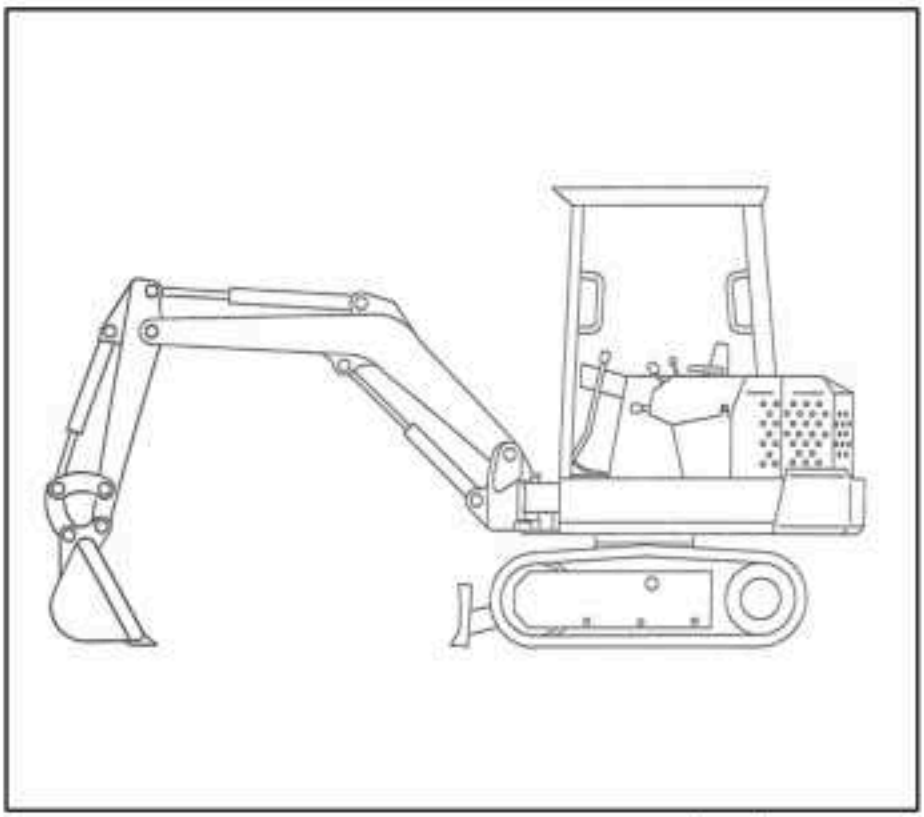
X 225

Excavator

Service Manual

(S/N 508312000 & Above)



MELROE
INGERSOLL-RAND

6720874 (1–91)

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bobcat

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TROUBLESHOOTING

The following troubleshooting chart is provided for assistance in locating and correcting problems which are most common. Many of the recommended procedures must be done by authorized Bobcat Service personnel only.

PROBLEM	CAUSE
Slow cranking speed.	1, 2, 3, 4
Engine will not start.	2, 5, 6, 7, 8, 9, 11, 12, 13, 14, 15, 16, 17, 19, 27, 28, 29
Difficult to start.	5, 7, 8, 9, 10, 11, 12, 13, 15, 16, 17, 18, 19, 20, 25, 27, 28, 29
No power from engine.	8, 9, 10, 11, 12, 13, 15, 16, 17, 21, 22, 24, 25, 26, 28, 29
Engine is mis–firing.	8, 9, 11, 12, 13, 15, 16, 17, 21, 22, 24, 25, 26, 28
Too much fuel consumption.	10, 12, 12, 13, 15, 16, 17, 19, 20, 21, 23, 24, 25, 27, 28, 29
Black exhaust.	10, 12, 12, 13, 15, 16, 17, 19, 20, 21, 23, 24, 25, 27, 28, 29
Blue/white exhaust.	4, 10, 15, 16, 17, 21, 23, 27, 29, 30, 50
Low oil pressure.	4, 31, 32, 33, 34, 35, 37, 38, 39, 52
Engine knocking.	13, 15, 16, 19, 22, 24, 25, 27, 29, 31, 40, 41, 53
Engine running rough.	7, 8, 9, 10, 11, 12, 13, 17, 18, 22, 24, 25, 26, 29, 40, 53
Vibration.	12, 13, 17, 21, 22, 25, 26, 29, 40, 42, 43
High oil pressure.	4, 33, 36
Overheating.	10, 12, 13, 15, 16, 20, 21, 40, 44, 45, 46, 47, 48, 51
Too much crankcase pressure.	22, 27, 29, 30, 40, 49
Poor compression.	10, 16, 21, 24, 25, 27, 28, 29, 30, 41, 53
Start and stop	9, 10, 11

KEY TO CORRECT THE CAUSE

1. Battery capacity low.
2. Bad electrical connections.
3. Faulty starter motor.
4. Incorrect grade of oil.
5. Low cranking speed.
6. Fuel tank empty.
7. Faulty stop control operation.
8. Plugged fuel line.
9. Plugged fuel filter.
10. Restriction in the air cleaner.
11. Air in the fuel system.
12. Faulty fuel injection pump.
13. Faulty fuel injectors.
14. Broken injection pump drive.
15. Incorrect injection pump timing.
16. Incorrect valve timing.
17. Poor compression.
18. Plugged fuel tank vent.
19. Incorrect grade of fuel.
20. Exhaust pipe restriction.
21. Cylinder head gasket leaking.
22. Overheating.
23. Cold running.
24. Incorrect tappet adjustment.
25. Sticking valves.
26. Incorrect high pressure fuel lines.
27. Worn cylinder bores.
28. Worn valves and seat.
29. Broken or worn piston rings.
30. Worn valve stems or guides.
31. Worn or damaged bearings.
32. Not enough oil in the oil pan.
33. Switch is defective.
34. Oil pump worn.
35. Relief valve is stuck open.
36. Relief valve is stuck closed.
37. Broken relief valve spring.
38. Faulty suction pipe.
39. Plugged oil filter.
40. Piston seizure.
41. Incorrect piston height.
42. Faulty engine mounting.
43. Incorrect alignment of flywheel.
44. Faulty thermostat.
45. Restriction in water jacket.
46. Loose alternator belt.
47. Plugged radiator.
48. Plugged breather pipe.
49. Plugged breather pipe.
50. Damaged valve stem oil deflectors.
51. Coolant level too low.
52. Plugged oil pump pipe strainer.
53. Broken valve spring.

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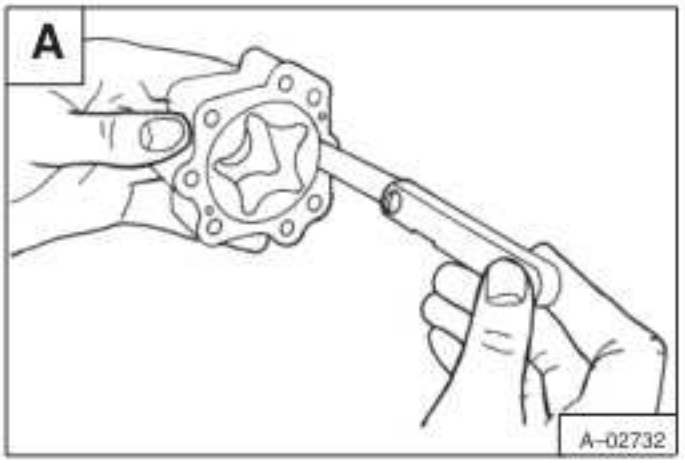
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Oil Pump Service (Cont'd)

Check the clearance between the outer rotor and the body of the oil pump **[A]**.

The clearance for the outer rotor is 0.004"–0.008" (0,10–0,20 mm).

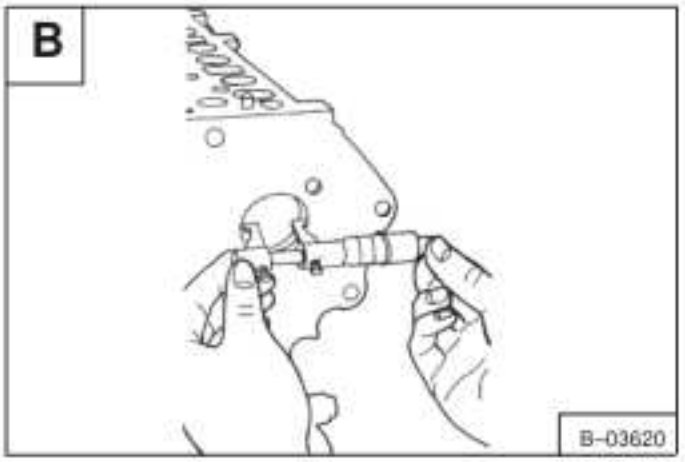
At rated engine speed, the normal oil pressure is 43–64 PSI (196–441 kPa) it must not be lower than 36 PSI (248 kPa).



Servicing the Camshaft

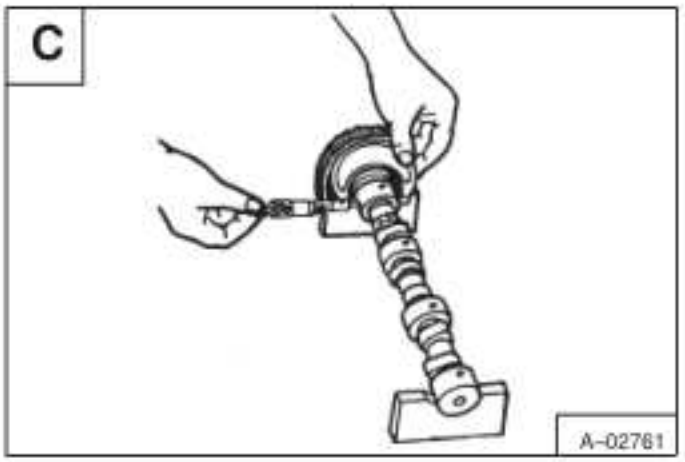
Measure the camshaft bearing in the engine block **[B]**.

The specification is 1.5748"–1.5758" (39–40 mm). The wear limit is 0.002"–0.0036" (0,051–0,091 mm).



Measure the camshaft journal **[C]**.

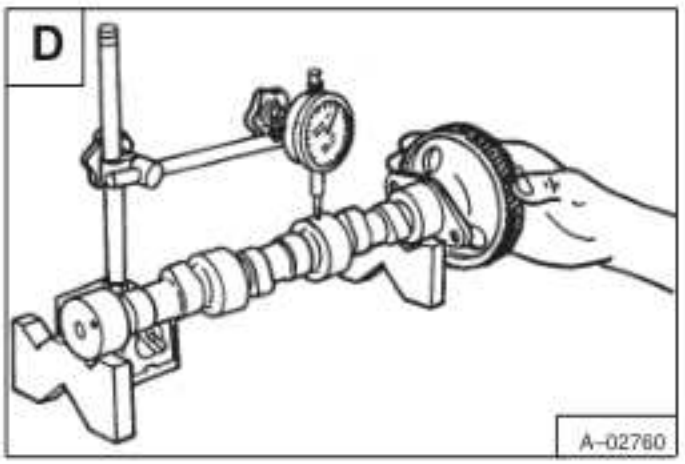
The specification is 1.5722"–1.5728" (39,93–39,94 mm). If the measurements are not within limits, replace the parts as needed.



Put the camshaft in V–blocks. Install a dial indicator on the journals **[D]**.

Turn the camshaft slowly. The wear limit is 0.002" (0,05 mm).

If the camshaft measurements are not within the specifications, replace the part as needed.



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225–1
Revision Number
29 April 1992
Date

SERVICE MANUAL REVISION

ROUTE TO ATTENTION	
PARTS MANAGER	☐
SERVICE MANAGER	☒
SALES MANAGER	☐

AFFECTING:

Product BOBCAT EXCAVATOR

Model 225 (S/N 12001 & Above)

Manual No. 6720874 (1–91)

NOTICE **Insert This Sheet With The Appropriate Manual For Future Reference.**

The attached pages are a revision to the 225 (12000) Service Manual (P/N 6720874).

Please take out and put in the pages shown below:

TAKE OUT	PUT IN
Section 2 – Content Page	Section 2 – Content Page (Revised Apr. 92)
225 EXCAVATOR HYD. SCHEMATIC (NORDIC) (S/N 12000 & Above)	225 EXCAVATOR HYD. SCHEMATIC (NORDIC) P/N 6722177 (Added April 1992)
	HYDRAULIC SYSTEM OPERATION Chart Legend P/N 6722177 (Added April 1992)
2–13, 2–14	2–13 (Revised Apr. 92), 2–14 (Revised Apr. 92)
Section 4 – Content Page 4–3, 4–4 4–5	Section 4 – Content Page (Revised Apr. 92) 4–3 (Revised Apr. 92), 4–4 (Revised Apr. 92) 4–5 (Revised Apr. 92), 4–6 (Added Apr. 92) 4–7 (Added Apr. 92), 4–8 (Added Apr. 92) 4–9 (Added Apr. 92), 4–10 (Added Apr. 92) 4–11 (Added Apr. 92), 4–12 (Added Apr. 92) 4–13 (Added Apr. 92)
Section 5 – Content Page 5–1, 5–2 5–3, 5–4 5–13, 5–14	Section 5 – Content Page (Revised Apr. 92) , 5–1, 5–2 (Revised Apr. 92) 5–3 (Revised Apr. 92), 5–4 5–13, 5–14 (Revised Apr. 92) 5–15 (Added Apr. 92)
Section 6 – Content Page	Section 6 – Content Page (Revised Apr. 92)
WIRING DIAGRAM (P/N 6720677)	WIRING DIAGRAM #6722143 (STANDARD) WIRING DIAGRAM #6722176 (NORDIC OPTION)
	6–9 (Added Apr. 92), 6–10 (Added Apr. 92) 6–11 (Added Apr. 92), 6–12 (Added Apr. 92) 6–13 (Added Apr. 92), 6–14 (Added Apr. 92)
Section 7 – Content Page 7–11, 7–12 7–13, 7–14	Section 7 – Content Page 7–11, 7–12 (Revised Apr. 92) 7–13 (Revised Apr. 92), 7–14

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HYDRAULIC SYSTEM OPERATION

To Be Used With

HYDRAULIC FLOW CHART

For Model

225 EXCAVATOR (S/N 12000 & Above) (NORDIC)

Chart # 6722177 (Printed April 1992)

CHART LEGEND

1. HYDRAULIC RESERVOIR . . . 10.5 Gals. (40L) (Tank Capcity)
2. RESERVOIR FILL NECK SCREEN . . . (25 Mesh)
3. HYDRAULIC RESERVOIR CAP . . vented .75 PSI Intake/1.50 PSI Exhaust
4. SUPPLY MANIFOLD
5. HYDRAULIC FILTER ELEMENT 10 Micron
6. FILTER BY-PASS . . . . . 25 PSI (172 kPa)
7. HYDRAULIC PUMP . Triple Section-Gear Pump: 3 x 7.14 GPM (27 L/min.), 2350 PSI (16201 kPa) @2500 RPM
8. SWING MOTOR
9. SWING MOTOR BRAKE PISTON
10. SWING MOTOR BRAKE SOLENOID
11. SWING MOTOR RELIEF VALVE 1650 PSI (11379 kPa)
12. HYDRAULIC CONTROL VALVE 3 Section-Boom Swing and Blade Cylinders and Swing Motor
13. MAIN RELIEF VALVE (Three Spool Control Valve) . 2350 PSI (16201 kPa)
14. LOAD CHECK VALVE (Blade Cylinder)
15. LOAD CHECK VALVE (Boom Swing Cyl.)
16. BUILD-UP VALVE . . 200 PSI (1379 kPa)
17. RESTRICTOR . . . . . .065" (1.62 mm)
18. BOOM SWING CYLINDER
19. SHUTTLE VALVE
20. PRESSURE REDUCING VALVE 363 PSI (2500 kPa)
21. ACCUMULATOR RELIEF VALVE
22. PRESSURE REDUCING VALVE BLOCK
23. ACCUMULATOR
24. CONSOLE LOCKOUT VALVE
25. L.H. JOYSTICK CONTROL
26. R.H. JOYSTICK CONTROL (With Horn Switch)
27. BUCKET CYLINDER
28. FRONT AUXILIARY HYDRAULICS
29. ARM CYLINDER
30. BOOM CYLINDER
31. DROP VALVE
32. ONE WAY RESTRICTOR . . .081" (2.06)
33. DROP VALVE RELIEF VALVE . 3150 PSI (21724 kPa)
34. AUXILIARY RETURN TO TANK
35. HYDRAULIC CONTROL VALVE 6 Section - R.H. Travel, Boom, Bucket Auxiliary, Arm and L.H. Travel
36. MAIN RELIEF VALVE (P1 Port) (6-spool Valve . . . . . 2350 PSI (16201 kPa)
37. MAIN RELIEF VALVE (P2 Port) (6-spool Valve . . . . . 2350 PSI (16201 kPa)
38. PORT RELIEF VALVE . . (Boom Cylinder) 3400 PSI (23440 kPa)
39. PORT RELIEF VALVES . (Boom Cylinder) 2950 PSI (20337 kPa)
40. PORT RELIEF VALVE . (Bucket Cylinder) 3400 PSI (23440 kPa)
41. PORT RELIEF VALVE . . (Arm Cylinder) 2950 PSI (20337 kPa)
42. PORT RELIEF VALVE . . (Arm Cylinder) 2950 PSI (20337 kPa)
43. ONE WAY RESTRICTOR .125" (3.18 mm)
44. OIL COOLER
45. PORT BLOCK
46. SWIVEL JOINT
47. RIGHT SIDE TRAVEL MOTOR
48. LEFT SIDE TRAVEL MOTOR
49. TRAVEL MOTOR BRAKE PISTON
50. CROSS OVER RELIEF VALVE . 1650 PSI (11375 kPa)
51. BLADE CYLINDER

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FLUID FLOW EXPLANATION

The fluid flows by gravity from the reservoir (1) through a manifold port block (4) to the 3 section hydraulic gear pump (7). The oil reservoir breather cap (3) is set at 1.5 PSI exhaust and .75 PSI intake and maintains a slight pressure in the reservoir (1). The 3 section gear pumps are coupler driven from the engine. Each gear pump section is protected by a relief valve located in the control valve it supplies.

Fluid from the hydraulic pump (Engine flywheel end) is forced to the 6-spool hydraulic control valve (35) P1 port (Inlet). These control valve sections control R.H. travel, Boom and Bucket.

When raising the boom, oil from the boom section of the 6-spool control valve (35) ("B" Port) passes through a drop valve (31), a one way restrictor (32) to the base end of the boom cylinder (30).

When lowering the boom, oil from the "A" port opens the relief valve (33) and retracts the cylinder (30). Oil returns through the one way restrictor (32), the relief valve (33), the control valve (35), the port block (45), the oil cooler (44), the filter (5) and to the reservoir (1).

Fluid from the center section hydraulic pump is forced to the P2 port of the 6-spool hydraulic control valve (35). These control valve sections control L.H. travel, Arm and Auxiliary. Adjustable relief valves (36) & (37) are located at each end of the 6-spool hydraulic control valve (35).

With all spools in the neutral position the open center control valve allows fluid to flow to the port block (45) and the oil cooler (44), the filter (5) and the reservoir (1). When a spool is activated, the fluid flows to the base or rod end of a cylinder (27), (29) & (30). The fluid on the other side of the cylinder flows back to the 6-spool hydraulic control valve (35). When a cylinder reaches the end of the stroke the pressure increases to 2350 PSI and opens the relief valve (36) or (37). The oil then flows internally through the 6-spool hydraulic control valve (35) and back to the port block (45), the oil cooler (44), the filter (5) and the reservoir (1).

The 6-spool hydraulic control valve has Port Relief Valves (38) & (39) in both ports of the Boom section, the Rod end (40) of the Bucket section and both ports (41) & (42) of the Arm section.

The auxiliary spool is hollow, and while in neutral, fluid flows through the center of the spool to the tank port of the valve. When the auxiliary spool is activated two pump flows are combined to supply more fluid to the auxiliary quick couplers (20) on the boom arm. The female coupler is pressure and the male coupler is return. The auxiliary fluid return flows to the reservoir (1).

For hydraulic breaker operation, remove the cap from the DIRECT TO TANK fitting (34) and move the return hose from the MALE fitting on the frame to the DIRECT TO TANK fitting (34). Install the cap on the MALE return line fitting on the frame. The foot pedal will now work one way only and the fluid will flow directly back to the reservoir (1) with no back pressure.

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