.

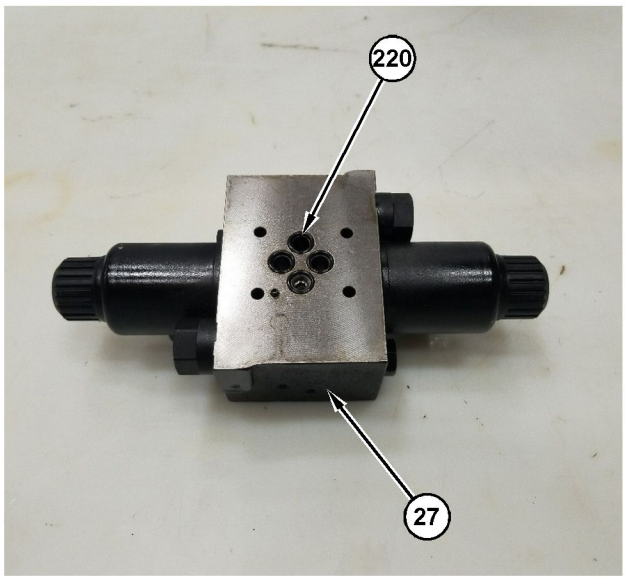

Illustration 148 g06694236

9. Install four O-ring seals (220) onto solenoid valve assembly (27).

Modulating Solenoid Valve Assembly

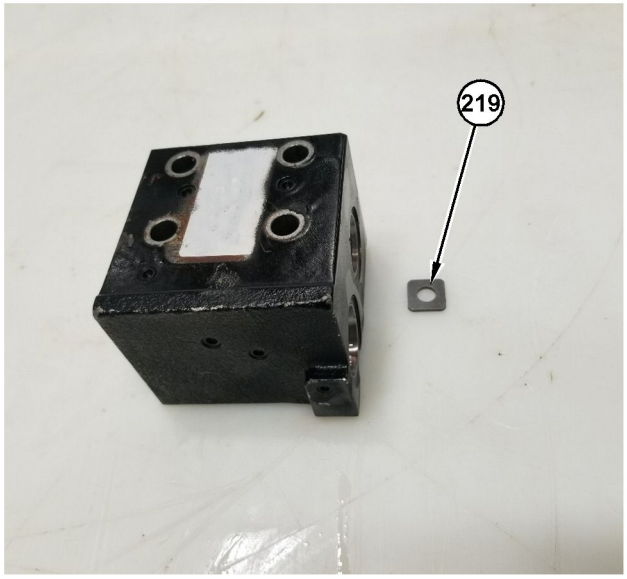

Illustration 149 g06694235

Modulating solenoid valve assembly

1. Install washer (219).

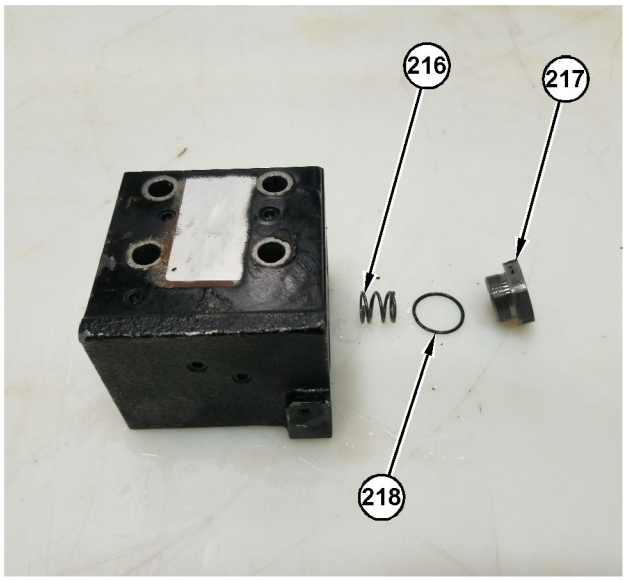

Illustration 150 g06694234

WARNING

Improper assembly of parts that are spring loaded can cause bodily injury.

To prevent possible injury, follow the established assembly procedure and wear protective equipment.

2. Install spring (216), O-ring seal (218), and plug (217).

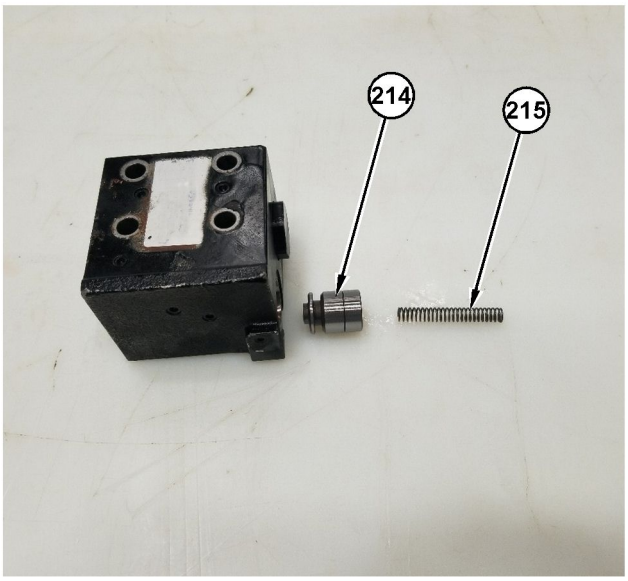

Illustration 151 g06694233

WARNING

Improper assembly of parts that are spring loaded can cause bodily injury.

To prevent possible injury, follow the established assembly procedure and wear protective equipment.

3. Install piston (214) and spring (215).

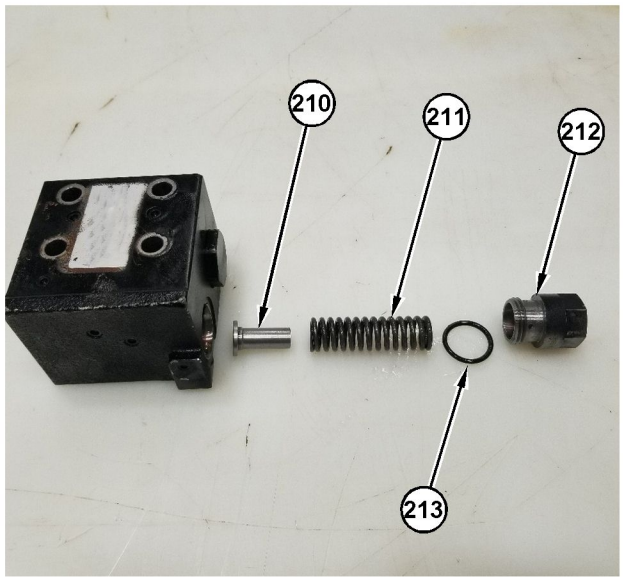

Illustration 152 g06694232

WARNING

Improper assembly of parts that are spring loaded can cause bodily injury.

To prevent possible injury, follow the established assembly procedure and wear protective equipment.

4. Install spring carrier (210), spring (211), O-ring seal (213), and plug (212). Tighten plug (212) to a torque of 25 to 35 N·m (18 to 26 lb ft).

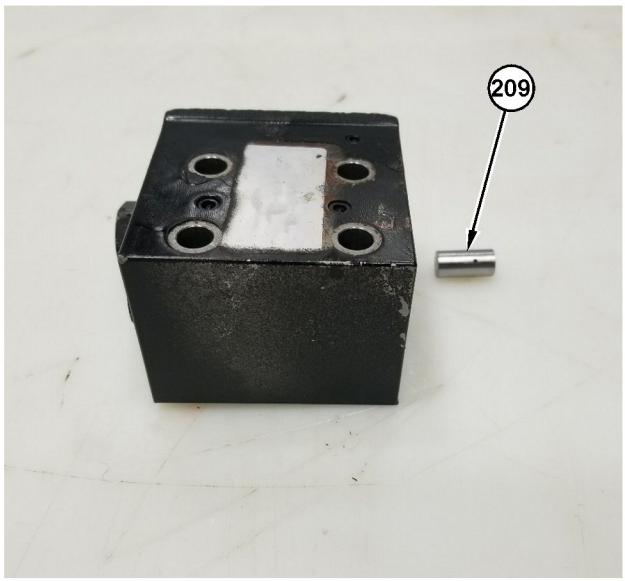

Illustration 153 g06694231

5. Install poppet (209).

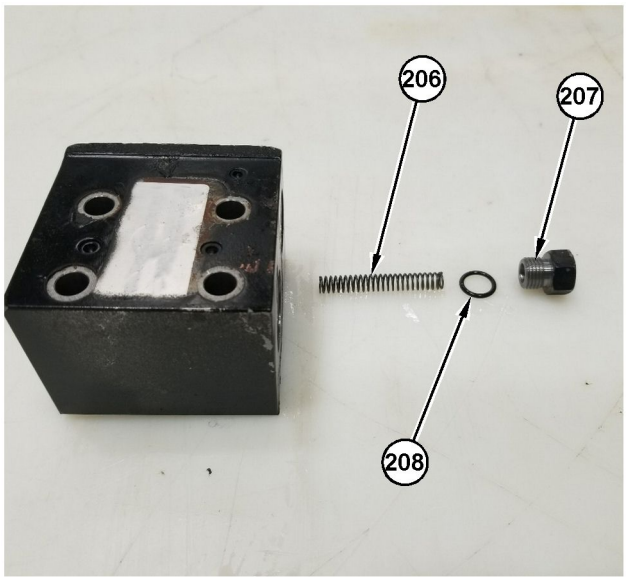

Illustration 154 g06694230

WARNING

Improper assembly of parts that are spring loaded can cause bodily injury.

To prevent possible injury, follow the established assembly procedure and wear protective equipment.

6. Install spring (206), O-ring seal (208), and plug (207). Tighten plug (207) to a torque of 10 to 20 N·m (89 to 177 lb in).

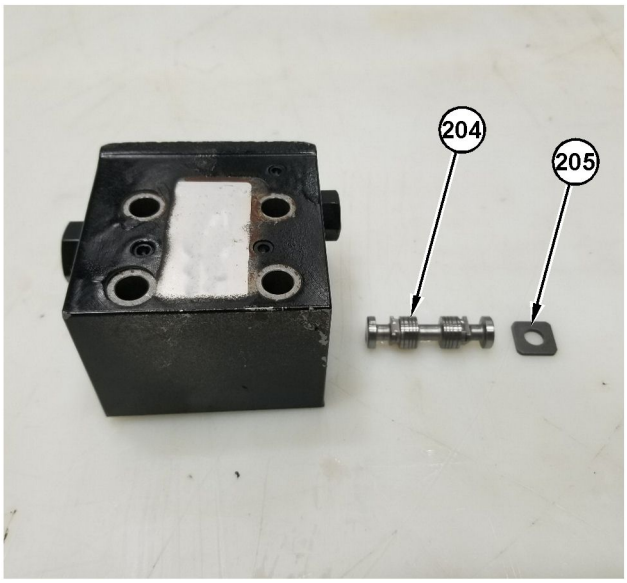

Illustration 155 g06694229

7. Install spool (204) and washer (205).

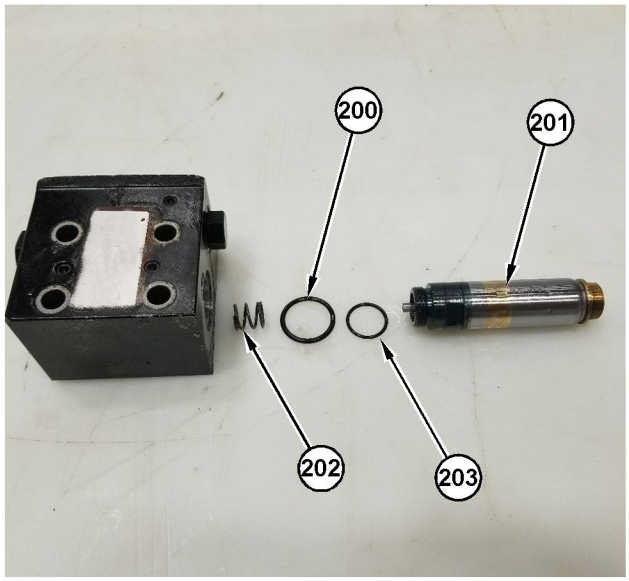

Illustration 156 g06694228

WARNING

Improper assembly of parts that are spring loaded can cause bodily injury.

To prevent possible injury, follow the established assembly procedure and wear protective equipment.

8. Install spring (202), O-ring seals (200), (203), and solenoid tube assembly (201). Tighten solenoid tube assembly (201) to a torque of 25 to 35 N·m (18 to 26 lb ft).

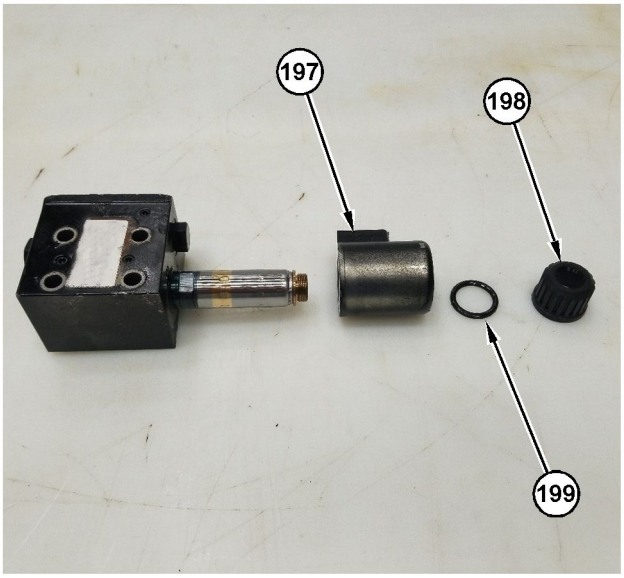

Illustration 157 g06694227

9. Install coil assembly (197), O-ring seal (199), and locknut (198). Tighten locknut (198) to a torque of 2.5 to 3.5 N·m (22 to 31 lb in).

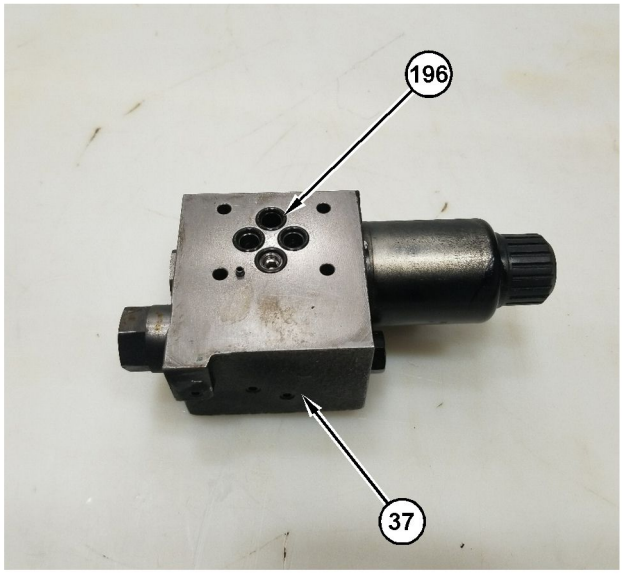

Illustration 158 g06694226

10. Install four O-ring seals (196) onto solenoid valve assembly (37).

Transfer Case Assembly

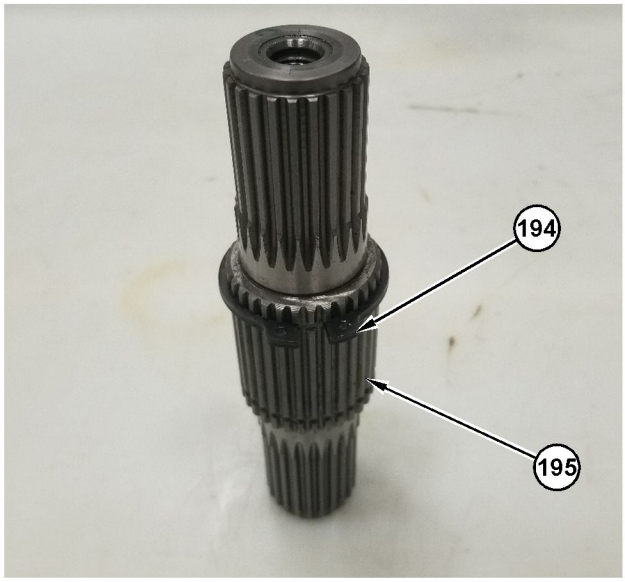

Illustration 159 g06695843

1. Use Tooling (J) to install retaining ring (194). Install retaining ring (194) onto output shaft (195).

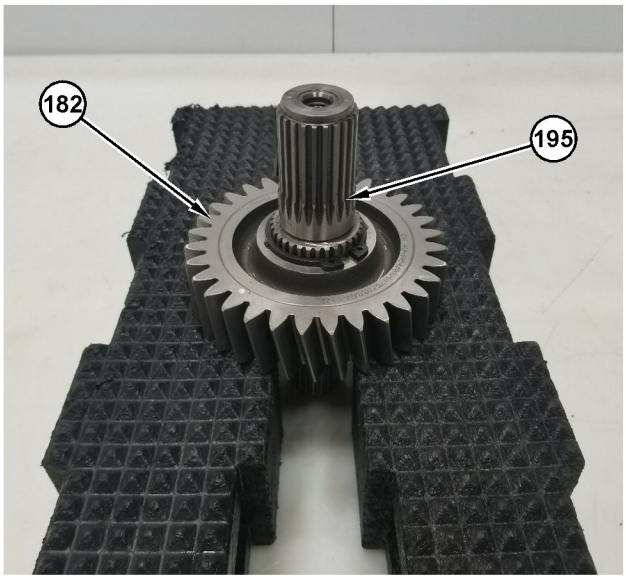

Illustration 160 g06695848

2. Raise the temperature of gear (182) and position gear (182) onto suitable cribbing.

3. Apply Tooling (T) to the splines of output shaft (195). Install output shaft (195) into gear (182).

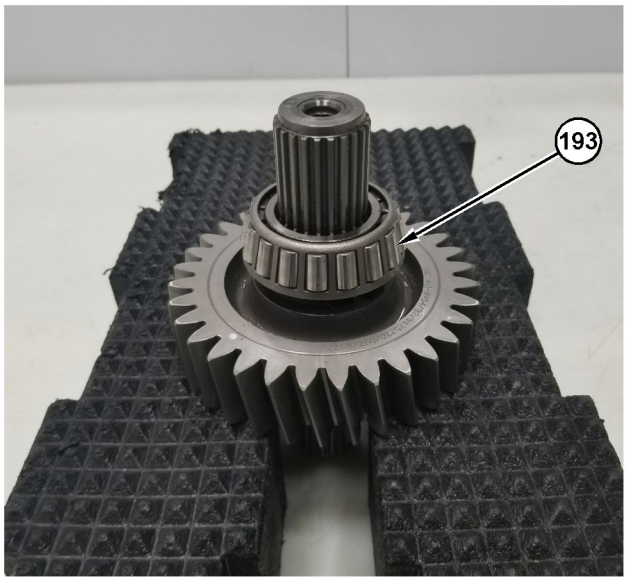

Illustration 161 g06695855

4. Raise the temperature of bearing (193). Install bearing (193).

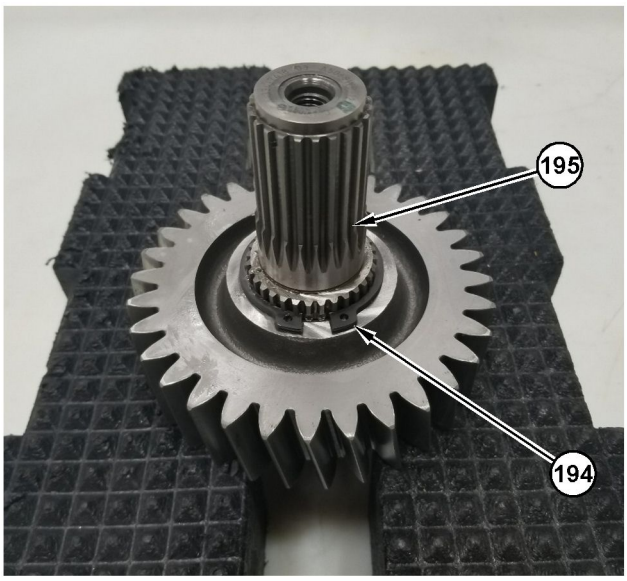

Illustration 162 g06695859

5. Use Tooling (J) to install retaining ring (194). Install retaining ring (194) onto output shaft (195).

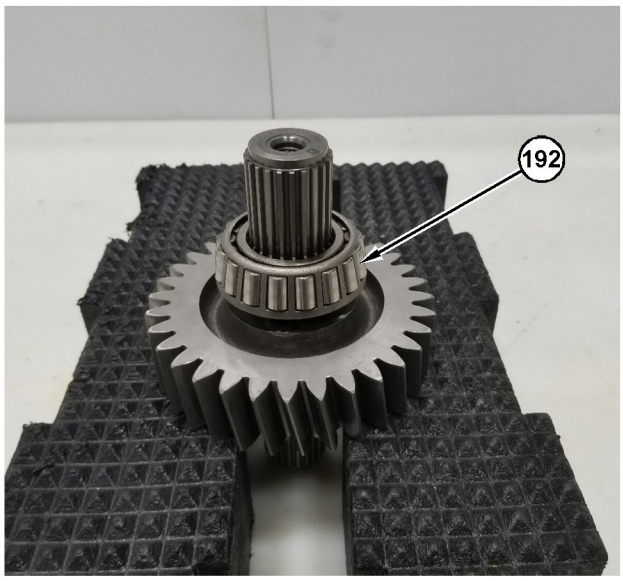

Illustration 163 g06695861

6. Raise the temperature of bearing (192). Install bearing (192).

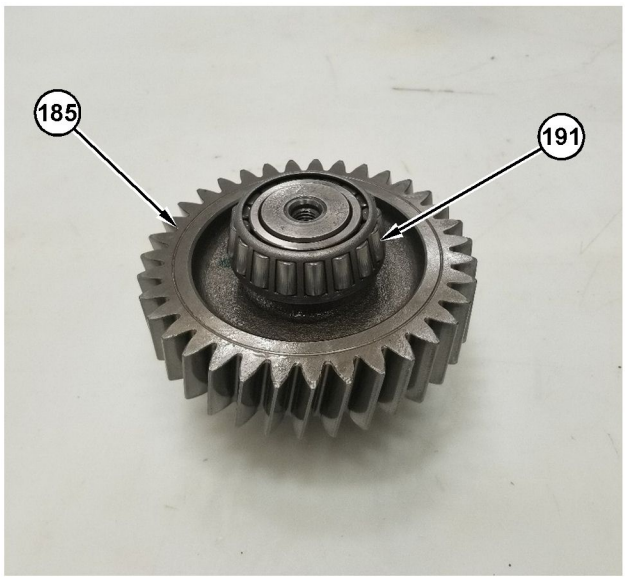

Illustration 164 g06695862

7. Raise the temperature of bearing (191). Install bearing (191) onto input gear assembly (185).

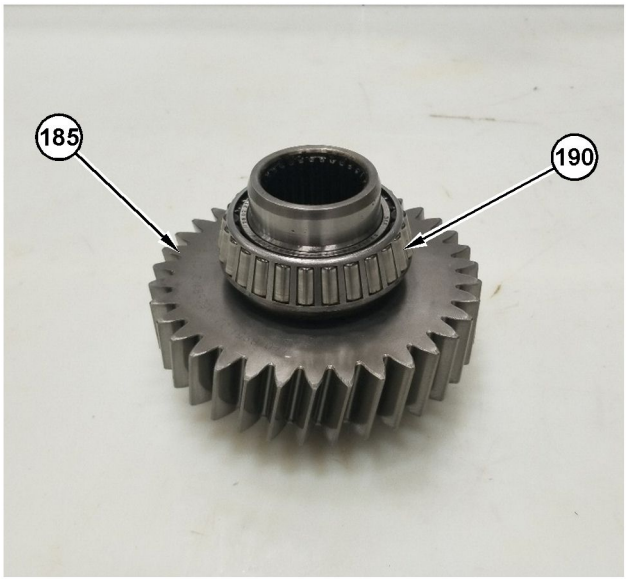

Illustration 165 g06695865

8. Raise the temperature of bearing (190). Install bearing (190) onto input gear assembly (185).

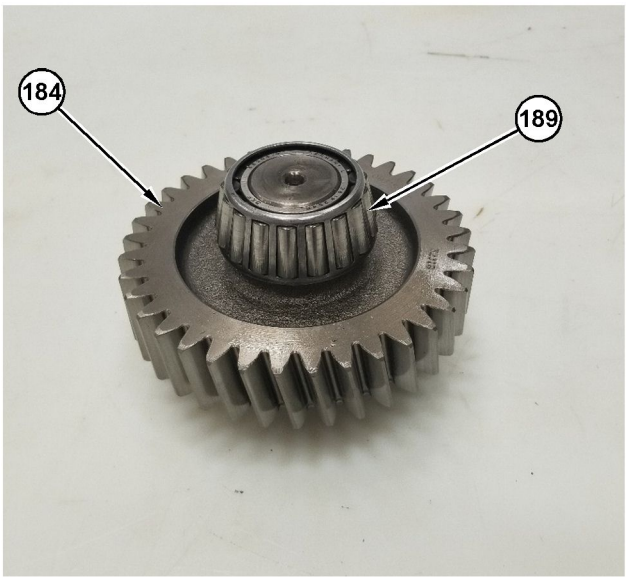

Illustration 166 g06695867

9. Raise the temperature of bearing (189). Install bearing (189) onto idler gear assembly (184). Repeat for the other side.

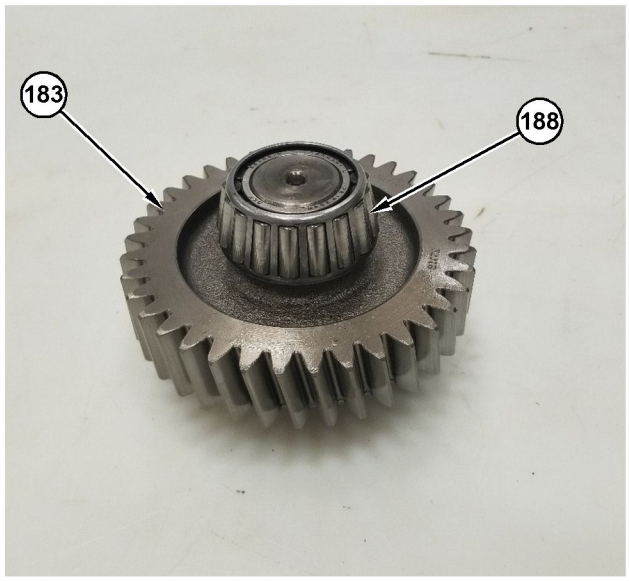

Illustration 167 g06695869

10. Raise the temperature of bearing (188). Install bearing (188) onto idler gear assembly (183). Repat for the other side.

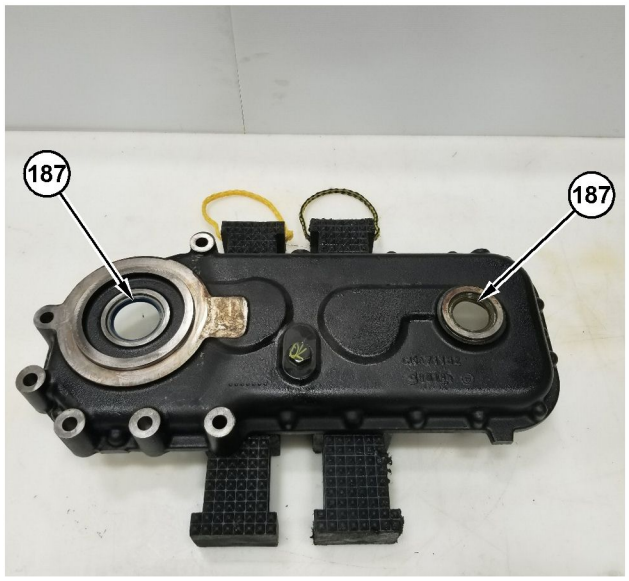

Illustration 168 g06695871

Note: Ensure the correct orientation of lip seals (187) from disassembly procedure.

11. Use Tooling (K) (not shown) to install lip seals (187). Install lip seals (187).

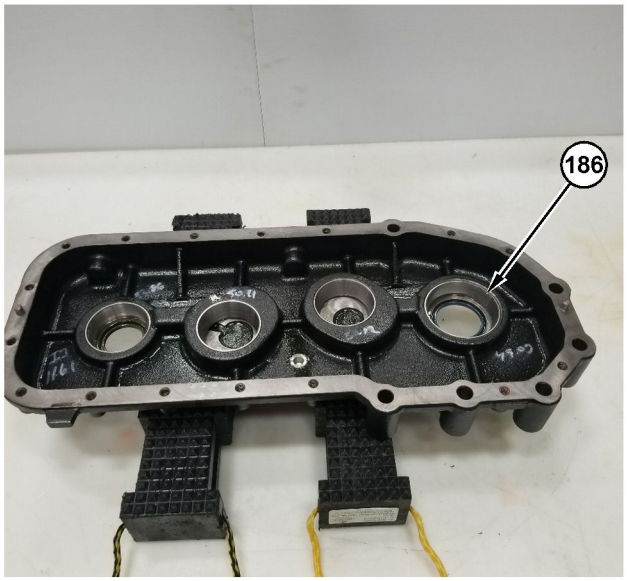

Illustration 169 g06695873

12. Use two people to position the case assembly onto suitable cribbing. The weight of the case assembly is approximately 25 kg (55 lb). Lower the temperature of bearing cups (186). Install bearing cups (186).

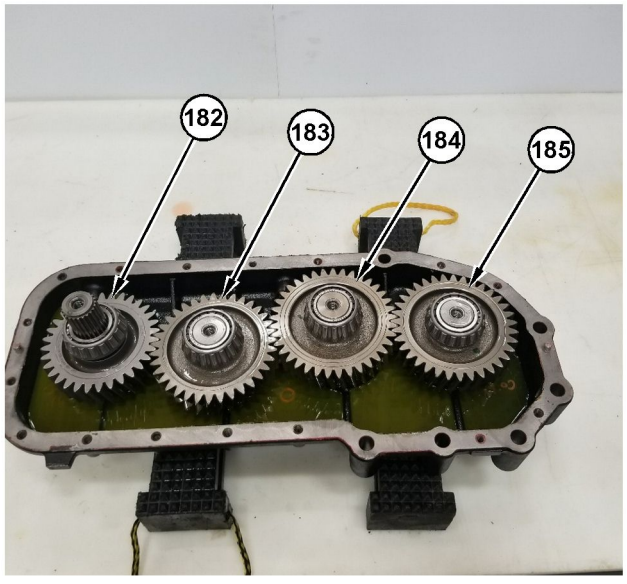

Illustration 170 g06694216

Note: Ensure that the threaded holes are facing upwards.

13. Install input gear assembly (185), idler gear assemblies (184), (183), and output gear assembly (182).

Illustration 171 g06695874

Note: Ensure the correct orientation of lip seal (180) from disassembly procedure.

14. Use Tooling (K) (not shown) to install lip seal (180). Install lip seal (180).

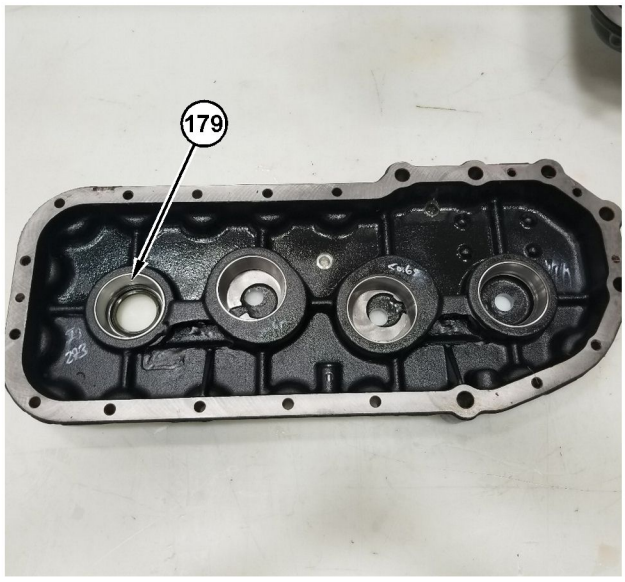

Illustration 172 g06695876

15. Use two people to remove the front case assembly onto suitable cribbing (not shown). The weight of the front case assembly is approximately 25 kg (55 lb).

16. Apply Tooling (U) to hold bearing cups (179) during installation of case assembly.

17. Lower the temperature of the bearing cups (179). Install bearing cups (179).

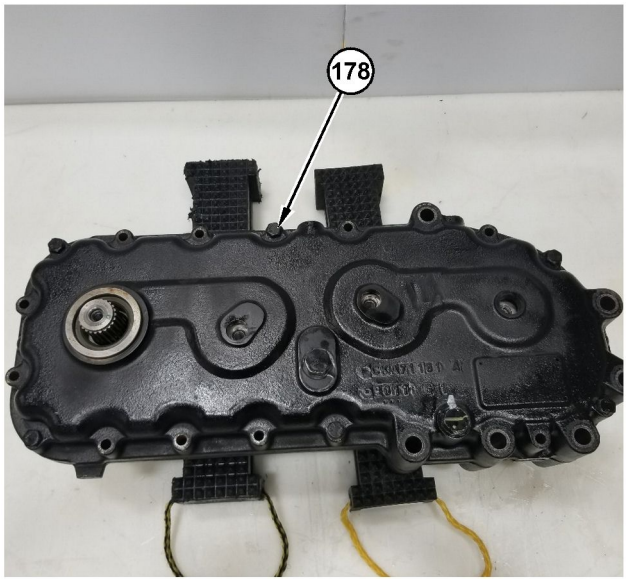

Illustration 173 g06695900

18. Use two people to install the front case assembly. Install the front case assembly and six bolts (178) evenly spaced. Tighten bolts (178) in a star pattern to a torque of 45 to 64 N·m (33 to 47 lb ft).

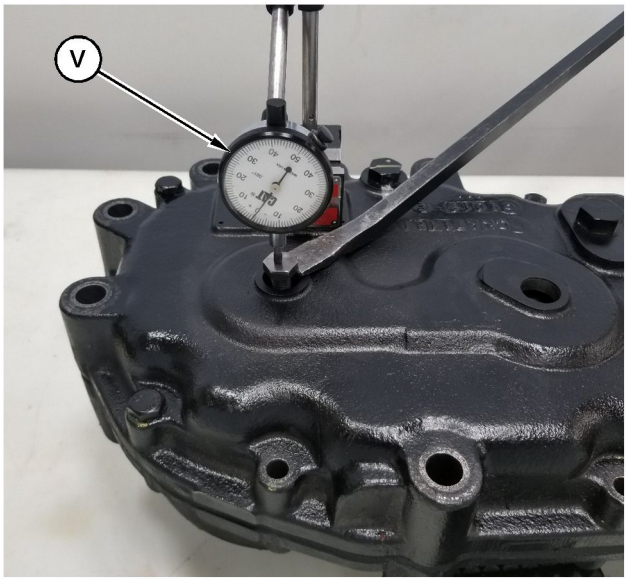

Illustration 174 g06695902

19. Install Tooling (V) with the head machined to a flat surface into the input gear. Set up Tooling (V) as shown in Illustration 174 and set zero. Use a suitable pry bar to check the input gear end float. Repeat for the other gear assemblies.

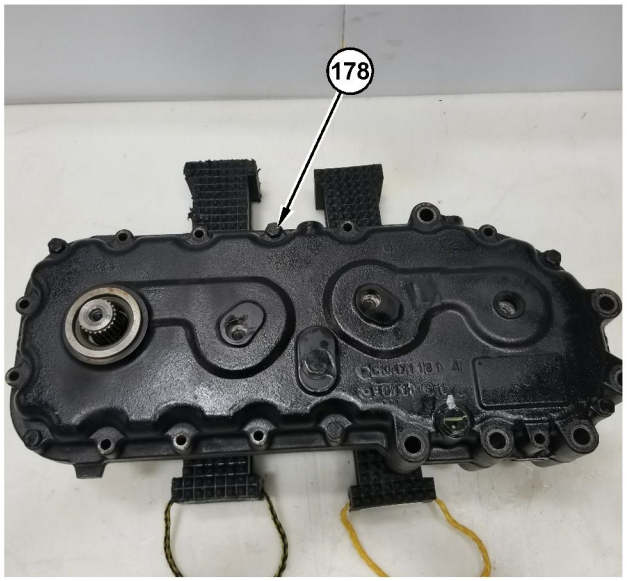

Illustration 175 g06695900

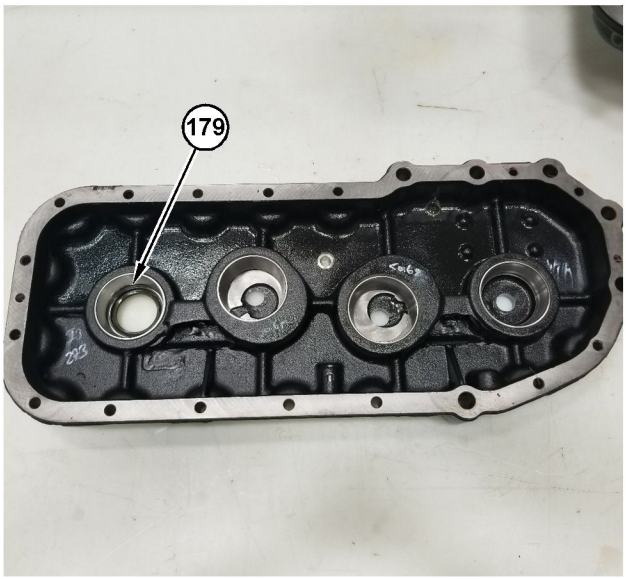

Illustration 176 g06695903

20. Remove six bolts (178).

21. Use two people to position the front case assembly. The weight of the front case assembly is approximately 25 kg (55 lb). Calculate the required shim size to give the correct end float for each gear assembly.

22. Install the shims behind each bearing cups (179). Use Tooling (U) to hold the bearing cups in place during installation of the front case assembly.

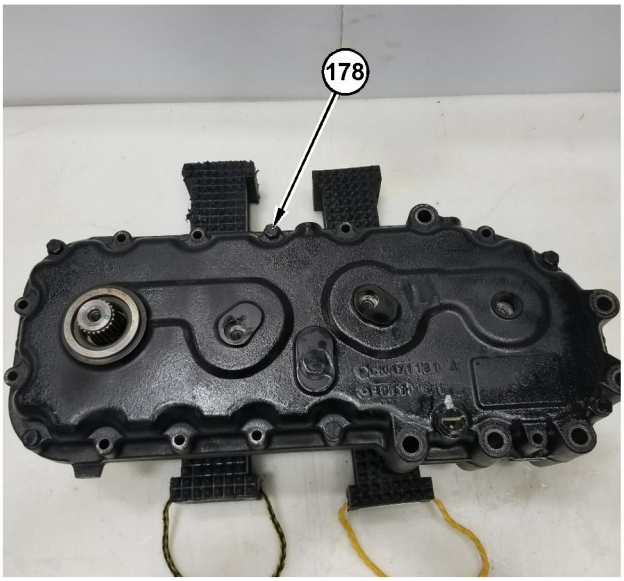

Illustration 177 g06695905

23. Use two people to install the front case assembly. The weight of the front case assembly is approximately 25 kg (55 lb).

24. Install the front case assembly and six bolts (178). Tighten bolts (178) in a star pattern to a torque of 45 to 64 N·m (33 to 47 lb ft).

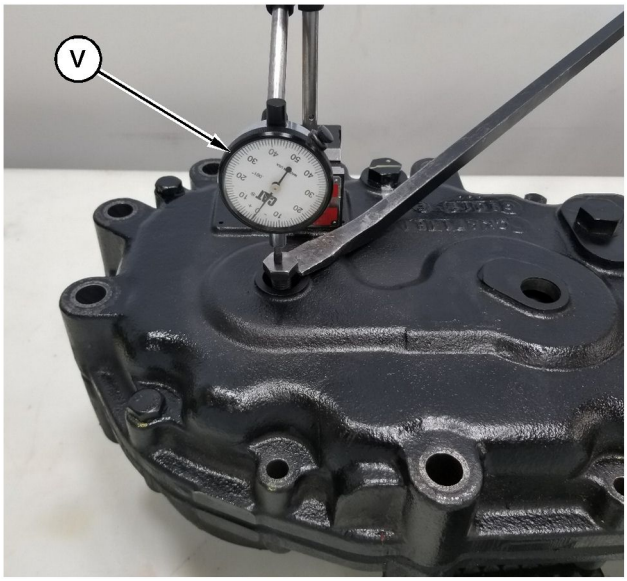

Illustration 178 g06695902

25. Reinstall Tooling (V) with the head machined to a flat surface into the input gear. Set up Tooling (V) as shown in Illustration 178 and set to zero. Use a suitable pry bar to recheck the input gear assembly end float. Repeat for the other gear assemblies.

26. Repeat Step 12 through Step 25 until the correct end float of 0.025 to 0.076 mm (0.0009 to 0.0029 inch) is achieved.

Illustration 179 g06695907

27. Remove the front case assembly (not shown). Apply a thin layer of Tooling (W) to the rear case assembly.

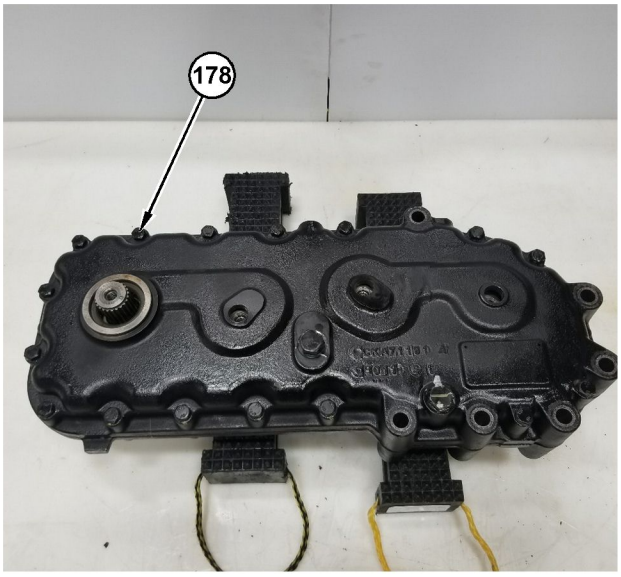

Illustration 180 g06695910

28. Install the front case assembly and bolts (178). Tighten bolts (178) in star pattern to a torque of 45 to 64 N·m (33 to 47 lb ft).

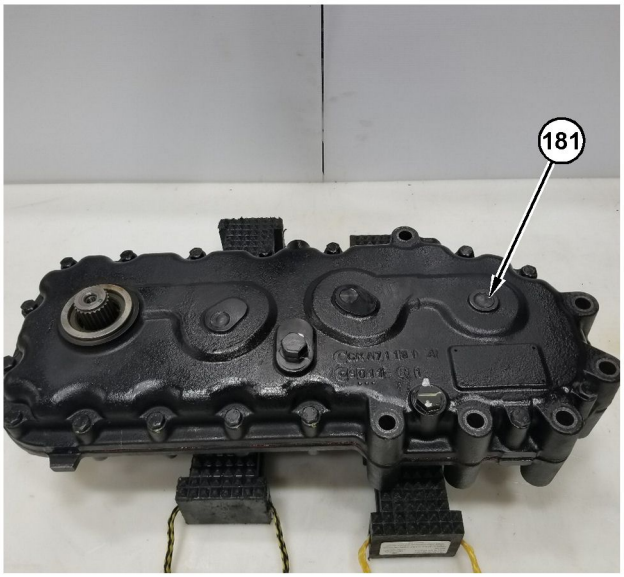

Illustration 181 g06695913

29. Use Tooling (K) to install plugs (181). Install three plugs (181).

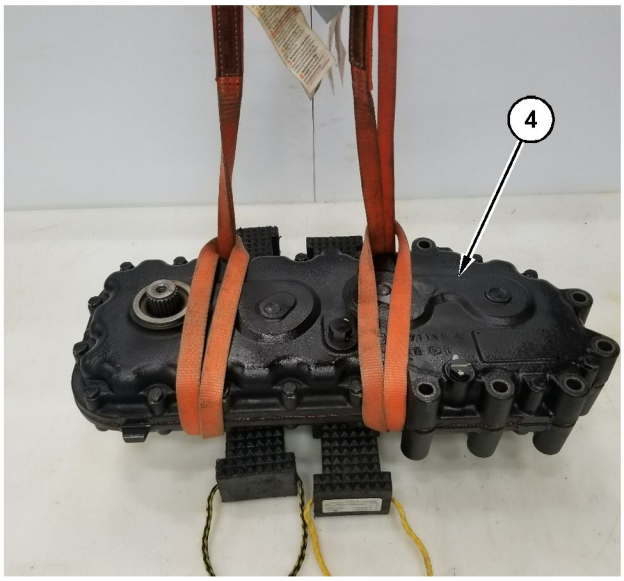

Illustration 182 g06696405

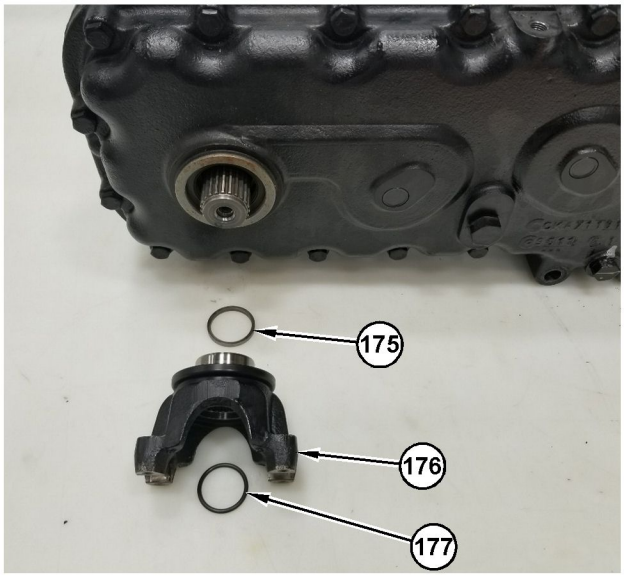

Illustration 183 g06694212

30. Attach a suitable lifting device to transfer case (4). The weight of transfer case (4) is approximately 73 kg (161 lb). Position transfer case (4) as shown in Illustration 183 .

31. Install spacer (175), yoke assembly (176), and O-ring (177).

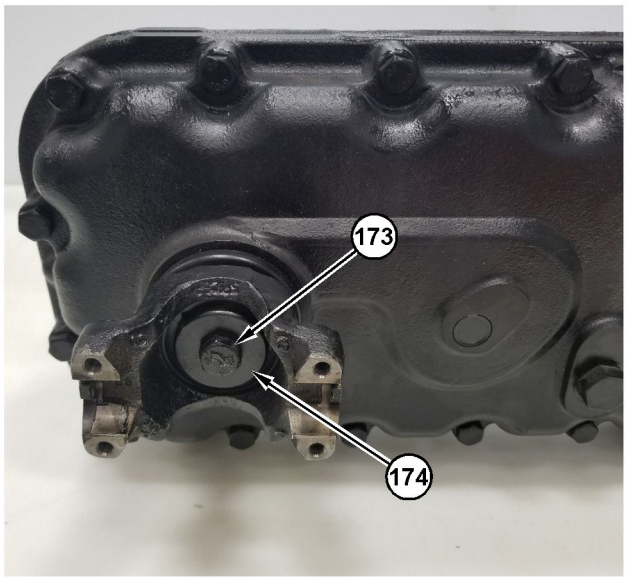

Illustration 184 g06694211

32. Install washer (174) and bolt (173). Tighten bolt (173) to a torque of 68 to 88 N·m (50 to 65 lb ft).

33. Repeat Step 31 and Step 32 for the other side.

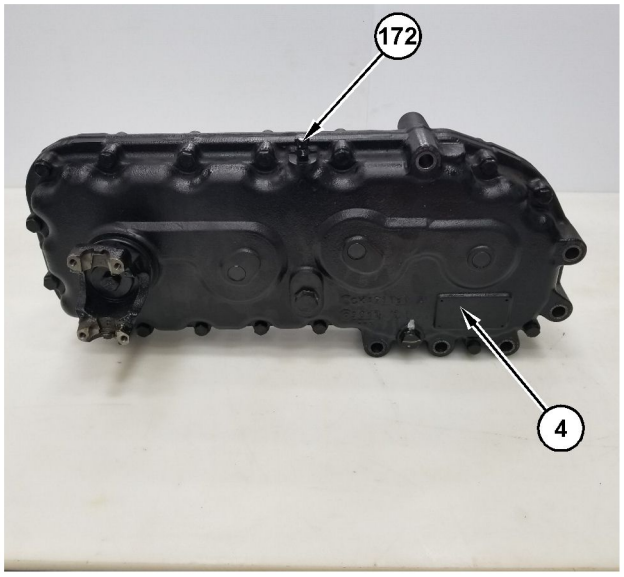

Illustration 185 g06694209

34. Install vent (172) onto transfer case (4).

First / Second clutch Assembly

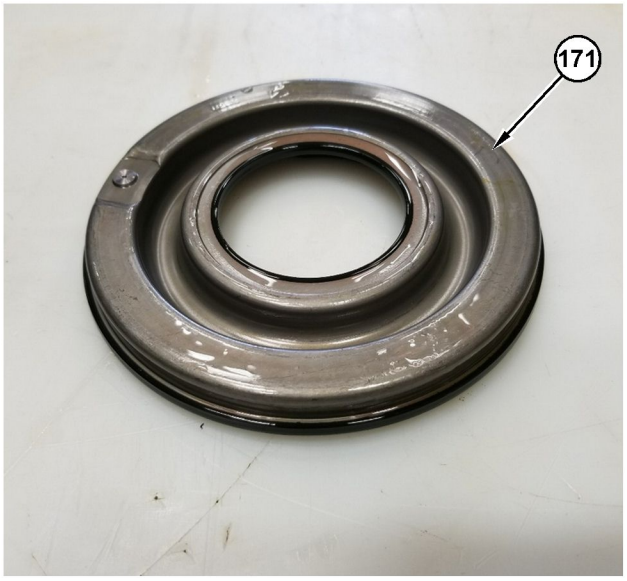

Illustration 186 g06696408

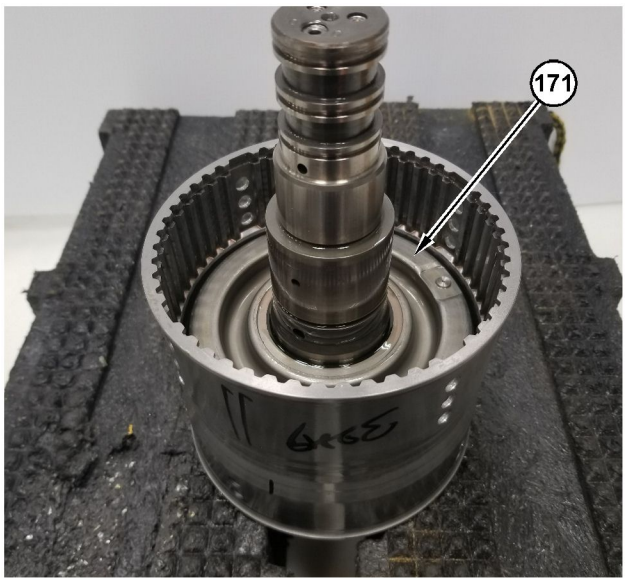

Illustration 187 g06697697

1. Lubricate the piston seals with new transmission oil.

2. Install piston (171).

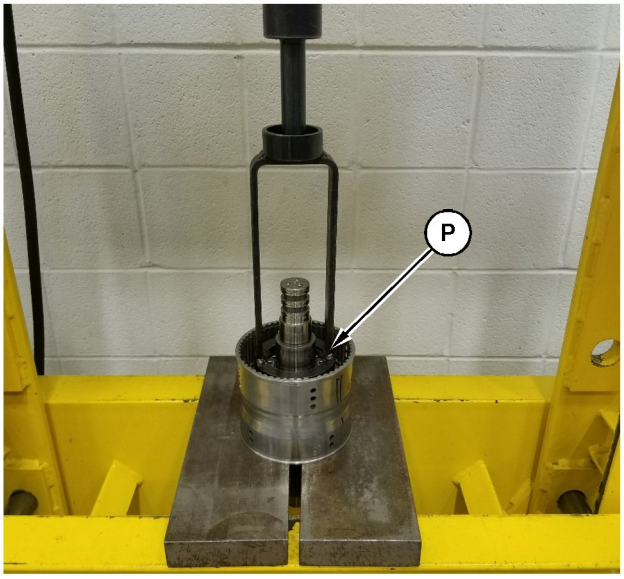

Illustration 188 g06694205

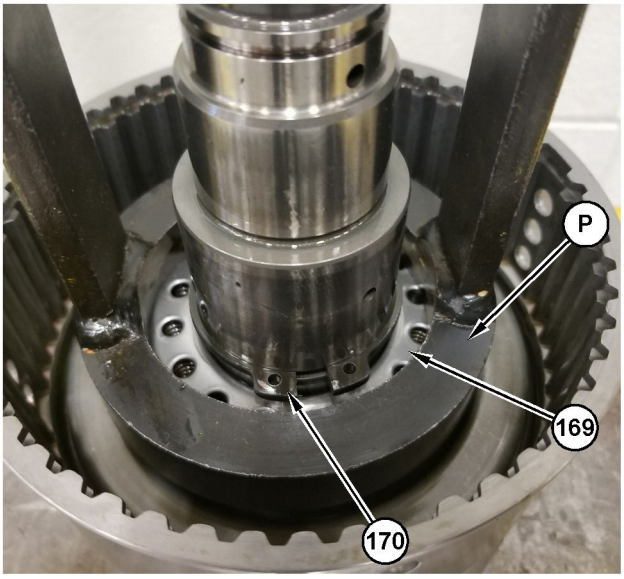

Illustration 189 g06694207

⚠ WARNING

Improper assembly of parts that are spring loaded can cause bodily injury.

To prevent possible injury, follow the established assembly procedure and wear protective equipment.

Note: Ensure that the flat surface of the retaining ring is facing up.

3. Install the spring retainer and spring assembly (169). Use Tooling (P) and a suitable press to compress spring assembly (169). Use Tooling (J) to install retaining ring (170). Compress spring assembly (169) and install retaining ring (170).

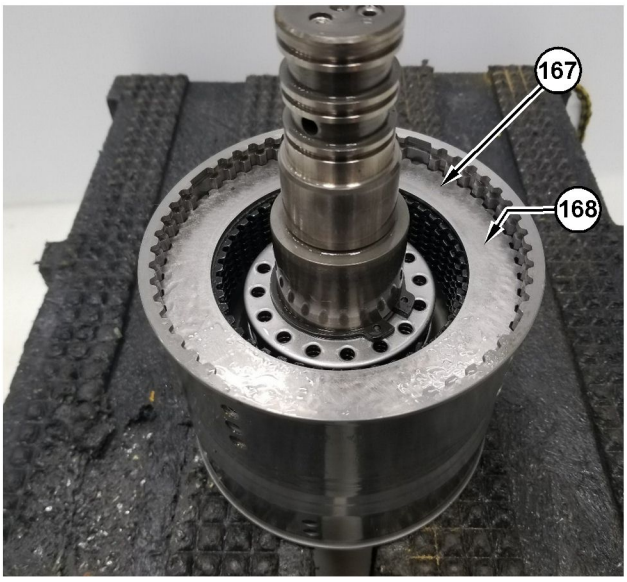

Illustration 190 g06694203

4. Lubricate friction discs (168) and clutch discs (167) with new transmission oil. Install friction discs (168) and clutch discs (167) alternately.

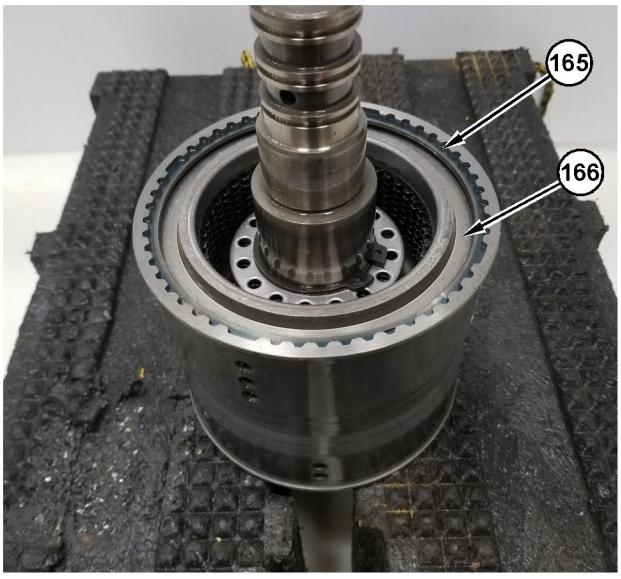

Illustration 191 g06694202

5. Install retainer plate (166) and retaining ring (165).

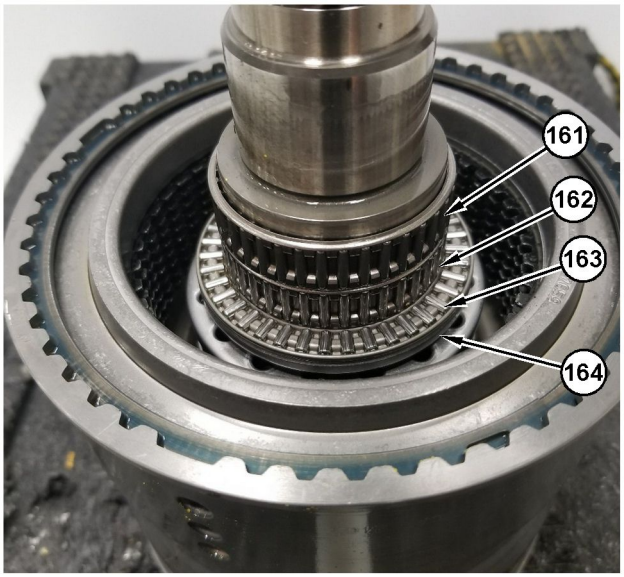

Illustration 192 g06694201

Note: Ensure the groove of thrust bearing (163) is facing thrust washer (164).

6. Install thrust washer (164) and thrust bearing (163).

7. Install bearings (162) and (161).

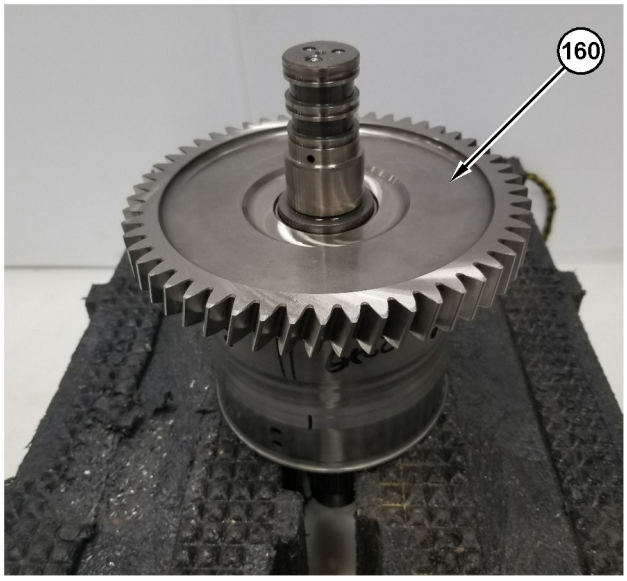

Illustration 193 g06697780

8. Install gear assembly (160).

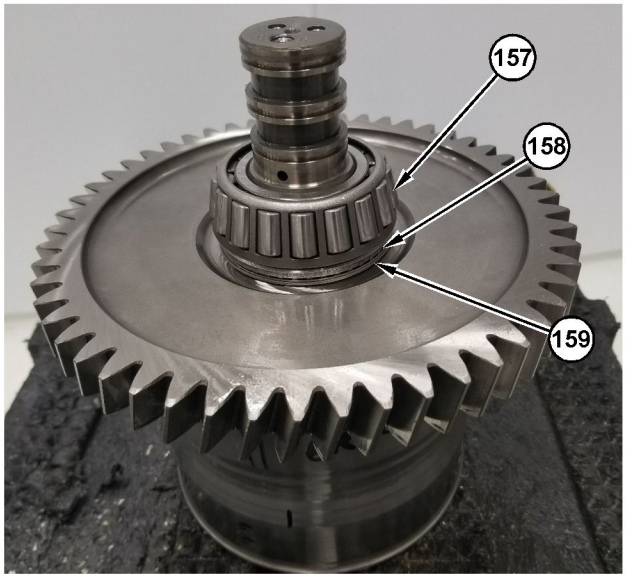

Illustration 194 g06697777

Note: Ensure the groove of thrust bearing (159) is facing thrust washer (158).

9. Install thrust bearing (159) and thrust washer (158).

10. Raise the temperature of bearing cone (157). Install bearing cone (157).

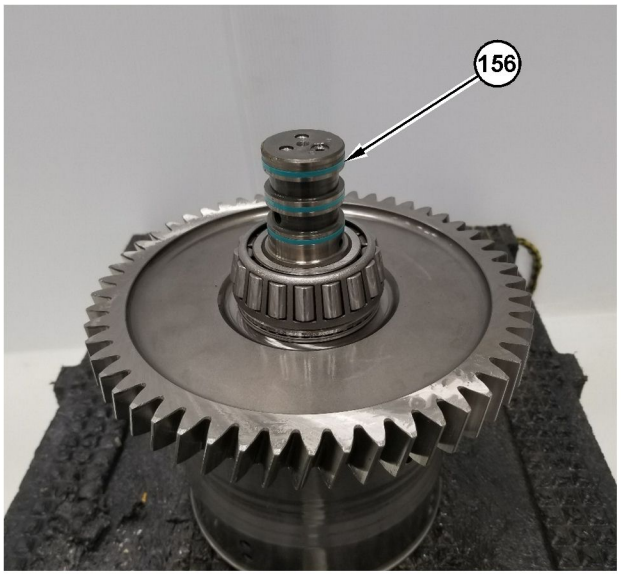

Illustration 195 g06694199

11. Install three O-ring seals (156).

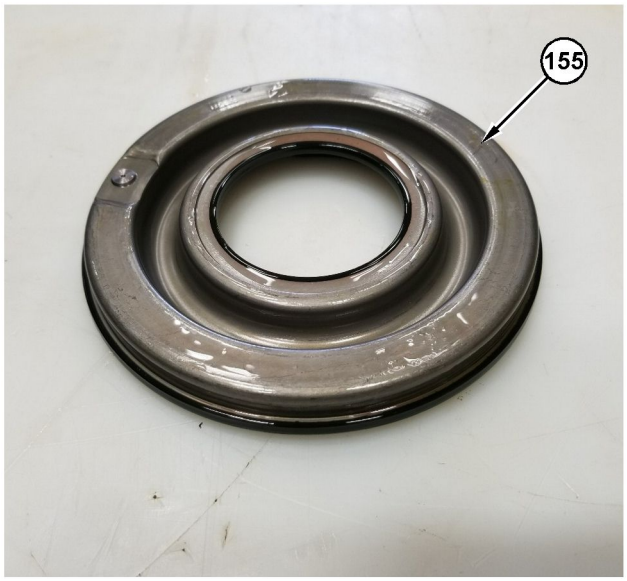

Illustration 196 g06697791

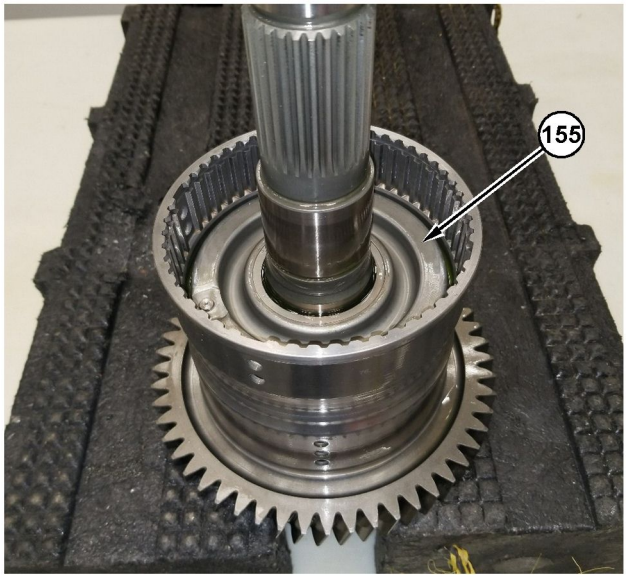

Illustration 197 g06694198

12. Lubricate the piston seals with new transmission oil.

13. Install piston (155).

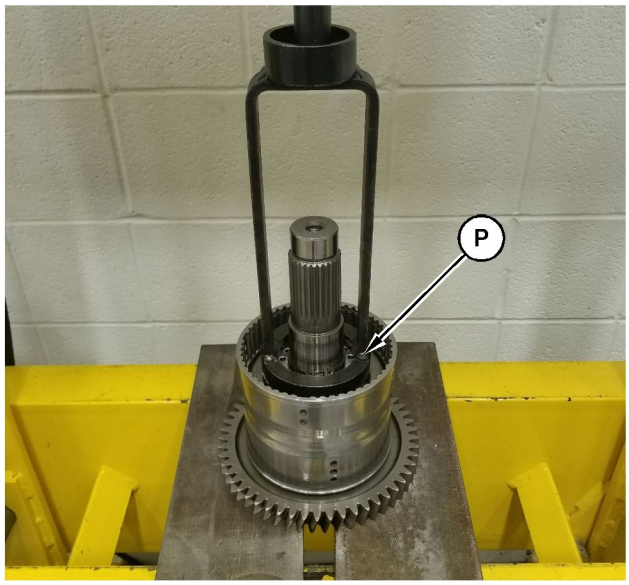

Illustration 198 g06694192

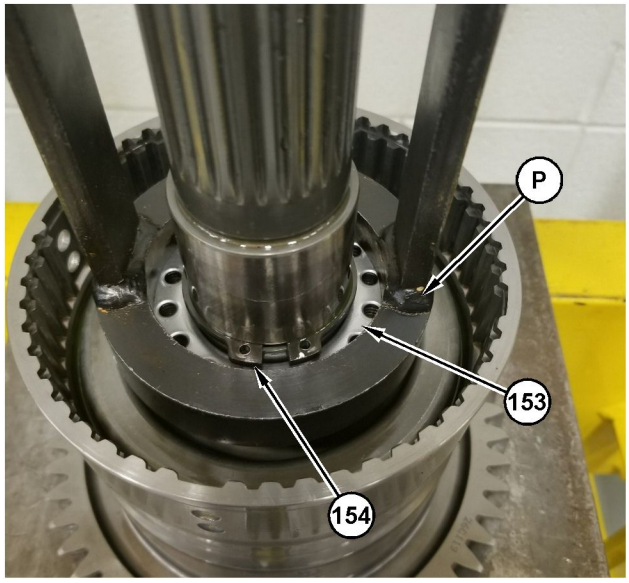

Illustration 199 g06694193

WARNING

Improper assembly of parts that are spring loaded can cause bodily injury.

To prevent possible injury, follow the established assembly procedure and wear protective equipment.

Note: Ensure that the flat surface of retaining ring (154) is facing up.

14. Install the spring retainer and spring assembly (153). Use Tooling (P) and a suitable press to compress spring assembly (153). Use Tooling (J) to install retaining ring (154). Compress spring assembly (153) and install retaining ring (154).

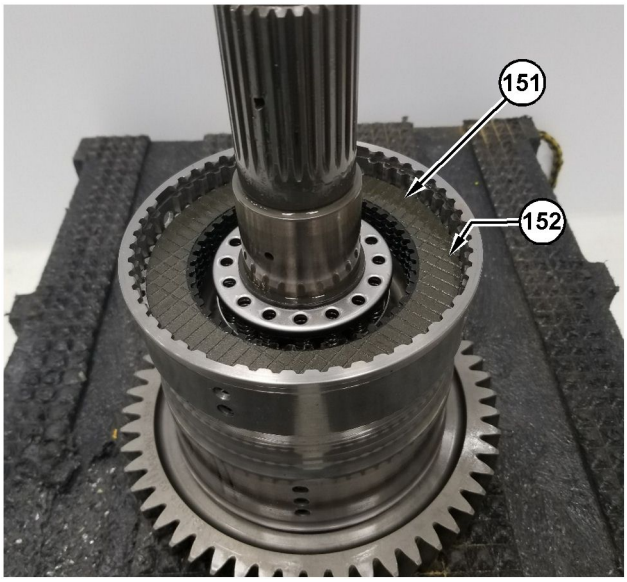

Illustration 200 g06694191

15. Lubricate friction discs (151) and clutch discs (152) with new transmission oil. Install friction discs (151) and clutch discs (152) alternately.

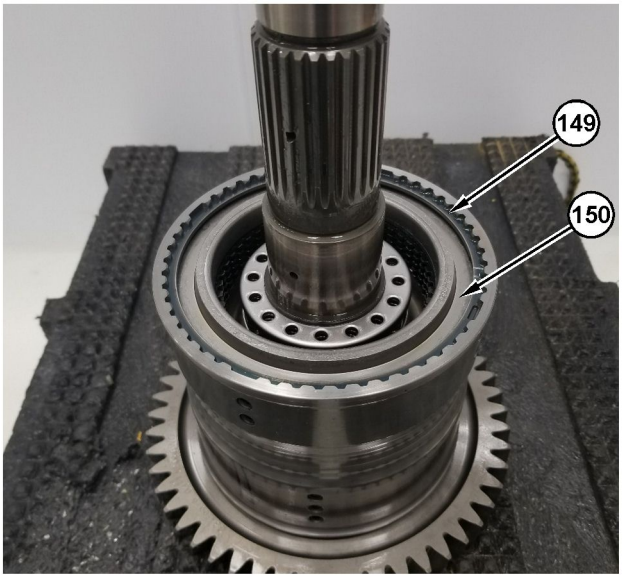

Illustration 201 g06694190

16. Install retainer plate (150) and retaining ring (149).

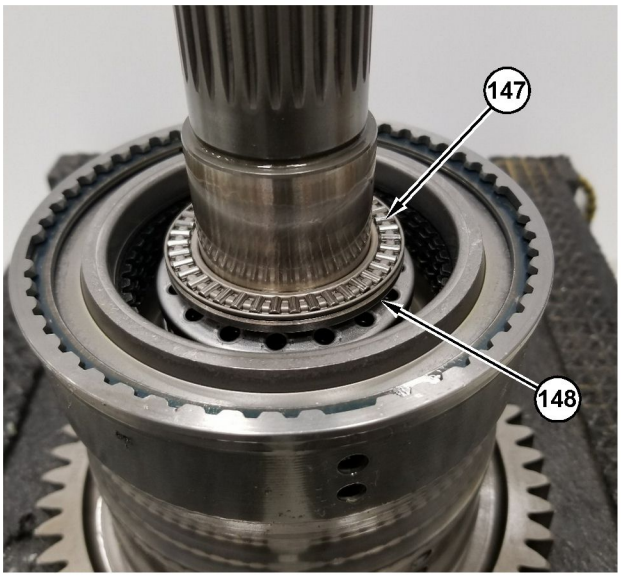

Illustration 202 g06697800

Note: Ensure the groove of thrust bearing (147) is facing thrust washer (148).

17. Install thrust washer (148) and thrust bearing (147).

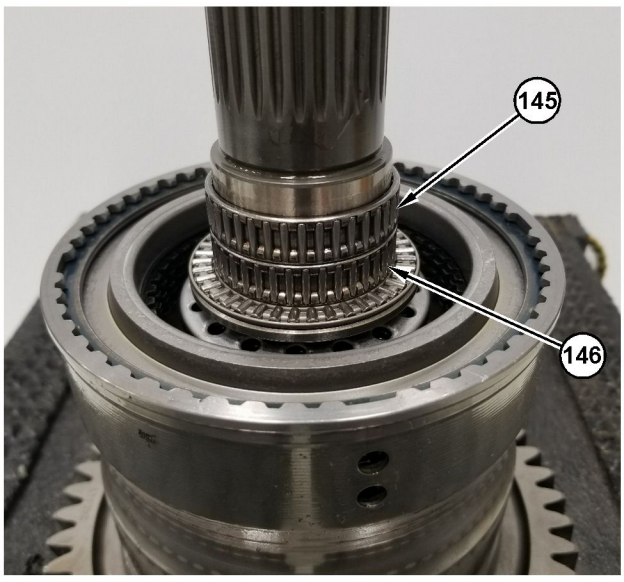

Illustration 203 g06697802

18. Install bearings (146) and (145).

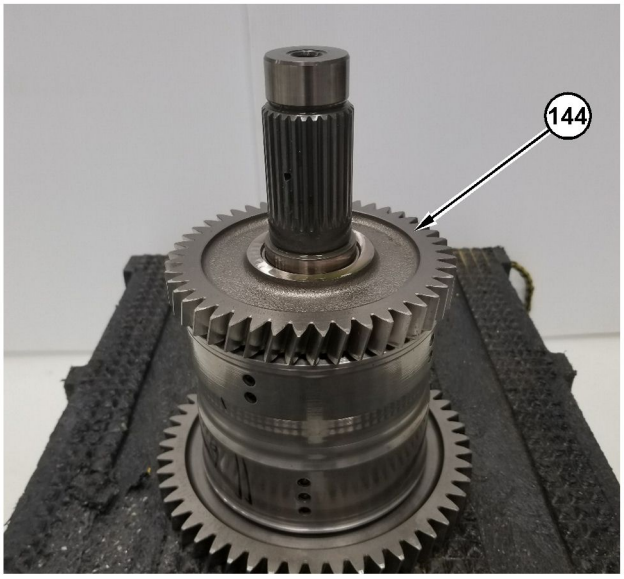

Illustration 204 g06694187

19. Install gear (144).

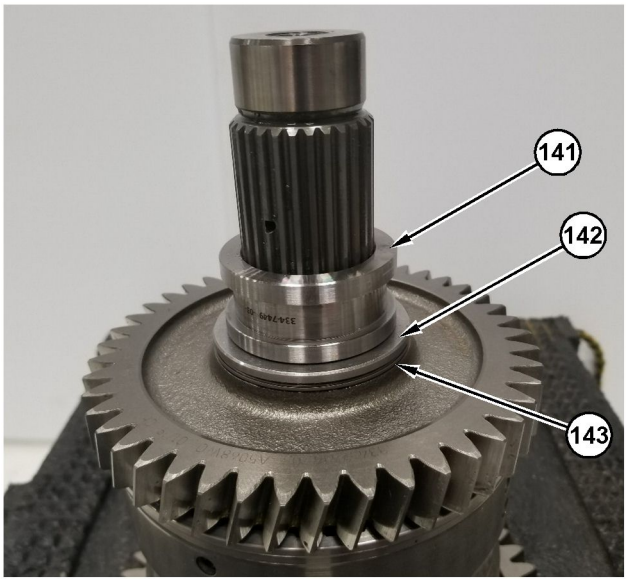

Illustration 205 g06694185

Note: Ensure the groove of thrust bearing (143) is facing thrust washer (142).

20. Install thrust bearing (143), thrust washer (142), and spacer (141).

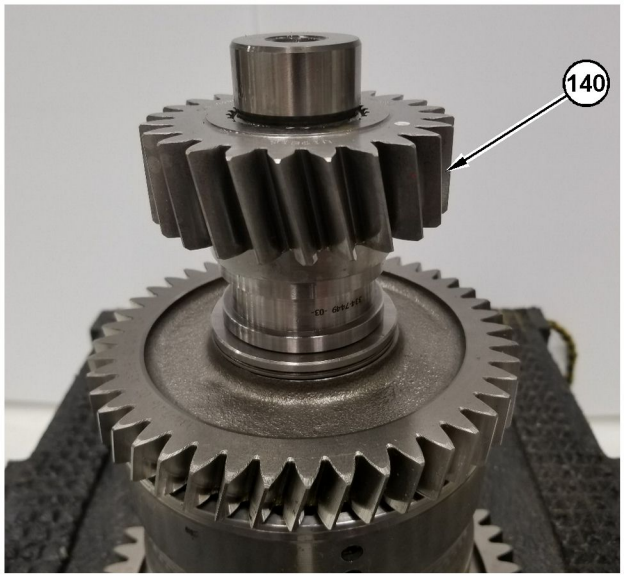

Illustration 206 g06697811

21. Apply Tooling (T) to the splines of the shaft. Raise the temperature of gear (140). Install gear (140).

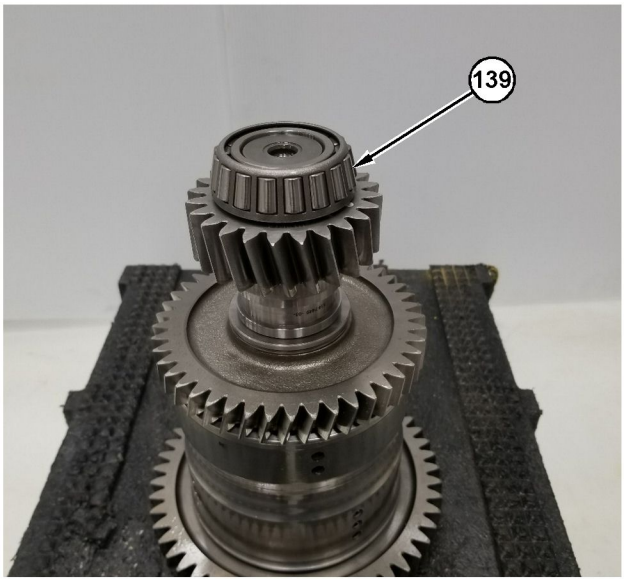

Illustration 207 g06697812

22. Raise the temperature of bearing cone (139). Install bearing cone (139).

Illustration 208 g06694182

Input shaft assembly

23. Install spacer (138).

Forward low / Reverse clutch Assembly

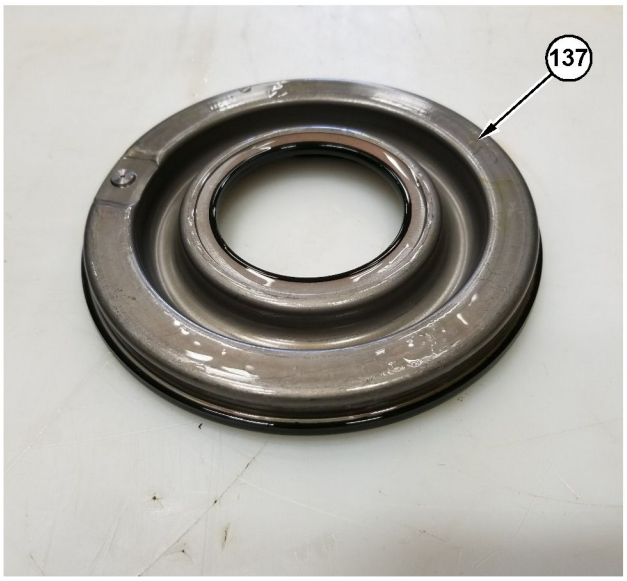

Illustration 209 g06697861

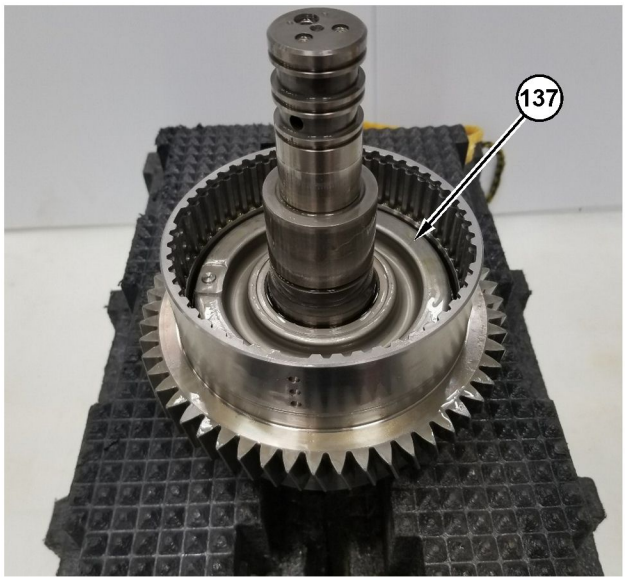

Illustration 210 g06697867

1. Lubricate the piston seals with new transmission oil.

2. Install piston (137).

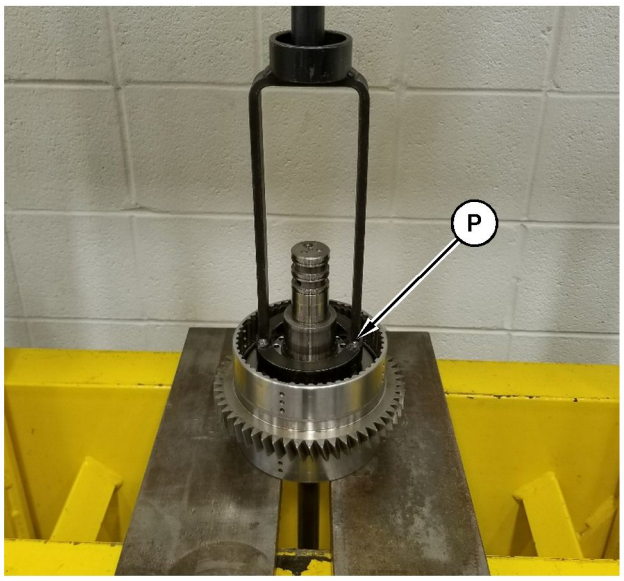

Illustration 211 g06694176

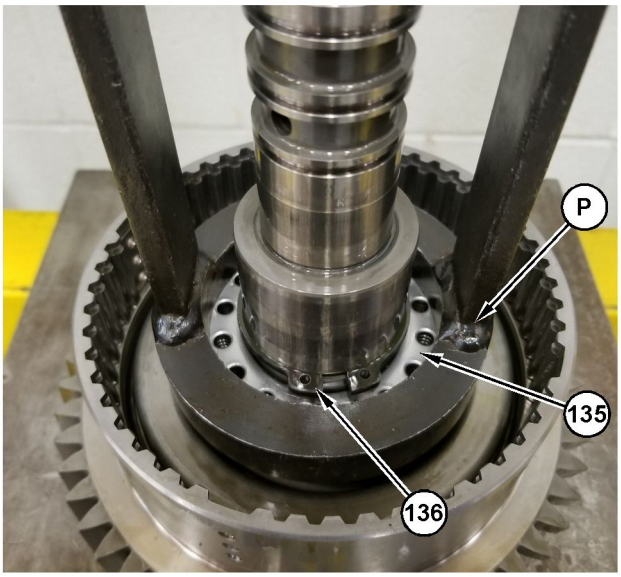

Illustration 212 g06694179

Note: Ensure that the flat surface of retaining ring (136) is facing up.

3. Install the spring retainer and spring assembly (135). Use Tooling (P) and a suitable press to compress spring assembly (135). Use Tooling (J) to install retaining ring (136). Compress spring assembly (135) and install retaining ring (136).

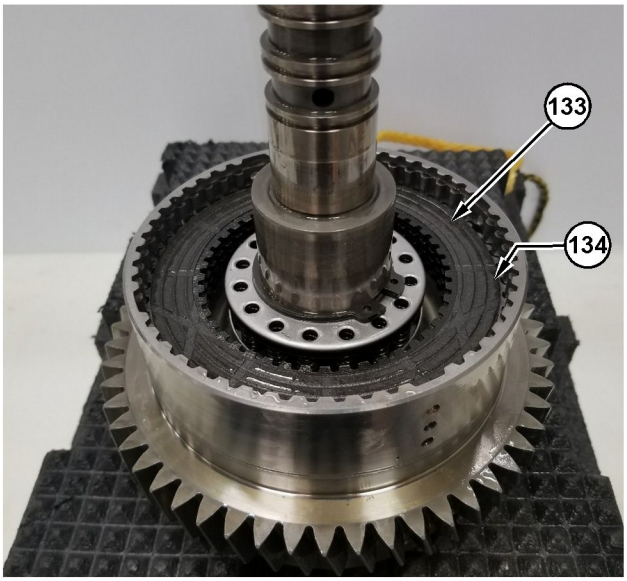

Illustration 213 g06694175

4. Lubricate friction discs (133) and clutch discs (134) with new transmission oil. Install friction discs (133) and clutch discs (134) alternately.

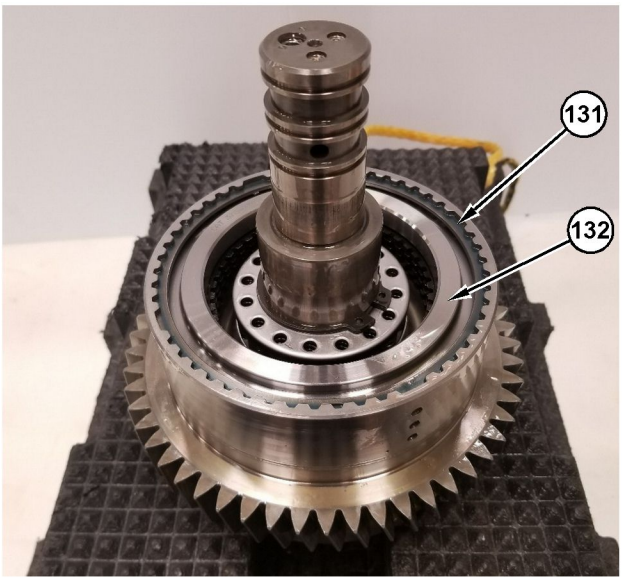

Illustration 214 g06694174

5. Install retainer plate (132) and retaining ring (131).

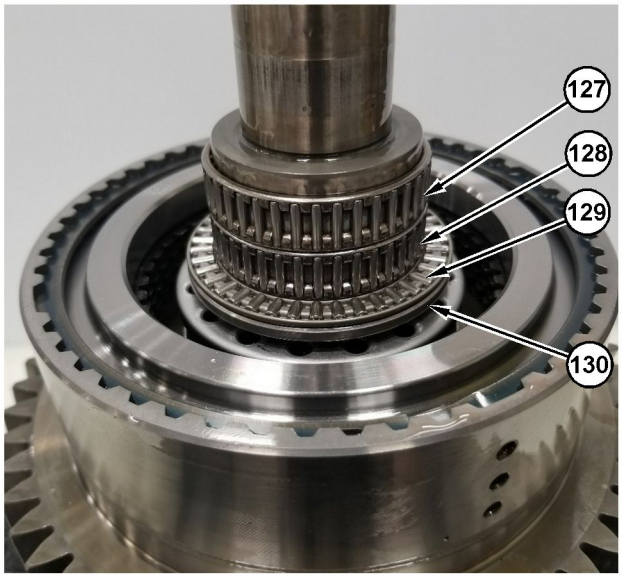

Illustration 215 g06694172

Note: Ensure the groove of thrust bearing (129) is facing thrust washer (130).

6. Install thrust washer (130) and thrust bearing (129).

7. Install bearing (128) and (127).

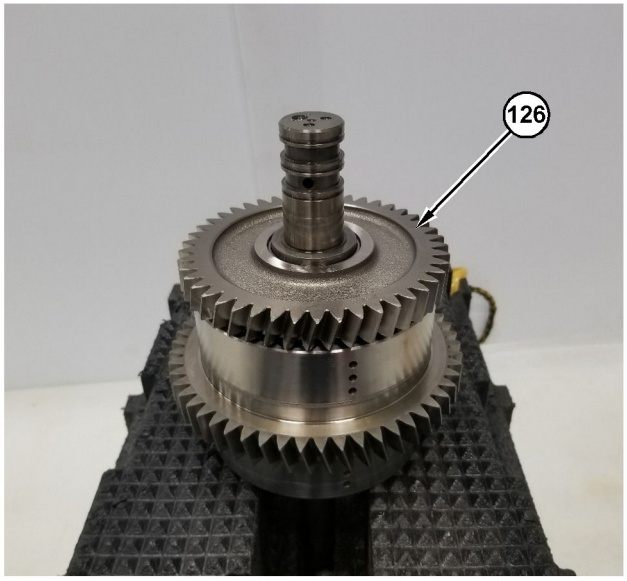

Illustration 216 g06698079

8. Install gear assembly (126).

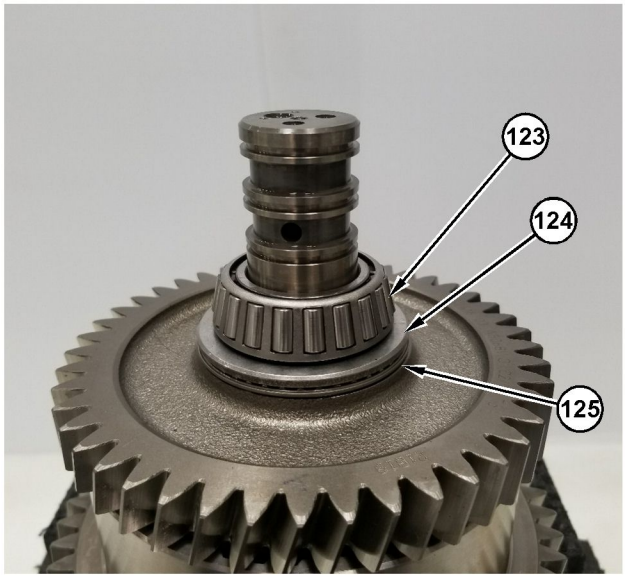

Illustration 217 g06698080

Note: Ensure the groove of thrust bearing (125) is facing thrust washer (124).

9. Install thrust bearing (125) and thrust washer (124).

10. Raise the temperature of bearing cone (123). Install bearing cone (123).

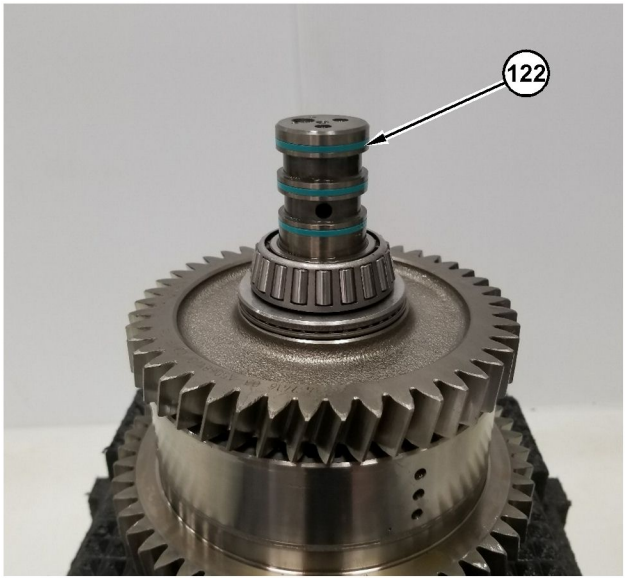

Illustration 218 g06694165

11. Install three ring seals (122).

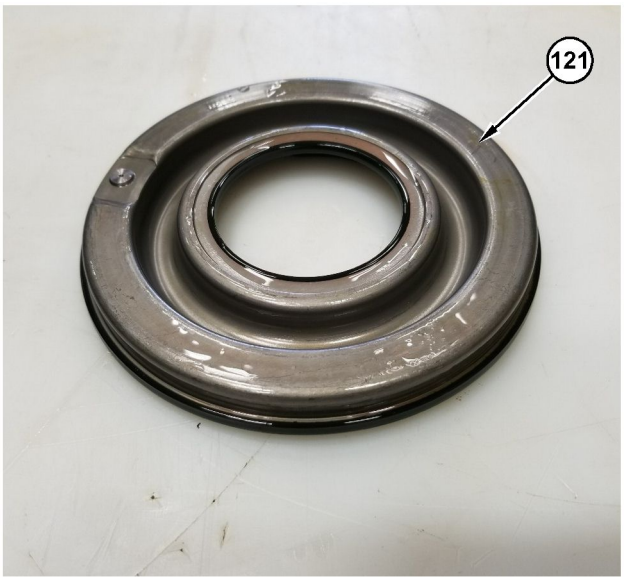

Illustration 219 g06698088

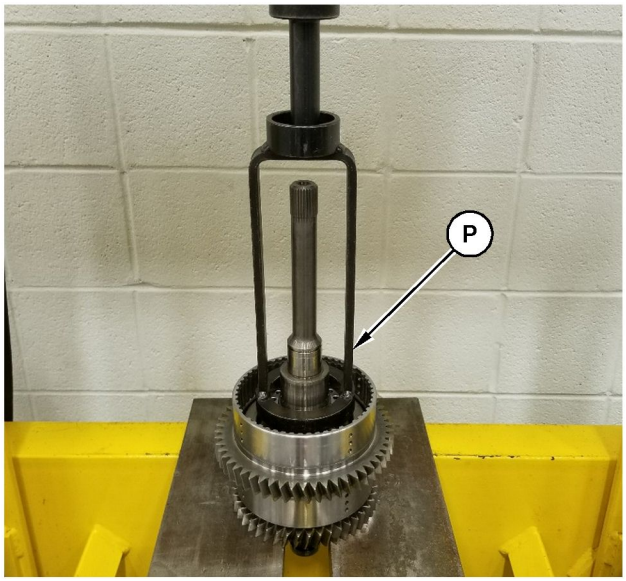

Illustration 221 g06694159

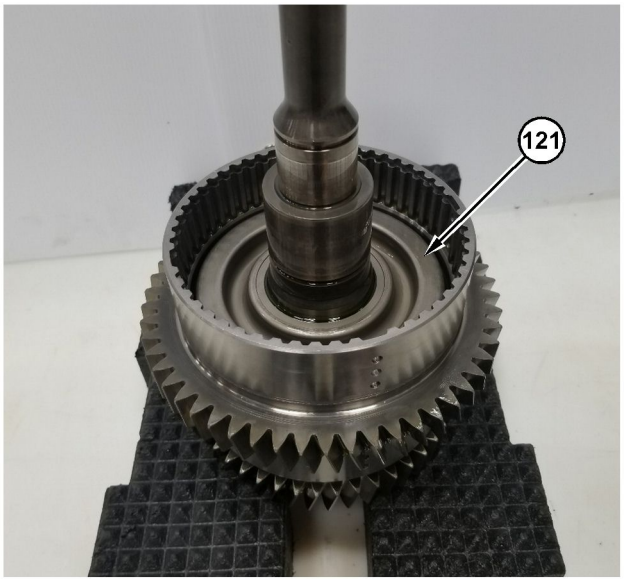

Illustration 220 g06694163

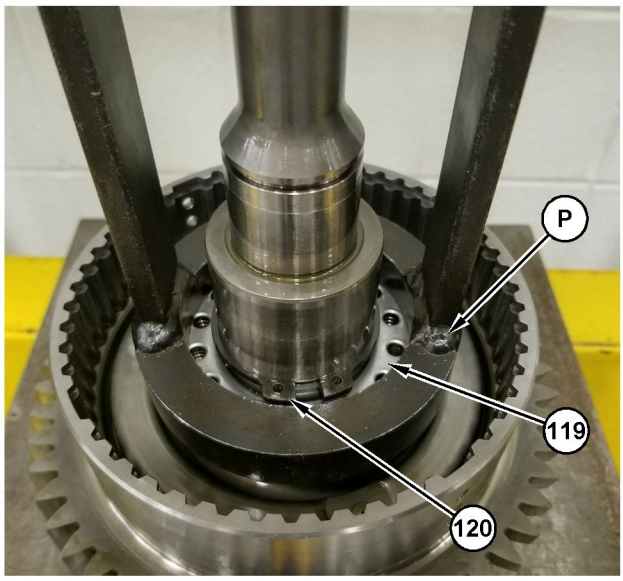

Illustration 222 g06694160

12. Lubricate the piston seals with new transmission oil.

13. Install piston (121).

WARNING

Improper assembly of parts that are spring loaded can cause bodily injury.

To prevent possible injury, follow the established assembly procedure and wear protective equipment.

Note: Ensure that the flat surface of retaining ring (120) is facing up.

14. Install the spring retainer and spring assembly (119). Use Tooling (P) and a suitable press to compress spring assembly (119). Use Tooling (J) to install retaining ring (120). Compress spring assembly (119) and install retaining ring (120).

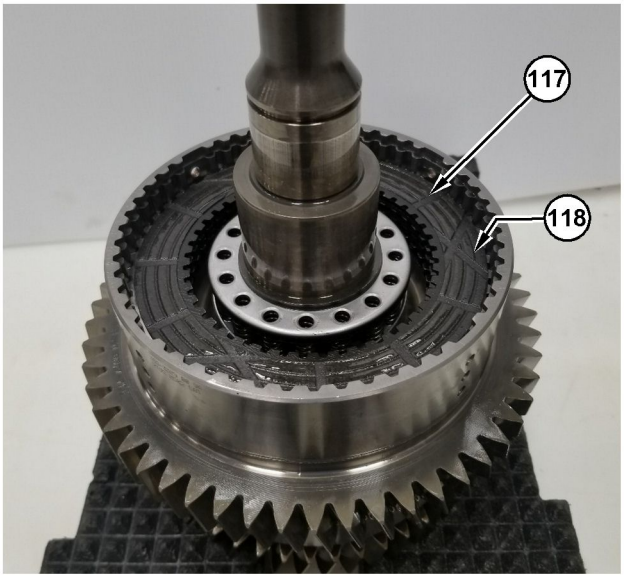

Illustration 223 g06694158

15. Lubricate friction discs (117) and clutch discs (118) with new transmission oil. Install friction discs (117) and clutch discs (118) alternately.

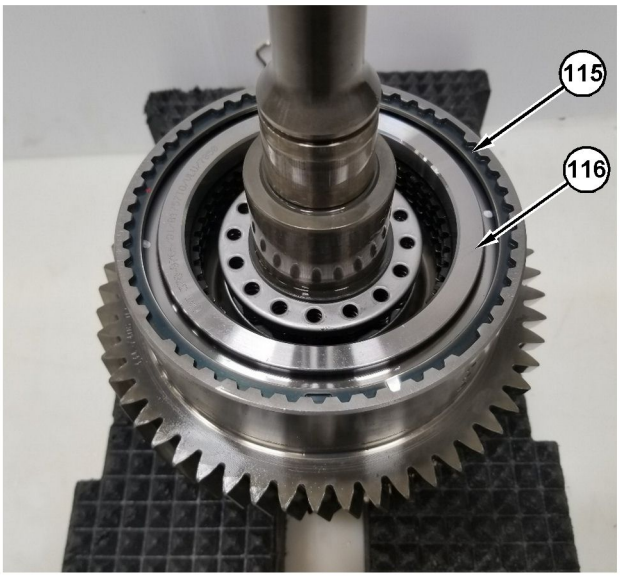

Illustration 224 g06694136

16. Install retainer plate (116) and retaining ring (115).

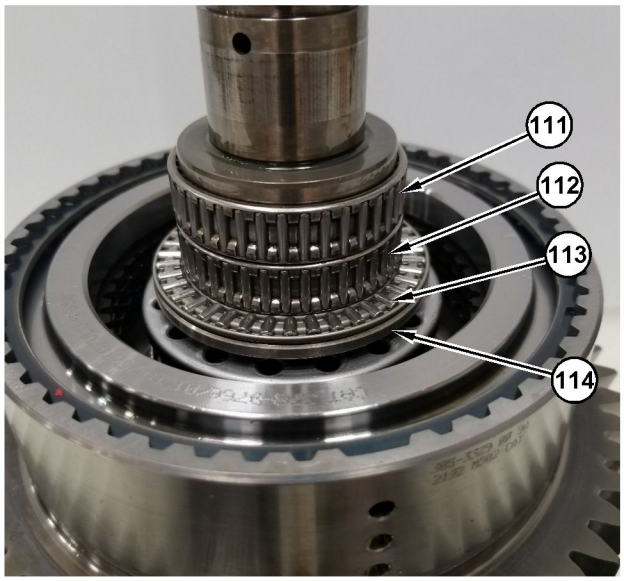

Illustration 225 g06694135

Note: Ensure the groove of thrust bearing (113) is facing thrust washer (114).

17. Install thrust washer (114) and thrust bearing (113).

18. Install bearings (112) and (111).

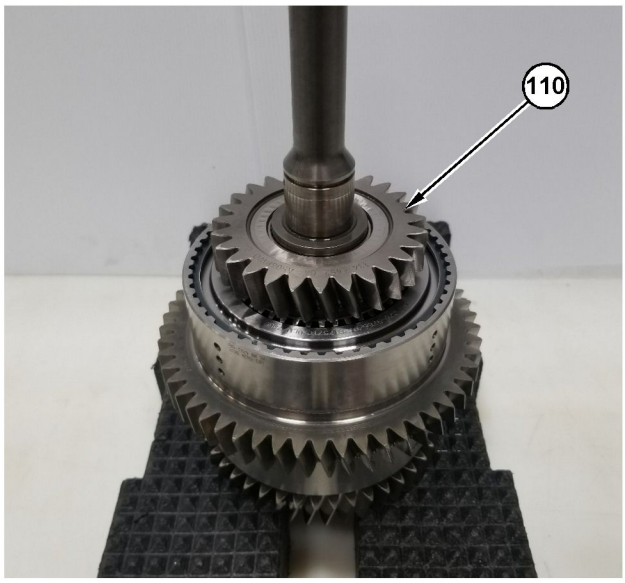

Illustration 226 g06698098

19. Install gear assembly (110).

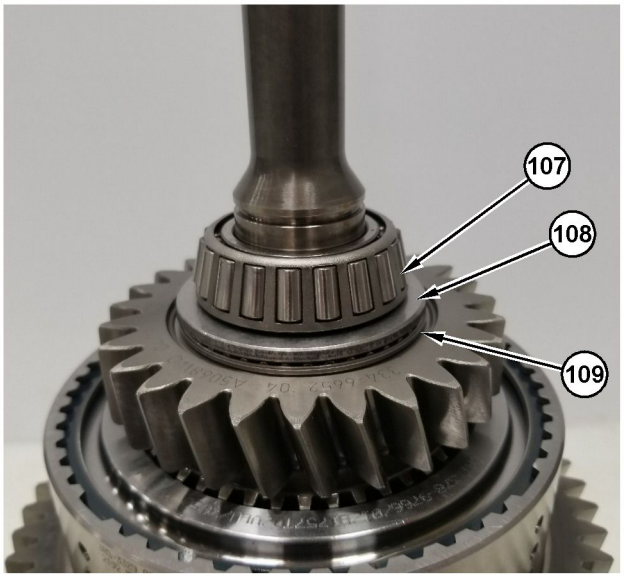

Illustration 227 g06698101

Note: Ensure the groove of thrust bearing (109) is facing thrust washer (108).

20. Install thrust bearing (109) and thrust washer (108).

21. Raise the temperature of bearing cone (107). Install bearing cone (107).

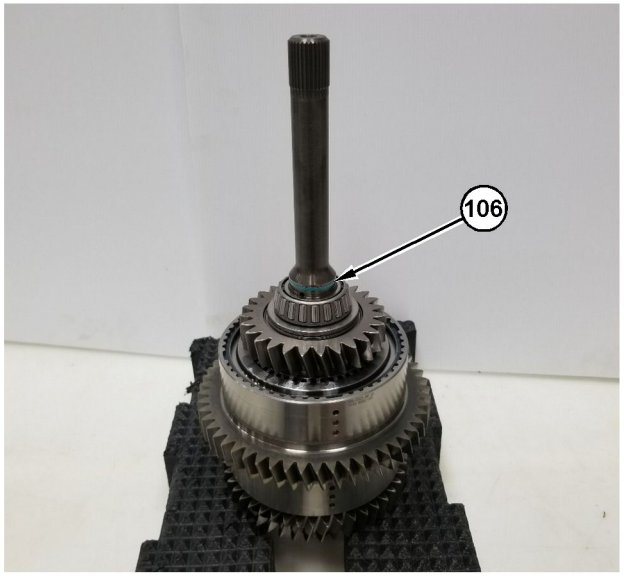

Illustration 228 g06694131

22. Install ring seal (106).

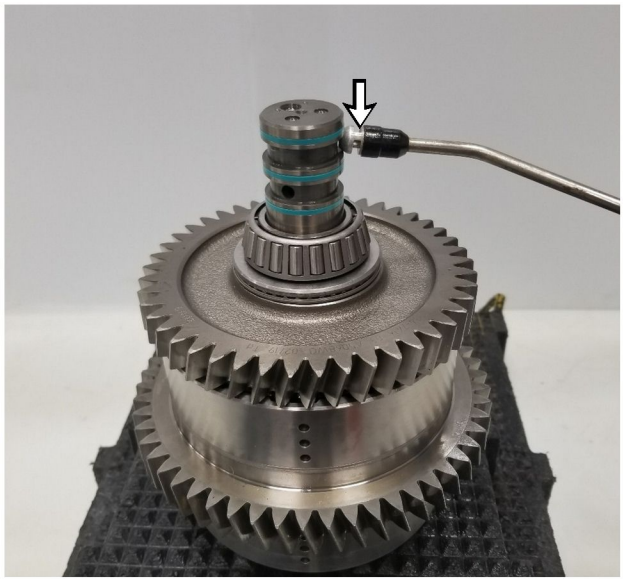

Illustration 229 g06698104

WARNING

To avoid personal injury, always wear eye and face protection when using pressurized air.

23. Use an air line with a low pressure supply as shown in Illustration 229 . Pressurize the forward low and reverse clutches to check operation of the clutches.

Forward high / Third clutch Assembly

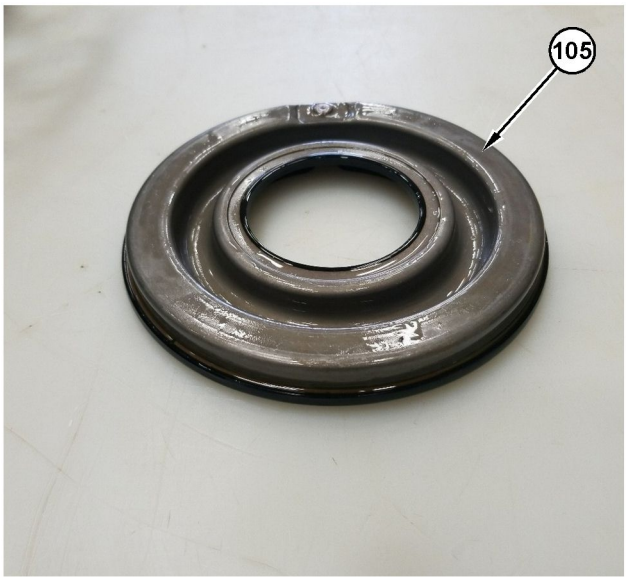

Illustration 230 g06698105

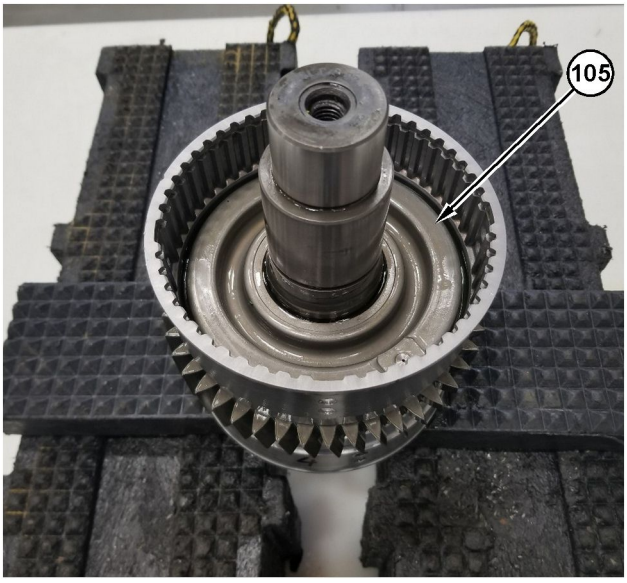

Illustration 231 g06698106

Forward high/third clutch shaft assembly

1. Lubricate the piston seals with new transmission oil.

2. Install piston (105).

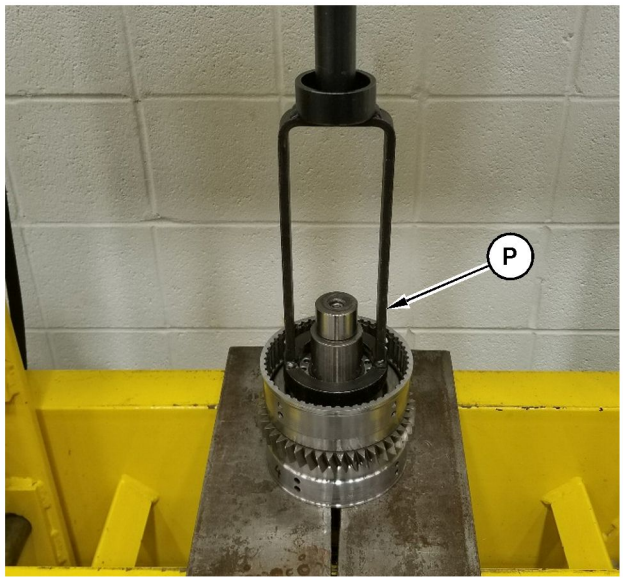

Illustration 232 g06694113

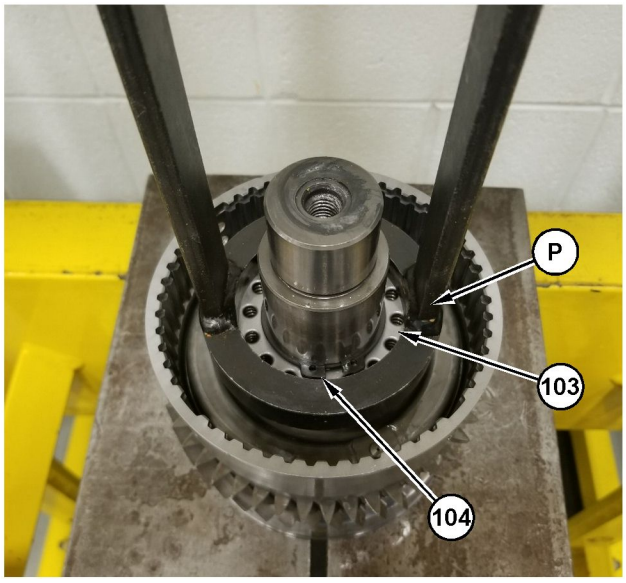

Illustration 233 g06694117

⚠ WARNING

Improper assembly of parts that are spring loaded can cause bodily injury.

To prevent possible injury, follow the established assembly procedure and wear protective equipment.

Note: Ensure that the flat surface of retaining ring (104) is facing up.

3. Install the spring retainer and spring assembly (103). Use Tooling (P) and a suitable press to compress spring assembly (103). Use Tooling (J) to install retaining ring (104). Compress spring assembly (103) and install retaining ring (104).

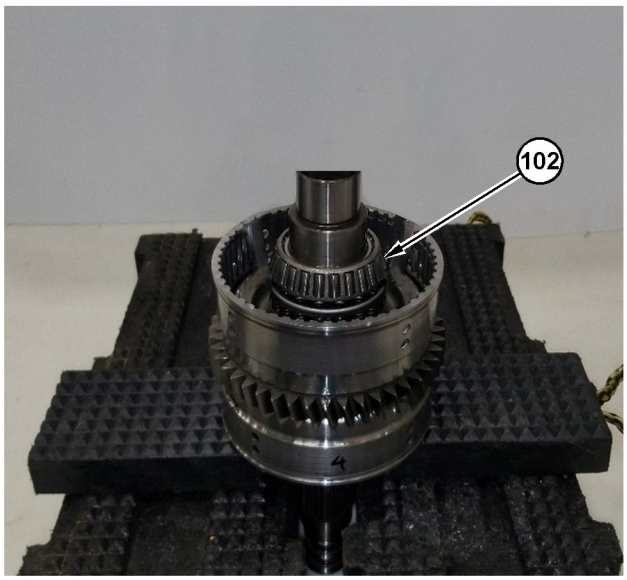

Illustration 234 g06698110

4. Raise the temperature of the bearing cone (102). Install bearing cone (102).

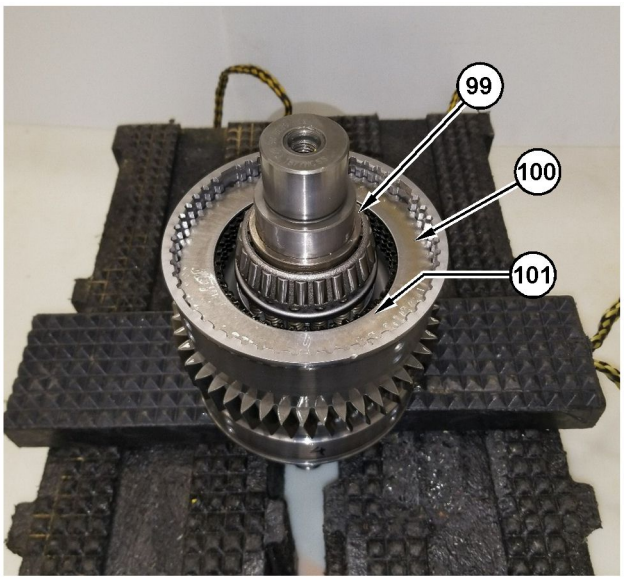

Illustration 235 g06694108

5. Lubricate clutch discs (100) and friction discs (101) with new transmission oil. Install clutch discs (100) and friction discs (101) alternately.

6. Install spacer (99).

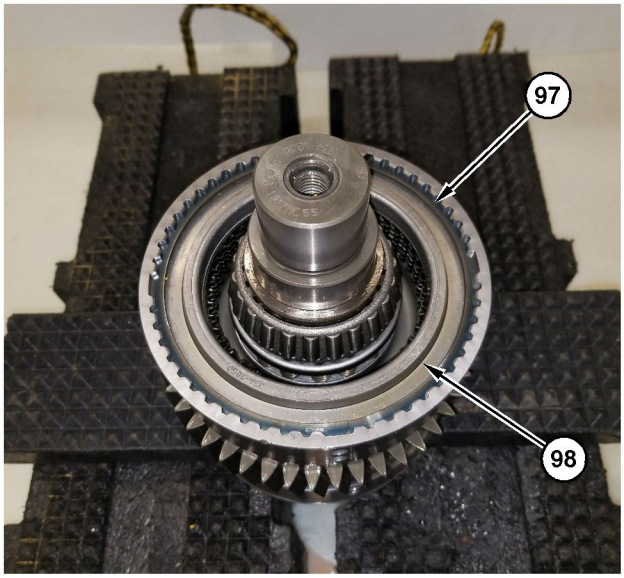

Illustration 236 g06694105

7. Install retainer plate (98) and retaining ring (97).

Illustration 237 g06694102

8. Lower the temperature of the bearing cups. Install the bearing cups.

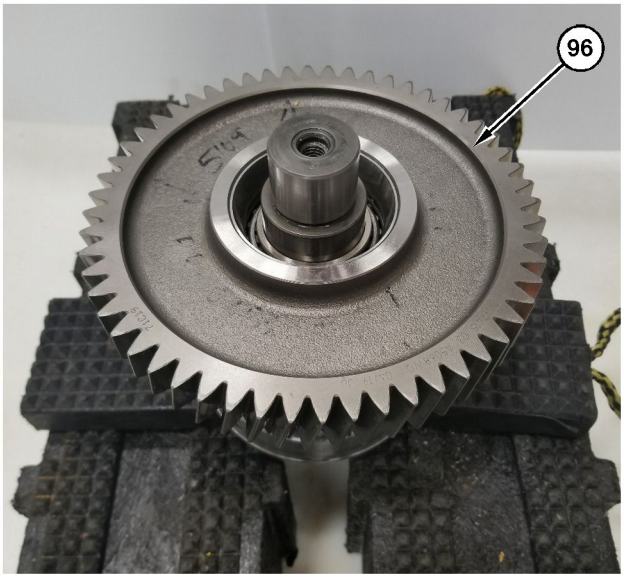

Illustration 238 g06698116

9. Install gear assembly (96).

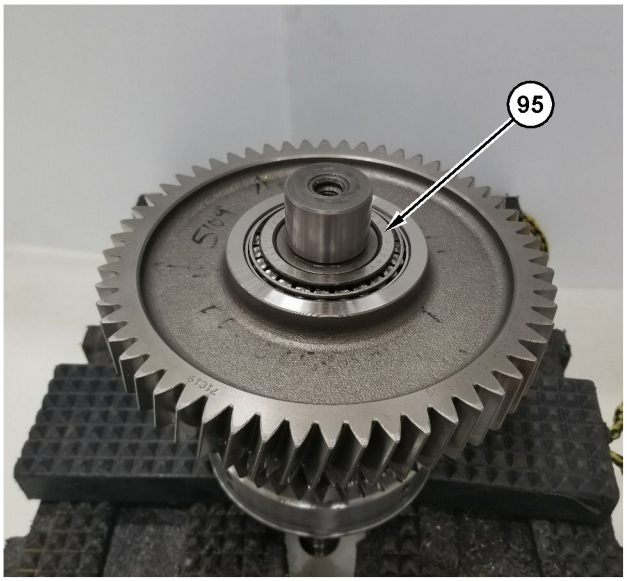

Illustration 239 g06698120

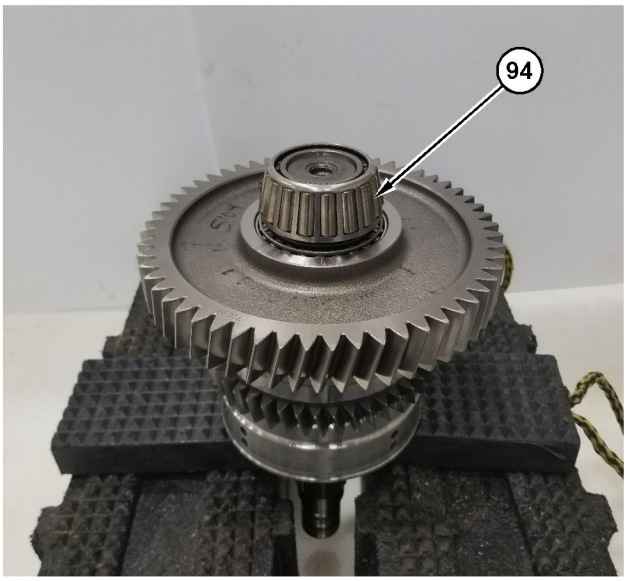

Illustration 240 g06698121

10. Raise the temperature of bearing cones (95) and (94). Install bearing cones (95) and (94).

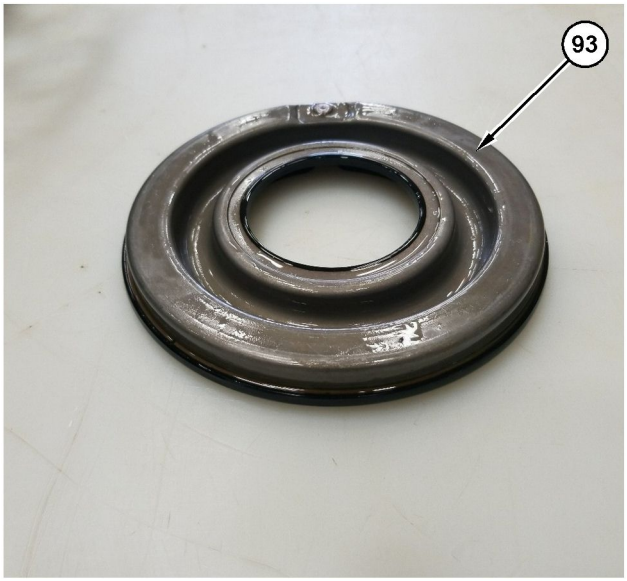

Illustration 241 g06698123

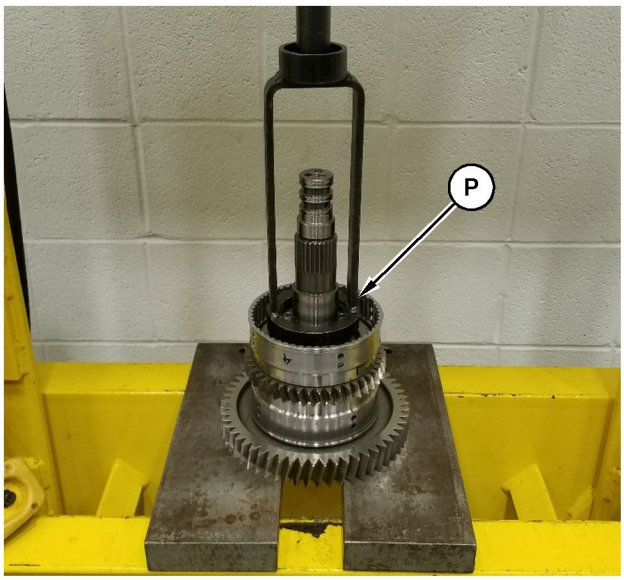

Illustration 243 g06694091

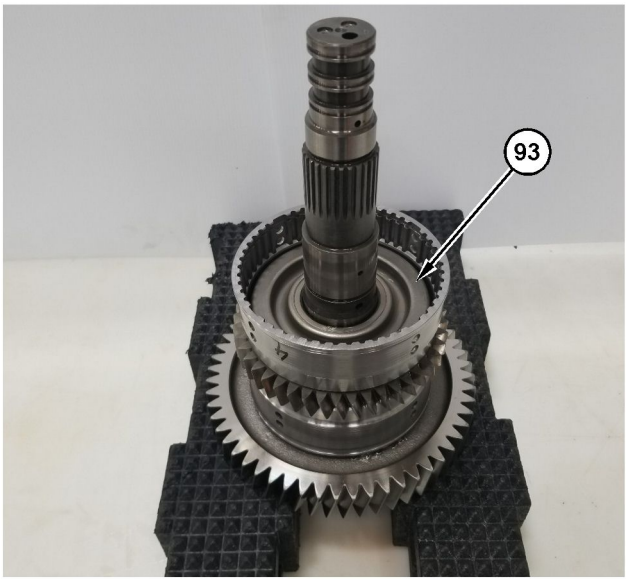

Illustration 242 g06698124

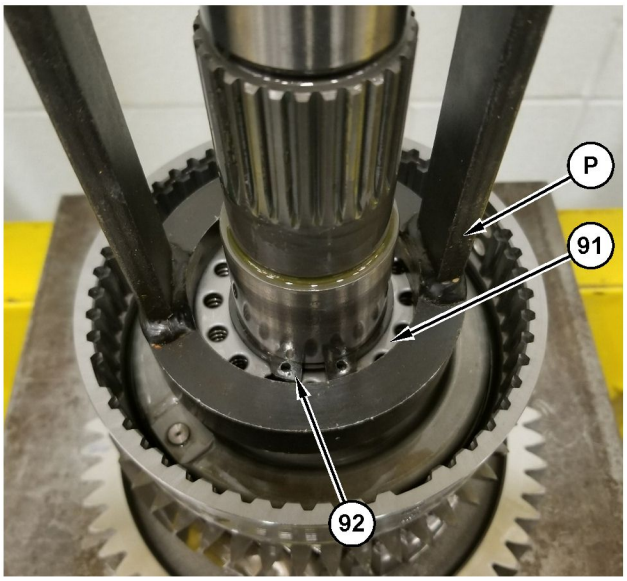

Illustration 244 g06694095

11. Lubricate the piston seals with new transmission oil.

12. Install piston (93).

WARNING

Improper assembly of parts that are spring loaded can cause bodily injury.

To prevent possible injury, follow the established assembly procedure and wear protective equipment.

Note: Ensure that the flat surface of retaining ring (92) is facing up.

13. Install the spring retainer and spring assembly (91). Use Tooling (P) and a suitable press to compress spring assembly (91). Use Tooling (J) to install retaining ring (92). Compress spring assembly (91) and install retaining ring (92).

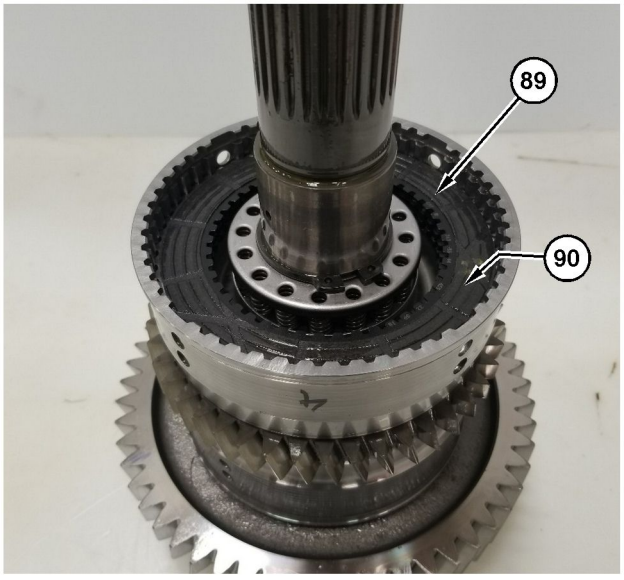

Illustration 245 g06694088

14. Lubricate friction discs (89) and clutch discs (90) with new transmission oil. Install friction discs (89) and clutch discs (90) alternately.

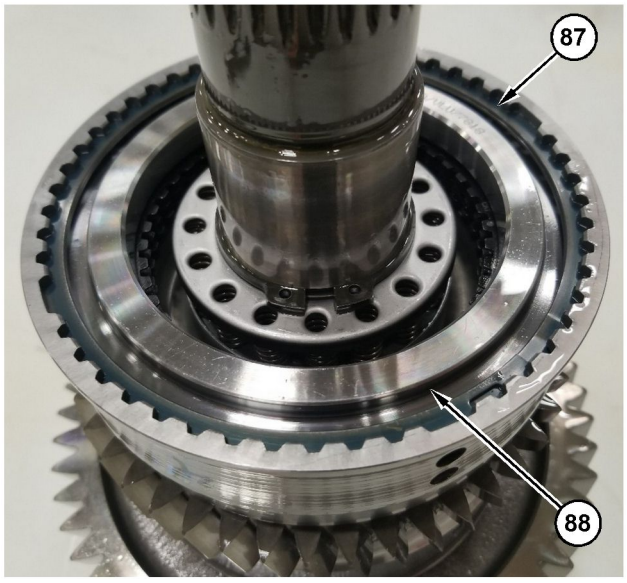

Illustration 246 g06694086

15. Install retainer plate (88) and retaining ring (87).

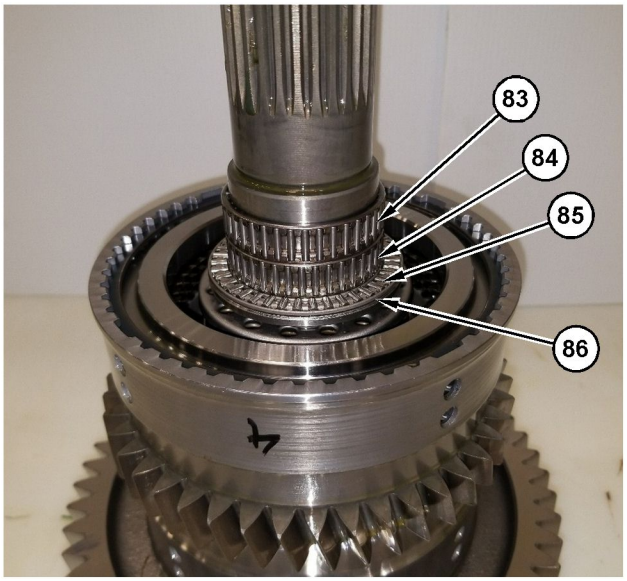

Illustration 247 g06694081

Note: Ensure the groove of thrust bearing (85) is facing thrust washer (86).

16. Install thrust washer (86) and thrust bearing (85).

17. Install bearings (84) and (83).

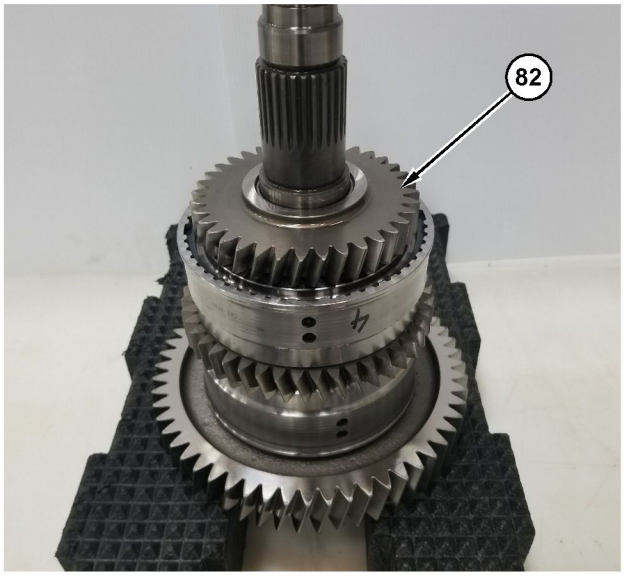

Illustration 248 g06698127

18. Install gear (82).

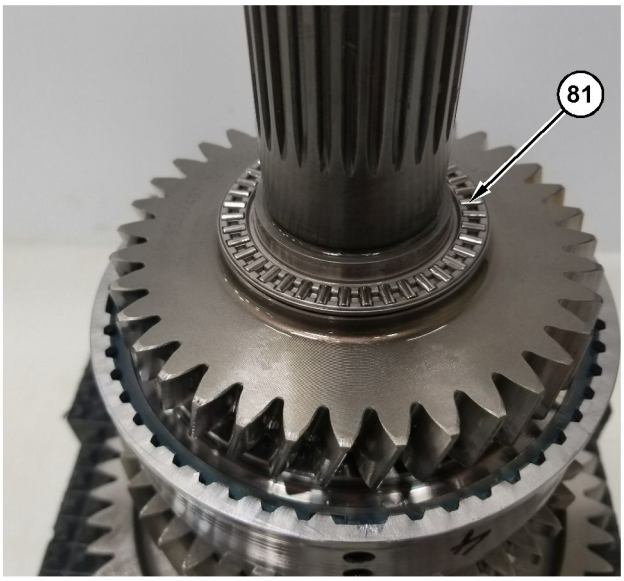

Illustration 249 g06698128

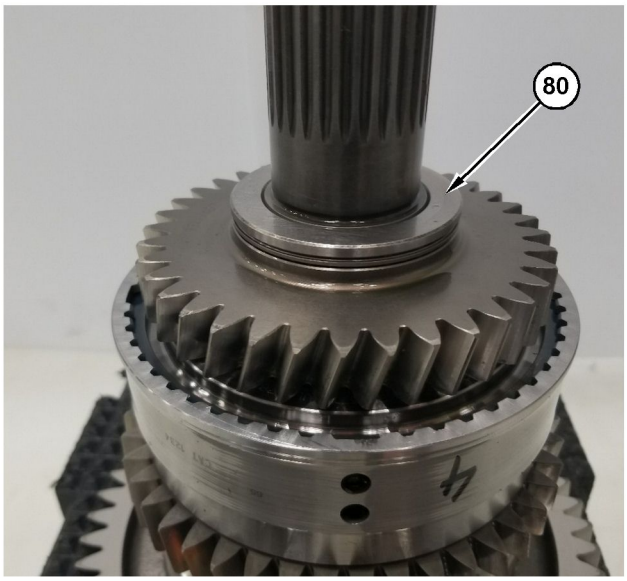

Illustration 250 g06698129

Note: Ensure the groove of thrust bearing (81) is facing thrust washer (80).

19. Install thrust bearing (81) and thrust washer (80).

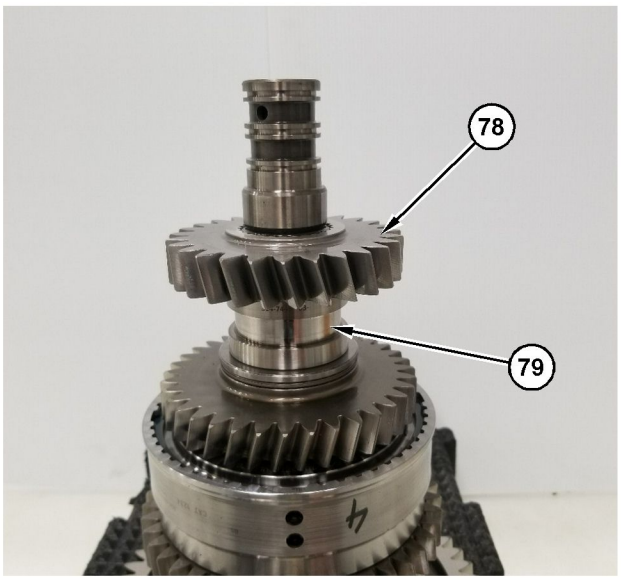

Illustration 251 g06698130

20. Install spacer (79). Apply Tooling (T) to the splines of the shaft. Raise the temperature of gear (78). Install gear (78).

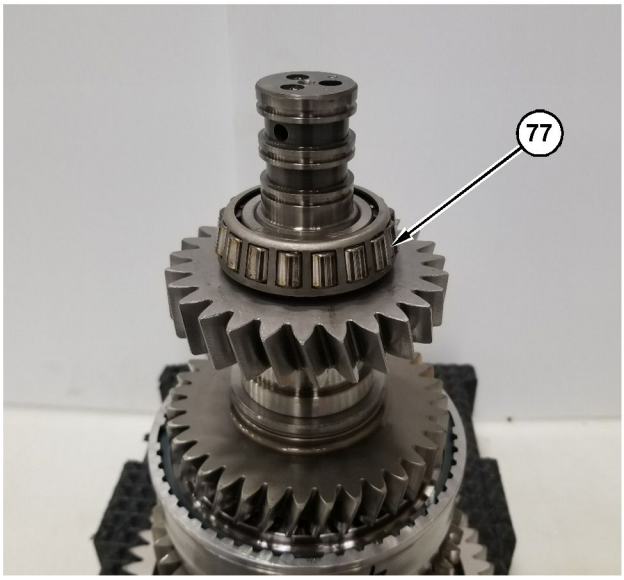

Illustration 252 g06698131

21. Raise the temperature of bearing cone (77). Install bearing cone (77).

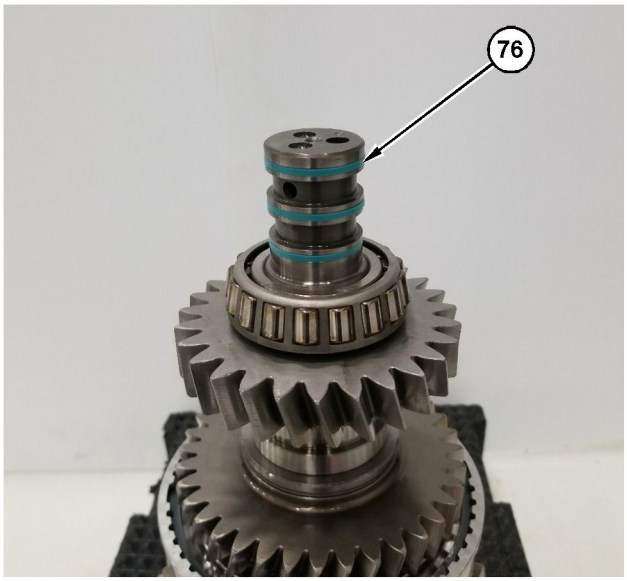

Illustration 253 g06698132

22. Install three ring seals (76).

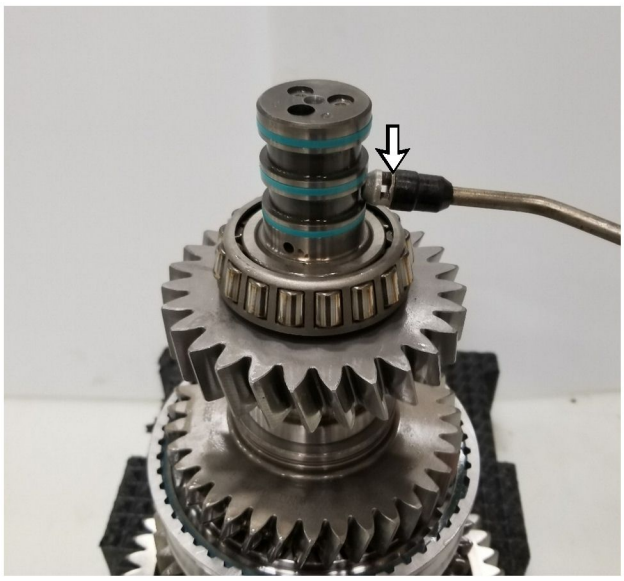

Illustration 254 g06698133

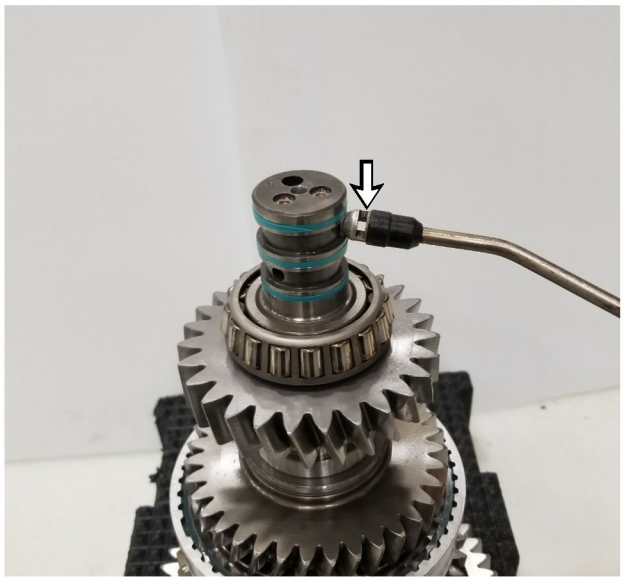

Illustration 255 g06698134

WARNING

To avoid personal injury, always wear eye and face protection when using pressurized air.

23. Use air line with a low pressure as shown in Illustration 254 and Illustration 255 . Pressurize the forward high and third clutch to check operation of the clutches.

Output shaft Assembly

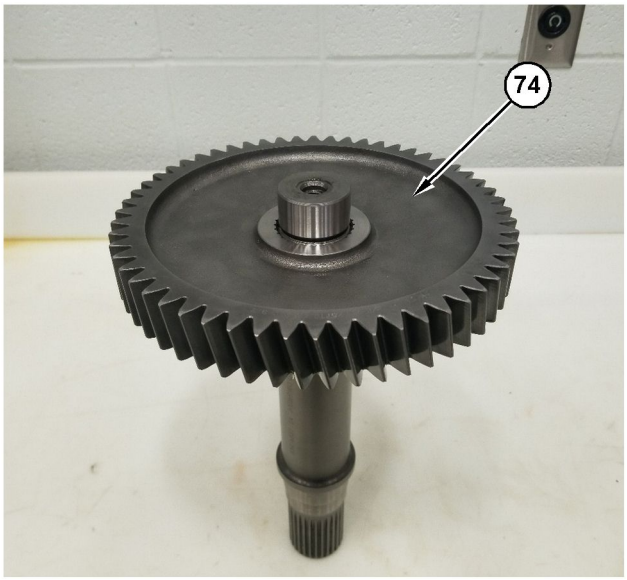

Illustration 256 g06698156

Output shaft

1. Apply Tooling (T) to the splines of the output shaft. Raise the temperature of the gear (74). Install gear (74) onto the output shaft.

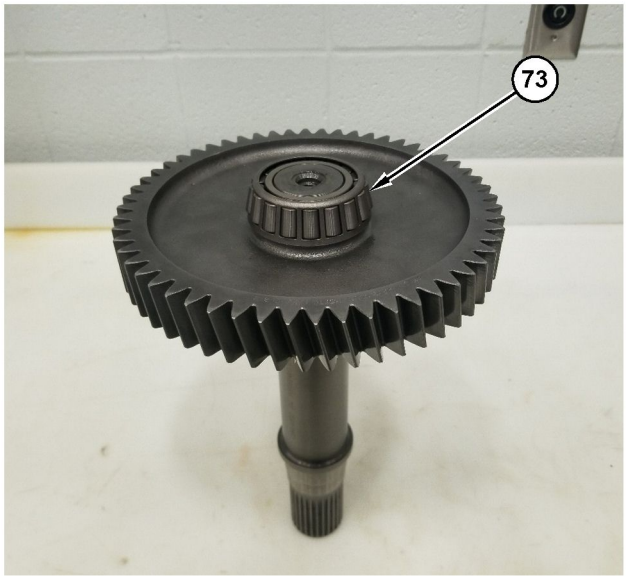

Illustration 257 g06698159

2. Raise the temperature of bearing cone (73). Install bearing cone (73) onto the output shaft.

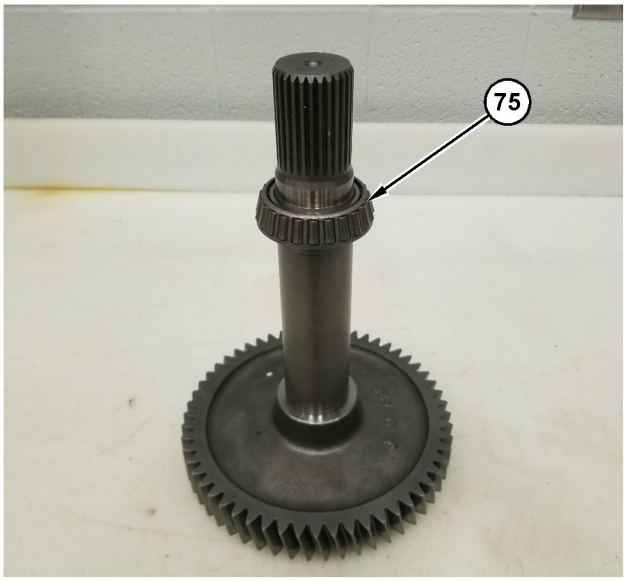

Illustration 258 g06698161

3. Raise the temperature of bearing cone (75). Install bearing cone (75) onto the output shaft.

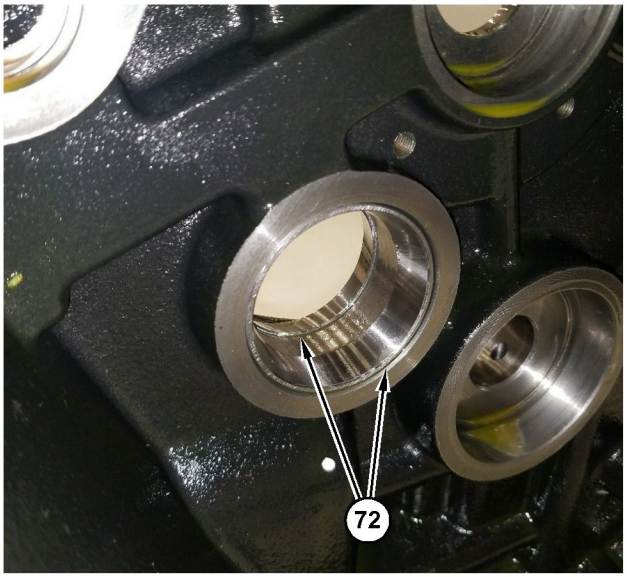

Illustration 259 g06694054

Note: Prepare the transmission intermediate case assembly and the rear case assembly for assembly by removing all sealant from the matting surfaces.

4. Lower the temperature of bearing cups (72). Install bearing cups (72).

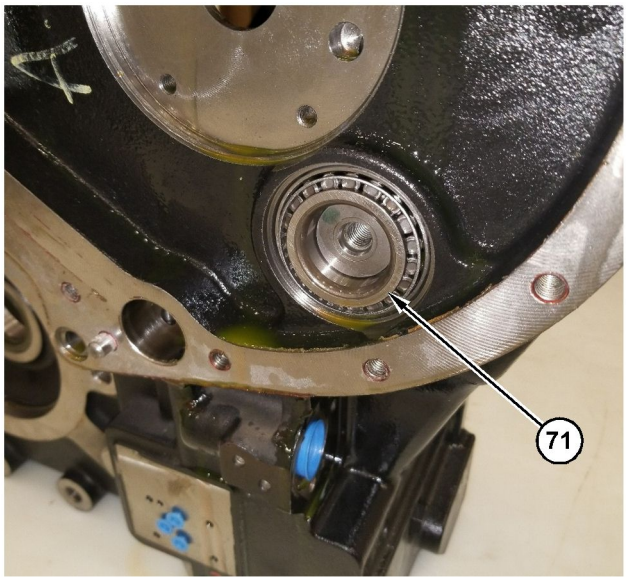

Illustration 260 g06694051

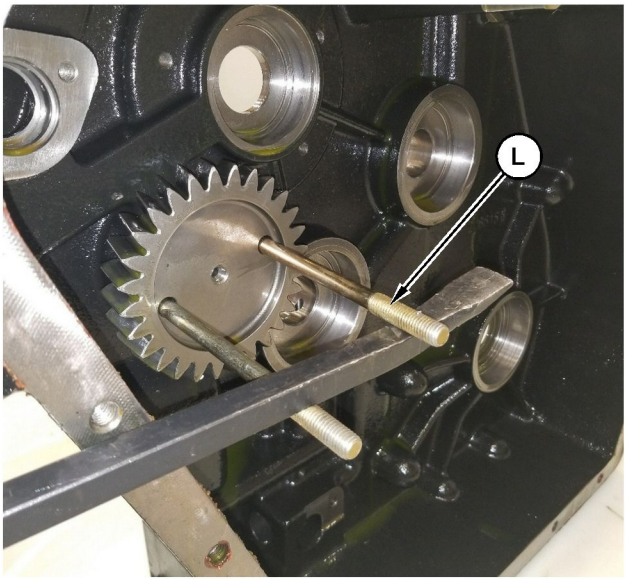

Illustration 262 g06694042

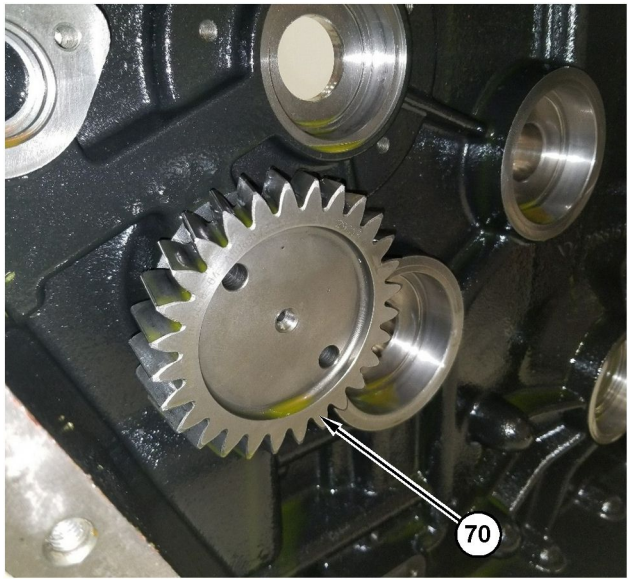

Illustration 261 g06694048

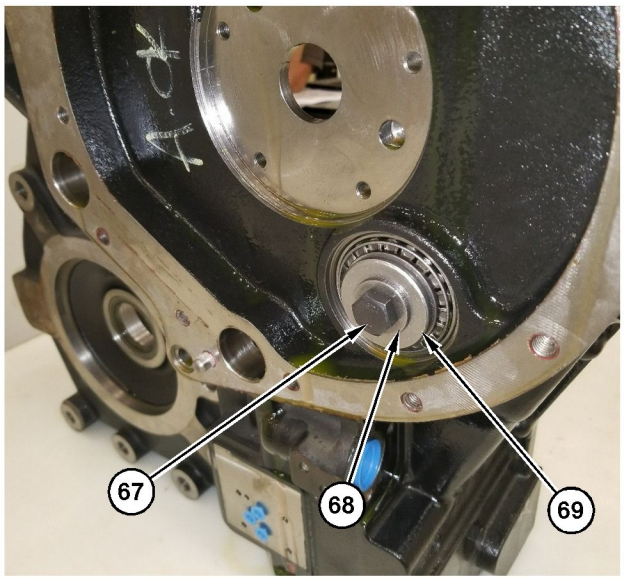

Illustration 263 g06694045

5. Install idler gear (70) and the spacer into the rear of the intermediate case assembly. Install bearing cone (71) into the front of the intermediate case assembly.

6. Use Tooling (L) and a suitable pry bar to hold the reverse idler gear. Install washers (69), (68), and bolt (67). Tighten bolt (67) to a torque of 68 to 88 N·m (50 to 65 lb ft).

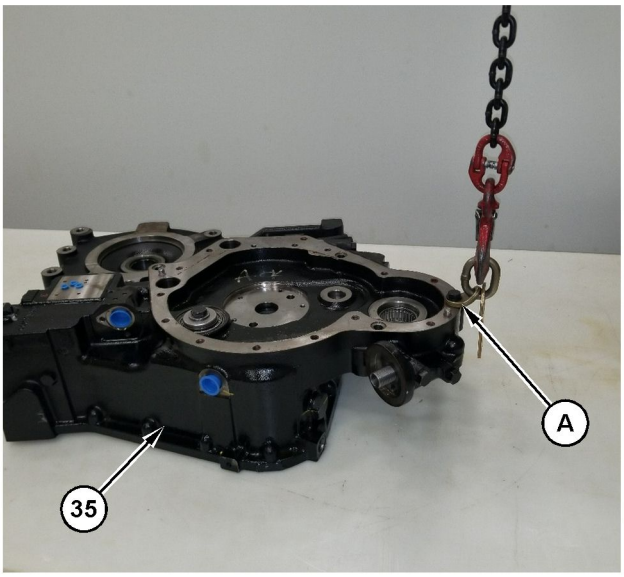

Illustration 264 g06694039

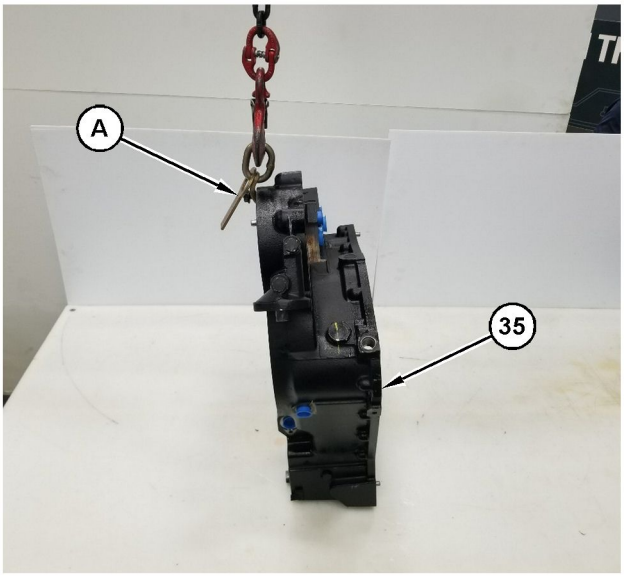

Illustration 265 g06698169

7. Attach Tooling (A) and a suitable lifting device to intermediate case assembly (35). The weight of intermediate case assembly (35) is approximately 108 kg (238 lb). Position intermediate case assembly (35) as shown in Illustration 264 .

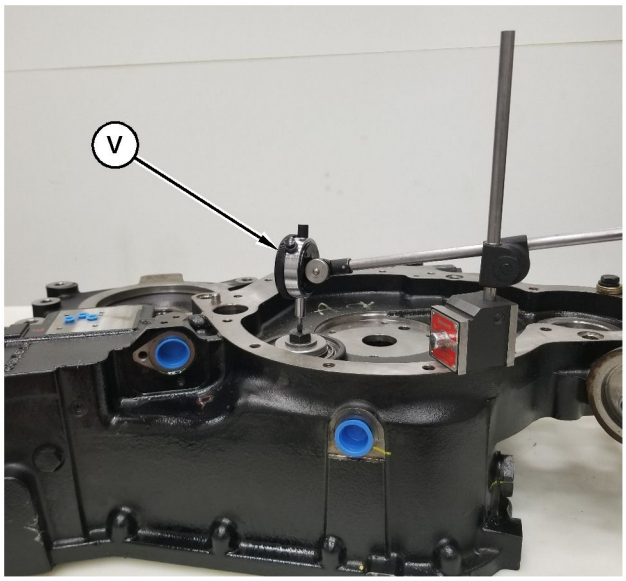

Illustration 266 g06698171

8. Use Tooling (V) to check the reverse idler gear end float. Spacer installed in Step 5 may need swapped with a different spacer to achieve the proper end float of 0.025 to 0.076 mm (0.001 to 0.003 inch).

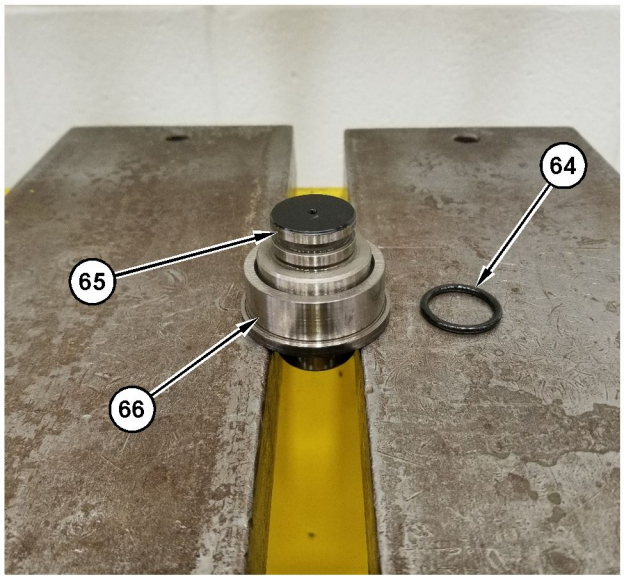

Illustration 267 g06698180

9. Raise the temperature of bearing race (66). Install bearing race (66).

10. Install O-ring seal (64) onto support shaft (65).

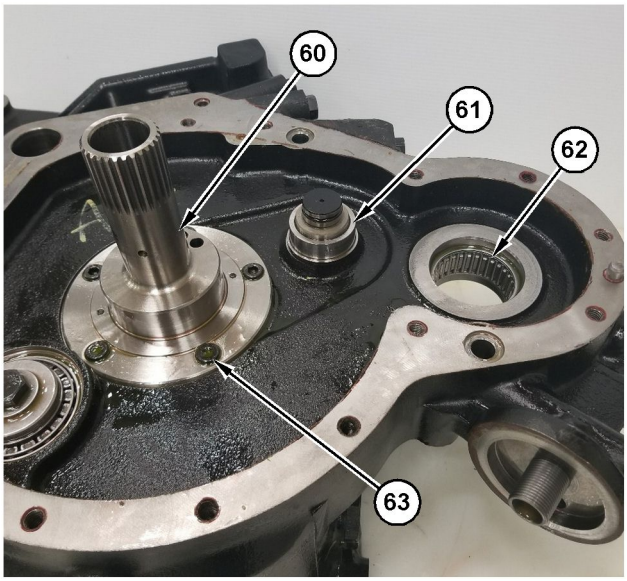

Illustration 268 g06694031

11. Use Tooling (K) (not shown) to install needle bearing (62). Install needle bearing (62).

12. Install support shaft assembly (61).

Note: Ensure proper orientation of oil passages while installation of stator support hub (60).

13. Install stator support hub (60) and five bolts (63). Tighten five bolts (63) to a torque of 18 to 31 N·m (159 to 274 lb in).

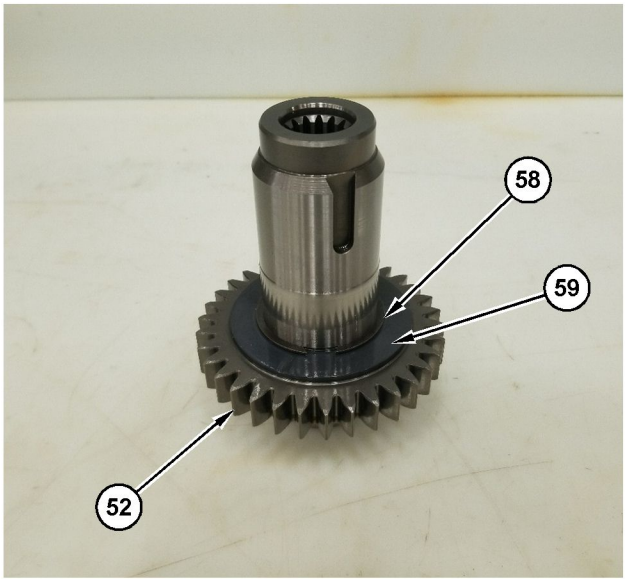

Illustration 269 g06694027

14. Install thrust washer (59) onto gear assembly (52). Use Tooling (H) (not shown) to install retaining ring (58). Install retaining ring (58).

15. Repeat Step 14 for the opposite side of gear assembly (52).

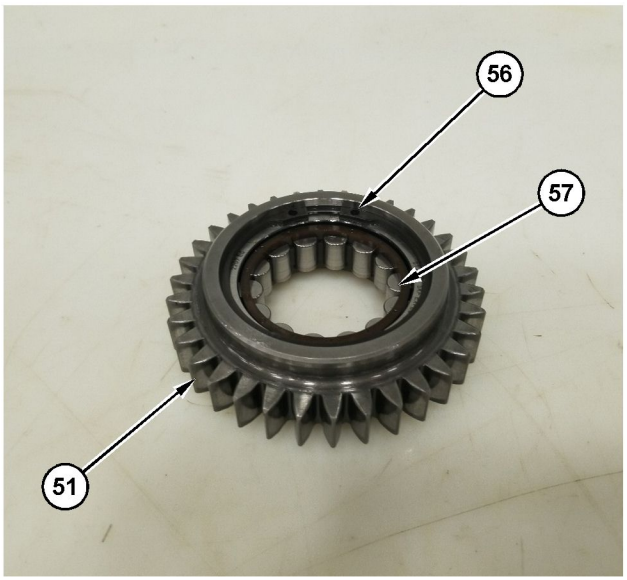

Illustration 270 g06698185

16. Raise the temperature of idler gear (51) and install bearing (57). Use Tooling (J) (not shown) to install retaining ring (56). Install retaining ring (56).

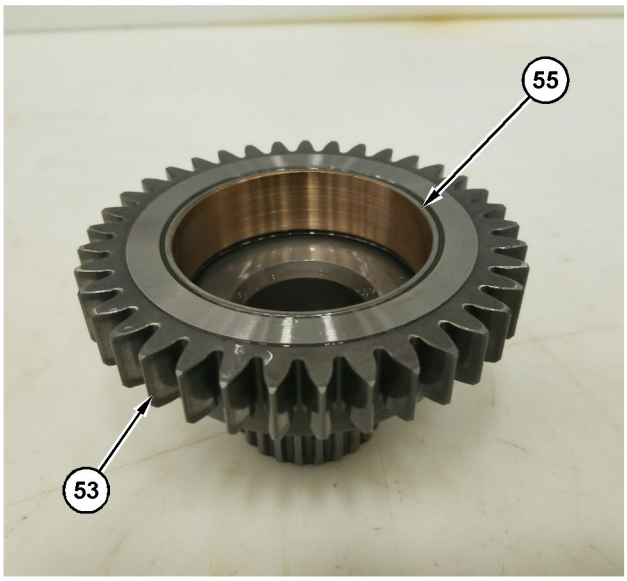

Illustration 271 g06694022

17. Use Tooling (K) (not shown) to install bushing (55). Install bushing (55) into gear assembly (53).

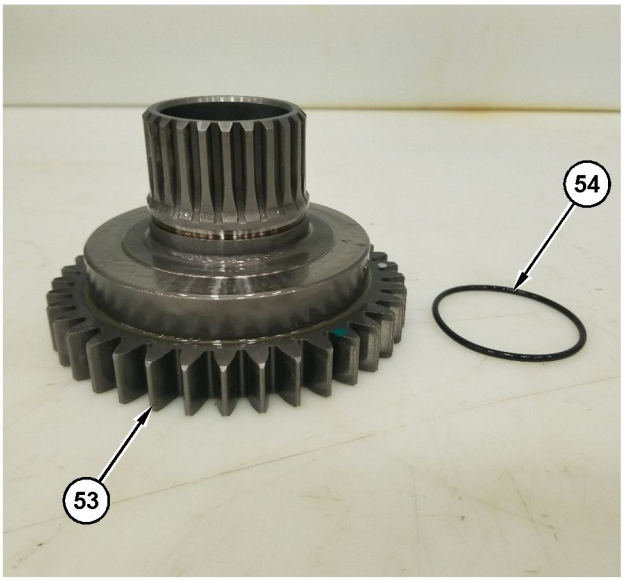

Illustration 272 g06694021

18. Install O-ring seal (54) onto gear assembly (53).

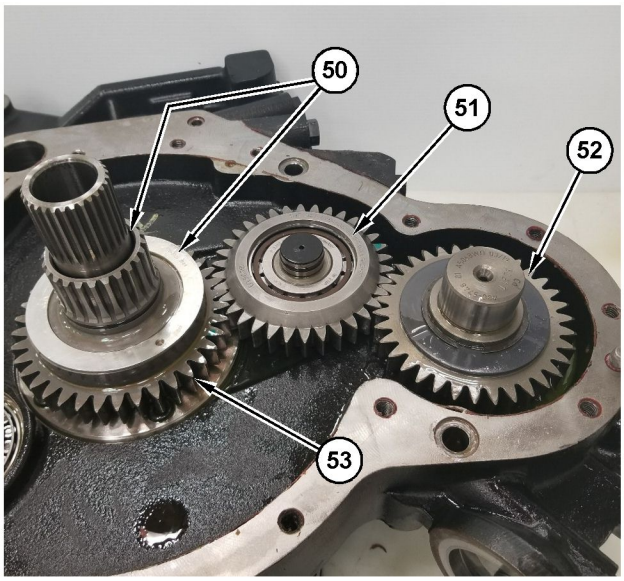

Illustration 273 g06694020

19. Install gear assembly (52).

20. Install gear assembly (51) and the spacer.

Note: Ensure correct orientation of thrust washer (50).

21. Install gear assembly (53) and thrust washer (50).

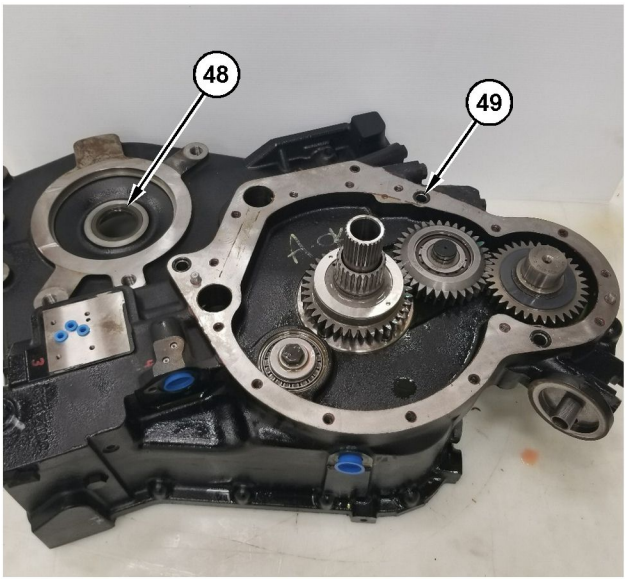

Illustration 274 g06694018

Note: Ensure the correct orientation of lip seal (48) from disassembly procedure.

22. Install four O-ring seals (49). Use Tooling (K) (not shown) to install lip seal (48). Install lip seal (48).

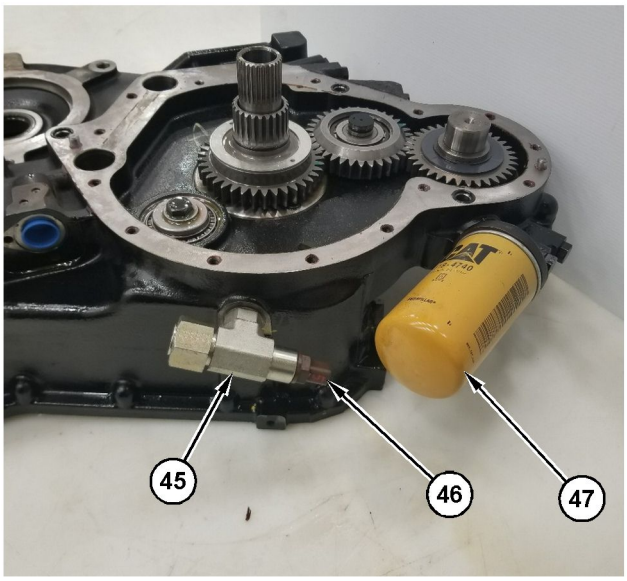

Illustration 275 g06694014

23. Install transmission filter (47).

24. Install the O-ring seals, adapter (45), and sensor (46).

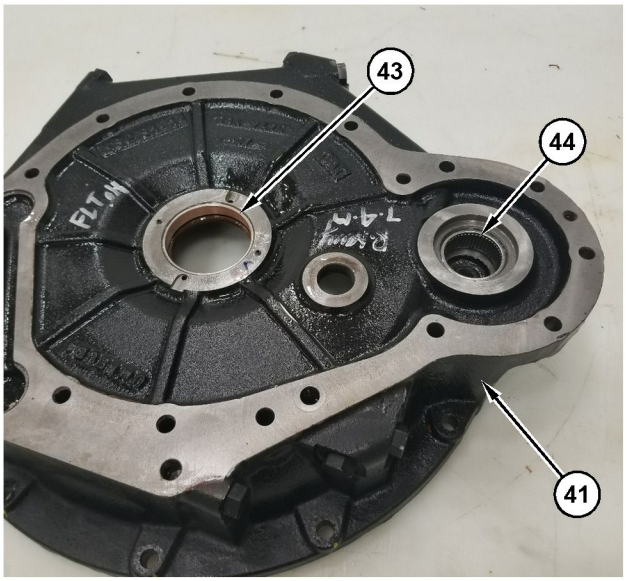

Illustration 276 g06694012

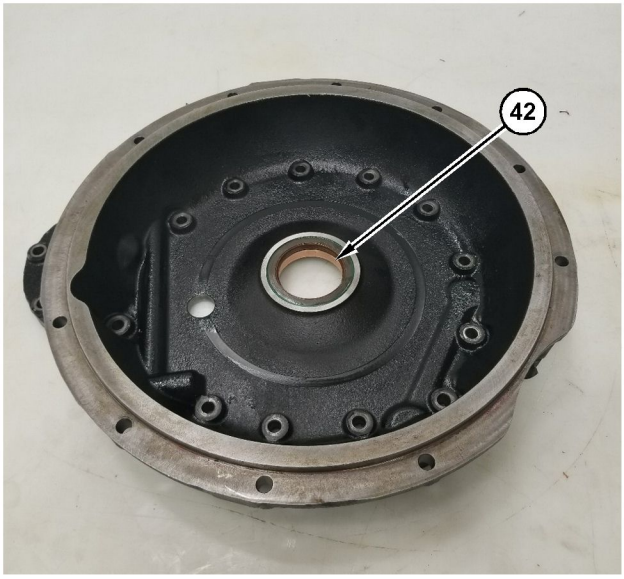

Illustration 277 g06694011

25. Use Tooling (K) (not shown) to install needle bearing (44) and bushing (43). Install needle bearing (44) and bushing (43) onto torque converter housing (41).

26. Use two people to position torque converter housing (41). The weight of torque converter housing (41) is approximately 25 kg (55 lb). Use Tooling (K) (not shown) to install seal (42). Install seal (42).

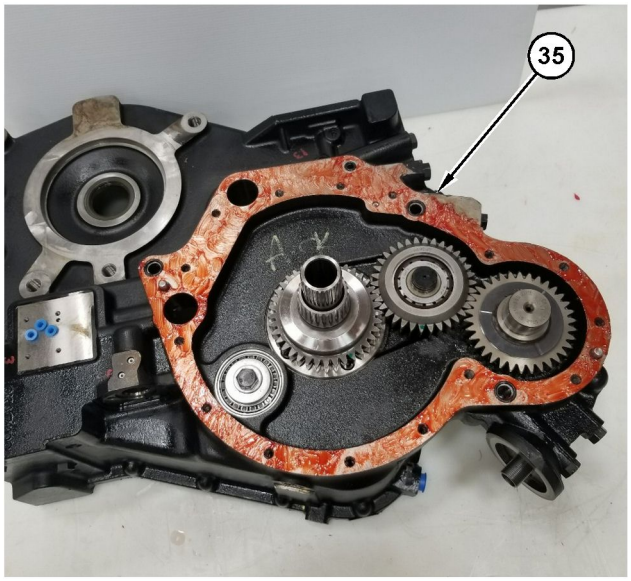

Illustration 278 g06698206

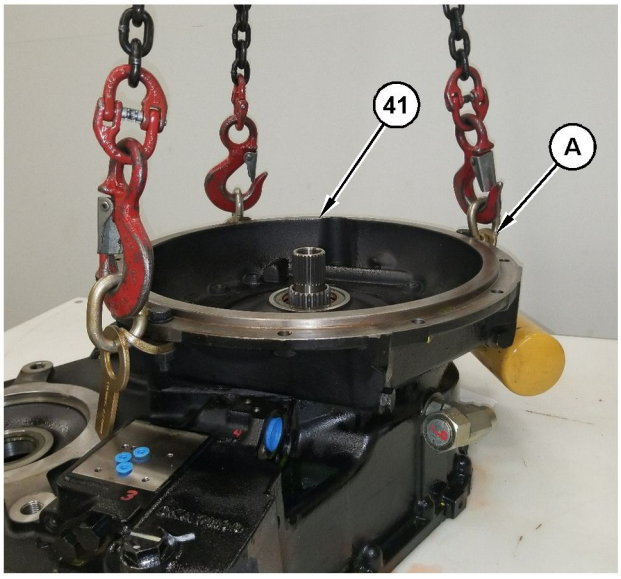

Illustration 279 g06694009

27. Apply a thin layer of Tooling (W) to intermediate case assembly (35).

28. Attach Tooling (A) and a suitable lifting device to torque converter housing (41). The weight of torque converter housing (41) is approximately 25 kg (55 lb). Install torque converter housing (41).

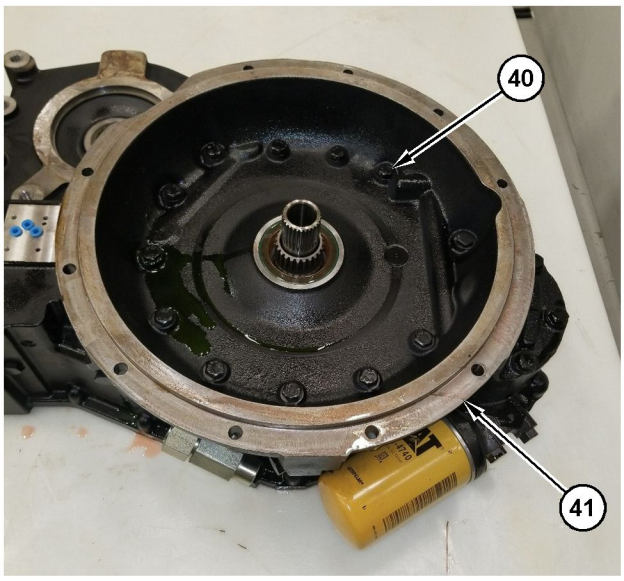

Illustration 280 g06694006

29. Install 15 bolts (40) onto torque converter housing (41). Tighten 15 bolts (40) to a torque of 40 to 64 N·m (30 to 47 lb ft).

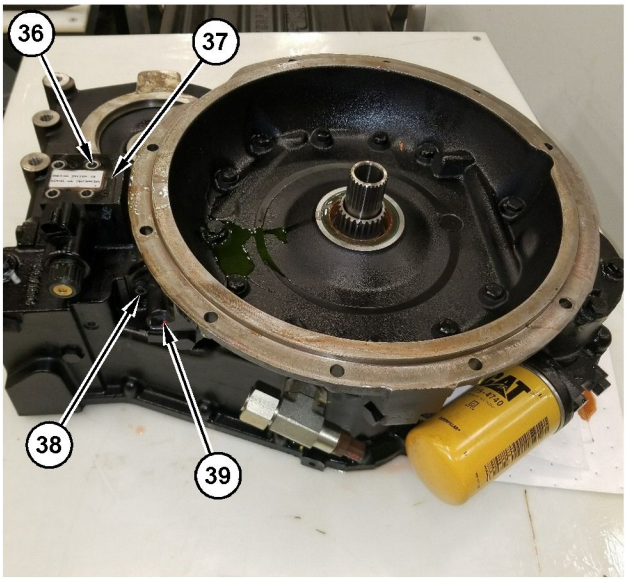

Illustration 281 g06694002

30. Install solenoid valve (39) and screw (38). Tighten screw (38) to a torque of 18 to 31 N·m (159 to 274 lb in).

31. Install solenoid valve assembly (37) and four bolts (36). Tighten four bolts (36) to a torque of 7 to 10 N·m (70 to 89 lb in).

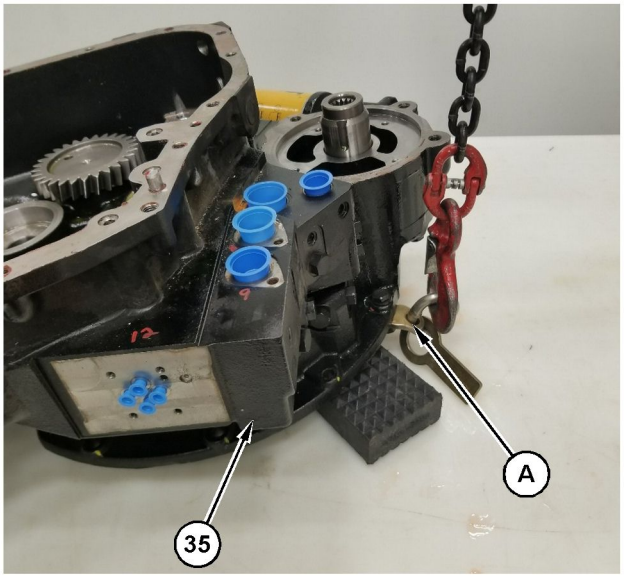

Illustration 282 g06694001

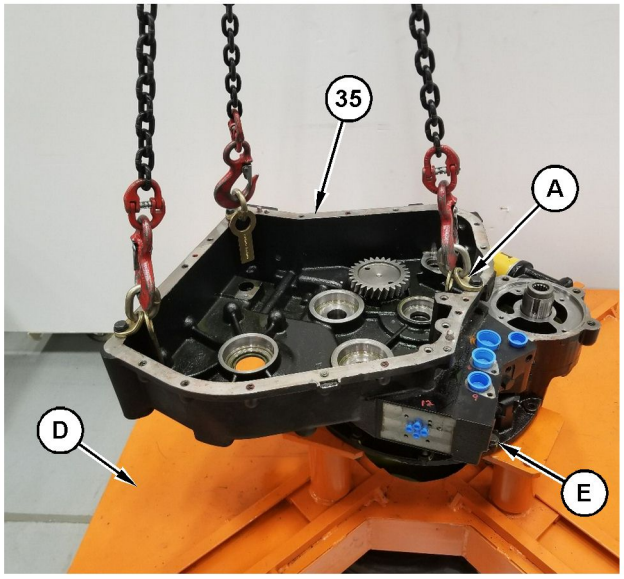

Illustration 283 g06693999

32. Attach Tooling (A) and a suitable lifting device to intermediate case assembly (35). The weight of intermediate case assembly (35) is approximately 108 kg (238 lb). Position intermediate case assembly (35) onto suitable cribbing. Remove Tooling (A) and a suitable lifting device.

33. Attach Tooling (A) and a suitable lifting device onto intermediate case assembly (35) as shown in Illustration 283 . Position intermediate case assembly (35) onto Tooling (D). Use Tooling (E) to secure intermediate case assembly (35).

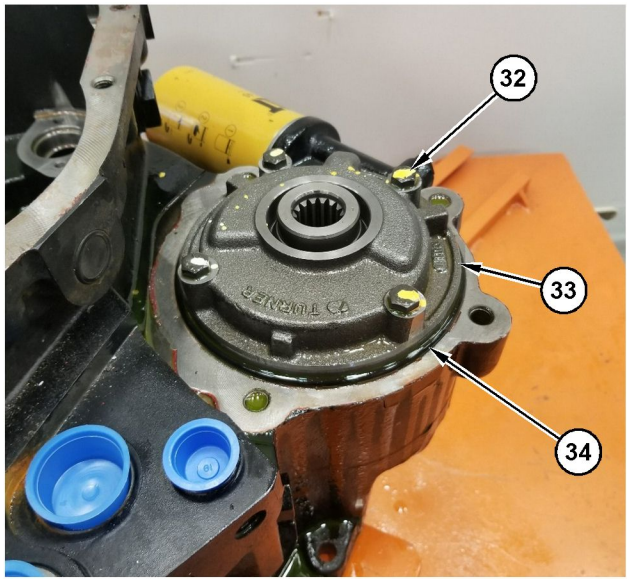

Illustration 284 g06693998

Note: Keep checking the gear rotate freely during tightening procedure.

34. Install pump (33) and four bolts (32). Tighten four bolts (32) to a torque of 18 to 21 N·m (159 to 186 lb in).

35. Install O-ring seal (34).

Relief Valve Assembly

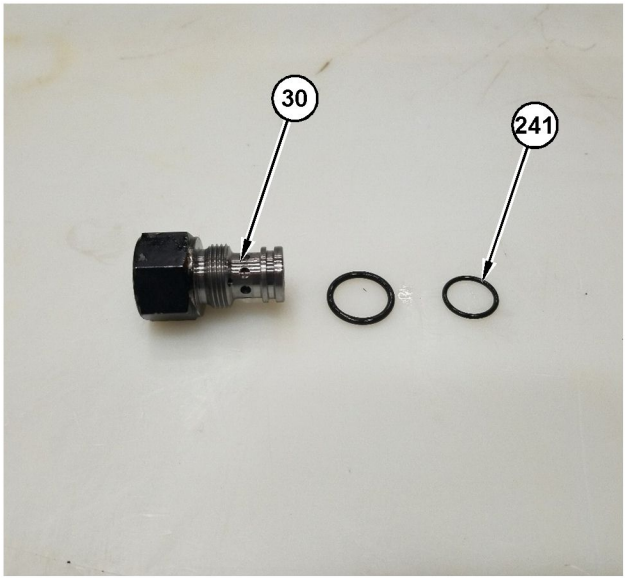

Illustration 285 g06694313

Relief valve

1. Install O-ring seals (241) onto relief valve (30).

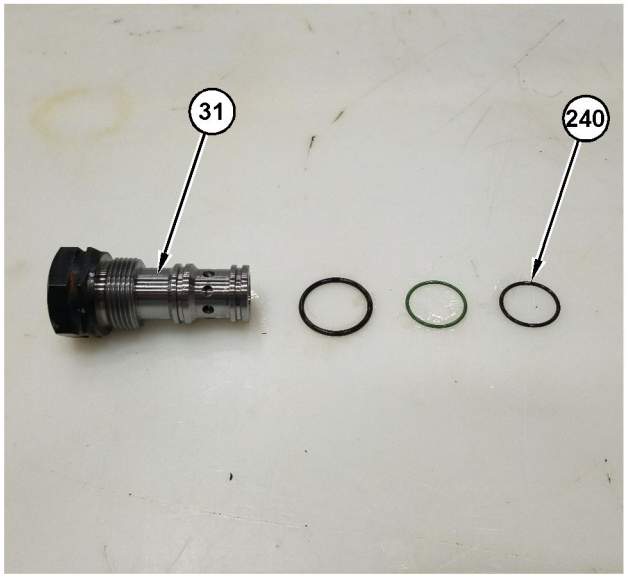

Illustration 286 g06694312

Relief valve

2. Install O-ring seals (240) onto relief valve (31).

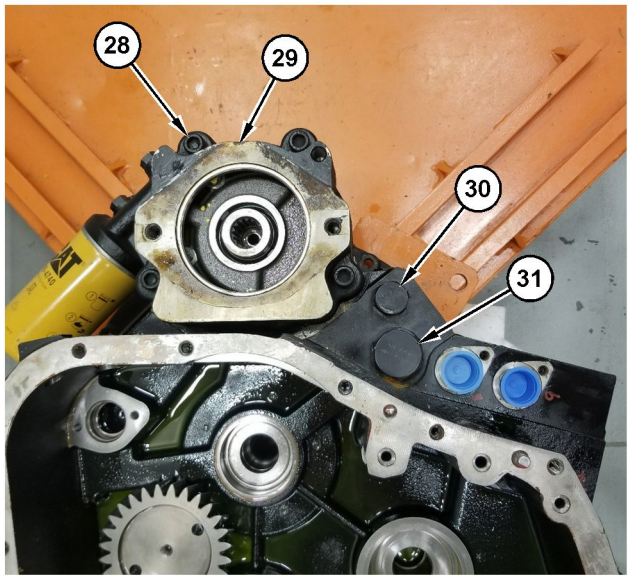

Illustration 287 g06693995

3. Install relief valve (31). Tighten relief valve (31) to a torque of 46 to 60 N·m (34 to 44 lb ft).

4. Install relief valve (30). Tighten relief valve (30) to a torque of 23 to 30 N·m (204 to 266 lb in).

5. Install pump housing (29) and four bolts (28). Tighten four bolts (28) to a torque of 68 to 88 N·m (50 to 65 lb ft).

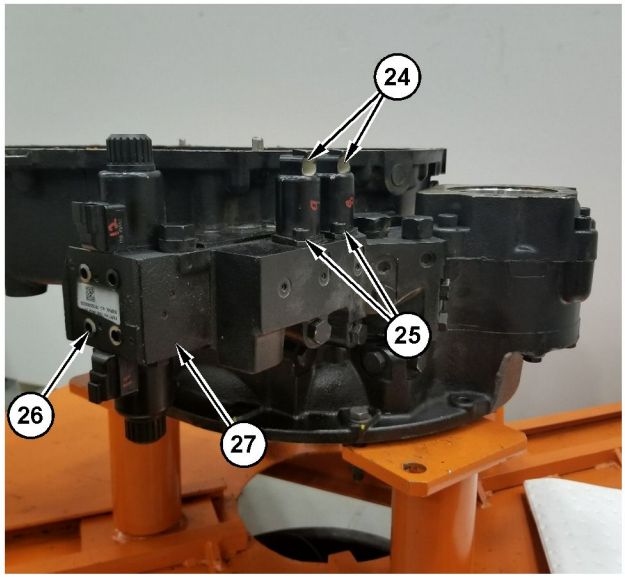

Illustration 288 g06693922

6. Install solenoid valve (24) and screw (25). Tighten screw (25) to a torque of 18 to 31 N·m (159 to 274 lb in). Repeat for the other solenoid valve.

7. Install solenoid valve assembly (27) and four bolts (26). Tighten four bolts (26) to a torque of 7 to 10 N·m (62 to 89 lb in).

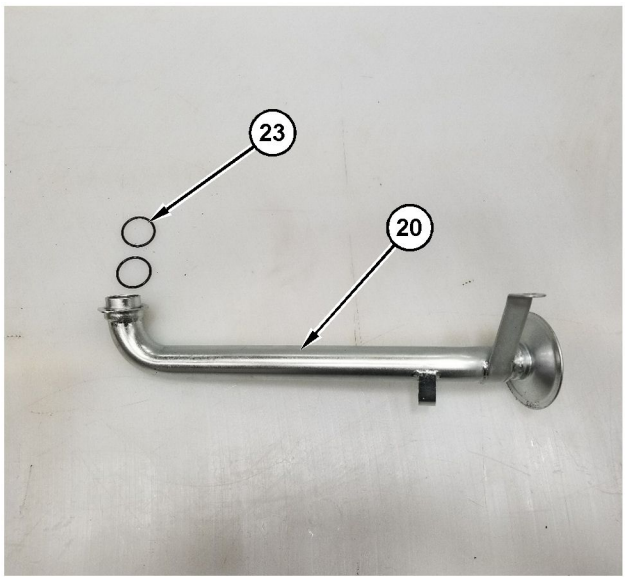

Illustration 289 g06693919

8. Install O-ring seals (23) onto suction strainer assembly (20).

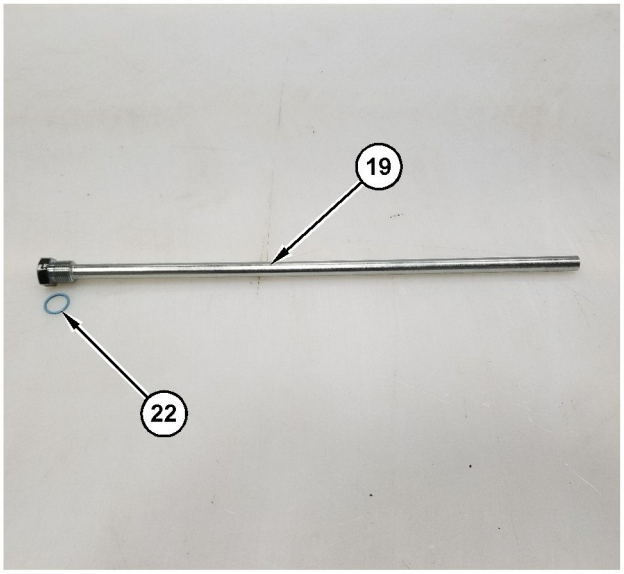

Illustration 290 g06693918

9. Install O-ring seal (22) onto tube assembly (19).

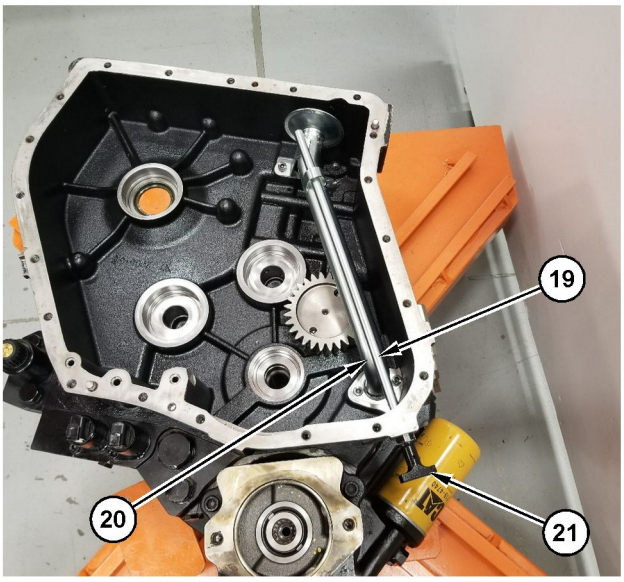

Illustration 291 g06693915

10. Install suction strainer assembly (20) and the three bolts. Tighten the three bolts to a torque of 18 to 31 N·m (159 to 274 lb in).

11. Install tube assembly (19) and gauge assembly (21).

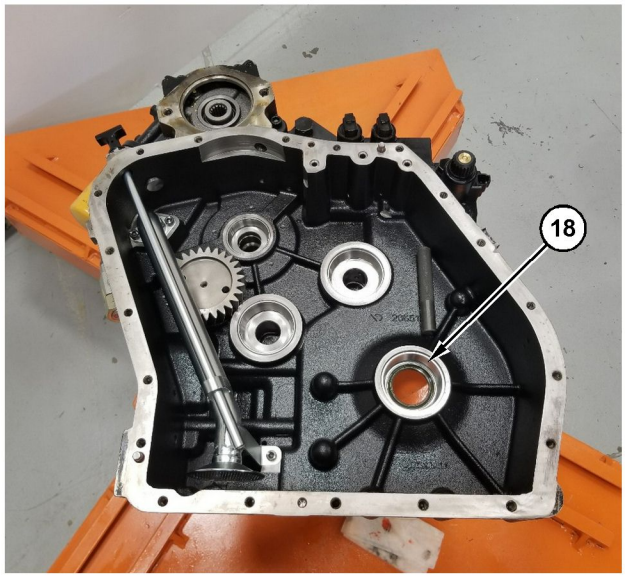

Illustration 292 g06693909

12. Lower the temperature of bearing cups (18). Install bearing cups (18).

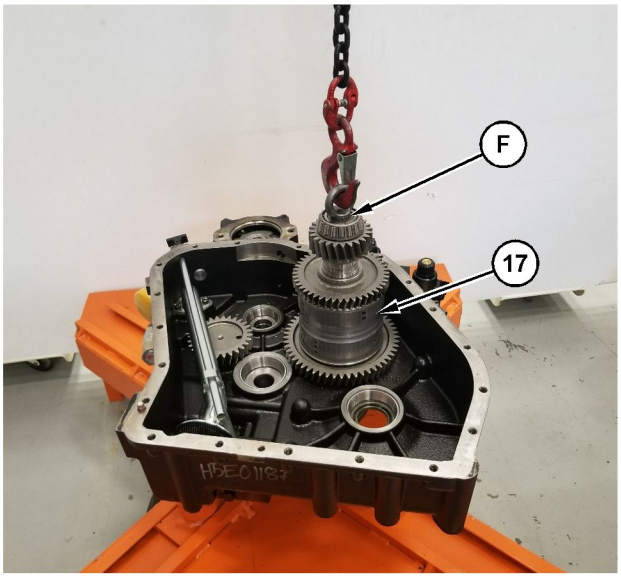

Illustration 293 g06693906

First/second clutch assembly

13. Attach Tooling (F) and a suitable lifting device to clutch assembly (17). The weight of clutch assembly (17) is approximately 20 kg (44 lb). Install clutch assembly (17).

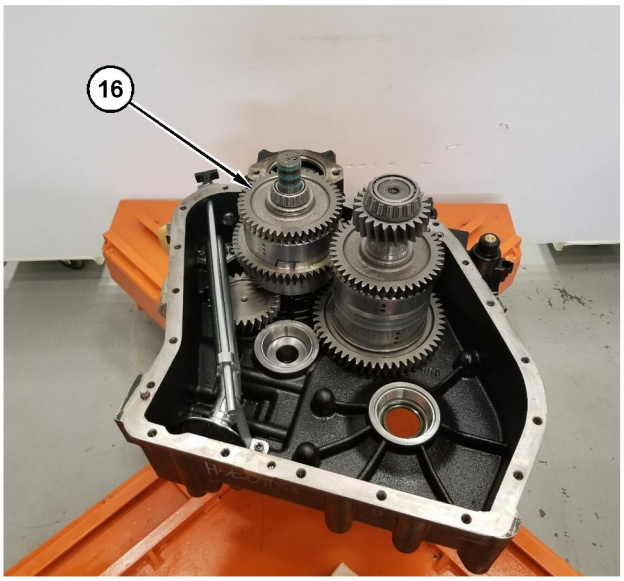

Illustration 294 g06693905

Input shaft assembly

Note: Be aware of possible pinch points during installation.

14. Install input shaft (16).

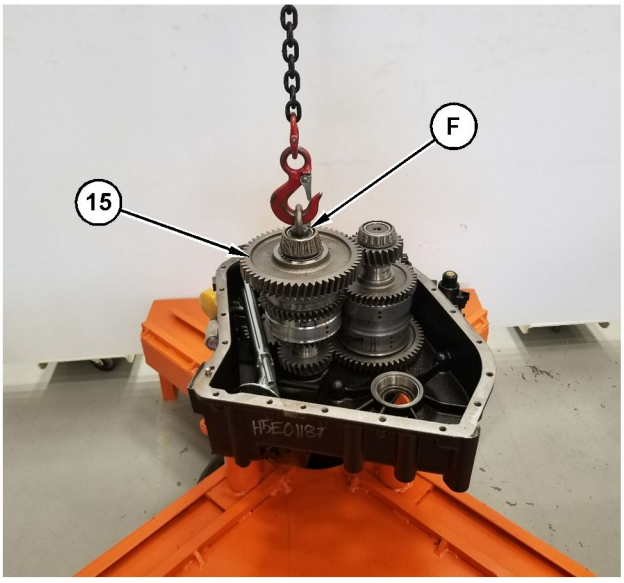

Illustration 295 g06693902

Forward high/third clutch assembly

15. Attach Tooling (F) and suitable lifting device to clutch assembly (15). The weight clutch assembly (15) is approximately 23 kg (51 lb). Install clutch assembly (15).

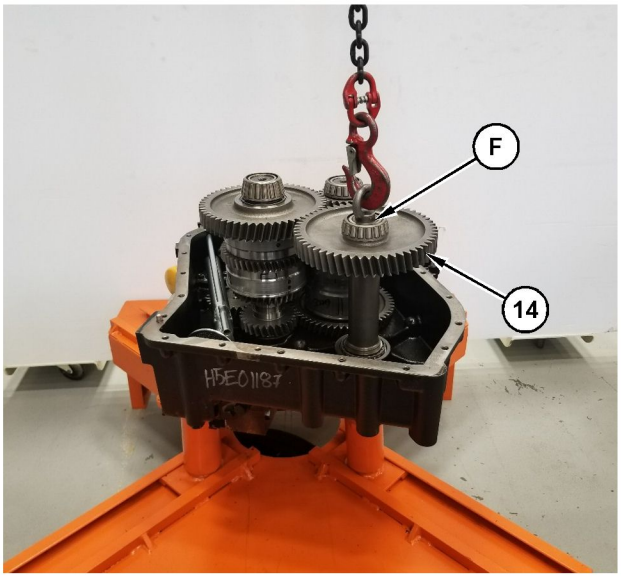

Illustration 296 g06693901

Output shaft assembly

16. Attach Tooling (F) and a suitable lifting device to output shaft assembly (14). Install output shaft assembly (14).

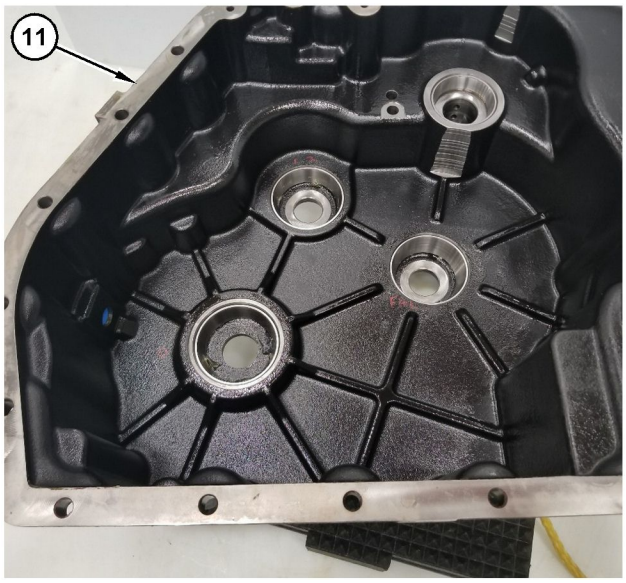

Illustration 297 g06698236

17. Use Tooling (K) to remove the three bearing cup plugs. Apply Tooling (U) onto rear case assembly (11) where the three bearing cups are installed. Lower the temperature of the three bearing cups and install the three bearing cups without the shims.

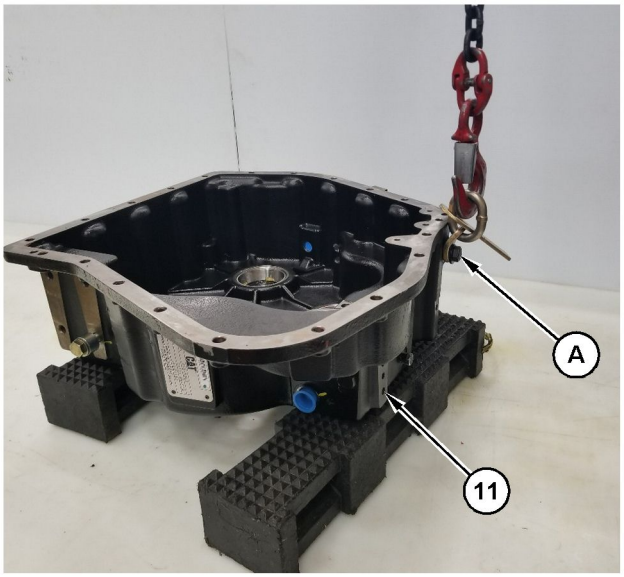

Illustration 298 g06698244

18. Attach Tooling (A) and a suitable lifting device to rear case assembly (11). Position rear case assembly (11) onto suitable cribbing.

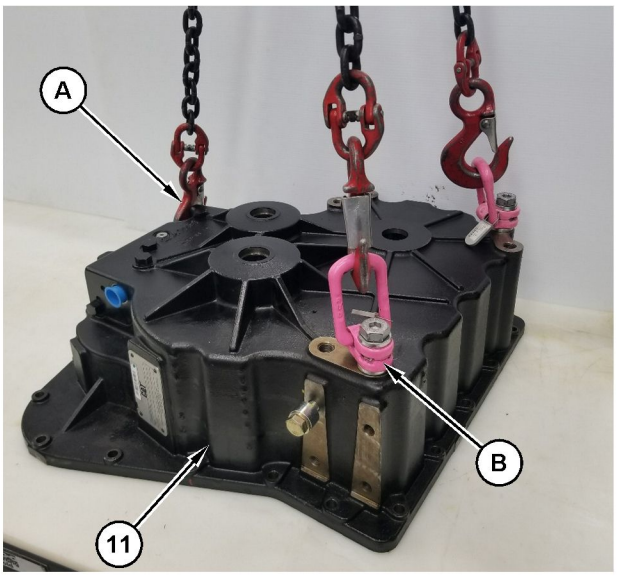

Illustration 299 g06698246

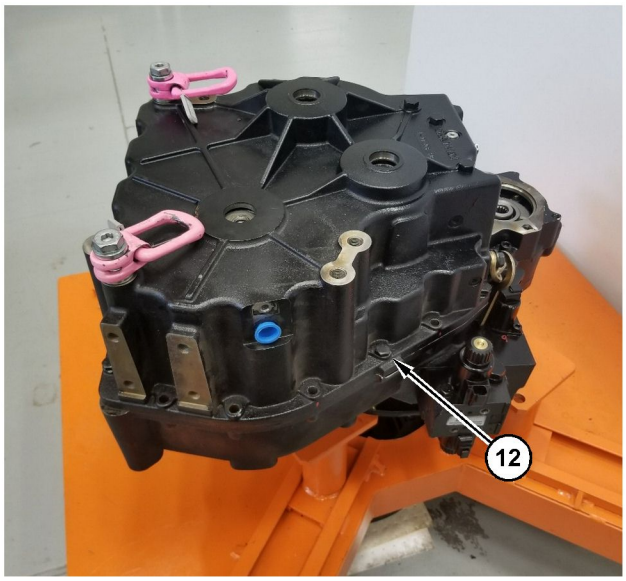

Illustration 300 g06698251

19. Attach Tooling (A), Tooling (B), and a suitable lifting device to rear case assembly (11).

20. Install rear case assembly (11) onto the intermediate case assembly. Install 6 bolts (12) evenly spaced. Tighten six bolts (12) to a torque of 45 to 64 N·m (33 to 47 lb ft).

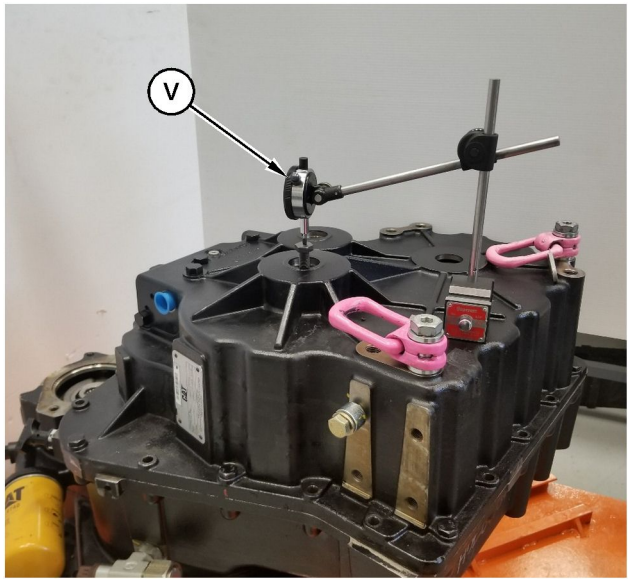

Illustration 301 g06698259

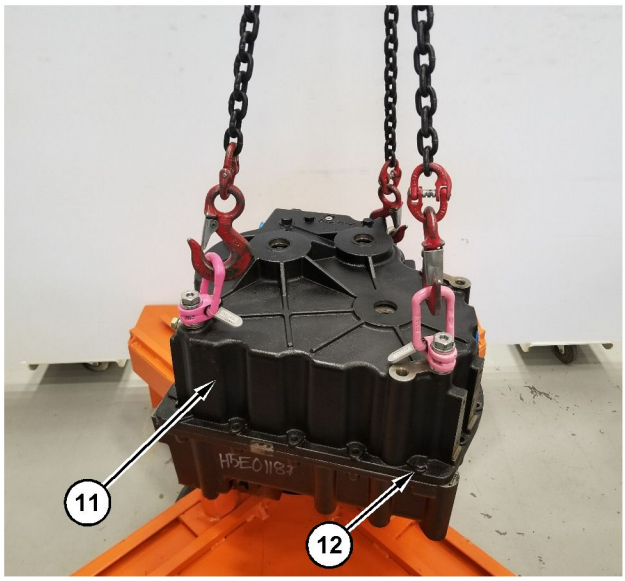

Illustration 302 g06698268

21. Install Tooling (V) with the head machined to a flat surface on the clutch assembly. Set up Tooling (V) as shown in Illustration 301 .

22. Check the bearing end float using a suitable pry bar. Repeat this step for the other clutch assemblies and output shaft assembly. Calculate the shim thickness needed to achieve 0.025 to 0.076 mm (0.0010 to 0.0030 inch) of end float for each of the clutch assemblies and the output shaft assembly.

23. Remove Tooling (V).

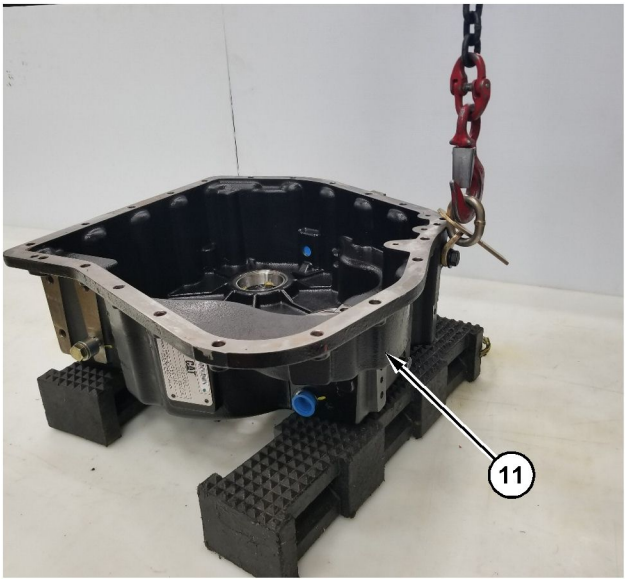

Illustration 303 g06698273

24. Attach a suitable lifting device to rear case assembly (11). Remove 6 bolts (12) and rear case assembly (11). Position rear case assembly (11) onto suitable cribbing.

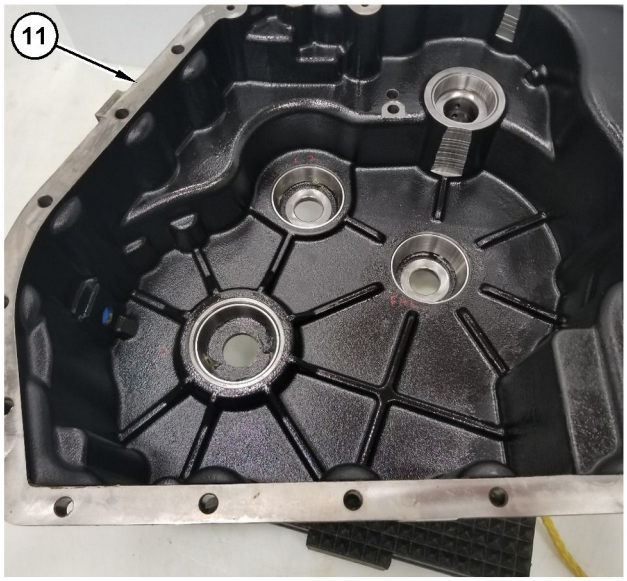

Illustration 304 g06698236

25. Remove the three bearing cups and install the shims calculated from Step21. Apply Tooling (U) to rear case assembly (11) where the bearing cups are installed. Install the bearing cups.

26. Repeat Step 17 through Step 25 until the desired 0.025 to 0.076 mm (0.0010 to 0.0030 inch) end float is achieved on the 2 clutch assemblies and the output shaft assembly.

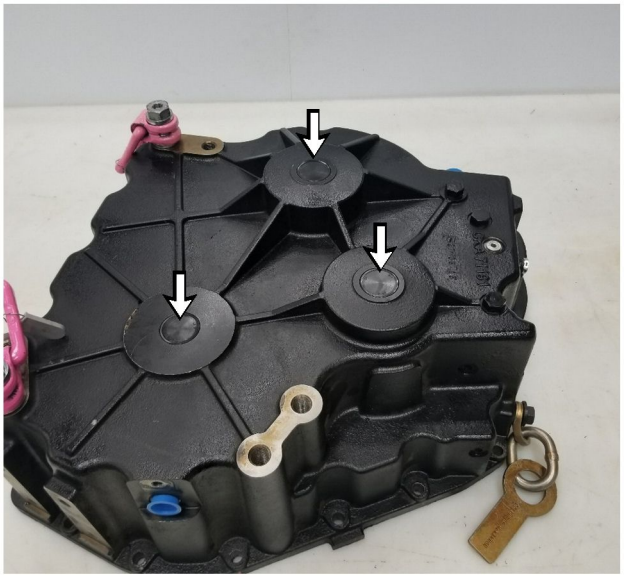

Illustration 305 g06698275

27. Use Tooling (K) to install three plugs. Install three plugs.

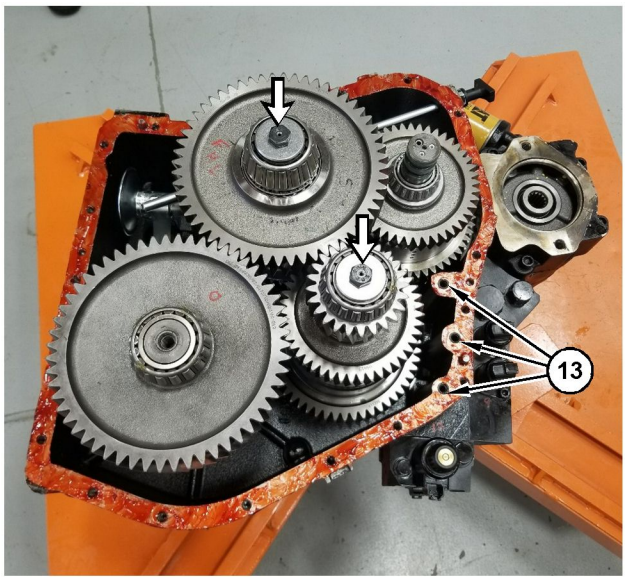

Illustration 306 g06698279

28. Install the two washers and the two bolts. Tighten the two bolts to a torque of 68 to 88 N·m (50 to 65 lb ft).

29. Apply a thin coating of Tooling (W) to the intermediate case assembly as shown in Illustration 306 .

30. Install three O-ring seals (13).

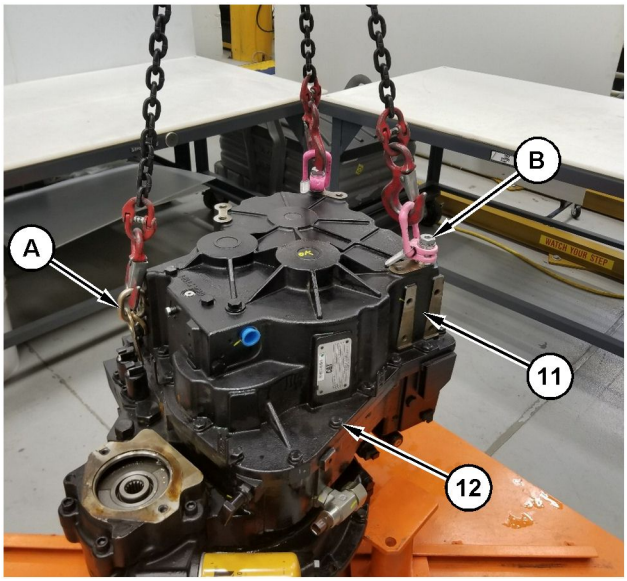

Illustration 307 g06693897

31. Attach suitable lifting device to rear case assembly (11). The weight of rear case assembly (11) is approximately 50 kg (110 lb). Install rear case assembly (11), the ladder clips, and bolts (12). Tighten bolts (12) to a torque of 45 to 64 N·m (33 to 47 lb ft).

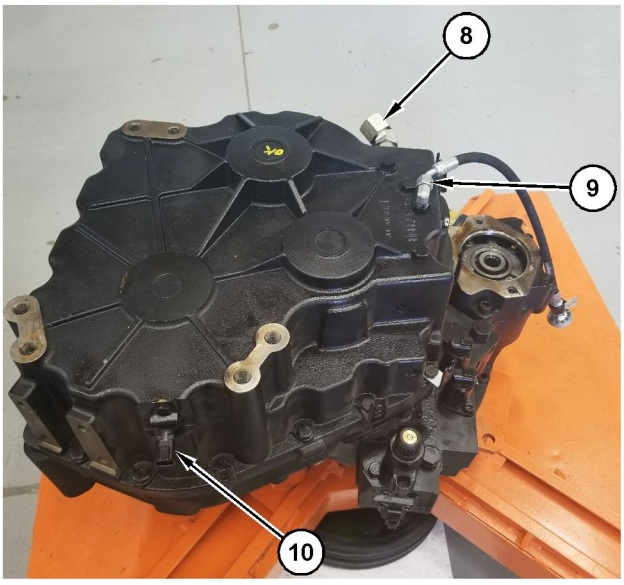

Illustration 308 g06693895

32. Install the O-ring seal, adapter (8), and hose assembly (9).

33. Install speed sensor (10) and the bolt. Tighten the bolt to a torque of 18 to 31 N·m (159 to 274 lb in).

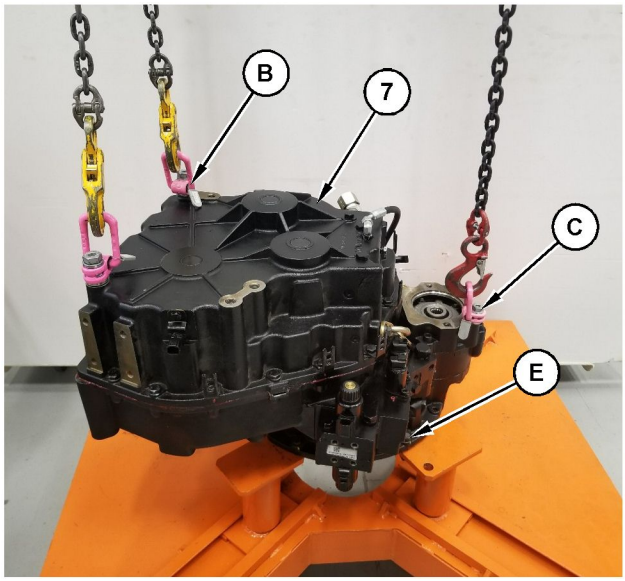

Illustration 309 g06698311

34. Attach Tooling (C), Tooling (B), and a suitable lifting device to transmission (7). The weight of transmission (7) is approximately 154 kg (340 lb).

35. Remove Tooling (E) from the transmission stand.

36. Rotate the transmission (7) 90 degrees to a VERTICAL position. Position transmission (7) onto suitable cribbing.

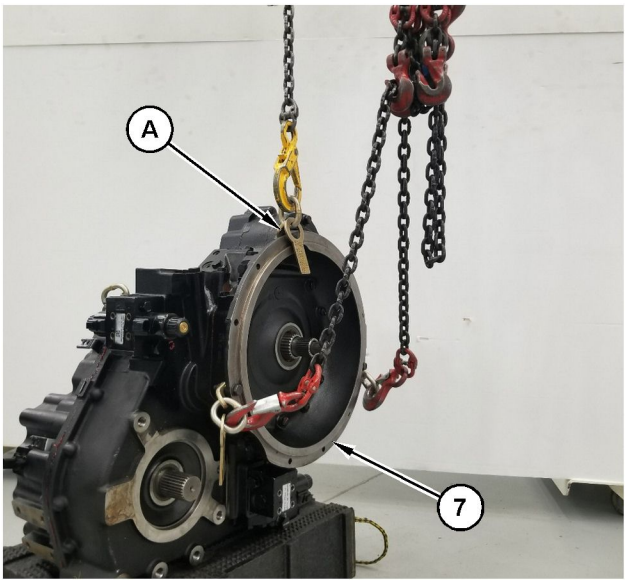

Illustration 310 g06693887

37. Remove Tooling (B) (not shown) and Tooling (C) (not shown). Attach Tooling (A) and a suitable lifting device to transmission (7).

38. Lift transmission (7) using suitable lifting device attached to the top of the torque converter housing. Use two lifting device attached near bottom of the torque converter housing to rotate transmission (7) 90 degree. Rotate transmission (7) 90 degree and position transmission (7) onto suitable bench or cribbing.

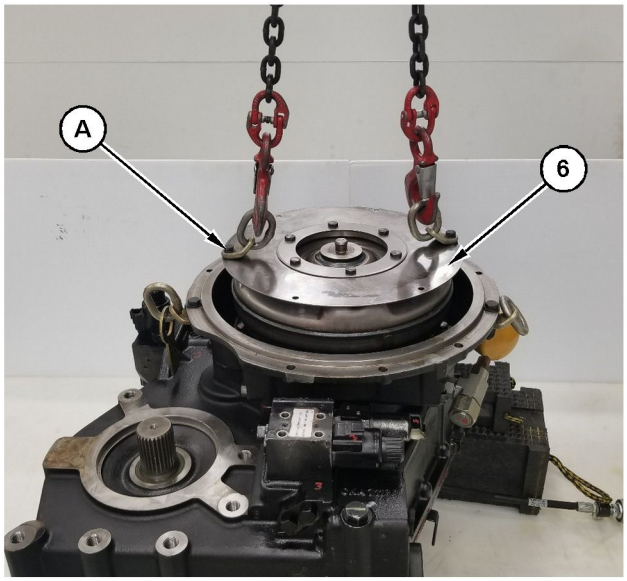

Illustration 311 g06693883

39. Attach Tooling (A) and a suitable lifting device to torque converter (6). The weight of torque converter (6) is approximately 20 kg (44 lb). Install torque converter (6).

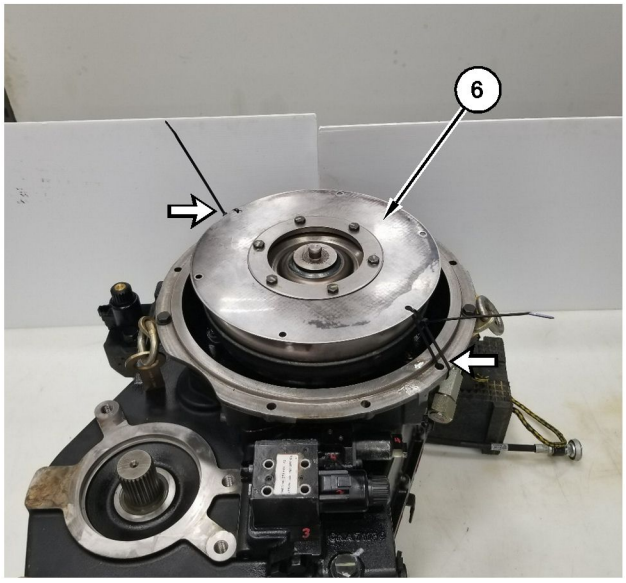

Illustration 312 g06698337

40. Install the two cable straps to keep torque converter (6) stable during the installation of the transmission.

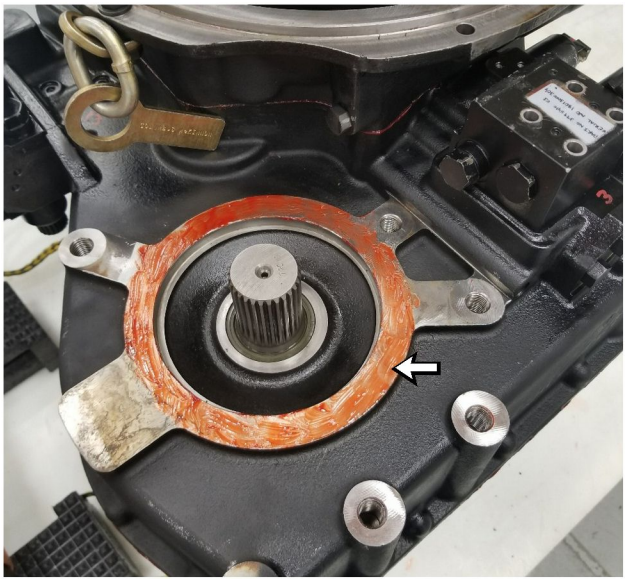

Illustration 313 g06698350

41. Apply a thin layer of Tooling (W) to the mating surface of the transfer case.

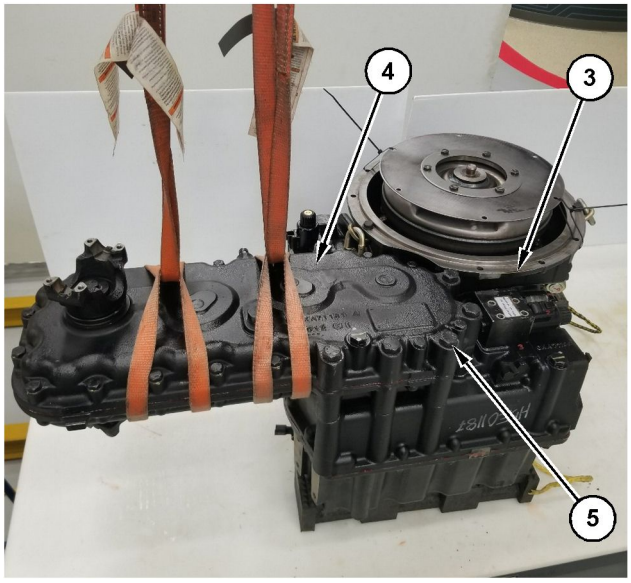

Illustration 314 g06693882

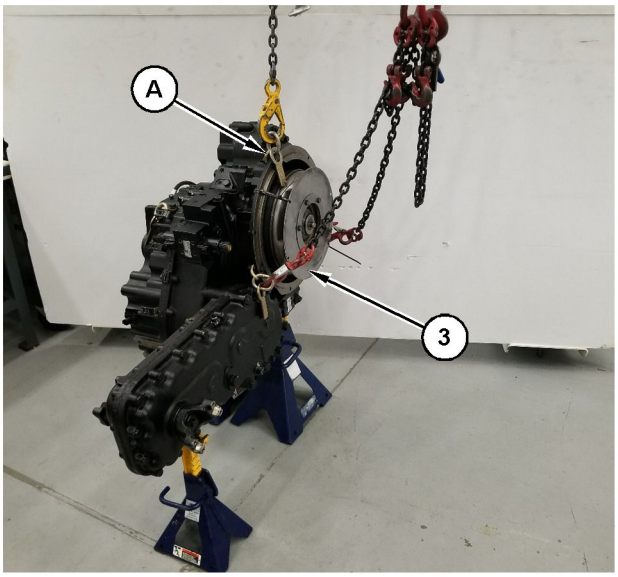

Illustration 315 g06693879

42. Attach a suitable lifting device to transfer case (4). The weight of transfer case (4) is approximately 73 kg (161 lb). Install transfer case (4) and six bolts (5).

43. Attach Tooling (A) and a suitable lifting device to transmission assembly (3). The weight of transmission assembly (3) is approximately 247 kg (545 lb). Position transmission assembly (3) 90 degree and place onto suitable jack stands.

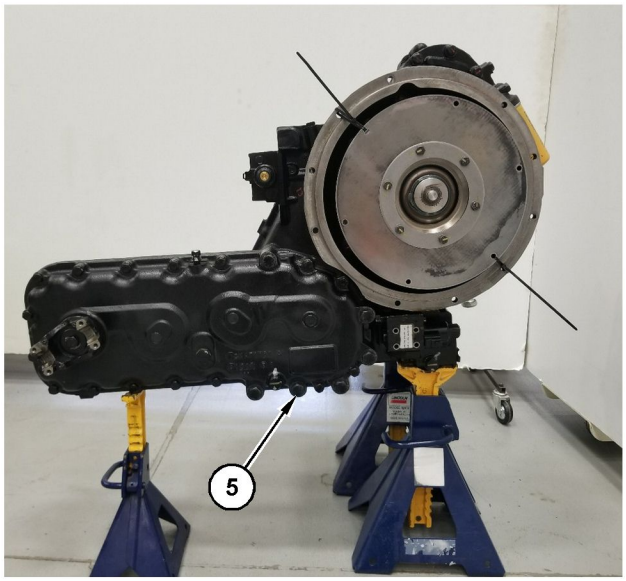

Illustration 316 g06698364

44. Tighten six bolts (5) to a torque of 200 to 280 N·m (148 to 207 lb ft).

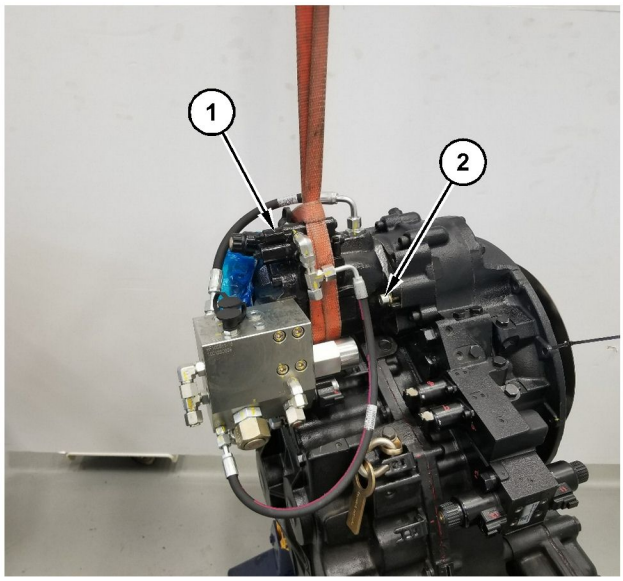

Illustration 317 g06693862

45. Attach a suitable lifting device to pump (1). The weight of pump (1) is approximately 41 kg (90 lb). Install the O-ring seal onto pump (1).

46. Install pump (1) and two bolts (2). Tighten bolts (2) to a torque of 68 to 88 N·m (50 to 65 lb ft).

End By:

a. Install the transmission.

Index