

# TM2053 - 27C ZTS and 35C ZTS Excavator Repair Propel Gearbox Disassemble and Assemble—35C ZTS

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## Propel Gearbox Disassemble and Assemble—35C ZTS

### Disassemble Propel Gearbox

1. [See Propel Gearbox Remove and Install—27C ZTS and 35C ZTS](#) for gearbox and motor removal. (Group 0250.)

[See Propel Gearbox Operation](#) for a cross-section of Propel Gearbox—35C ZTS. (Group 9020-05.)

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- 2.

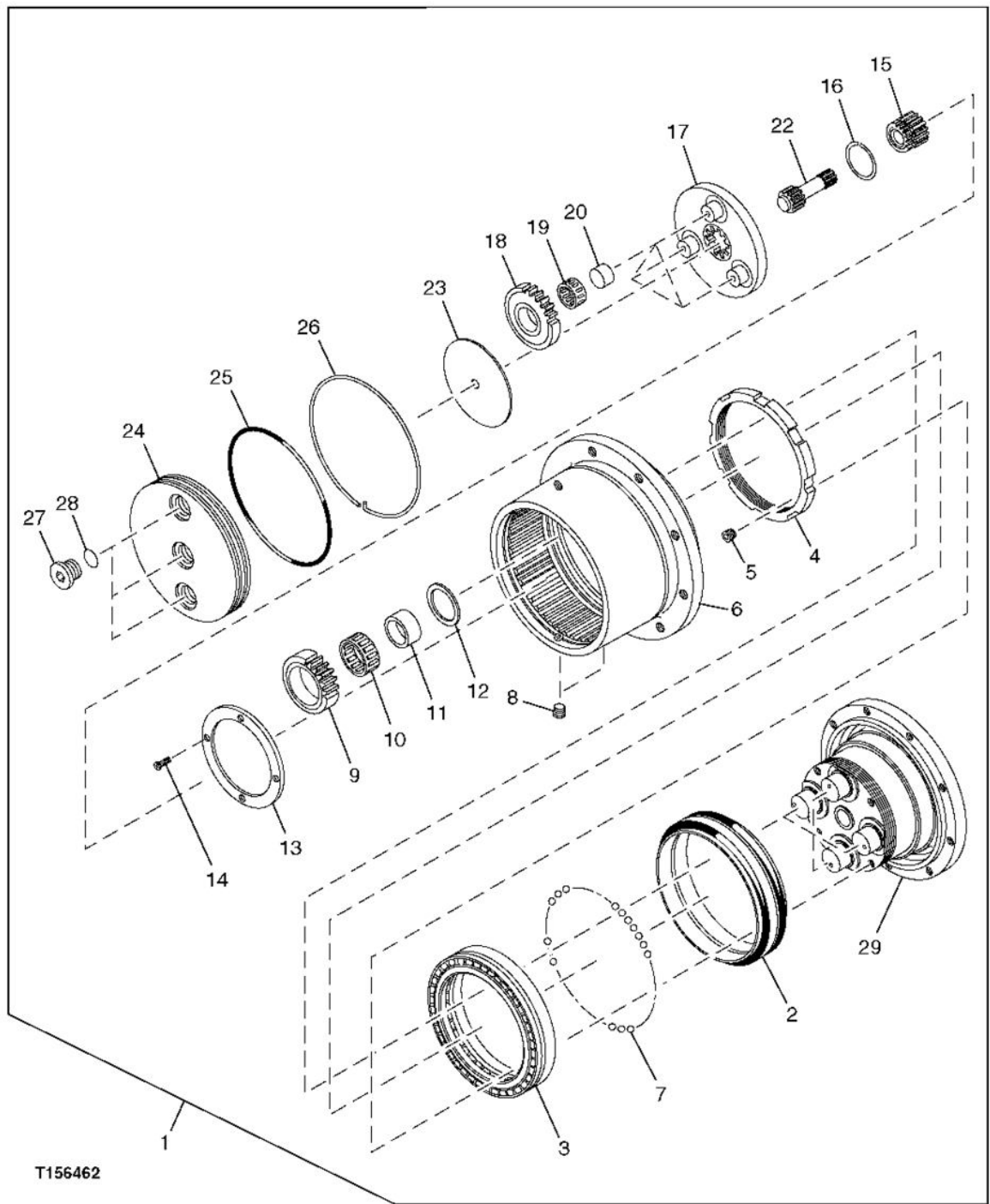


**CAUTION:**

*Heavy component; use a hoist.*

Item	Measurement	Specification
Propel Gearbox—35C ZTS		
Propel Gearbox and Motor	Weight	44 kg (97 lb) approximate

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T156462-UN: Propeller Gearbox Exploded View—35C ZTS

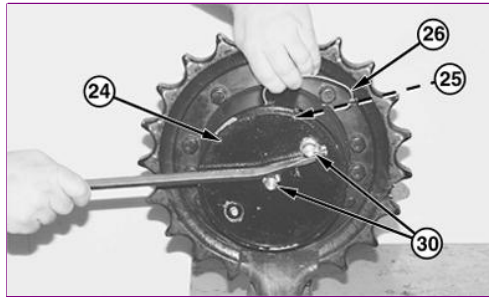
**LEGEND:**

- 1 - Propeller Gearbox
- 2 - Metal Face Seal
- 3 - Bearing
- 4 - Bearing Nut (Retainer)
- 5 - Plug
- 6 - Ring Gear (Housing)
- 7 - Steel Ball (132 used)
- 8 - Pipe Plug (2 used)
- 9 - Second Planet Gear (4 used)
- 10 - Needle Bearing (4 used)
- 11 - Bearing Race (4 used)
- 12 - Thrust Washer (4 used)
- 13 - Thrust Washer
- 14 - Cap Screw
- 15 - Second Planet Sun Gear
- 16 - Snap Ring
- 17 - First Planet Carrier
- 18 - First Planet Gear (3 used)
- 19 - Needle Bearing (3 used)
- 20 - Bearing Race (3 used)
- 21 - Not Used
- 22 - Input Shaft and First Planet Sun Gear

- 23 - Thrust Washer
- 24 - Cover
- 25 - O-Ring
- 26 - Wire (Retainer)
- 27 - Plug (3 used)
- 28 - O-Ring
- 29 - Propel Motor Housing and Second Planet Carrier

Remove plugs (27) and O-rings (28) to drain oil. Approximate capacity is 0.5 L (0.5 qt).

3. Remove pipe plug (8) located on the side of ring gear at cover end.



4. T163455-UN: Cover-to-Ring Gear Wire (Retainer)

**LEGEND:**

- 24 - Cover
- 25 - O-Ring
- 26 - Wire (Retainer)
- 30 - Fitting (2 used)

Install fittings (30) into holes.

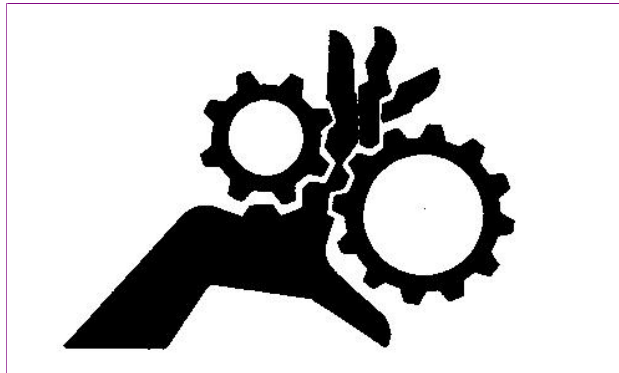
5. Turn cover (24) until the end of wire (26) is visible through hole. Continue turning the cover, pulling the wire out through the hole.
6. Remove cover and O-ring (25).
7. Remove thrust plate (23).

- 8.



**CAUTION:**

*Planet gears can turn. Keep fingers away from gears.*



T6639GK-UN: Keep Fingers Away From Gears

Remove input shaft (22).

Remove parts for first planet carrier and gears (17—20), second planet sun gear (15), and second planet gears (9—14). Keep parts for each planet gear together.

9. Remove the sprocket.
10. Remove pipe plug (8) located on the side of ring gear adjacent to the sprocket mounting flange.  
Remove the 132 steel balls (7) through the hole.
11. Push the housing (29) and bearing (3) out of ring gear using a shop press or three M12 x 1.75 cap screws installed in the sprocket mounting flange and tighten against the housing. To protect the housing, use steel plates between the end of cap screws and housing.

12. **IMPORTANT:**

**Metal face seals can be reused if they are not worn or damaged. A used seal must be kept together as a set because of wear patterns on seal ring face.**

Remove the metal face seals (2) from ring gear and housing. Keep seal rings together as a matched set with a piece of clean cardboard between them to protect the seal ring face.

[See Inspect Metal Face Seals](#) to determine if seals can be reused. (Group 0130.)

13. Remove plugs (5). Remove bearing nut (4) using a spanner wrench or ST3313 Special Tool.
14. Remove bearing (3) from housing for replacement only. Bearing is a press fit.

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**NOTE:**

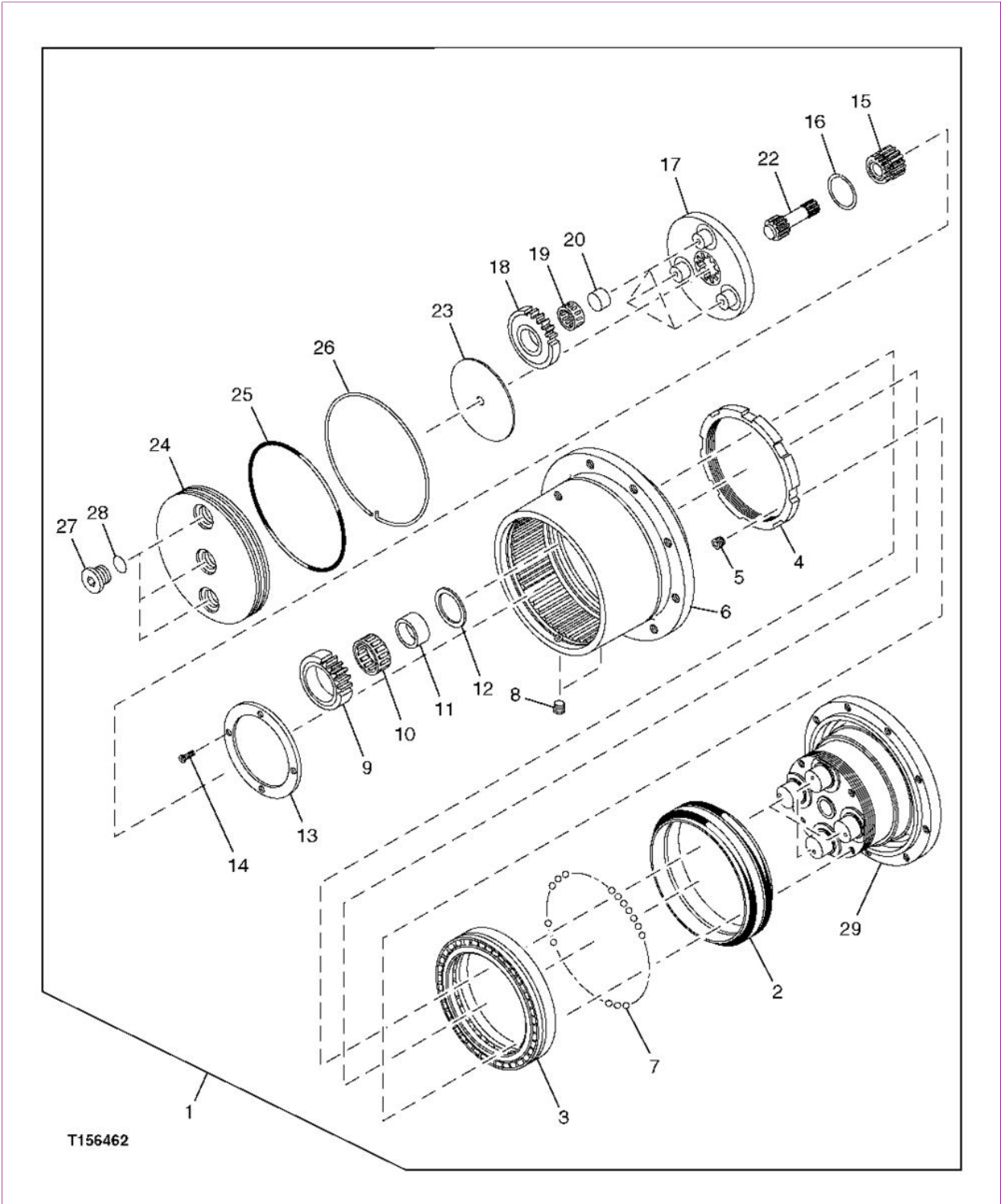
*A new bearing should be installed if removed.*

15. [See Propel Motor Disassemble and Assemble—35C ZTS](#) for motor disassembly. (Group 0260.)

**Assemble Propel Gearbox**

1. [See Propel Gearbox Operation](#) for a cross-section of Propel Gearbox—35C ZTS. (Group 9020-05.)

[See Propel Motor Disassemble and Assemble—35C ZTS](#) for motor assembly. (Group 0260.)



2. T156462-UN: Propel Gearbox Exploded View—35C ZTS

**LEGEND:**

- 1 - Propel Gearbox
- 2 - Metal Face Seal
- 3 - Bearing
- 4 - Bearing Nut (Retainer)
- 5 - Plug

- 6 - Ring Gear (Housing)
- 7 - Steel Ball (132 used)
- 8 - Pipe Plug (2 used)
- 9 - Second Planet Gear (4 used)
- 10 - Needle Bearing (4 used)
- 11 - Bearing Race (4 used)
- 12 - Thrust Washer (4 used)
- 13 - Thrust Washer
- 14 - Cap Screw
- 15 - Second Planet Sun Gear
- 16 - Snap Ring
- 17 - First Planet Carrier
- 18 - First Planet Gear (3 used)
- 19 - Needle Bearing (3 used)
- 20 - Bearing Race (3 used)
- 21 - Not Used
- 22 - Input Shaft and First Planet Sun Gear
- 23 - Thrust Washer
- 24 - Cover
- 25 - O-Ring
- 26 - Wire (Retainer)
- 27 - Plug (3 used)
- 28 - O-Ring
- 29 - Propeller Motor Housing and Second Planet Carrier

Install bearing (3) so the thicker edge of outer race is towards the threaded end of housing (29).

3. Tighten bearing nut (4) to specifications using spanner wrench or ST3313 Special Tool.

Item	Measurement	Specification
<b>Propeller Gearbox—35C ZTS</b>		
Bearing-to-Housing Bearing Nut	Torque	196 ±10 N·m (144 ± 7.2 lb-ft)

4. Tighten plug (5) to specification.

Item	Measurement	Specification
<b>Propeller Gearbox—35C ZTS</b>		
Bearing Nut-to-Housing Plug	Torque	14.7 N·m (132 lb-in.)

5. **IMPORTANT:**

**The metal face seal O-rings and their seat surfaces must be clean, dry, and oil free so the O-rings do not slip.**

Thoroughly clean O-rings, seat surfaces in housing (29), ring gear (6), and seal rings using volatile, non-petroleum base solvent and lint-free tissues.

6. Install O-rings on seal rings. Check that O-ring is not twisted.

7. **NOTE:**

*A volatile, non-petroleum base solvent or talcum powder can be used as a lubricant. Solvent must not damage the O-ring or leave an oil residue.*

Apply equal pressure with fingers at four equally spaced points on seal ring face. Seal must "pop" down into place so O-ring is tight against seal bore and seal ring is installed squarely.

8. Wipe finger prints and foreign material off seal ring face using clean oil and lint-free tissues.
9. Apply a thin film of clean oil on each seal ring face.
10. Install ring gear onto bearing and housing. Tap around the top edge of ring gear using a soft-faced hammer to seat the ring gear on bearing.
11. Install the 132 steel balls (7) through hole and into the groove in bearing and ring gear.
12. Apply pipe sealant to threads of pipe plug (8). Tighten plug to specification.

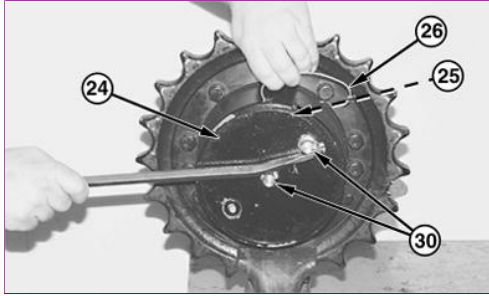
Item	Measurement	Specification
<b>Propeller Gearbox—35C ZTS</b>		
Pipe Plug to Ring Gear	Torque	7.9 N·m (70 lb-in.)

13. Install thrust plates (12), races (11), needle bearings (10), and second planet gears (9) onto pins.
14. Install thrust washer (13).

Apply thread lock and sealer (low strength) to threads of cap screw (14). Tighten cap screws to specifications.

Item	Measurement	Specification
<b>Propeller Gearbox—35C ZTS</b>		
Thrust Washer-to-Housing Cap Screw	Torque	6.1 N·m (54 lb-in.)

15. Install snap ring (16) on second planet sun gear (15). Install sun gear.
  16. Install races (20) and needle bearings (19).
  17. Install first planet gears (18) so the flat side is against machined surface of first planet carrier (17).
  18. Install input shaft (22).
  19. Install thrust plate (23).
  20. Install O-ring (25) on cover (24). Apply grease to O-ring.
-



21. T163455-UN: Cover-to-Ring Gear Wire (Retainer)

**LEGEND:**

- 24 - Cover
- 25 - O-Ring
- 26 - Wire (Retainer)
- 30 - Fitting (2 used)

Install cover. Install fittings (30).

22. Bend end of wire (26) to 90° approximately 6 mm (0.24 in.) from end.
23. Push wire through hole and into groove in cover and ring gear.
24. Turn cover to pull remaining wire into the groove.
25. Apply pipe sealant to threads of pipe plug (8). Tighten plug.

Item	Measurement	Specification
<b>Propel Gearbox—35C ZTS</b>		
Pipe Plug to Ring Gear	Torque	7.9 N·m (70 lb-in.)

26. Remove fittings.
27. Add approximately 0.5 L (0.5 qt) of gear oil to gearbox. [See Propel Gearbox Oil](#) for specification. (Operator's Manual.)  
[See Check Propel Gearbox Oil Level](#) after plugs and O-rings (27 and 28) are installed. (Operator's Manual.)
28. Tighten plugs to specification.

Item	Measurement	Specification
<b>Propel Gearbox—35C ZTS</b>		
Plug to Cover	Torque	34 N·m (25 lb-ft)

# TM2053 - 27C ZTS and 35C ZTS Excavator Repair Propel Motor Disassemble and Assemble—27C ZTS

## Propel Motor Disassemble and Assemble—27C ZTS

### Disassemble Propel Motor

1.



**CAUTION:**

*Heavy component; use a hoist.*

Item	Measurement	Specification
Propel Motor—27C ZTS		
Propel Gearbox and Motor	Weight	44 kg (97 lb) approximate

[See Propel Gearbox Remove and Install—27C ZTS and 35C ZTS](#) for gearbox and motor removal. (Group 0250.)

[See Propel Gearbox Disassemble and Assemble—27C ZTS](#) for gearbox disassembly. (Group 0250.)

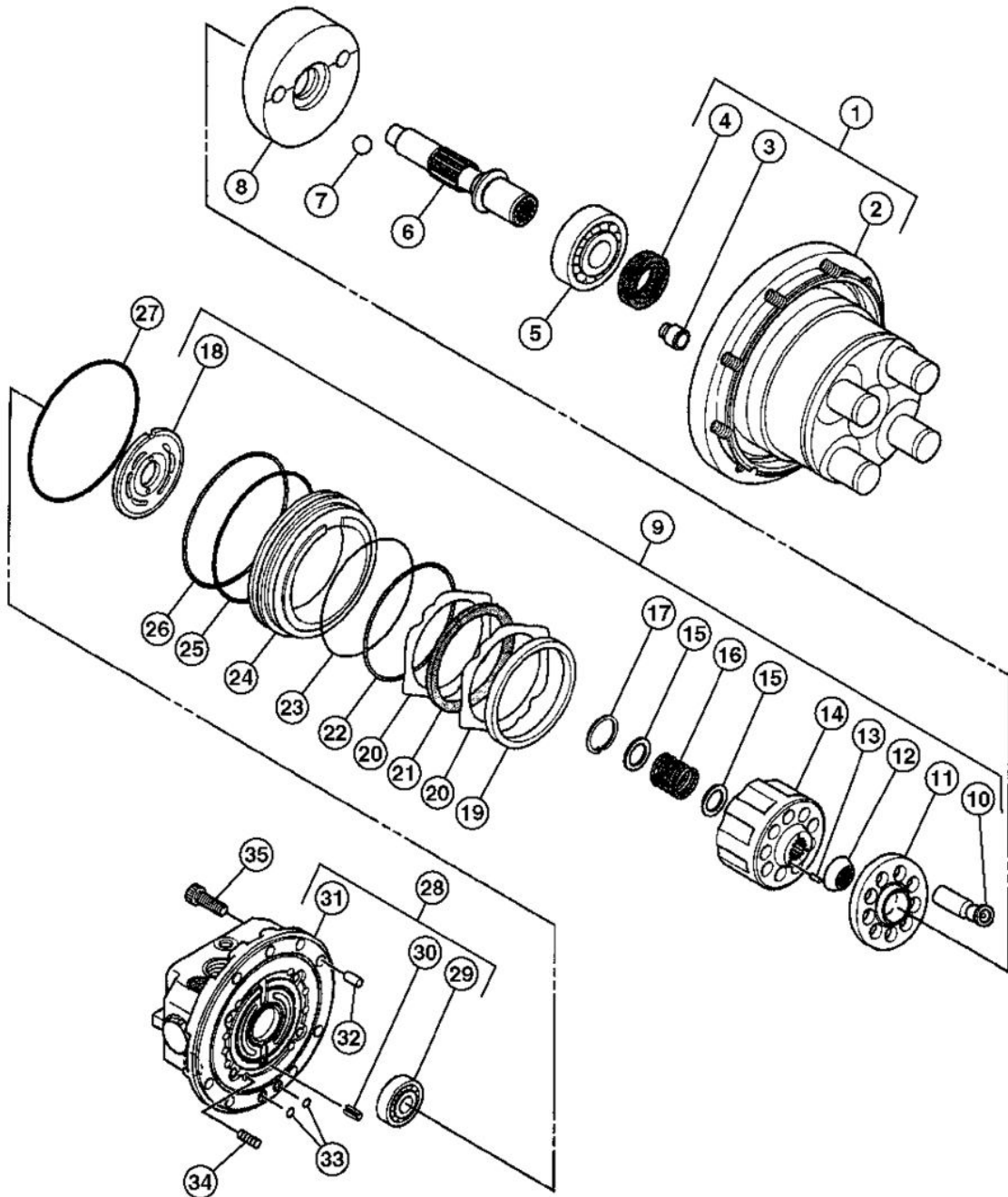
[See Propel Motor and Brake Valve Housing Operation](#) for a cross-section of Propel Motor and Brake Valve Housing—27C ZTS. (Group 9025-05.)

2.



**CAUTION:**

*Brake valve housing contains springs under load. Prevent injury from sudden release by loosening cap screws evenly.*



**T163627**

T163627-UN: Propeller Motor Exploded View—27C ZTS

LEGEND:

- 1 - Housing Kit
- 2 - Propeller Motor Housing and Second Planet Carrier
- 3 - Control Piston
- 4 - Oil Seal
- 5 - Ball Bearing
- 6 - Drive Shaft
- 7 - Pivot Ball (2 used)
- 8 - Swash Plate
- 9 - Rotary Group Kit
- 10 - Piston and Shoe (9 used)
- 11 - Retainer (Holder)
- 12 - Ball Guide (Holder)
- 13 - Pin (3 used)
- 14 - Cylinder Block
- 15 - Retainer (2 used)
- 16 - Spring
- 17 - Snap Ring
- 18 - Valve Plate
- 19 - Spacer
- 20 - Plate (2 used)
- 21 - Disk
- 22 - Backup Ring
- 23 - Piston
- 24 - Shoe
- 25 - Retainer
- 26 - Retainer
- 27 - Retainer
- 28 - Retainer
- 29 - Retainer
- 30 - Retainer
- 31 - Retainer
- 32 - Retainer
- 33 - Retainer
- 34 - Retainer
- 35 - Retainer

- 23 - O-Ring
- 24 - Park Brake Piston
- 25 - O-Ring
- 26 - Backup Ring
- 27 - O-Ring
- 28 - Brake Valve Housing Kit
- 29 - Ball Bearing
- 30 - Spring Pin
- 31 - Brake Valve Housing
- 32 - Dowel Pin
- 33 - O-Ring (2 used)
- 34 - Park Brake Spring (8 used)
- 35 - Cap Screw (7 used)

Loosen cap screws (35) evenly to release force of park brake springs (34).

3. Before removing the brake valve housing (31), measure and record the distance between it and motor housings as a reference for assembly.

4. **IMPORTANT:**

**Valve plate can stick to the brake valve housing. Dropping the valve plate can damage the highly machined surfaces. Use care when removing the brake valve housing.**

Remove brake valve housing being careful not to drop the valve plate (18).

Protect machined surfaces of valve plate from damage.

5. Remove ball bearing (29) from brake valve housing only if replacement is necessary. Bearing is press fit. If removed, install new bearings.

6. Remove park brake piston (24).

7. Hold the housing in a horizontal position and then slid the rotary group (10—17) out of housing and off the drive shaft.

8.

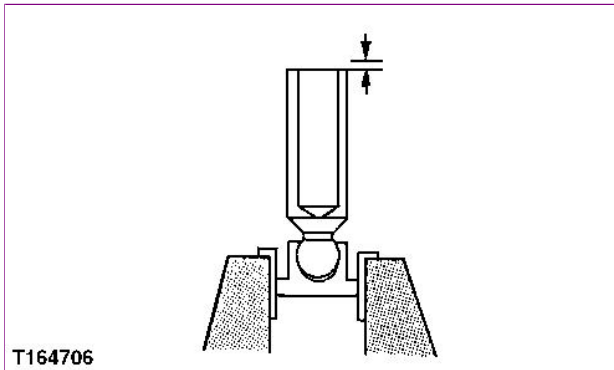


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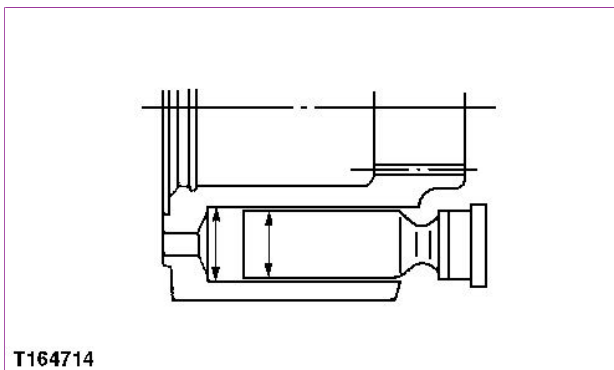
**Cylinder block contains a springs under load. Prevent injury from sudden release by using a press to compress the spring before removing snap ring.**

Disassemble rotary group for inspection and cleaning only. Rotary group is serviced as an assembly.

Compress spring (16) using a press before removing the snap ring (21).



9. **T164706**  
T164706-UN: Piston-To-Shoe Clearance



**T164714**  
T164714-UN: Piston-To-Cylinder Block Bore Clearance

Check the clearance between piston and shoe.

Item	Measurement	Specification
<b>Propel Motor—27C ZTS</b>		
Piston to Shoe	Clearance	0.4 mm (0.0157 in.) or less

10. Subtract piston diameter from cylinder block bore diameter to check for wear.

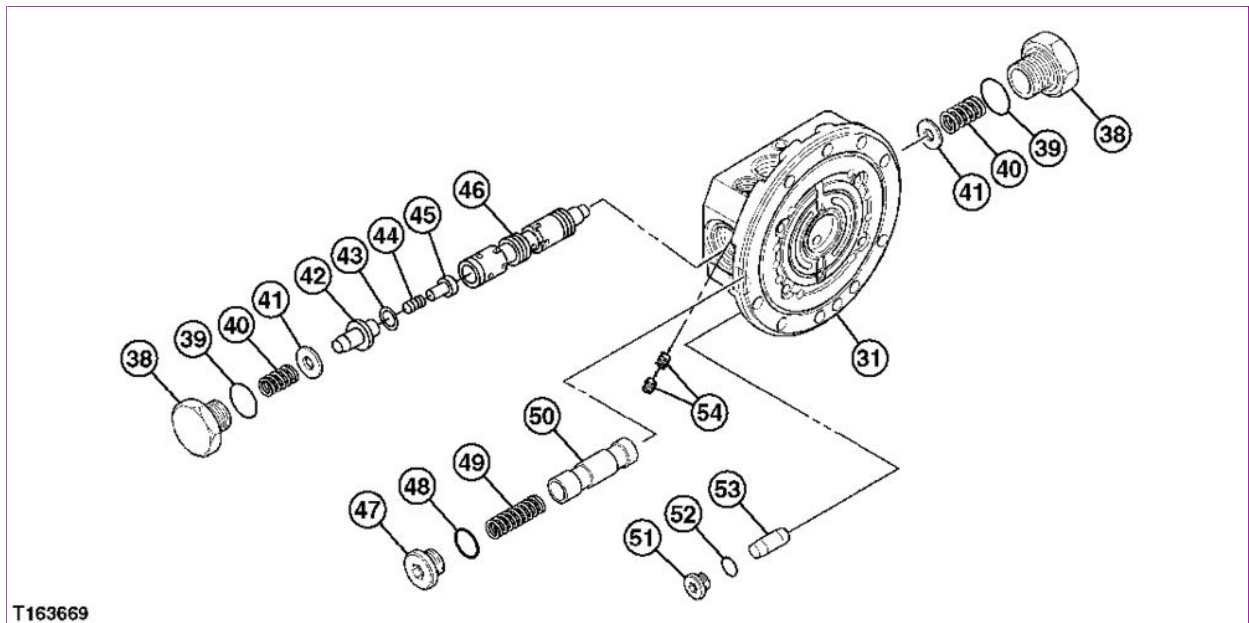
Item	Measurement	Specification
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**Propel Motor—27C ZTS**

Piston to Cylinder Block Bore

Clearance

0.04 mm (0.00157 in.) or less



11. **T163669**  
T163669-UN: Brake Valve Housing Exploded View—27C ZTS

**LEGEND:**

- 31 - Brake Valve Housing
- 38 - Plug (2 used)
- 39 - O-Ring (2 used)
- 40 - Spring (2 used)
- 41 - Washer (2 used)
- 42 - Guide (2 used)
- 43 - O-Ring (2 used)
- 44 - Spring (2 used)
- 45 - Check Valve (2 used)
- 46 - Counterbalance Valve Spool
- 47 - Plug (2 used)
- 48 - O-Ring (2 used)
- 49 - Spring
- 50 - Propel Speed Change Valve Spool
- 51 - Plug (2 used)
- 52 - O-Ring (2 used)
- 53 - Shuttle Valve Spool
- 54 - Counterbalance Valve Orifice (4 used)

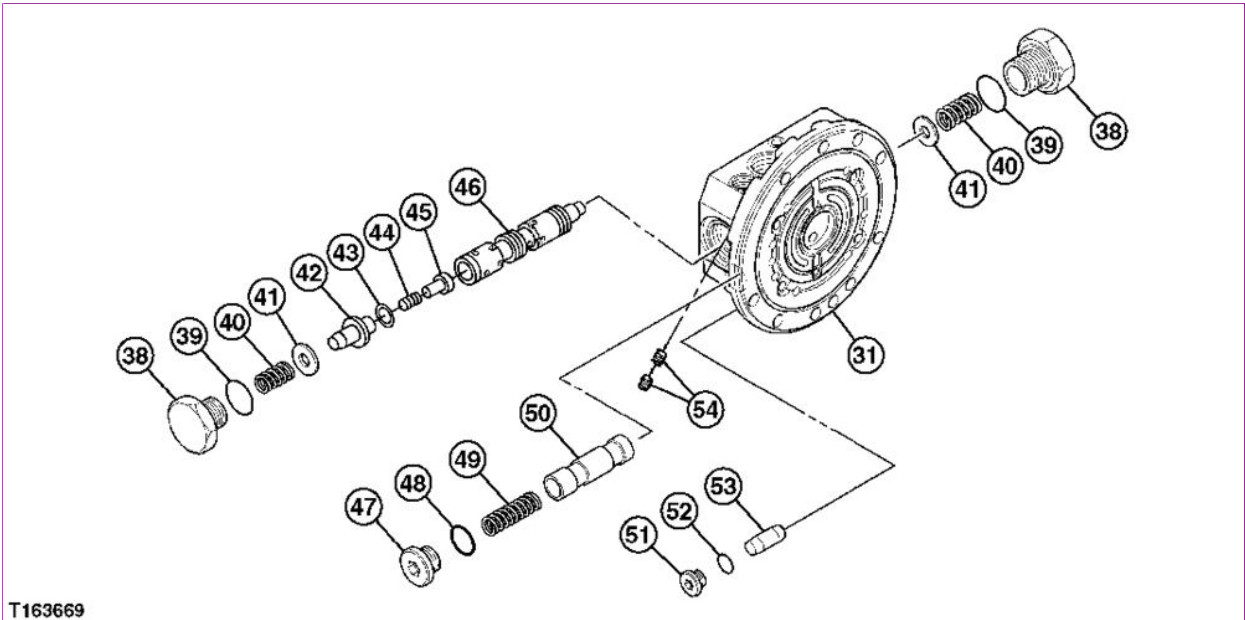
Brake valve housing (31) is serviced as an assembly except the O-rings (39, 43, 48, and 52) and springs (8 and 9). Disassemble for inspection and cleaning only.

12. Apply clean hydraulic oil to all machined surfaces after cleaning.

**Assemble Propel Motor**

1. [See Propel Motor and Brake Valve Housing Operation](#) for a cross-section of Propel Motor and Brake Valve Housing—27C ZTS. (Group 9025-05.)

[See Propel Gearbox Disassemble and Assemble—27C ZTS](#) for gearbox assembly. (Group 0250.)



2. **T163669**  
 T163669-UN: Brake Valve Housing Exploded View—27C ZTS

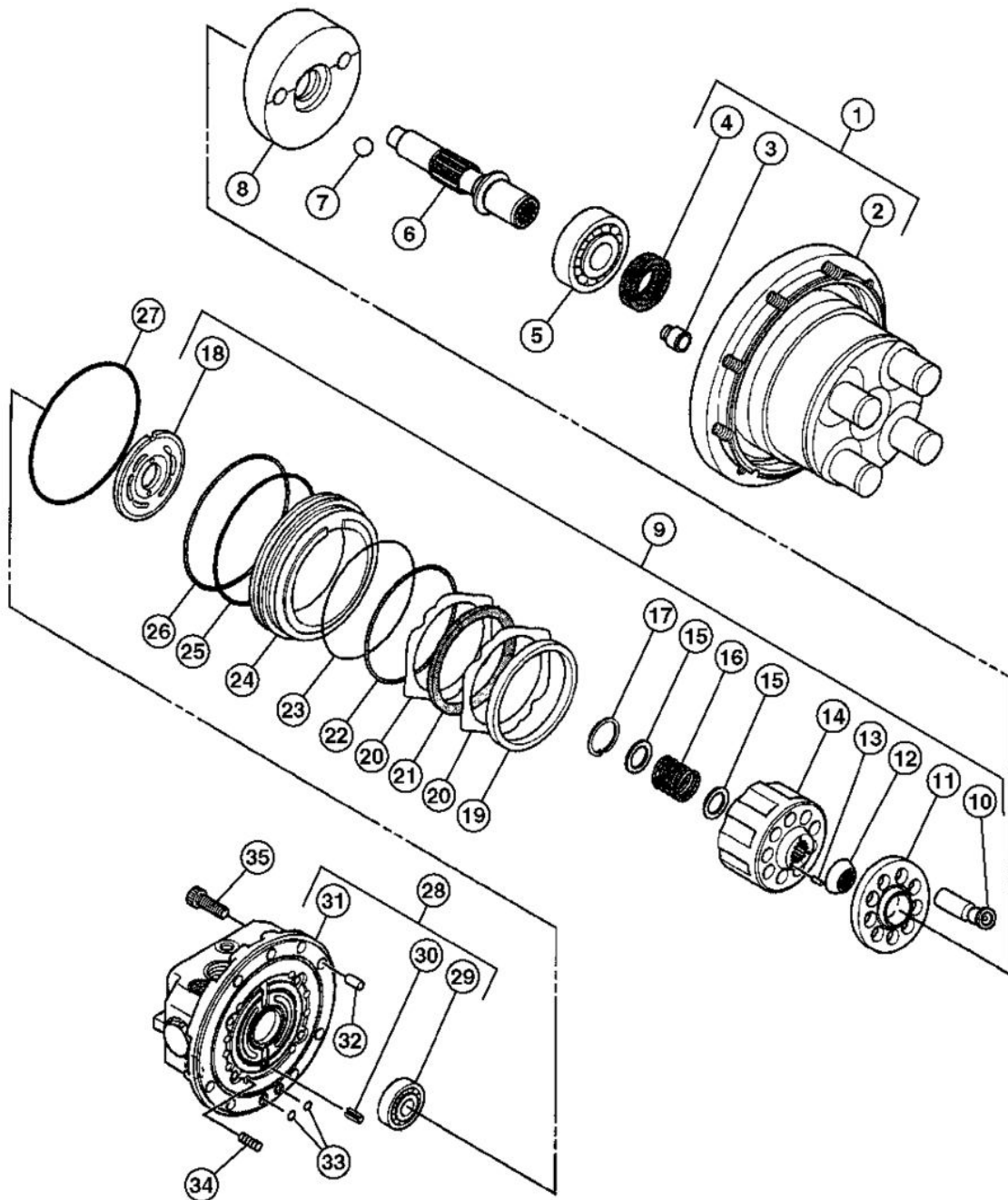
**LEGEND:**

- 31 - Brake Valve Housing
- 38 - Plug (2 used)
- 39 - O-Ring (2 used)
- 40 - Spring (2 used)
- 41 - Washer (2 used)
- 42 - Guide (2 used)
- 43 - O-Ring (2 used)
- 44 - Spring (2 used)
- 45 - Check Valve (2 used)
- 46 - Counterbalance Valve Spool
- 47 - Plug (2 used)
- 48 - O-Ring (2 used)
- 49 - Spring
- 50 - Propel Speed Change Valve Spool
- 51 - Plug (2 used)
- 52 - O-Ring (2 used)
- 53 - Shuttle Valve Spool
- 54 - Counterbalance Valve Orifice (4 used)

Apply clean hydraulic oil to all parts before installing.

3. Tighten plugs (38, 47, and 51) to specification.

Item	Measurement	Specification
<b>Propel Motor—27C ZTS</b>		
Shuttle Valve-to-Housing Plug	Torque	11.8—21.5 N·m (104—190 lb-in.)
Speed Change Valve-to-Housing Plug	Torque	46—51 N·m (34—38 lb-ft)
Counterbalance Valve-to-Housing Plug	Torque	167—196 N·m (123—145 lb-ft)



4. **T163627**  
 T163627-UN: Propeller Motor Exploded View—27C ZTS

LEGEND:

- 1 - Housing Kit
- 2 - Propeller Motor Housing and Second Planet Carrier
- 3 - Control Piston
- 4 - Oil Seal
- 5 - Ball Bearing
- 6 - Drive Shaft
- 7 - Pivot Ball (2 used)
- 8 - Swash Plate
- 9 - Rotary Group Kit
- 10 - Piston and Shoe (9 used)
- 11 - Retainer (Holder)
- 12 - Ball Guide (Holder)
- 13 - Pin (3 used)
- 14 - Cylinder Block
- 15 - Retainer (2 used)
- 16 - Spring
- 17 - Snap Ring
- 18 - Valve Plate
- 19 - Spacer
- 20 - Plate (2 used)
- 21 - Disk
- 22 - Backup Ring
- 23 - Backup Ring
- 24 - Backup Ring
- 25 - Backup Ring
- 26 - Backup Ring
- 27 - Backup Ring
- 28 - Housing Kit
- 29 - Housing Kit
- 30 - Housing Kit
- 31 - Housing Kit
- 32 - Housing Kit
- 33 - Housing Kit
- 34 - Housing Kit
- 35 - Housing Kit

- 23 - O-Ring
- 24 - Park Brake Piston
- 25 - O-Ring
- 26 - Backup Ring
- 27 - O-Ring
- 28 - Brake Valve Housing Kit
- 29 - Ball Bearing
- 30 - Spring Pin
- 31 - Brake Valve Housing
- 32 - Dowel Pin
- 33 - O-Ring (2 used)
- 34 - Park Brake Spring (8 used)
- 35 - Cap Screw (7 used)

Install oil seal (4) so the sealing lip (spring side) is towards ball bearing (5). Push to the bottom of bore.

Apply petroleum jelly to lip of oil seal

5. Apply clean hydraulic oil to components before installing.

As needed, apply petroleum jelly to help hold components in place.

6. Install a new ball bearing tight against shoulder on drive shaft (6).

Install shaft into housing so bearing is to the bottom of bore.

7. Install control piston (3) so large diameter end is to the bottom of piston bore.

8. Install swash plate (8) making sure the pivot balls (7) are seated in the holes in housing and swash plate.

9. Assemble the rotary group (10—17).

10. Hold the propel motor housing (2) in a horizontal position. Carefully install the rotary group aligning the splines in ball guide (12) and cylinder block (14) with the splines on drive shaft.

**NOTE:**

*The valve plate (18) is installed on the brake valve housing.*

11. Install spacer (19).

Starting with a plate (20), alternately install two plates and one disk (21).

12. Install O-rings (23 and 25) and backup rings (22 and 26) into grooves of park brake piston (24) making sure the backup rings are to outer edges.

13. Push park brake piston into housing against the plate.

14. Add approximately 0.2 L (0.2 qt) of hydraulic oil to housing.

15. Push the new ball bearing (29) to bottom of bore in brake valve housing (31).

16. Install valve plate (18), springs (34) and O-rings (27 and 33) to brake valve housing. Use petroleum jelly to hold parts in place while installing brake valve housing.

17. Install brake valve housing (2) being careful that the valve plate does not drop off.

18. Measure the distance between the two housings and compare to measurement made at disassembly. If not the same, disassemble and check for correct assembly.

19. Tighten cap screws (35) in steps to pull housing down evenly against the springs. Tighten cap screws to specification in a diagonal pattern.

Item	Measurement	Specification
<b>Propel Motor—27C ZTS</b>		
Brake Valve Housing-to-Housing Cap Screw	Torque	51—65 N·m (38—48 lb-ft)

20. [See Propel Gearbox Remove and Install—27C ZTS and 35C ZTS](#) for gearbox and motor installation. (Group 0250.)

# TM2053 - 27C ZTS and 35C ZTS Excavator Repair Propel Motor Disassemble and Assemble—35C ZTS

## Propel Motor Disassemble and Assemble—35C ZTS

### Disassemble Propel Motor

1.



**CAUTION:**

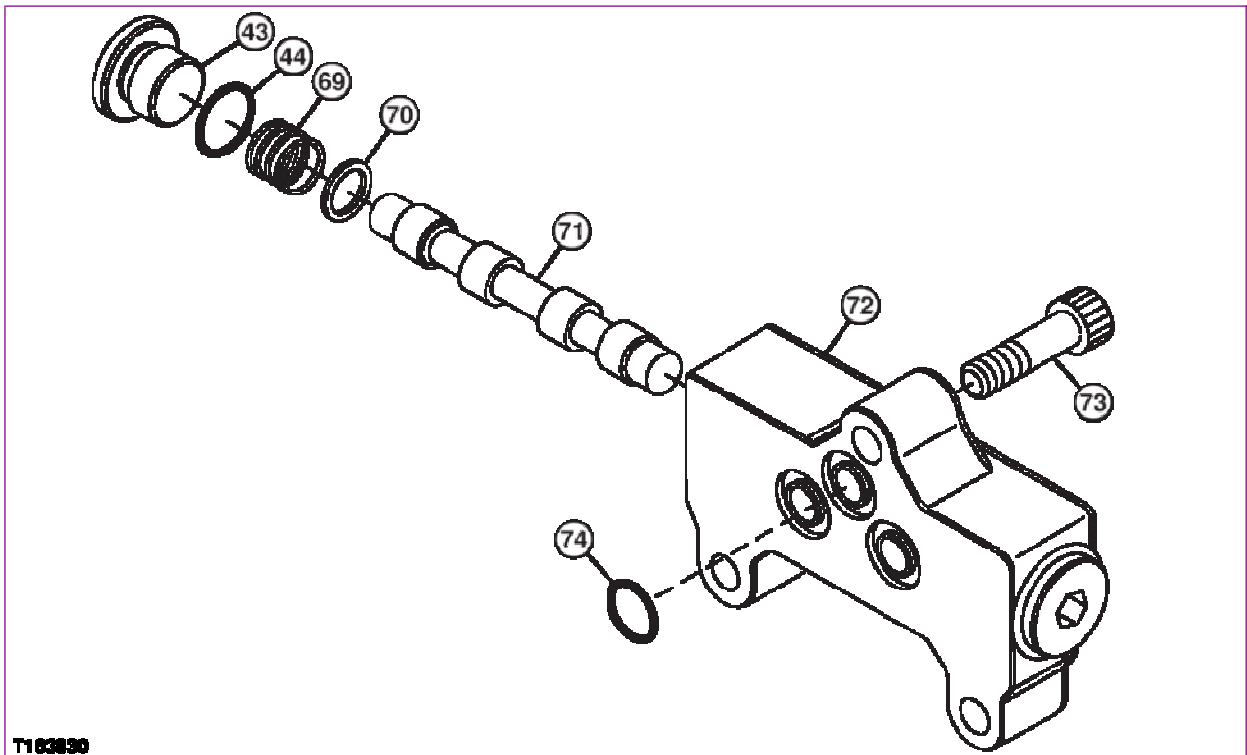
*Heavy component; use a hoist.*

Item	Measurement	Specification
Propel Motor—35C ZTS		
Propel Gearbox and Motor	Weight	44 kg (97 lb) approximate

See [Propel Gearbox Remove and Install—27C ZTS and 35C ZTS](#) for gearbox and motor removal. (Group 0250.)

See [Propel Gearbox Disassemble and Assemble—35C ZTS](#) for gearbox disassembly. (Group 0250.)

See [Propel Motor and Brake Valve Housing Operation](#) for a cross-section of Propel Motor and Brake Valve Housing—35C ZTS. (Group 9025-05.)



2. **T163830**

T163830-UN: Propel Motor Flow Control Valve—35C ZTS

#### LEGEND:

- 43 - Plug (2 used)
- 44 - O-Ring (2 used)
- 69 - Spring (2 used)
- 70 - Spring Seat (2 used)
- 71 - Flow Control Valve Spool
- 72 - Housing
- 73 - Cap Screw (3 used)
- 74 - O-Ring (3 used)

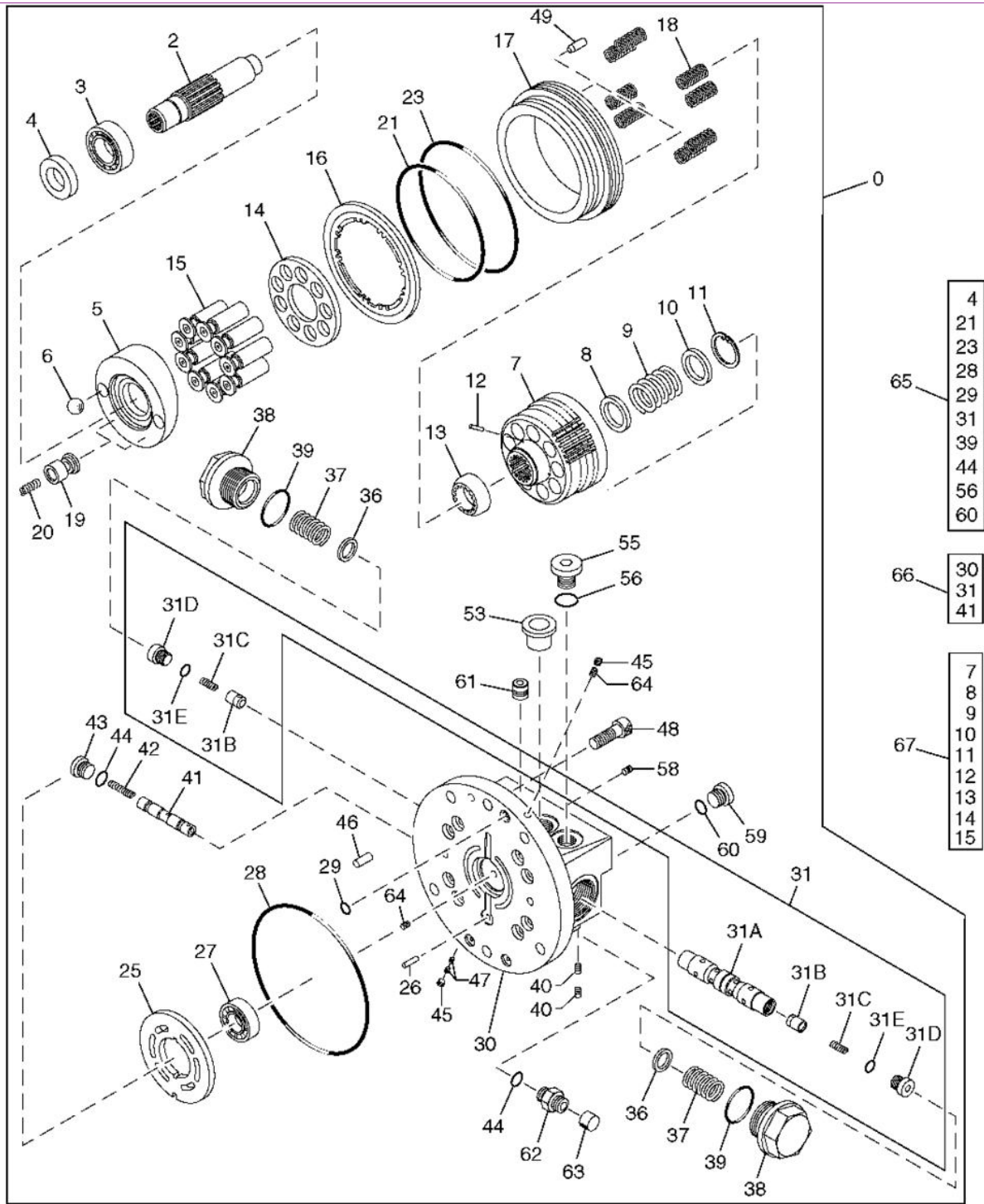
Check the flow control valve spool (71) moves freely in housing bore.

3.



**CAUTION:**

*Brake valve housing contains springs under load. Prevent injury from sudden release by loosening cap screws evenly.*



T156461

T156461-UN: Propeller Motor And Park Brake Exploded View—35C ZTS

**LEGEND:**

- 0 - Propeller Motor and Brake Valve Housing
- 1 - Plug
- 2 - Drive Shaft
- 3 - Ball Bearing
- 4 - Oil Seal
- 5 - Swash Plate
- 6 - Pivot Ball (2 used)
- 7 - Cylinder Block
- 8 - Washer
- 9 - Spring
- 10 - Washer
- 11 - Snap Ring
- 12 - Pin (3 used)
- 13 - Ball Guide (Holder)
- 14 - Retainer (Plate)
- 15 - Piston and Shoe (9 used)
- 16 - Park Brake Disk
- 17 - Park Brake Piston
- 18 - Park Brake Spring (8 used)
- 19 - Control Piston (2 used)
- 20 - Spring (2 used)
- 21 - O-Ring



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- 23 - O-Ring
- 25 - Valve Plate
- 26 - Dowel Pin
- 27 - Ball Bearing
- 28 - O-Ring
- 29 - Packing (4 used)
- 30 - Brake Valve Housing
- 31 - Counterbalance Valve
- 31A - Counterbalance Valve Spool
- 31B - Check Valve (2 used)
- 31C - Spring (2 used)
- 31D - Plug (2 used)
- 31E - O-Ring (2 used)
- 36 - Spring Seat (2 used)
- 37 - Spring (2 used)
- 38 - Plug (2 used)
- 39 - O-Ring (2 used)
- 40 - Orifice (4 used)
- 41 - Propel Speed Change Valve Spool
- 42 - Spring
- 43 - Pipe Plug
- 44 - O-Ring (2 used)
- 45 - Pipe Plug (3 used)
- 46 - Dowel Pin (2 used)
- 47 - Orifice (4 used)
- 48 - Cap Screw (6 used)
- 49 - Dowel Pin (2 used)
- 53 - Plug (2 used)
- 55 - Plug (2 used)
- 56 - Packing (2 used)
- 58 - Plug (2 used)
- 59 - Plug (2 used)
- 60 - O-Ring (2 used)
- 61 - Plug
- 63 - Cap
- 64 - Orifice (2 used)
- 65 - Seal Kit
- 66 - Brake Valve Housing Kit
- 67 - Cylinder Block Kit

Loosen cap screws (48) evenly to release force of park brake springs (18).

4. Before removing the brake valve housing (30), measure and record the distance between it and motor housings as a reference for assembly.

5. **IMPORTANT:**

**Valve plate can stick to the brake valve housing. Dropping the valve plate can damage the highly machined surfaces. Use care when removing the brake valve housing.**

Remove brake valve housing being careful not to drop the valve plate (14).

Protect machined surfaces of valve plate from damage.

6. Remove ball bearings (3 and 27) from drive shaft (2) and brake valve housing only if replacement is necessary. Bearings are press fit. New bearings should be installed if removed.



7. T163857-UN: Park Brake Piston Oil Passage

**LEGEND:**

- 17 - Park Brake Piston
- 28 - O-Ring
- 29 - Oil Passage
- 68 - Park Brake Oil Passage

Before removing park brake piston (17), take notice of its position with respect to motor housing. Piston must be installed so dowel pin holes and springs align with dowel pins and holes in brake valve housing.

8. Hold the housing in a horizontal position then slid the rotary group (7—15) out of housing and off the drive shaft.

- 9.



**CAUTION:**

**Cylinder block contains a springs under load. Prevent injury from sudden release by using a press to compress the spring before removing snap ring.**

Disassemble rotary group for inspection and cleaning only. Rotary group is serviced as an assembly.

Compress spring (9) using a press before removing the snap ring (11).

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