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Service Manual

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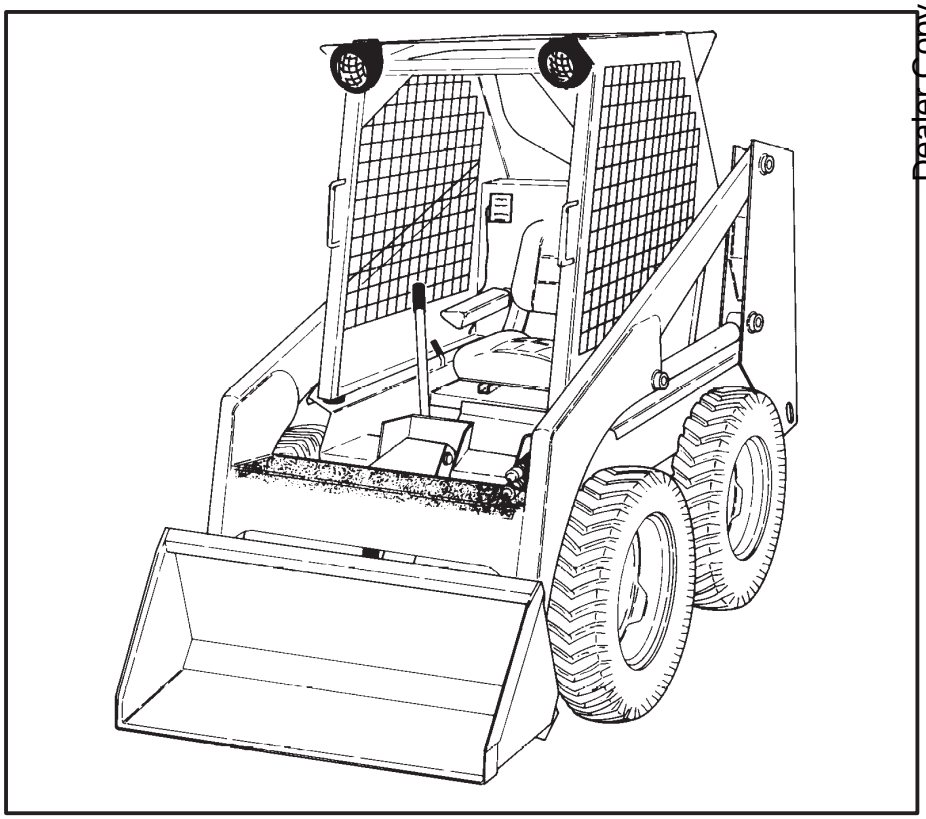


MELROE
INGERSOLL-RAND

6556583 (6-12) Printed in U.S.A.

1 PREVENTIVE MAINTENANCE

1–1 INTRODUCTION

1–1.1 Symbols

IMPORTANT

This notice identifies important procedures which must be followed to prevent damage to the loader.

⚠ WARNING

This safety alert symbol indicates important safety messages in this manual. Be alert to the possibility of personal injury and carefully read the message that follows this symbol.

1–1.2 Serial Number Identification

It is important to make correct reference to the serial number of the loader when making repairs or ordering parts. It is possible that the present machines do not use all the same parts as earlier machines; or it is possible that dif ferent procedures are used for service or repair.

1–1.3 Loader Serial Number

The loader serial number plate location is on the inside of the left upright, above the grill (Fig. 1–1).

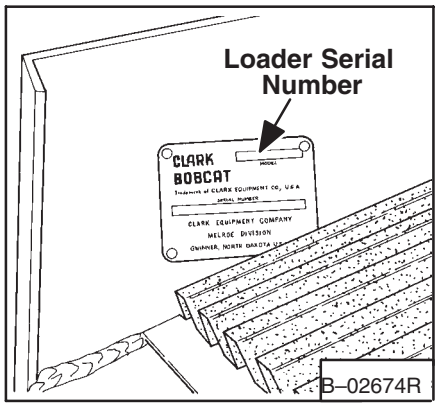


Fig. 1–1 Loader Serial Number

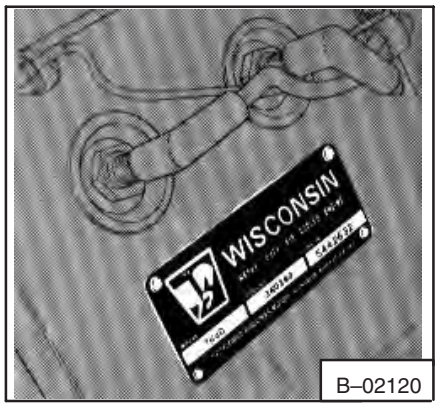


Fig. 1–2 Engine Serial Number (730)

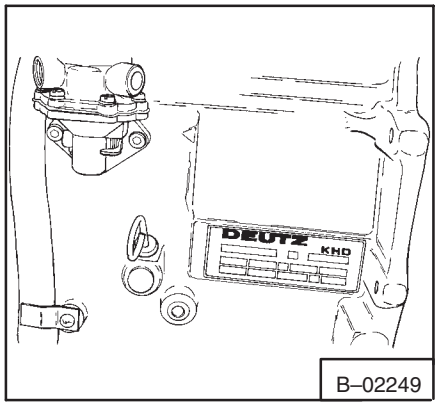
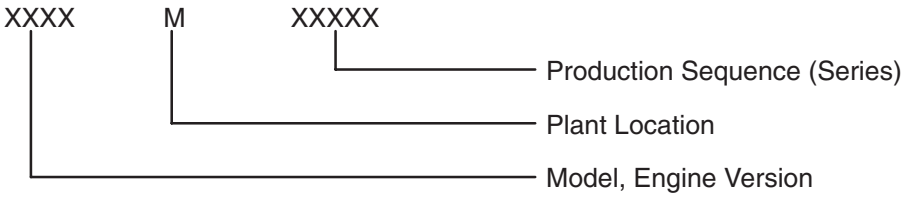


Fig. 1–3 Engine Serial Number (731)

Explanation of serial number:



1–1.4 Engine Serial Number

730 Wisconsin: (Fig. 1–2) The engine serial number location is on the engine shroud on the left side of engine. Use all numbers when ordering parts for this engine.

731 Deutz: (Fig. 1–3) The engine serial number location is on the right side of cylinder block. Use all numbers when ordering parts for this engine.

732 Ford: (Fig. 1–4) The engine serial number location is on the right side of the valve cover. Use all numbers when ordering parts for this engine.

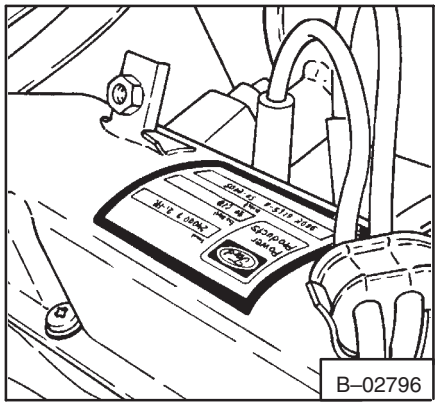


Fig. 1–4 Engine Serial Number (732)

Installing New Battery

1. Remove battery cables.
2. Mark cables for correct installation on new battery.
3. Thoroughly clean new battery connectors and ends of cable.
4. Put new battery in same position as old one was in. Fasten battery in place.
5. Be sure cable ends do not touch anything except battery connectors.
6. Tighten cables.

NOTE: Connect ground cable (–) last to avoid sparks.

1–3.7 Ignition System (730 & 732)

The basic items of the ignition system are coil, distributor and spark plugs.

Every 200 hours, check condition of points and make replacement of spark plugs.

Making Adjustment of Spark Plug Gap

1. Remove wires from spark plugs.
2. Remove spark plugs.
3. Remove carbon deposits from spark point.
4. Set spark plug gap. See Section 8 for correct gap.
5. Install spark plugs and wires.

Making Adjustment of Point Gap

1. Turn engine until rubbing block is on high point of cam.
2. Put correct thickness feeler gauge (See Section 8–Technical Data) between contact points.
3. Loosen adjustment screw. Move breaker arm contact until correct gap is given. Tighten screws again.

1–4 HYDRAULIC FLUID AND FILTER

Fluid

Check level of hydraulic fluid every 50 hours (Fig. 1–22).

1. Lower the lift arms and tilt the Bob–Tach backwards. Stop the engine.
2. Turn lower check valve counterclockwise.
3. If hydraulic fluid comes from valve, fluid level is satisfactory.
4. If fluid does not come from valve, turn lower valve clockwise until tight. Turn upper valve counterclockwise and fill reservoir (See below for oil specifications. DO NOT OVERFILL.) until fluid comes from upper valve. Turn valve clockwise until tight.

Use only SAE 10W–30 or 10W–40 oil which has an API classification of SE.

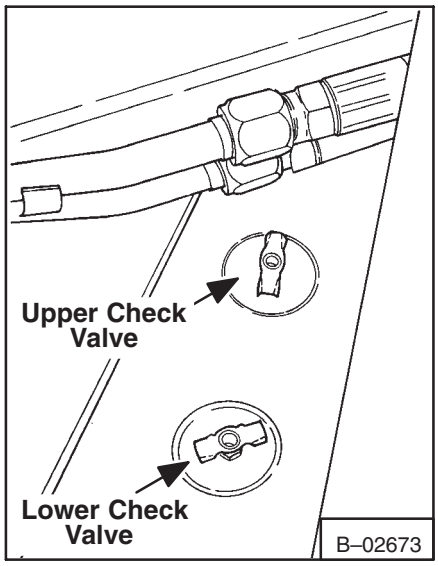


Fig. 1–22 Checking Hydraulic Fluid

IMPORTANT **DO NOT USE AUTOMATIC TRANSMISSION FLUID!**

HYDROSTATIC FLOW CHART

Forward Position (Closed Center System)

730, 731, 732

3. Remove the front panel.

4. Clean the control valve area. Always use caps and plugs in the ports and tubelines.

5. Remove the hose from the control valve which goes to the port block.

6. Remove the hose which goes from the control valve to the hydraulic pump.

7. Remove all the tubelines from the control valve (Fig. 2–6).

8. Remove the hydraulic pedal linkages at the control valve (Fig. 2–7, Item 1 & 2).

9. Remove the three bolts on the outside of the fender (Fig. 2–8).

10. Remove the control valve from the loader (Fig. 2–9).

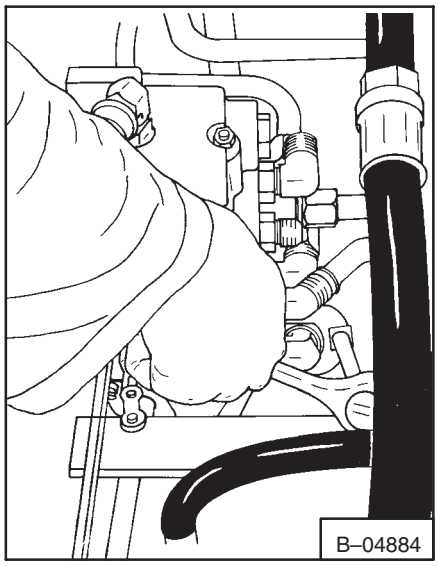


Fig. 2–6 Removing Hoses and Tubelines

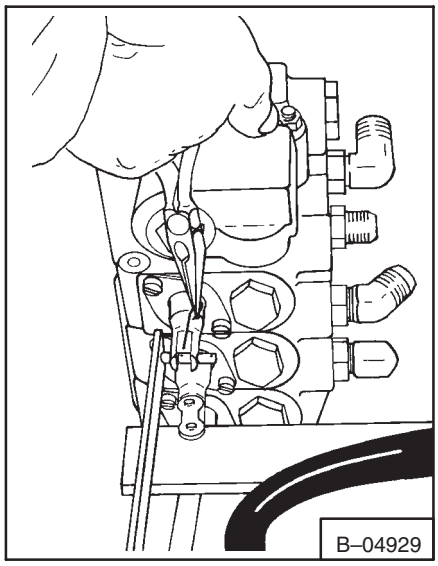


Fig. 2–7 Removing Linkage

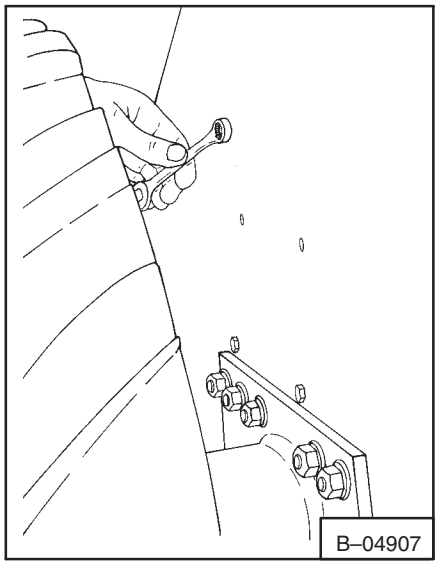


Fig. 2–8 Removing Control Valve Bolts

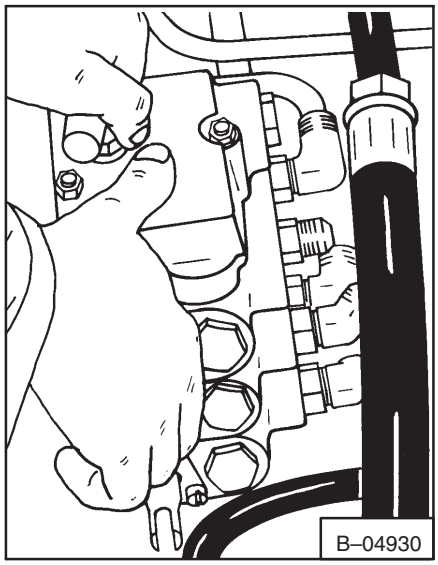


Fig. 2–9 Removing Control Valve

2–3.3 Disassembly of the Control Valve

The tools listed will be needed to do the following procedure:

MEL–1074 O–ring Seal Hook

⚠ WARNING

When making repairs on the hydraulic control valve, keep all parts clean and remove all the dirt from the control valve. Use caps and plugs to keep dirt out of the tubelines or ports.

1. Mark each section of the control valve for identification so it will be assembled correctly.

2. Remove the bolts that hold the control valve sections together (Fig. 2–10).

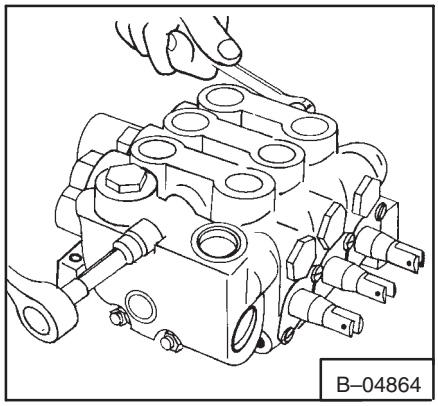


Fig. 2–10 Removing Bolts

2–4 HYDRAULIC PUMP

2–4.1 Checking Output of the Hydraulic Pump

⚠ WARNING

Loader can fall and cause injury during some service and repair. Put jackstands under both front axles and both rear corners of frame.

IMPORTANT

Do not turn flow control valve (on tester) all the way off. When tester is connected this way, there is no relief valve in the system.

This test will determine the acceptable flow of the hydraulic pump. A hydraulic tester is required that will measure flow, temperature and pressure.

NOTE: Be sure that all air is removed from the system before beginning the test. Air in the system can give an inaccurate test.

1. Remove the operator cab. Remove the hose between the outlet of the hydraulic pump and the inlet of the hydraulic control valve (Fig. 2–66).
2. Connect the inlet of the tester to the outlet of the hydraulic pump (Fig. 2–67).
3. Connect the outlet of the tester to the inlet of the hydraulic control valve.

NOTE: Be sure that the restrictor valve on the tester is fully open.

4. Start the engine and run at low throttle. Be sure that the tester is connected correctly. If no flow is indicated on the tester, the hoses may be connected backwards.
5. Increase the engine RPM to full throttle.*
6. Warm the hydraulic fluid to 140°F (60°C) by turning the restrictor knob on the tester to about 1000 PSI (6895 kPa). Do not exceed the system relief pressure.*
7. Open the restrictor on the tester and record the free flow (GPM) at full throttle. *
8. Disconnect any attachment from the auxiliary quick couplers and operate the auxiliary control lever. Record the high pressure (PSI) and the flow (GPM) at full throttle.*
9. The high pressure flow must be at least 80% of free flow.

$$\% = \frac{\text{HIGH PRESSURE FLOW (GPM)}}{\text{(FREE FLOW (GPM)}}$$

10. A low percentage may indicate a failed hydraulic pump, or it may be caused by air in the system. Be sure that all air is removed from the system.

* Refer to the T echnical Service Guide or Service Manual for system relief pressure and full throttle RPM specifications for the model Bobcat being tested. The system relief pressure must be per specification before test if run.

11. Remove the tester hoses.
12. Connect the hose which goes from the outlet of the hydraulic pump to the inlet of the hydraulic control valve.

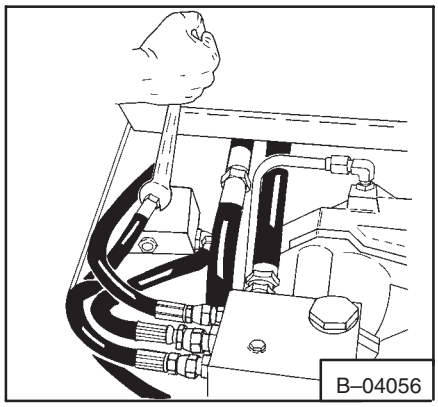


Fig. 2–66 Removing Hydraulic Valve Inlet Hose

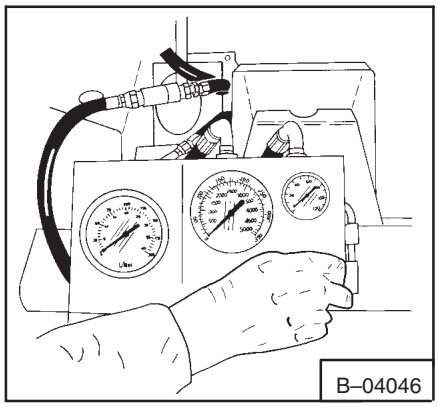


Fig. 2–67 Testing Pump Output

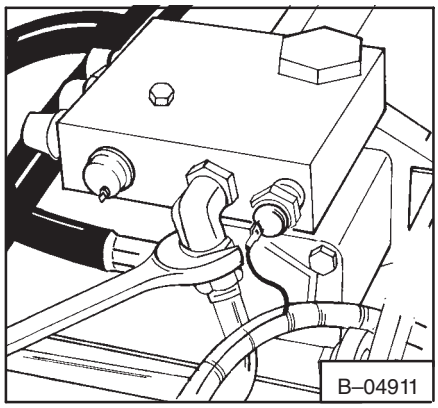


Fig. 2–68 Removing Tubeline

6. Install the bolt and locknut in the pin in the base end of the cylinder (Fig. 2–122).

7. Close the rear door.

8. Start the engine, operate thelift arms, stop the engine and check for leaks.

9. Check the hydraulic/ hydrostatic reservoir. Add fluid as needed.

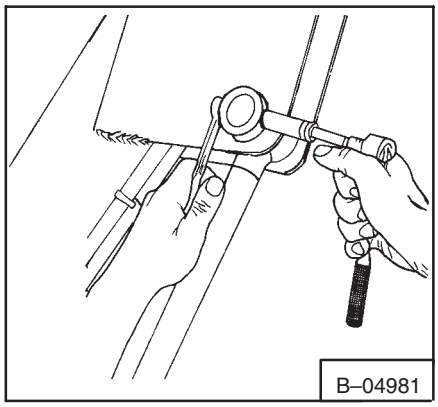


Fig. 2–121 Installing Bolt and Locknut

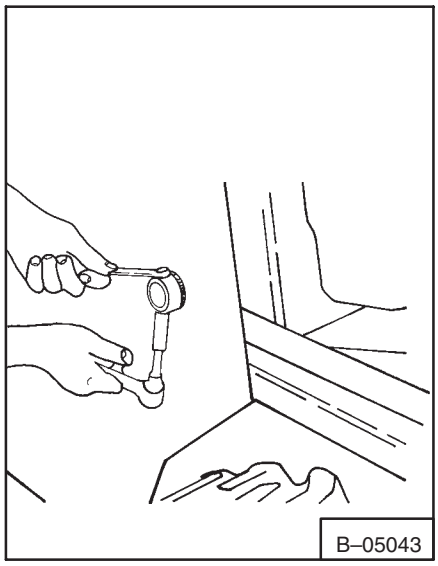


Fig. 2–122 Installing Bolt and Locknut

2–6 TILT CYLINDER

2–6.1 Checking the Tilt Cylinder

1. Remove the bucket, roll Bob–T ach fully backward and stop the engine. Activate the hydraulic controls to release the hydraulic pressure.

⚠ WARNING

Loader can fall and cause injury during some service and repair. Put jackstands under both front axles and both rear corners of frame.

2. Disconnect the hose that goes to the base end of the tilt cylinder (Fig. 2–123) and plug the hose.

3. Start the engine. Push the bottom (heel) of the tilt pedal.

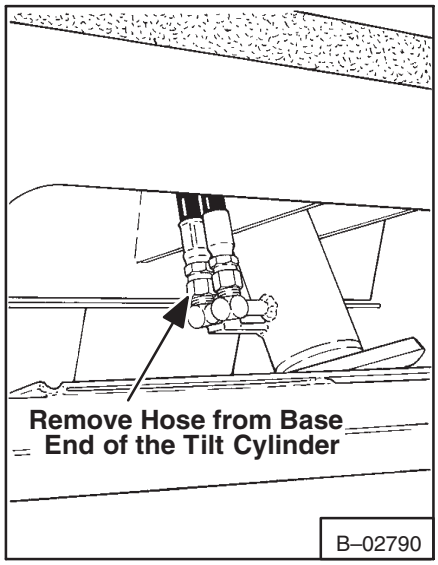


Fig. 2–123 Checking Tilt Cylinder

⚠ WARNING

Diesel fuel or hydraulic fluid under pressure can penetrate the skin or eyes. Fluid leaks under pressure may not be visible. Use a piece of cardboard or wood to find leaks but do not use bare hand. W ear safety goggles. If fluid enters skin or eyes, get immediate medical attention.

4. If there is leakage from the tube, remove the tilt cylinder for repair (See Paragraph 2–6.2).

5. If there is no leakage, connect the hose and tighten.

6. Remove the jackstands from under the loader frame.

2–6.2 Removing the Tilt Cylinder

1. Stop the engine.

2. Activate the hydraulic controls to release the hydraulic pressure.

3. Remove the locknut and bolt from the pin at the rod end of the cylinder (Fig. 2–124).

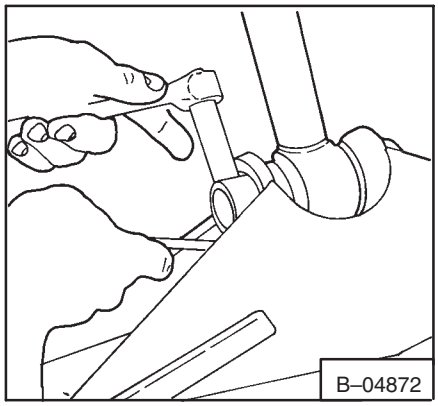


Fig. 124 Removing Lockbolt

g. Inspect spring, washer and snap ring in cylinder block. Disassemble as follows: Use a bolt and nut with washers to tighten against spring, remove snap ring and loosen bolt to relieve spring tension (Fig. 3–9).

If there are any defects in the rotating group, the complete unit must be replaced.

5. Inspect yoke for wear or damage.

3–7.3 Yoke, Pintle Bearing, etc.–Assembly to Housing

1. Use a press to install bearing on drive shaft and bearing race into housing. Push bearing and race until each are against shoulders on shaft and housing.

2. Put drive shaft through yoke and install both together into housing.

NOTE: Be sure long pintle shaft is on the correct side of housing.

3. Install pintle bearings and bearing races on each end of yoke.

4. Install bearing spacer on short pintle shaft.

5. Install new o–ring in groove.

NOTE: If new bearings and races were installed, go to step 10. If the same bearings and races are being used, follow with step 6 below .

6. Install the exact same shims that were removed (or new shims the same thickness) from pintle cover and install pintle cover on short pintle.

7. Install four pintle cover screws. If the screws have separate lock washers, tighten them to 115–125 in.–lbs. (12,9–14,1 Nm) torque. If the screws and lock washers are all one piece, tighten them to 170–190 in.–lbs.(19,2–21,5 Nm) torque.

8. Install same shims removed under pintle cover and install pintle cover/seal on long pintle shaft.

9. Install four pintle cover screws. If the screws have separate lock washers, tighten them to 115–125 in.–lbs. (12,9–14,1 Nm) torque. If the screws and lock washer are all one piece, tighten them to 170–190 in.–lbs. (19,2–21,5 Nm) torque.

10. If new bearings and races were used, follow step a thru g below.

a. Install one 0.010 inch (0,25 mm) shim under pintle cover and install pintle cover on short pintle.

b. Install four pintle cover screws. If the screws have separate lock washers, tighten them to 115–125 in.–lbs. (12,9–14,1 Nm) torque. If the screws and lock washers are all one piece, tighten them to 170–190 in.–lbs. (19,2–21,5 Nm) torque.

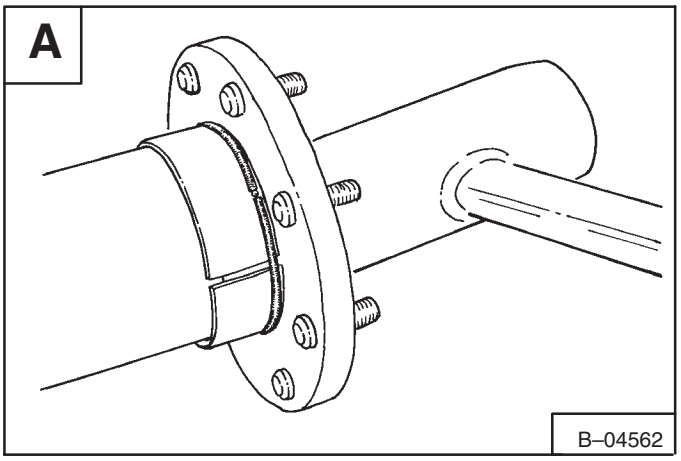
c. Set housing on side so that long pintle shaft is up.

d. Install bearing spacer and turn yoke while pushing on spacer so that bearings and spacers are in correct position.

DRIVE SYSTEM

Installation (Cont'd)

Using a large hammer, hit the axle hub until it is in the correct position. The tool will control the position of the axle and the seal will be in the correct location in the housing **[A]**.

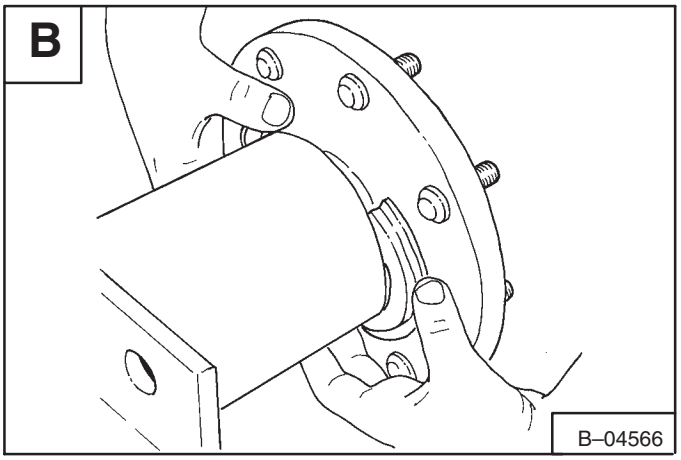


Remove the spring from the tool. Remove the outer halves of the tool. Remove the inner halves from the axle **[B]**.

Use the same procedure to install the front axle.

Install the washer and bolt (inside the chaincase) on the axle.

Tighten the sprocket bolt to 300 ft.–lbs.(409 Nm) torque.



Center the reduction gearcase between the front and rear drive chains. Tighten the bolts to 220–245 ft.–lbs. (300–330 Nm) torque **[C]**.

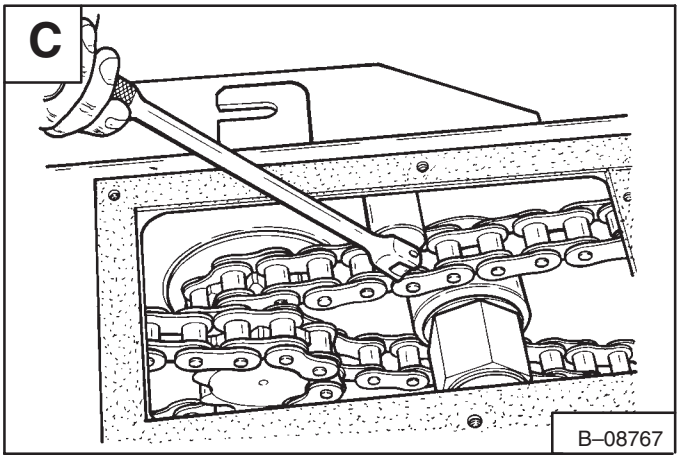
Check the axle end play. It must not exceed 0.013" (0,33 mm).

If end play is not correct replace the washer at the sprocket bolt to get the correct end play . (See Parts Microfiche.)

Install the transmission covers. (See Page 4–4).

Install the brake linkage.

Install the center steering controls and linkages.

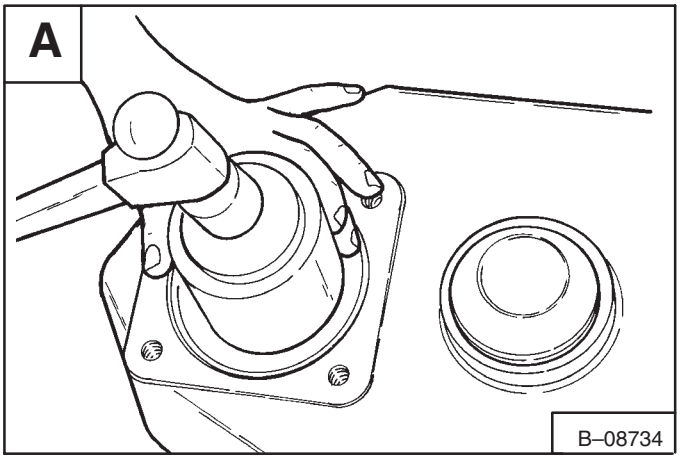


REDUCTION GEARCASE (Cont'd)

Installation

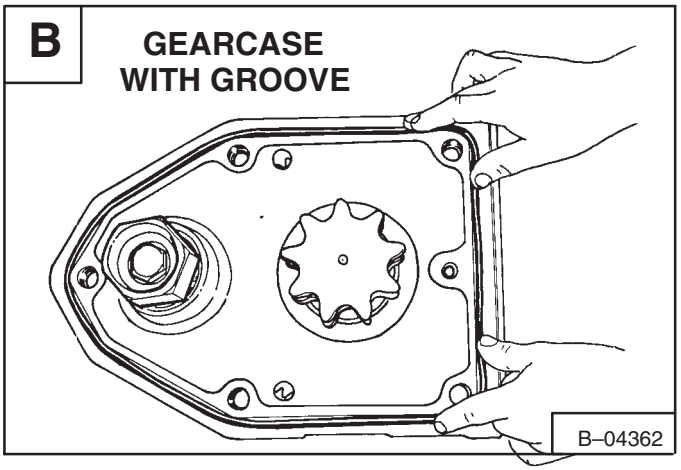
Put *Boretite* sealant around the new seal.

Install the new seal using the seal installation tool (MEL1074) **[A]**.



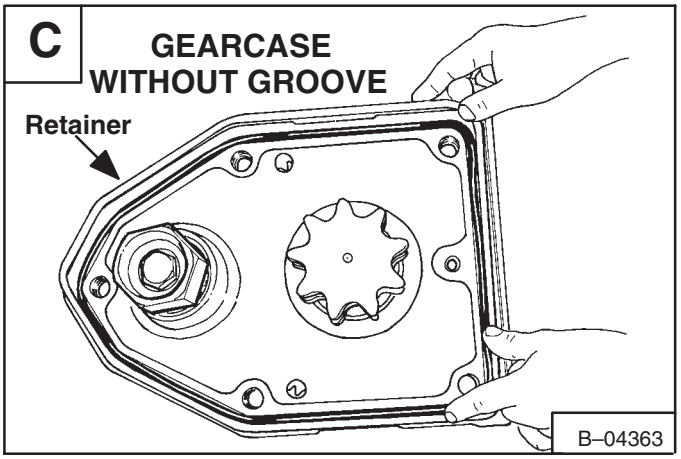
NOTE: Always use new O–rings when installing the reduction gearcase.

Put grease on the O–ring and install it on the outside of the gearcase **[B]** & **[C]**.



NOTE: There are two different types of gearcase housings used, some later units used a retaining ring instead of a groove [C].

Install the retainer. Some later type uses sealant to hold the retainer ring.

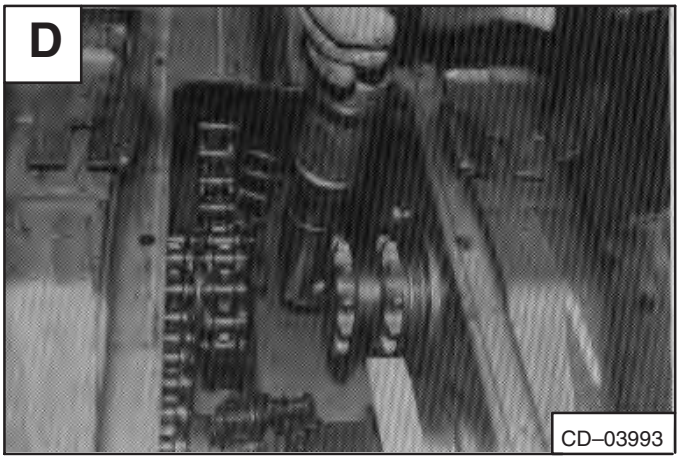


Put the reduction gearcase on a jack and lift it into position **[D]**.

Install the five bolts inside the chaincase. Do not tighten.

Install the final drive chains. (See page 4–12).

Move the reduction gearcase backward or forward toget the same amount of chain play and equatension on both chains.



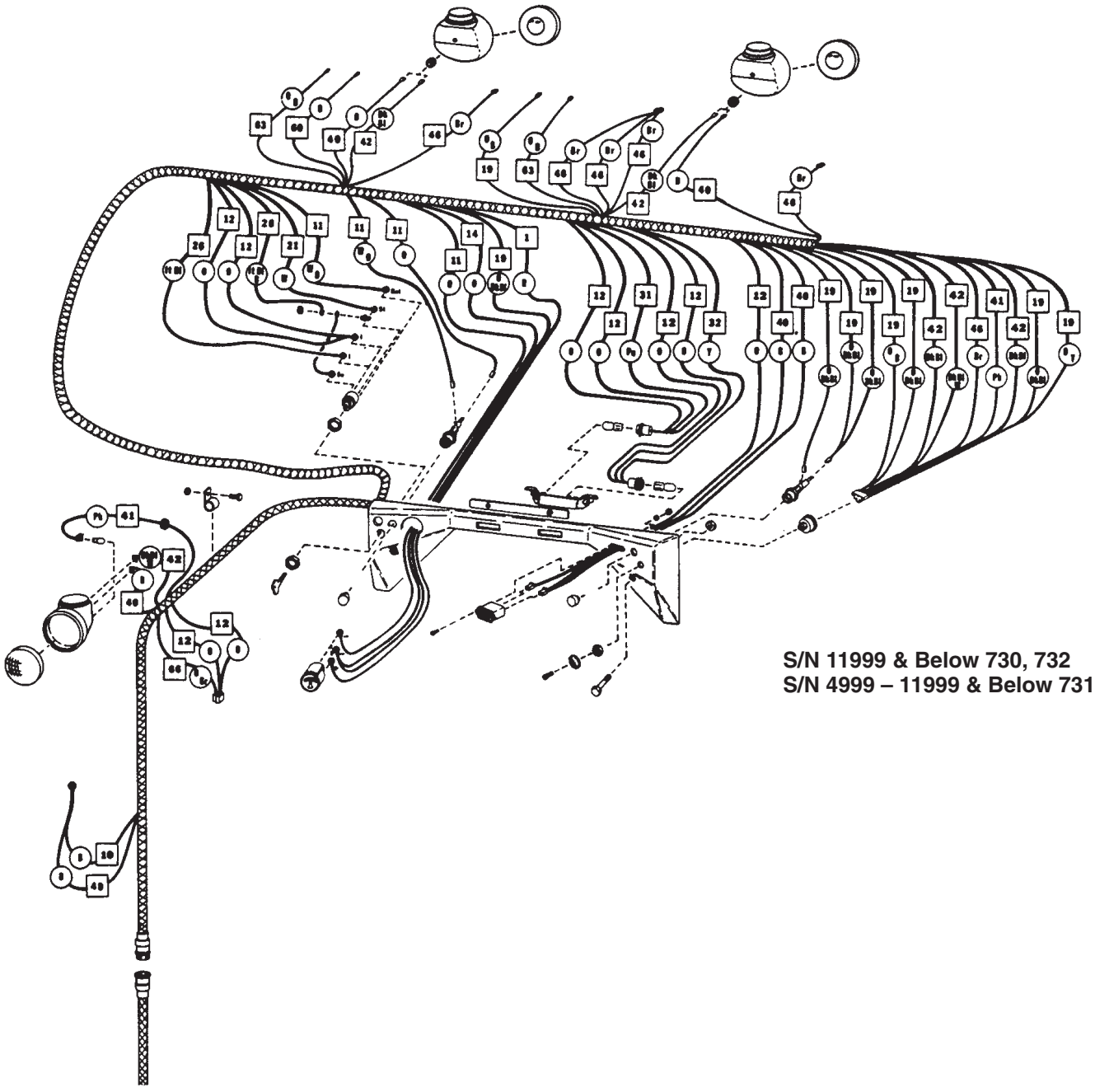


Fig. 6–1 ROPS Electrical System

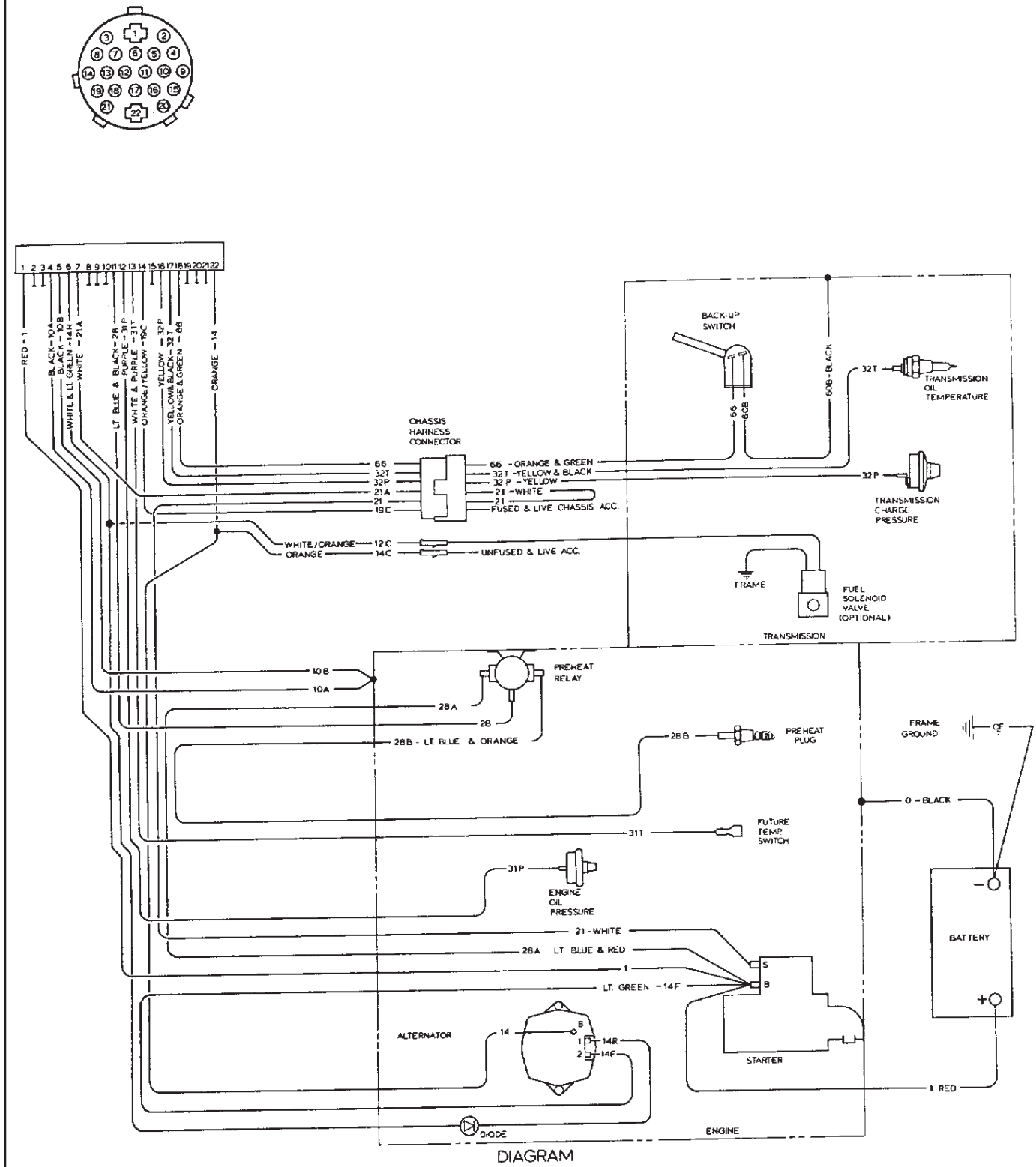


Fig. 6–10 Engine Wiring Diagram (731) 4999–11999 & Below

6–3.7 Alternator Assembly and Installation

Assembly and installation is reverse of removal and disassembly.

If the regulator is removed, be sure the two insulation washers and spacers are in good condition (Fig. 6–24).

To install the rotor, put a piece of straight wire through the housing to hold the brushes in plate (Fig. 6–25).

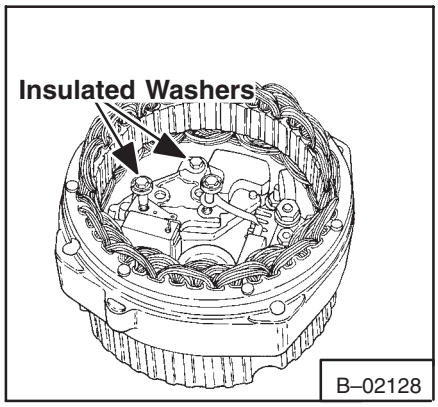


Fig. 6–24 Insulation Washers & Spacers

6–3.8 Checking Starter

1. Lift the Bobcat and put blocks under the frame so that there is no danger of the machine falling and causing personal injury.
2. Keep ignition switch off. Be sure the battery has full charge and the connections are clean and tight.
3. Connect a jumper wire between the small connection on solenoid and the battery connection on solenoid (Fig. 6–26). If the starter turns, but does not turn the engine, the defect is in the starter drive. If the starter does not turn, continue with step below.
4. Connect the jumper wire between the battery connection on solenoid to the lower connection on starter (Fig. 6–27). If the starter turns rapidly, the defect is in the solenoid. If starter does not turn, the defect is in the starter.

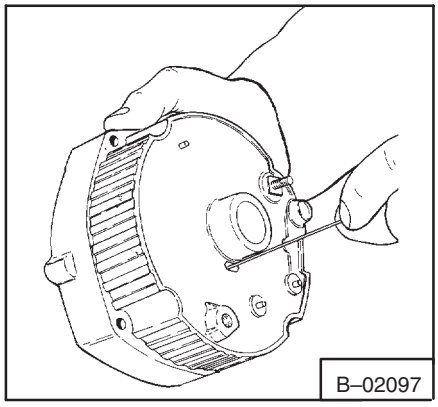


Fig. 6–25 Holding Brushes

6–3.9 Removing Starter

1. Disconnect negative battery cable.
2. Disconnect wires from starter connections.
3. Remove the two bolts that hold the starter in place, and remove starter.

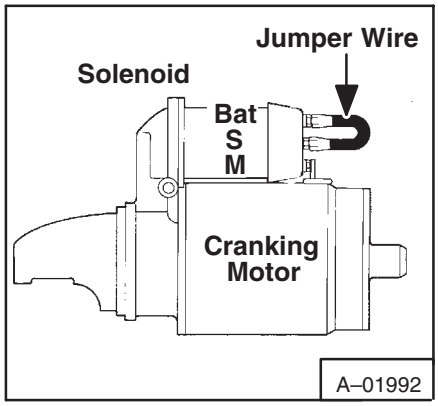


Fig. 6–26 Checking Solenoid

6–3.10 Starter Disassembly (Fig. 6–28)

1. Remove the connector link between the solenoid and the starter.
2. Remove nuts and washers that fasten the solenoid to the drive end of housing.
3. Remove the main part of the solenoid (Item 7). Remove the rubber seal (Item 14), plunger and spring assembly (Item 8) by lifting it from the top of the shift fork (Item 9).

NOTE: The plunger (Item 8) must also be replaced if the main part of the solenoid is replaced.

4. Remove rubber sealing block from between the drive end housing and the frame.
5. Remove the retaining clip (Item 18) from the groove in the shift fork pivot pin and remove the pin (Item 17).
6. Remove nuts and drive housing (Item 21) from starter frame (Item 25).
7. Remove the shift fork (Item 9) from the starter frame.
8. Remove dirt cover (Item 33), cotter pin (Item 32), shim washer (Item 31) and thrust plate (Item 30) from armature shaft at commutator end. Remove the armature (Item 26), complete with internal thrustwasher (Item27) and drive assembly (Item 24), through the drive end of starter frame.
9. Remove thrustwasher (Item 27) from the commutator end of armature shaft.

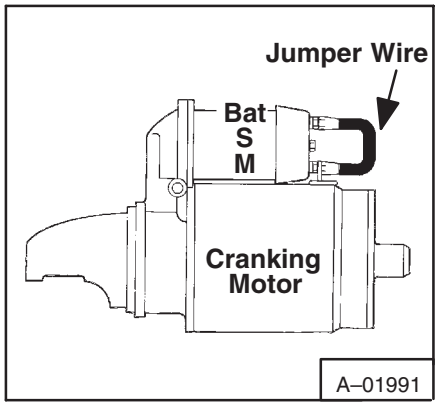


Fig. 6–27 Checking Starter

7A–3 CARBURETOR SERVICE (Fig. 7A–4)

Adjustments

1. Adjust the throttle stop screw for correct idle RPM by turning the screw IN to increase RPM and OUT to decrease RPM.
2. Adjust the idle adjustment needle for smooth idle of the engine. T urn the needle OUT for more fuel and IN for less fuel.

7A–3.1 Float Adjustment

To check the position of the float assembly, remove the fuel bowl from the throttle body by removing the three screws.

1. Use a depth gauge to measure from the machined edge (no gasket) of float bowl to the top side of the float body (highest point). This measurement should be 31/32" (24,61 mm) plus or minus 1/32" (,79 mm).
2. To increase or decrease the distance between the float body and the machined edge, use a long nosed plier to bend the lever close to the float body.

NOTE: To much fuel to the engine can be caused by the float level being too high. Make adjustment of float level. It may be necessary to change the float level adjustment to 1–1/4" (31,75 mm). This is a recommendation for operation in rough ground.

7A–3.2 Governor Adjustment

The control rod between the governor and the carburetor must be the correct length for the governor to operate correctly.

1. Stop the engine.
2. Disconnect the control rod from the governor linkage.
3. Push the governor linkage as shown in figure 7A–5.
4. Push the control rod toward the carburetor (Fig. 7A–5).
5. Make adjustment of the control rod until it just goes into the hole in the governor linkage. Then turn the rod IN (shorter) TWO MORE TURNS.
6. Install the control rod into the hole in the governor linkage and install the cotter pin.
7. There must be about 1/16 inch (1,59 mm) clearance between the stop pin and throttle stop screw (Fig. 7A–6).
8. The governor linkage has 12 holes for installing the governor spring (Fig. 7A–7).
9. Install the spring in hole number 10.
10. Connect a tachometer to the engine. Start the engine and run at full throttle.
11. Adjust the screw at the bottom end of the governor spring until you get correct IDLE (Maximum) (See 8A TECHNICAL DATA for correct idle speed).

7A–4 REMOVAL OF ENGINE

1. Remove the ROPS (Operator Guard).
2. Remove the exhaust pipe.
3. Disconnect the throttle and choke linkages.
4. Disconnect the fuel line and air cleaner hose.
5. Disconnect the wiring at connector plug.
6. Remove the engine oil filter.
7. Remove the battery cables.
8. Remove the fastening bolts from the support plate for the engine.
9. Use a hoist to lift the engine. Slide the engine backward until the drive coupling is disconnected from the transmission.
10. Lift the engine out through the rear of the Bobcat.
11. To install, reverse the above steps.

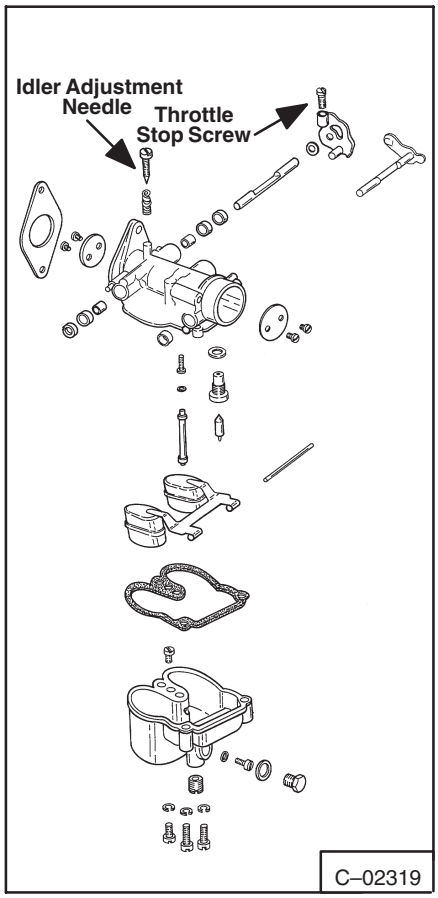


Fig. 7A–4 Carburetor

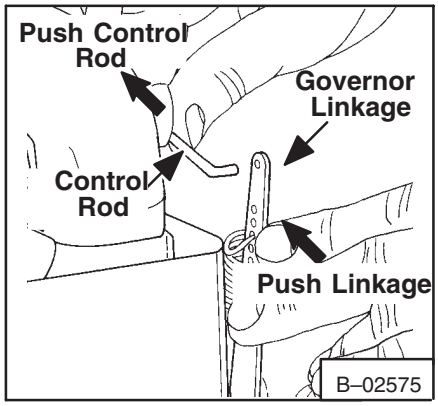


Fig. 7A–5 Governor Adjustment

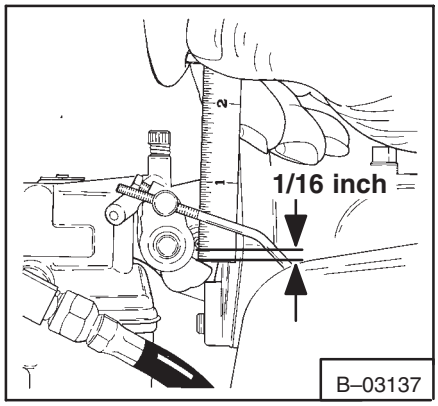


Fig. 7A–6 Linkage Adjustment

ENGINE SERVICE (DEUTZ ENGINE–F2L411D)

ENGINE SERVICE (DEUTZ ENGINE–F2L511)

3. Remove the three bolts which hold the air housing to the crossmember. Connect a chain hoist to the engine. Remove the four bolts which hold the engine mounting plate to the frame. Slide the engine back and out.

4. Installation is the reverse of removal.

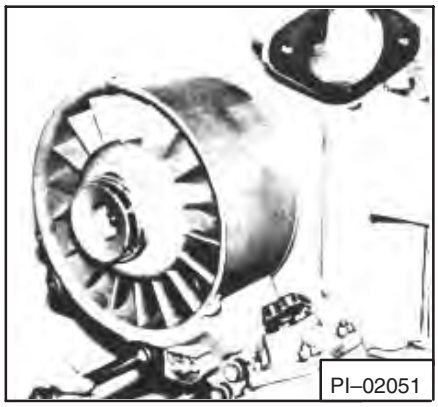


Fig. 7B–26 Removing Blower

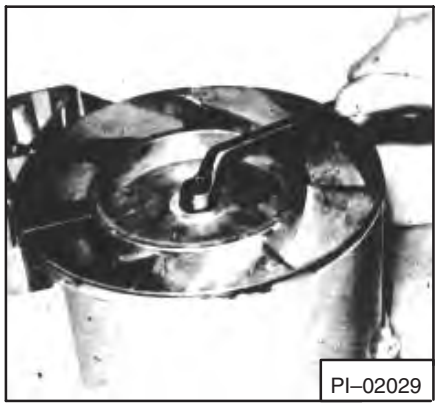


Fig. 7B–27 Loosening Bolt

7B–6 BLOWER FAN

7B–6.1 Removal (Fig. 7B–26)

⚠ WARNING **Use care not to damage the fan blades. The fan is balanced.**

1. Loosen the alternator to remove belts.

2. Remove the idler bracket and three bolts which hold the blower in place. Lift the blower assembly off the engine.

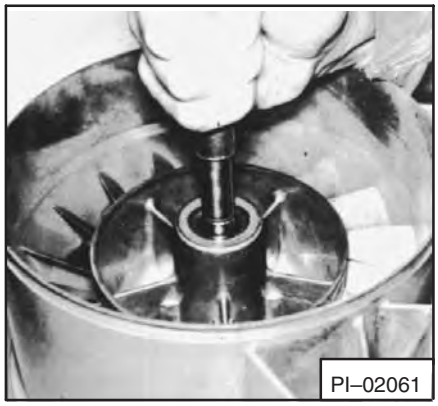


Fig. 7B–28 Removing Blower Fan

7B–6.2 Installation

Installation is the reverse of removal.

7B–6.3 Disassembly

1. Loosen the bolt (do not remove the bolt from the shaft) which holds the fan to the shaft (Fig. 7B–27). Using a soft hammer, hit the bolt (Fig. 7B–28) while holding the fan with your hand. Remove the bolt and lift the fan out of the housing.

2. Using a soft hammer, hit the shaft until it comes out of the housing.

3. The bearing may come out with the shaft, if not use a puller to remove the bearing before you proceed to step 4.

4. Remove the snap ring from inside the housing and before you remove the bearing (a soft hammer and punch may have to be used) (Fig. 7B–29 & 7B–30).

5. If the bearing is still on the shaft use a puller to remove it.

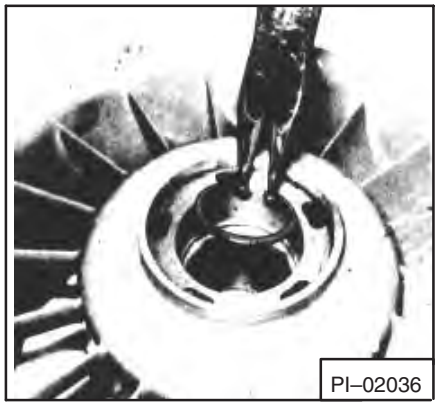


Fig. 7B–29 Removing Snap Ring

7B–6.4 Assembly

Assembly is the reverse of disassembly. Put high temperature grease in the bearings before assembly.

Fig. 7B–30 Removing Bearing

7B–7 CYLINDER HEAD AND VALVES

7B–7.1 Removal

1. Remove the blower and air housing.

2. Remove the manifolds and injection tubelines.

3. Remove the four bolts which hold the head in place with a socket. (Loosen the bolts evenly).

4. Lift the cylinder head off. The push rod tubes will come off with the head.

7B–12.3 Crankshaft Removal

1. Remove the cylinders and pistons.
2. Remove the front cover and crankshaft gear (Fig. 7B–99).
3. Remove the flywheel and end cover (Fig. 7B–100).
4. Remove the bolt from the center main bearing. Slide the crankshaft out of the block.
5. Remove the center main bearing from the crankshaft (Fig. 7B–101).

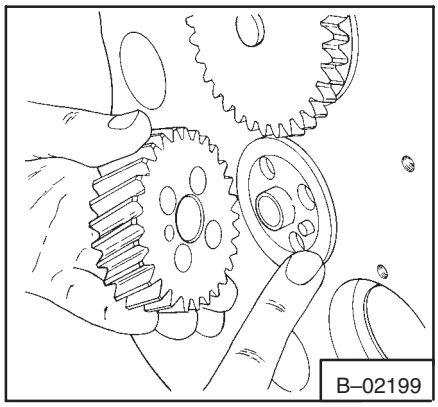


Fig. 7B–99 Removing Crankshaft Gear

7B–12.4 Inspection

Clean all parts thoroughly and inspect for wear or damage.

1. Measure the crankshaft, and have it ground if necessary (See Section 8 "Technical Data" for specifications).
2. Install the correct bearing in the crankcase, center bearing, end plate and connecting rods.
3. Inspect the thrustwashers for wear or damage. Install new thrustwashers of the same thickness as those removed.

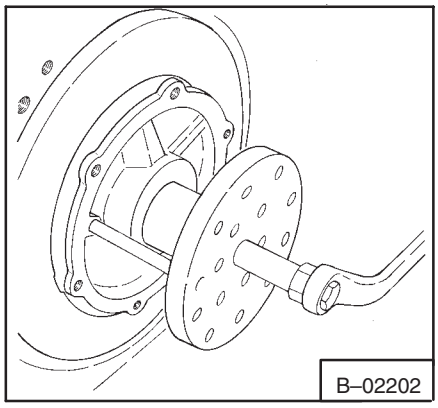


Fig. 7B–100 Removing Flywheel & End Cover

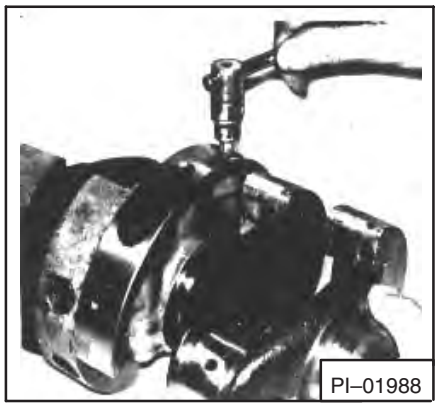


Fig. 7B–101 Installing Crankshaft Counterweights

7B–12.5 Assembly

1. Install the correct bearing into the block. Be sure the oil hole in the bearing is in alignment with the hole in the block (Fig. 7B–102).

NOTE: The bearing will be extended .055"–.065" (1,4–1,7 mm) outside the front of the block.

2. Put grease on the thrustwasher to hold it in position. Be sure the tang on the washer is in the slot in the block (Fig. 7B–103).
3. Install bearings of the correct size in the center bearing support, and install the support on the crankshaft. Be sure the numbers on the support are together (Fig. 7B–104).
4. Slide the crankshaft into the block. Use care not to damage the bearing in the block during installation. Be sure the hole in the bearing support is in alignment with the hole in block (Fig. 7B–105).

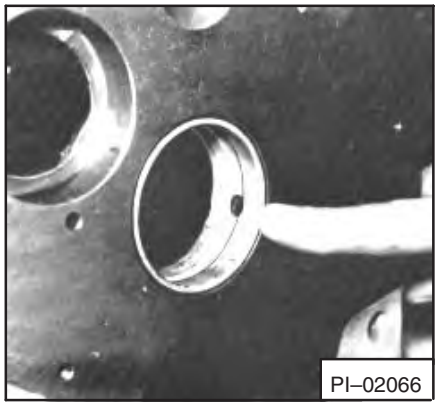


Fig. 7B–102 Installing Bearing

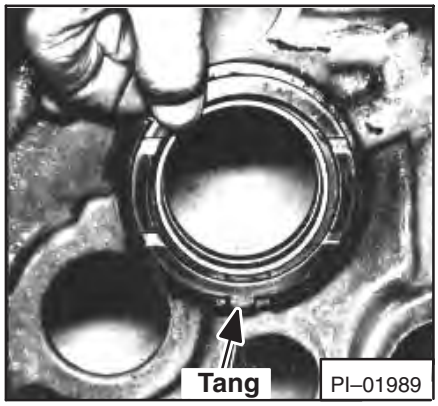


Fig. 7B–103 Installing Thrustwasher

Fig. 7B–104 Bearing Support Check Marks

Fig. 7B–105 Installing Crankshaft

7B–20.2 Installation

Installation is the reverse of removal.

7B–20.3 Disassembly

1. Clamp the pulley of the cooling fan in a vice with protective aluminum jaws and unscrew the center bolt (Fig. 7B–139).

2. Remove the blower fan (Fig. 7B–140).

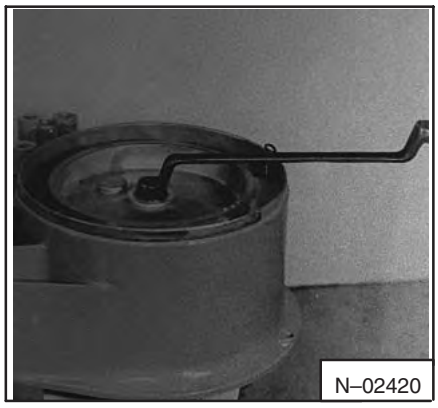


Fig. 7B–139 Removing Center Bolt

Fig. 7B–140 Removing Blower Fan

3. Remove the drive shaft from the fan housing with a soft metal drift punch.

4. Remove the ball bearing from the drive shaft using a bearing puller.

5. Remove the snap ring (Fig. 7B–141) from the ball bearing in the housing. Remove the ball bearing using a soft metal drift punch (Fig. 7B–142).

Fig. 7B–141 Removing Snap Ring

7B–20.4 Assembly

1. Fill the new bearing with high temperature bearing grease.

2. Press the small bearing into the fan housing with the closed side down.

3. Install the snap ring to hold the bearing in position.

4. Press the large ball bearing over the drive shaft with the closed side toward the V–belt pulley.

5. Press the fan shaft (with the bearing on) into the housing.

6. Clamp the cooling fan in a vice by the pulley.

7. Position the rotor wheel and tighten the bolt to correct torque as specified in Technical Data.

Fig. 7B–142 Removing Bearing

7B–21 CYLINDER HEAD AND VALVES

7B–21.1 Removal and Disassembly

1. Remove the blower and air housing.

2. Remove the manifold and injector line.

3. Remove the valve covers and the rocker arm brackets (Fig. 7B–143).

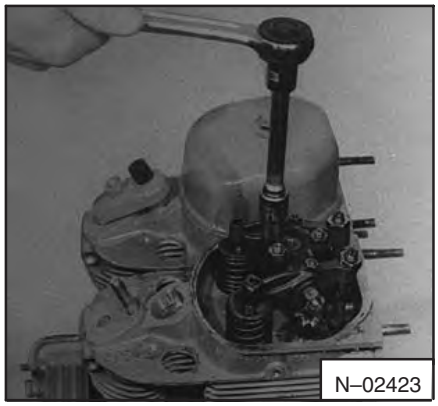


Fig. 7B–143 Removing Rocker Arm Bracket

7B–26 CAMSHAFT (Engine Must Be Out of Machine)

7B–26.1 Removal

1. Remove injection pump.
2. Remove the blower and air housing, the front cover and the rocker arm covers.
3. Remove the rocker arms and push rods.
4. Put the engine on its die so the exhaust manifold is up.
5. Remove the fuel lift pump.
6. Remove the camshaft. Be careful not to damage the camshaft bushing.
7. Remove the oil pan. Remove the tappets (Check all parts for wear or damage).
8. If the bushing is good, it can be used again. If not, use a driver to push out the old one and install a new one. Align the oil holes in the bushing with those in the block when you install a new bushing (Fig. 7B–200).

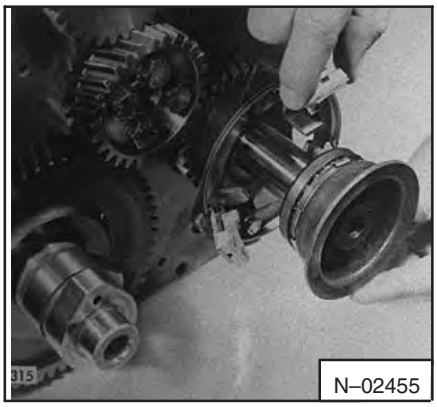


Fig. 7B–199 Installing Flyweights

Fig. 7B–200 Installing Camshaft Bearings

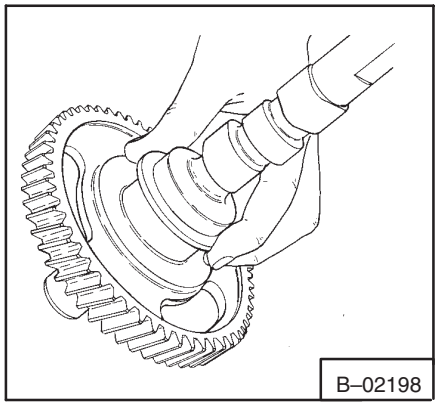


Fig. 7B–201 Installing Thrust Washer

7B–26.2 Installation

1. Position the tappets into their boxes from inside the crankcase.
2. Put oil on the thrust washer and put it on the camshaft (Fig. 7B–201).
3. Install oil pan and turn engine upright.
4. Install the fuel lift pump, push rods and rocker arms.
5. Install the fuel injection pump (7B–16.8) and other parts removed.
6. Prime fuel injection system.

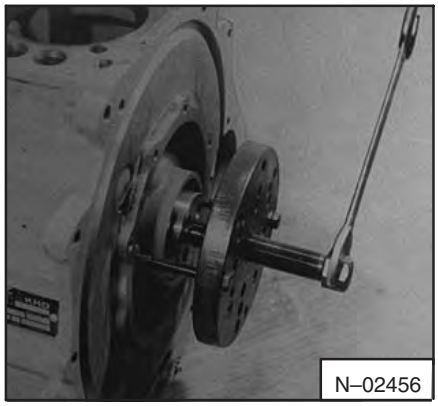


Fig. 7B–202 Removing Flywheel and End Cover

7B–26.3 Crankshaft Removal

1. Remove the cylinder heads, pistons and rods.
2. Remove the front cover (See Section 7B–23) and crankshaft gear.
3. Remove oil pan and oil pump.
4. Remove the flywheel and end cover (Fig. 7B–202).
5. Remove the bolt from the center main bearing. Remove the crankshaft from the block.
6. Remove the center main bearing from the crankshaft (Fig. 7B–203).

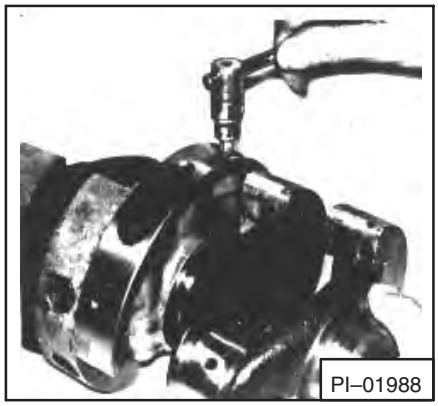


Fig. 7B–203 Removing Center Main Bearing

7. Make adjustment to linkage so that the distance between pivot points is 4–7/8 inches (123,8 mm) (Fig. 7C–5).

8. Check to see that there is free movement of the throttle plate in carburetor.

9. Install linkage on governor control arm.

10. Loosen control arm stop until it has no ef fect on governor control arm (Fig. 7C–6).

11. Loosen the two screws on the governor control arm (Fig. 7C–7).

12. Move the governor control arm and control arm–to–carburetor linkage as shown in figure 7C–7.

13. Hold control arm and linkage in this position and tighten the two screws.

14. Start the engine and turn idle screw on the carburetor to set the engine speed at 750–850 RPM (Fig. 7C–8).

15. Set the correct ignition timing. (See 7C–2.7 “Ignition T iming” for correct procedure).

16. Set the throttle lever in slow position.

17. Hold governor control arm all the way as shown in figure 7C–7, then make adjustment to throttle linkage until the pin goes exactly into the throttle jackshaft.

18. Start engine and set throttle lever (inside ROPS on right side of seat) at fast idle. Make adjustment to stop bolt until engine runs at 2600–2675 RPM.

19. Turn control arm stop (Fig. 7C–6) until there is an increase of 25 RPM.

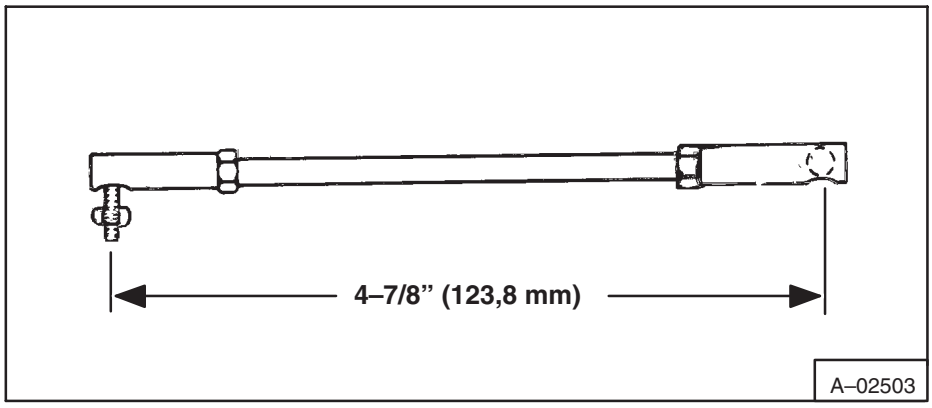


Fig. 7C–5 Linkage Adjustment (Governor to Carburetor)

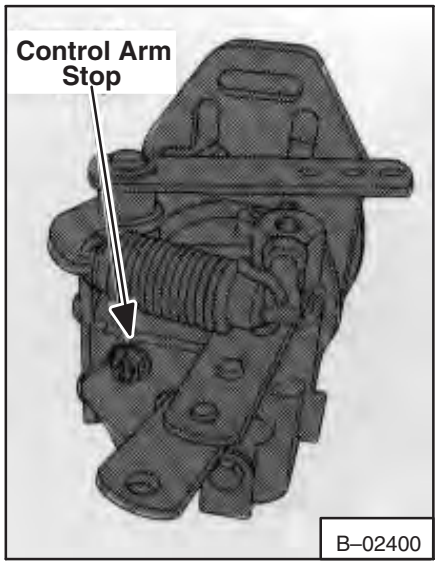


Fig. 7C–6 Control Arm Stop

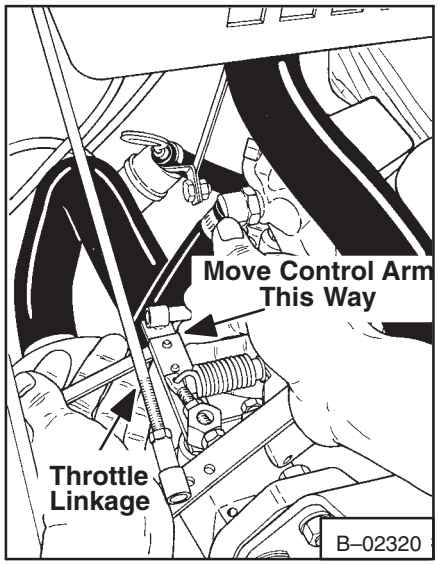


Fig. 7C–7 Control Arm Adjustment

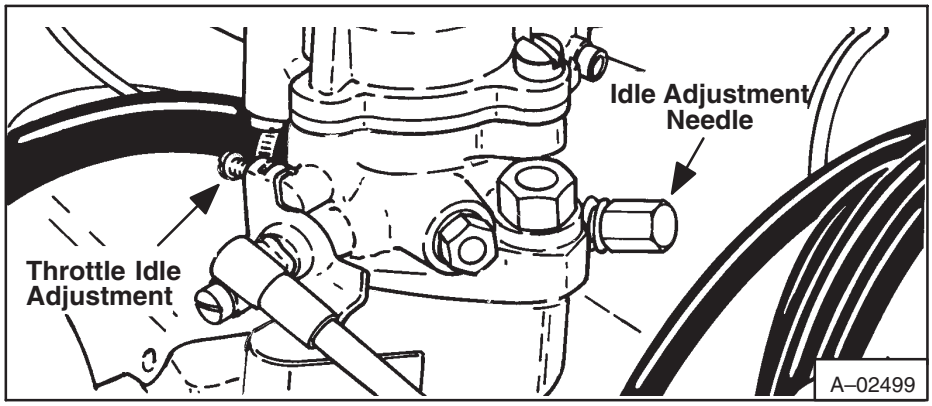


Fig. 7C–8 Carburetor Adjustment

Inspection

Inspect the connecting rod bearing bores for out–of–round and taper. Check the inside diameter of the connecting rod piston pin bore. If the pin bore in the connecting rod is larger than specifications, install a 0.002 inch oversize piston pin. First, fit the oversize piston pin to the piston pin bore by using a reamer tool. Then assemble the piston, piston pin and connecting rod.

7C–5.18 Pistons, Pins and Rings

Cleaning

Remove deposits from the piston surfaces. Clean deposits from the piston skirt, piston pins and rings with solvent.

Clean the ring grooves with a ring groove cleaner. Make sure the oil ring slots (or holes) are clean.

Inspection

Replace pistons that show signs of over maximum wear or damage.

Check the piston to cylinder bore clearance by measuring the piston and bore diameters. Refer to the specifications for correct clearance. Refer to 7C–5.20 “Cylinder Block Inspection” for the bore measurement procedure. Measure the outside diameter of the piston with micrometers about 2–1/4 inches (57.15 mm) below the dome and at 90 degrees to the piston pin bore. Check the ring side clearance. See 7C–5.10 “Pistons, Pins and Rings”.

Check the outside diameter of the piston pin and the inside diameter of the pin bore in the piston. Make replacement of any piston pin or piston that is not within specifications.

Replace all rings that have damage. Check the end gap and side clearance. Rings must not be removed from one piston and installed on another.

7C–5.19 Main and Connecting Rod Bearings

NOTE: Main bearings have color codes; to identify size. See Section 8 “Technical Data”.

Cleaning

Clean the bearing inserts and caps thoroughly in solvent, and dry them with compressed air. Do not scrape deposits from the bearing shells.

Inspection

Inspect each bearing carefully. Bearings that have a damage or much wear need replacement. Check the clearance of bearings that look good with Plastigage (7C–5.9 “Main and Connecting Rod Bearings”).

7C–5.20 Cylinder Block

Cleaning

After any cylinder bore repair operation, clean the bore(s) with soap and water. Then, thoroughly rinse the bore(s) with clean water to remove the soap, and wipe the bore(s) with a clean cloth with engine oil on it.

If the engine is disassembled, thoroughly clean the block with solvent. Remove old gasket material from all machined surfaces. Remove all pipe plugs that seal oil passages; then clean all the passages. Clean all passages, bolt holes, etc., with compressed air. Make sure the threads in the cylinder head bolt holes are clean. Use a tap to clean the threads and to remove any deposits. Thoroughly clean the grooves in the crankshaft bearing and bearing retainers.

18. Install the water pump sheave. Install the drive belt on the sheave and make adjustment of the belt tension to specifications. Connect the fuel line from the carburetor to the fuel pump.

19. Install distributor cap and connect wires to spark plug.

20. Remove the engine from stand.

21. Install the engine assembly in the Bobcat.

22. Start the engine and check for oil and water leaks.

23. Make second adjustment of the valve clearances (hot) to specification.

24. Install the rocker cover and a new gasket and fasten with screws and tighten to specifications.

25. Start engine, make adjustment of the ignition timing, if necessary.

26. Make adjustment of the carburetor idle speed and fuel–air mixture to specifications.

7C–19 FLYWHEEL RING GEAR

7C–19.1 Removal

1. Cut between teeth with hacksaw.

2. Use a chisel to break the ring gear.

7C–19.2 Installation

1. Heat ring gear evenly to a temperature of not more than 600°F. (315°C.). Temperatures more than 600° will cause damage to the hardness of the ring gear.

2. Install hot ring gear on flywheel.

7C–20 OIL PAN

7C–20.1 Removal

1. Remove the crankcase oil.

2. Remove the dipstick.

3. Remove three bolts and remove the starter motor.

4. Remove the oil pan fastening bolts and remove the pan and gasket.

7C–20.2 Installation

1. Clean the oil pump inlet tube and screen assembly.

2. Clean the gasket surfaces of the block and oil pan. Be sure to clean the seal grooves in the timing chain cover and the rear seal retainer. The oil pan has a two–piece gasket. Put sealing compound on the block surface and the oil pan gasket surface. Install the oil pan and tighten the bolts evenly to specifications following first the alphabetical, then the numerical steps shown in figure 7C–35.

3. Clean and install the starter motor and fasten it with the three bolts.

4. Fill the oil pan with the correct grade of engine oil and install the dipstick.

8A TECHNICAL DATA

8A–1 ENGINE SPECIFICATIONS, 730 (Wisconsin)

All specifications are given in inches with metric in parenthesis.

Displacement . . . . . 107.7 cu. in. (1,76 liters)
Bore . . . . . 3.25 (82,55 liters)
Stroke . . . . . 3.25 (82,55 liters)
Firing Order 1–3–4–2
Oil Capacity W/Filter . . . . . 1 gal. (3,79 liters)

8A–1.1 Fuel Specifications

Always use clean fuel. Do not let the fuel tank become empty.

Type of Fuel . . . . . Regular gasoline 85–90 octane.

8A–1.2 Engine Oil

System:

Check oil level after every 8 hours of operation. (Check oil every 4 hours on new engine during the first 50 hours of operation.)

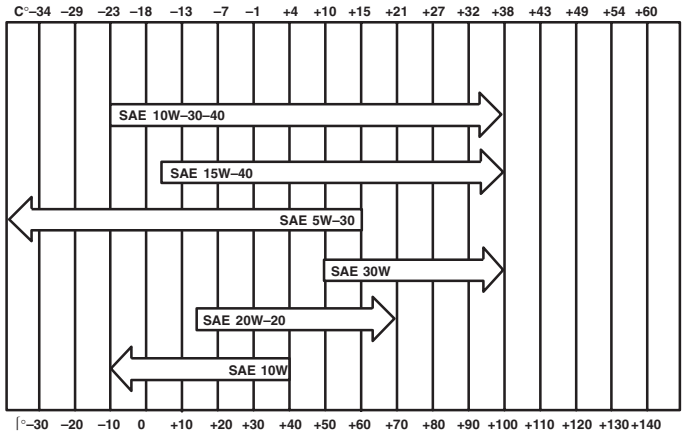
Oil level must be maintained between the “add” and “full” mark on the dipstick.

Specifications:

Use a good quality detergent motor oil that meets the correct API service classification.

Use oil of proper SAE viscosity for expected temperature conditions.

RECOMMENDED SAE VISCOSITY NUMBER
(LUBRICATION OILS FOR ENGINE CRANKCASE)



TEMPERATURE RANGE ANTICIPATED BEFORE NEXT OIL CHANGE
(GASOLINE: USE API CLASSIFICATION SE)
(DIESEL: USE API CLASSIFICATION CD)

8A–1.3 Valve Mechanism

Valve Stem Clearance in Guide 003 (0,076–0,127)
  Maximum 007 (0,178)
Valve Tappet Clearance:
  Intake 008 (0,203)
  Exhaust 016 (0,406)

8B–2 ENGINE SPECIFICATIONS, 731 (Deutz F2L511)

All specifications are given in inches with metric in parenthesis.

Displacement	100.7 cu. in. (1650 cm^3)
Bore	3.94 (100 mm)
Stroke	4.133 in. (105 mm)
Firing Order	2–1
Oil Capacity W/Filter	1.2 gals. (4,5 L)

8B–2.1 Fuel System

Pressure of Fuel Lift Pump	4–5 PSI (0,28 bar – 0.35 bar)
Make of Fuel Injection Pump	Bosch DILLA 149 S 774
Make of Fuel Injection Nozzle	Bosch
Release Pressure of Injection Nozzle (New)	2646–2764 (180–188 bar)
(Used)	2572–2690 (175–183 bar)
Distance from Injection Pump Mounting Flange to Camshaft Base Circle (Including Gasket and Shims)	3.2519–3.2559 (82,6–82,7 mm)
Injection Timing (Start of Injection)	25° BTDC Capillary Tube

8B–2.2 Governor, Front Cover and Throttle

Distance from Governor Bearing Cup to Engine Block	3.334–3.374 (84,7–85,7 mm)
End Play in Throttle Shaft	.008–.043 (0,2–1,1 mm)
Engine High Idle Speed	2625–2675 RPM
Engine Low Idle Speed	1050–1150 RPM

8B–2.3 Cylinder Head and Valves

I.D. of Valve Guides	.3149–.3155 (8,0–8,015 mm)
I.D. of Bore for Exhaust Valve Seat	1.575–1.577 (40,0–40,025 mm)
I.D. of Bore for Intake Valve Seat	1.791–1.792 (45,5–45,525 mm)
Valve Seat Width, Inlet	.059–.0826 (1,5–2,1 mm)
Valve Seat Width, Exhaust	.059–.0826 (1,5–2,1 mm)
Valve Seat Angle, Exhaust and Intake	45°
Valve Stem Diameter, Intake	.3127–.3133 (7,945–7,96 mm)
Valve Stem Diameter, Exhaust	.311–.312 (7,92–7,94 mm)
Maximum Distance Valves may be Recessed into Head	.232 (5,9 mm)
Maximum Distance Valves may Protrude from Head	.205 (5,2 mm)
Valve Clearance, Cold (Intake & Exhaust)	.006 (0,15 mm)
Minimum Free Length of Valve Springs	2.32 (59 mm)
Length of Head Bolts (New)	7.381–7.421 (187.5–188.5 mm)
Max. Length of Head Bolts (Used)	7.460 (189,5 mm)

8B–2.4 Cylinder, Piston and Connecting Rod

Compression	420–449 PSI (2895.9–3095.8 kPa)
Cylinder Bore (Standard)	3.937–3.9763 (100,000–100,022 mm)
Maximum Wear Limit	.004 (0,1 mm)
Piston Diameter (Standard)	3.9354–3.9361 (99,951–99,968 mm)
Piston Diameter (1st Oversize)	3.9551–3.9554 (100,451–100,468 mm)
Piston Diameter (2nd Oversize)	3.975–3.9782 (100,951–100,968 mm)
Wrist Pin Bore	1.38965–1.38999 (35,004–35,010 mm)
Wrist Pin Diameter	1.38927–1.38950 (34,994–35,000 mm)
Piston Ring Side Clearance, Top Compression Ring	.004–.006 (0,105–0,145 mm)

8C–1.5 Camshaft

Journal Diameter	1.5597–1.5605 (39,617–39,637)
Bearing I.D.	1.5615–1.5620 (39,662–39,675)
Length Front & Rear	2.26 (57,4)
Center	2.26 (57,4)
Clearance	.001–.0023 (0,025–0,058)
	wear limit .003 (0,076)
Bore for Bearing	1.6885–1.6895 (42,888–42,913)
Oversize Bearing	
O/Son OD Standard ID	.020 (0,513)
End Play	.0024–.075 (0,061–0,192)
Thrust Plate Thickness	1755–.1775 (4,458–4,509)
Valve Timing–	
Inlet Opens–°BTDC	17–21
Inlet Closes–°ABDC	51–55
Exhaust Opens–°BBDC	51–70
Exhaust Closes–°ATDC	17–22
Inlet Cam Lift	0.2108 (5,3548)–0.2356 (5,9851)
Exhaust Cam Lift	0.2176(5,5276)–0.2321 (5,8943)

8C–1.6 Crankshaft

Main Bearing Journal Diameter	2.1253–2.1261 (53,983–54,003)
Main Bearing Clearance	.0005–.002 (0,013–0,051)
Rod Bearing Journal Diameter	1.9368–1.9376 (49,194–49,215)
Rod Bearing Clearance	.0005–.002 (0,013–0,051)
Main & Rod Bearing Journal–	
Max. Taper	.0003 (0,008)
Max. Out–of–Round	.0004 (0,010)
Crankshaft End Play	.003–.011 (0,08–0,28)
Bearing Wall Thickness–Standard	.0719–.0722 (1,788–1,796)

For every .002 (0,051) undersized thickness add .001 (0,026) to standard thickness.

Thrust Washer Standard	.091–.093 (2,31–2,36)
Oversize	0.002 (0,05)–.005 (0,13)–.007 (0,18)–.010 (2,5)

The crankshaft and cylinder block are color–coded for installation of the correct bearings AT THE FACTORY.

Use a micrometer to measure the inside diameter and the outside diameter of the bearing surfaces so that correct replacement bearings can be ordered.

8C–1.7 Connecting Rod

Piston Pin Bushing I.D.	.8121–.8125 (20,627–20,638)
Connecting Rod Bearing Bore	2.0825–2.0830 (52,90–52,91)
Connecting Rod Length Center to Center	4.9265–4.9295 (125,133–125,209)
Side Clearance	.004–.010 (0,10–0,25)
Max. Twistor Bend	.004 (0,10)

Pin bushing and crankshaft bearing bore must be parallel and in the same vertical plane within the specified total difference at ends of 8–inch long bar measure 4 inches on each side of rod.

8C–1.8 Piston

Diameter	3.1853–3.1877 (80,907–80,967)
Piston to Bore Clearance	.0016–.0025 (0,040640–0,06350)
	(Measure 90° to pin centerline and at bottom of pin)
	(Clearance 90° to pin centerline and at bottom of pin)
Clearance between Deck and Piston at TDC	.025–.043 (0,63–1,09)

8C–1.9 Piston Pin

Diameter	.8119–.8123 (20,622–20,632)
Interference Fit in Piston	.0001–.0003 (0,003–0,008)
Clearance in Rod Bushing	.001–.003 (0,003–0,008)

ALPHABETICAL INDEX

MELROE
INGERSOLL-RAND

bobcat®

730–004
Revision Number

18 DECEMBER 1979
Date

SERVICE BULLETIN

ROUTE TO ATTENTION

PARTS MANAGER	☐
SERVICE MANAGER	☒
SALES MANAGER	☐

AFFECTING:

Product BOBCAT LOADER

Model 730, 731 and 732

Serial No. 730–11999 & Below; 731–5006–M–11003 & Below; 732–11999 & Below

Manual No. 6556583

SUBJECT: REPAIR KIT FOR THE LIFT ARMS

This Service Bulletin replaces Service Bulletin #730–004 dated 27 Nov79. Destroy the Service Bulletin dated 27 Nov. 79.

PROBLEM:

Cracks at the “knee” of the lift arms.

CAUSE:

Severe duty.

CORRECTION:

Make repair of the lift arms by using kit (P/N 6561588). The kit can be ordered from Chicago Central Parts.

POLICY:

Melroe will give compensation for the cost of the kit and one (1) hour labor for the repair of any of the above serial number Bobcats which have a lift arm problem (cracking) during the normal warranty period.

EXPIRATION DATE:

31 May 1980

This Service Bulletin includes one page which is to be put in the 730, 731 and 732 Service Manual (6556583 [4–79]).

PUT IN

Page 5–3

Printed in U.S.A.

MELROE
INGERSOLL-RAND

bobcat®

730–009
Revision Number

15–APRIL–80
Date

SERVICE BULLETIN

ROUTE TO ATTENTION

PARTS MANAGER	☐
SERVICE MANAGER	☒
SALES MANAGER	☐

AFFECTING:

Product BOBCAT LOADER

Model 731

Serial No. _____

Manual No. 6556583 (4–79)

SUBJECT: REVISION TO THE SERVICE MANUAL

The attached pages are a revision to the 730, 731, 732 Service Manual (P/N 6556583 [4–79]). There are 34 pages to this bulletin, check to see that you have them all. They include servicing information for the 511 Deutz engine.

Remove the following pages in the Service Manual and put in revised or added pages as follows:

REMOVE	PUT IN
5–1, 5–2	5–1, Revised April 80 5–2
Index Page–731 Deutz Engine Service	Revised April 80–731 Deutz Engine Service–Index Page
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	7B–21, 7B–22
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	7B–39
Index Page–Engine Spec. (731 Deutz)	Revised Engine Spec. (731 Deutz) Index Page
8B–3, 8B–4	Revised 8B–3, 8B–4
	8B–5, 8B–6
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	8B–9
8D–1, 8D–2	Revised 8D–1, 8D–2

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