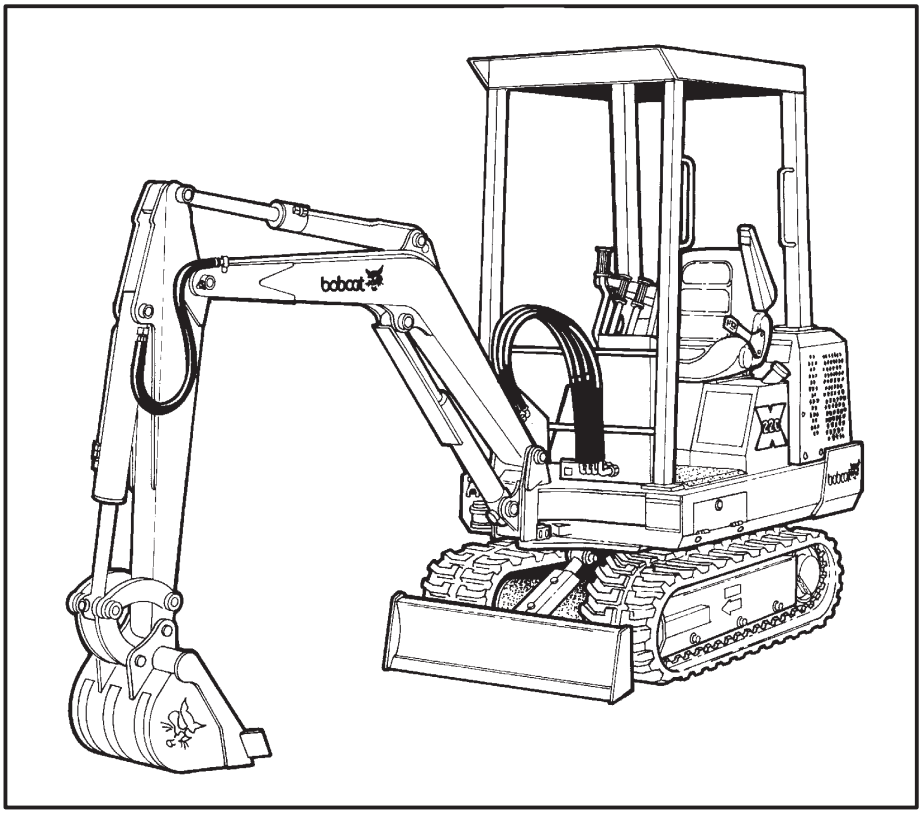
X 220

Excavator

Service Manual

(S/N 508212001 & Above)



MELROE
INGERSOLL-RAND

bobcat®

6720503(6–90)–7.5C

Printed in U.S.A.

SAFETY INSTRUCTIONS

WARNING

Instructions are necessary before operating or servicing machine. Read Operation & Maintenance Manual, Handbook and signs (decals) on machine. Follow warnings and instructions in the manuals when making repairs, adjustments or servicing. Check for correct function after adjustments, repairs or service. Failure to follow instructions can cause injury or death.

W–2003–1289

The following publications provide information on the safe use and maintenance of the loader and attachments:

- The Delivery Report is used to assure that complete instructions have been given to the new owner and that the machine is in safe operating condition.
- The Operation & Maintenance Manual delivered with the excavator gives operating information as well as routine maintenance and service procedures. It is a part of the excavator and must stay with the machine when it is sold. Replacement Operation & Maintenance Manuals can be ordered from your Bobcat excavator dealer.
- The excavator has machine signs (decals) which instruct on the safe operation and care. The signs and their locations are shown in the Operation & Maintenance Manual. Replacement signs are available from your Bobcat Excavator dealer.
- The CIMA Safety Manual delivered with the excavator gives information for safe operating and standard signals.
- The Service Manual and Parts Manual are available from your dealer for use by mechanics to do shop–type service and repair work.

WARNING

Warnings on the machine and in the manuals are for your safety. Failure to obey warnings can cause injury or death.

W–2044–1285

IMPORTANT

This notice identifies procedures which must be followed to avoid damage to the machine.

I–2019–0284

Safety Alert Symbol: This Safety Symbol is used for important safety messages. When you see this symbol follow the safety message to avoid personal injury or death.

- Wear tight fitting clothing. Always wear safety glasses when maintaining or servicing the excavator. Safety glasses, hearing protection or loader special application kits are required for some work. See your dealer for Melroe Safety equipment.
- Know where fire extinguishers and first aid kits are located and how to use them.
- Do not use the Bobcat excavator where exhaust, arcs, sparks or hot components can contact flammable material, explosive dust or gases.
- The engine compartment and engine cooling system must be inspected every day and cleaned if necessary to prevent a fire hazard and overheating.
- Check all electrical wiring and connections for damage. Keep the battery terminals clean and tight. Repair or replace any damaged part.
- Check fuel and hydraulic tubes, hoses and fittings for damage and leakage. Never use open flame or bare skin to check for leaks. Tighten or replace any parts that show leakage. Always clean fluid spills. Do not use gasoline or diesel fuel for cleaning parts. Use commercial nonflammable solvents.
- Follow any environmental safety regulations when disposing of used fluids such as engine oil, grease or anti–freeze.
- Do not use ether or starting fluids on an engine that has glow plugs. These starting aids can cause an explosion and injure you or bystanders.
- Always clean the excavator and disconnect the battery before doing any welding. Cover rubber hoses, battery and all other flammable parts. Keep a fire extinguisher near the excavator when welding. Have good ventilation when grinding or welding painted parts. Wear a dust mask when grinding painted parts. Toxic dust or gas can be produced.
- Stop the engine and let it cool before adding fuel. No smoking!
- Use the procedure in the Operation & Maintenance or Service Manuals for connecting the battery.

ENGINE LUBRICATION SYSTEM

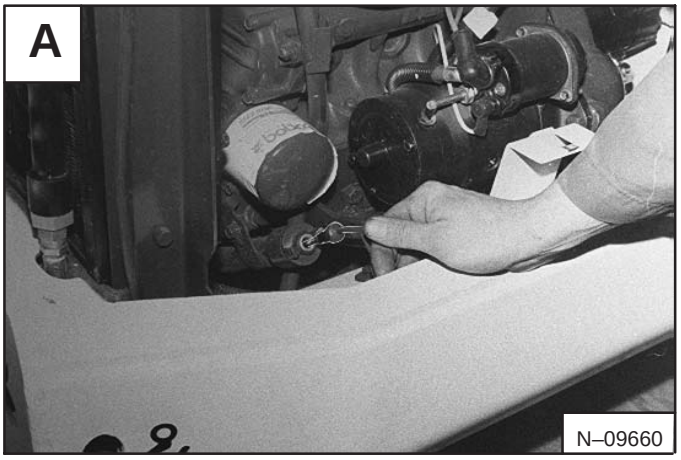
Check the engine oil every day.

Stop the engine. Open the engine cover.

Remove the dipstick **[A]**.

Keep the oil level between the marks on the dipstick.

Use a good quality motor oil that meets API Service Classification of CC–CE or CD. (See *FUEL, COOLANT AND LUBRICANTS Chart*, Page 8–1.)

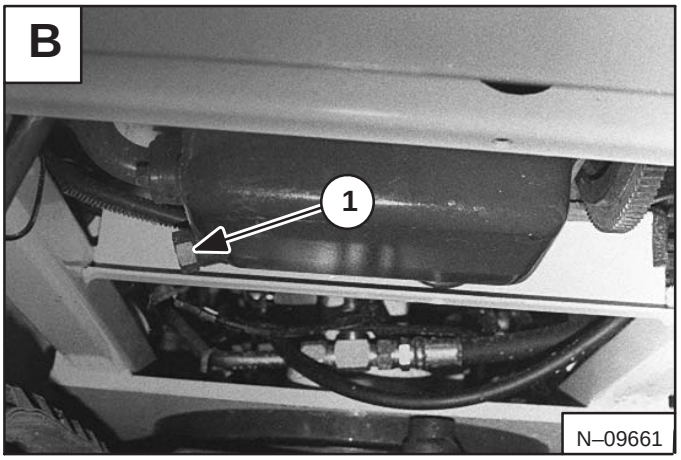


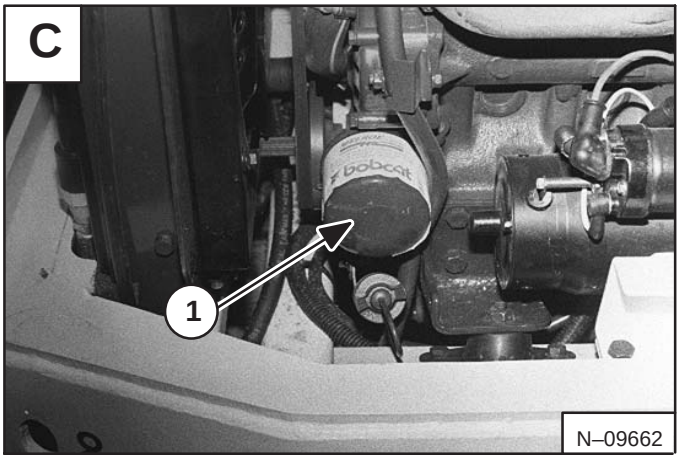
Engine Oil And Filter Replacement

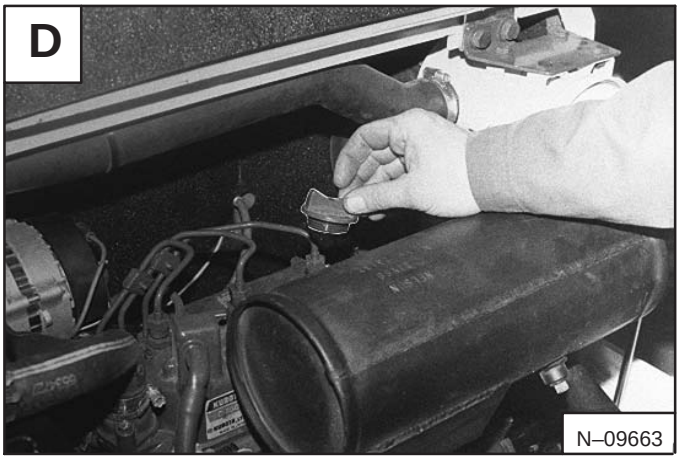
See the *SERVICE SCHEDULE* (See Page 1–1) for the correct service interval.

Use the following procedure to change the oil and filter:

1. Run the engine until it is at operating temperature.
2. Turn the upper works so there is clearance for the engine oil drain plug. Stop the engine.
3. Remove the drain plug (Item 1) **[B]**. Drain the oil into a container.
4. Remove the oil filter (Item 1) **[C]**, using a filter wrench.
5. Clean the filter housing surface. Put clean oil on the filter gasket. Install the new filter and hand tighten only.
6. Install and tighten the oil drain plug.
7. Remove the oil fill cap **[D]**. Put 4.5 quarts (4,3 L) of oil into the engine. (See *FUEL, COOLANT AND LUBRICANTS Chart*, Page 8–1).
8. Start the engine and let it run for several minutes. Stop the engine. Check for leaks at the oil filter.
9. Check the oil level and add oil as needed to bring it to the *top* mark on the dipstick.

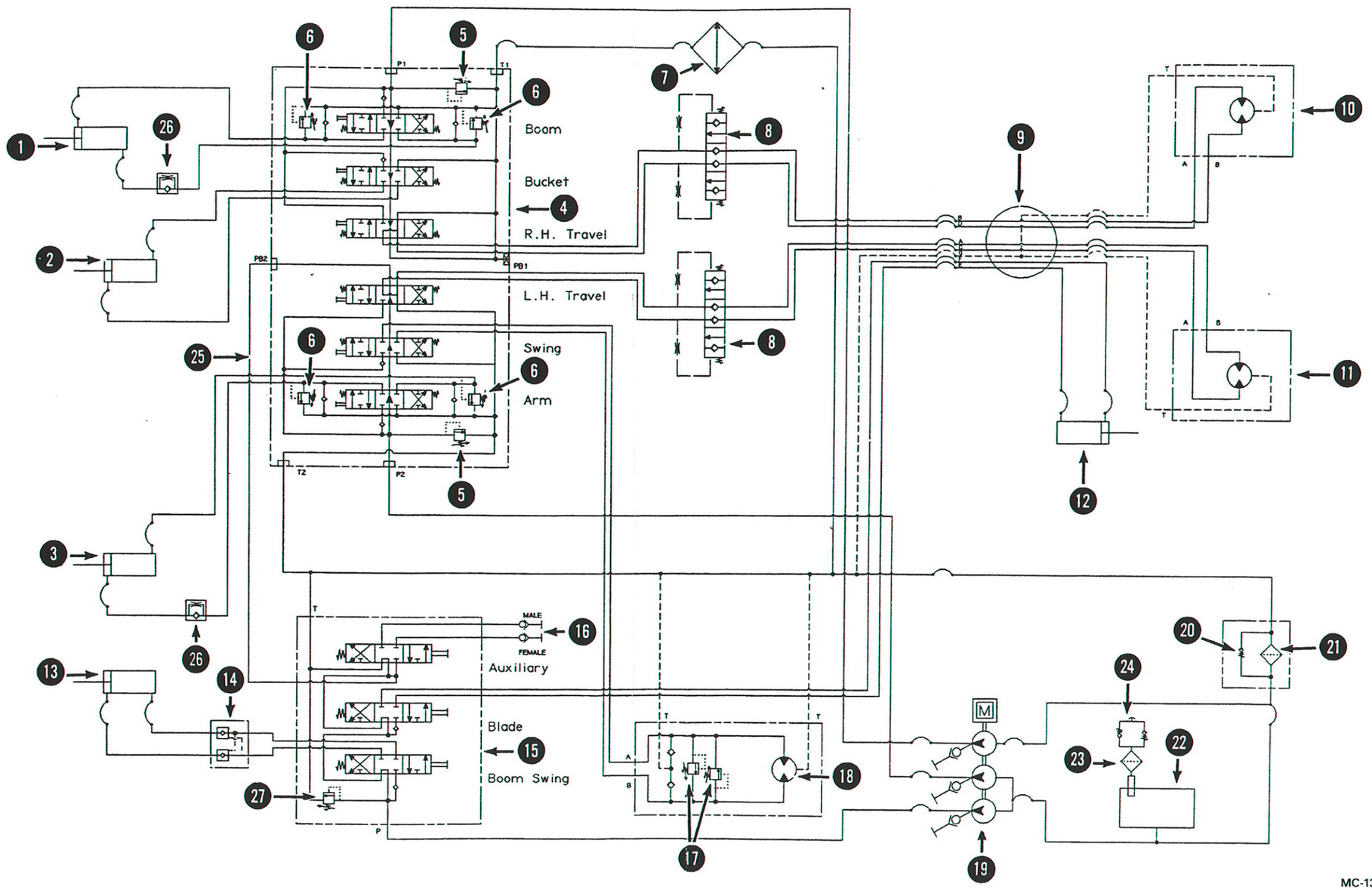






HYDRAULIC SYSTEM OPERATION
For Model
220 EXCAVATOR (S/N 12001–12286) (I.S.O.)
(Without Brakes)
Chart #6720535 (Printed June 1992)

Pressure Line
Case Drain
Pilot Pressure



MC-1384

thru the swivel joint (18) . The flow is then tee'd to the shuttle valve (24) which directs flow to the R.H. travel motor (17) to unlock the brakes. Oil also flows thru the holding valve (13) and into the R.H. travel motor (17) port A. This travel motor (17) will turn counterclockwise (reverse travel). Return flow will be from the R.H. travel motor (17) B port, to and thru the holding valve (13) and the swivel joint (18) and back to the top port of the control valve (9) . Any internal oil leakage in the R.H. travel motor (17) would flow out of the T port, to and thru the swivel joint (18) , into the drain line which goes back to the hydraulic tank (16) .

Activating Section 4 of the 6 spool control valve (9) (L.H. Travel) by pushing the spool into the valve, will allow the flow of oil out of the top port of the control valve (9) , to and thru the swivel joint (18) . The flow is then tee'd to the shuttle valve (24) and to the holding valves (13) . Oil flows into the shuttle valve (24) which directs flow to the L.H. travel motor (19) to unlock the brakes. Oil also flows thru the holding valve (13) and into the L.H. travel motor (19) port A. This travel motor (19) will turn counterclockwise (forward travel). Return flow will be from the L.H. travel motor (19) B port, to and thru the holding valves (13) and the swivel joint (18) and back to the bottom port of the control valve (9) .

By pulling out on the spool, will allow the flow of oil out the bottom port of the control valve (9) , to and thru the swivel joint (18) . The flow is then tee'd to the shuttle valve (24) and to the holding valves (13) . Oil flows into the shuttle valve (24) which directs flow to the L.H. travel motor (19) to unlock the brakes. Oil also flows thru the holding valve (13) and into the L.H. travel motor (19) port B. This travel motor (19) will turn clockwise (reverse travel). Return flow will be from the L.H. travel motor (19) A port, to and thru the holding valves (13) and the swivel joint (18) and back to the top port of the control valve (9) . Any internal oil leakage in the L.H. travel motor (19) would flow out of the T port, to and thru the swivel joint (18) , into the drain line which goes back to the hydraulic tank (16) .

Activating Section 5 of the 6 spool control valve (9) (swing motor) by pushing the spool into the valve, will allow the flow of oil out of the top port of the control valve (9) and to the A port of the swing motor (20) , turning the upper structure in the clockwise direction. Return flow will be from the B port of the swing motor (20) and to the top port of the control valve (9) . By pulling out on the spool will allow the flow of oil out the bottom port of the control valve (9) and to the B port of the swing motor (20) , turning the upper structure in the counterclockwise direction. Return flow will be from the A port of the swing motor (20) and to the top port of the control valve (9) . Any internal oil leakage from the swing motor (20) would flow out of the T port and into the drain line which goes back to the hydraulic tank (16) . If the upper structure is unable to rotate, the swing motor relief valves (21) will open once 1150-1275 PSI (7928-8790 kPa) is reached.

Activating Section 6 of the 6 spool control valve (9) (Arm) by pushing the spool into the valve, will allow the flow of oil out of the top port of the control valve (9) thru the check valve orifice (28) and to the rod end of the cylinder (2) . This will force the piston to the base end of the cylinder (3) (this would push the arm away from the excavator). By pulling out on the spool will allow the flow of oil out of the bottom port of the control valve (9) and to the base end of the cylinder (2) . This will force the piston to full rod extension (this will pull the arm towards the excavator). (NOTE: Port relief valves (10) on Section 1 and Section 6 will activate only under certain conditiones, Example: If the arm and boom section of the control valve is in the neutral position, with the arm in the full down position and the excavator is backed up. Extreme hydraulic pressure would be placed on the arm and boom section the control valves. The port relief valve (10) will open once 2850 PSI (19648 kPa) is reached. This would allow the oil to flow out of the boom (2) , and/or arm cylinder (3) , and to the drain line).

Activating Section 1 of the 3 spool control valve (7) (Auxiliary) by pushing the spool into the valve, will allow the flow of oil out of the front port of the control valve (7) (NOTE: Additional oil flow is also obtained from the power beyond port PB2 of the 6 spool valve (9) , thru the power beyond hose routing (27) and to the 3 spool control valve (7)) and to the female quick coupler (6) and into the installed attachment. Return flow from the attachment will be to the male quick coupler (6) and back to the rear port of the control valve (7) . By pulling the spool out on the control valve (7) , oil will flow out of the rear port of the control valve (7) and to the male quick coupler (6) and into the installed attachment. Return

HYDRAULIC FLOW CHART

For Model

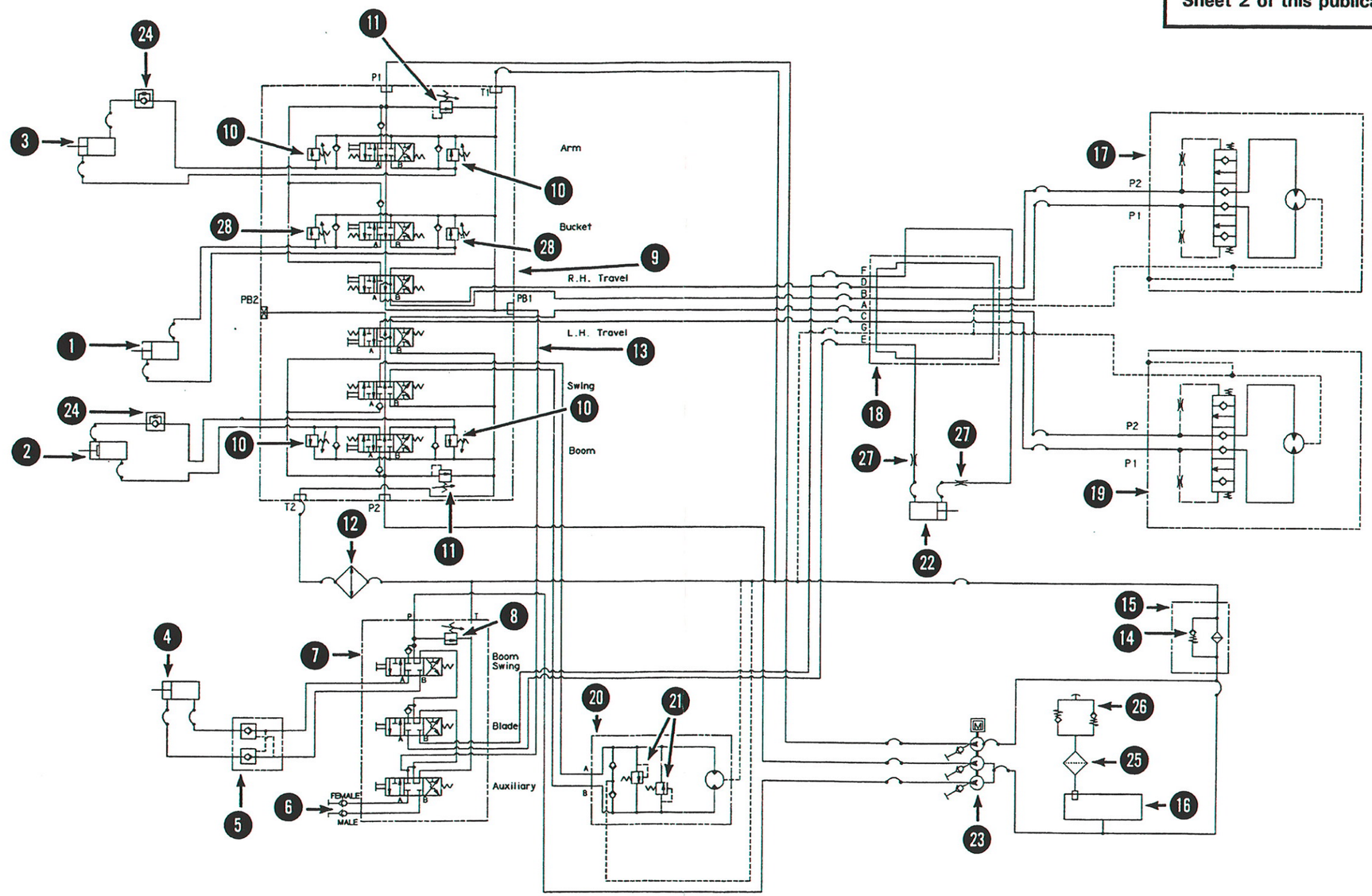
220 EXCAVATOR (S/N 12930 & Above) (STANDARD)

Chart #6722103 (Printed June 1992)

———	Pressure Line
- - - - - -	Case Drain
—·—·—	Pilot Pressure

NOTE

Chart shows oil flow in Forward Drive Position and with Hydraulic Cylinders Partially Extended. For Hydraulic/ Hydrostatic System Operation, refer to Sheet 2 of this publication.

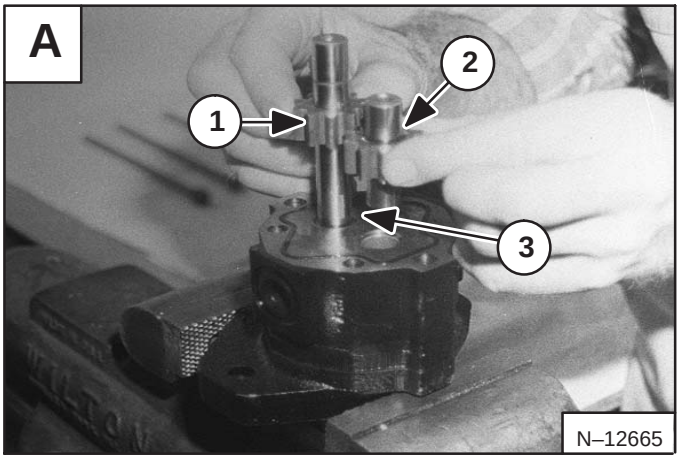


HYDRAULIC PUMP (Cont'd)

Disassembly (Cont'd)

Remove the second drive gear (Items 1) **[A]** and the idler gear (Item 2) **[A]**.

Remove the woodruff key (Item 3) **[A]**.



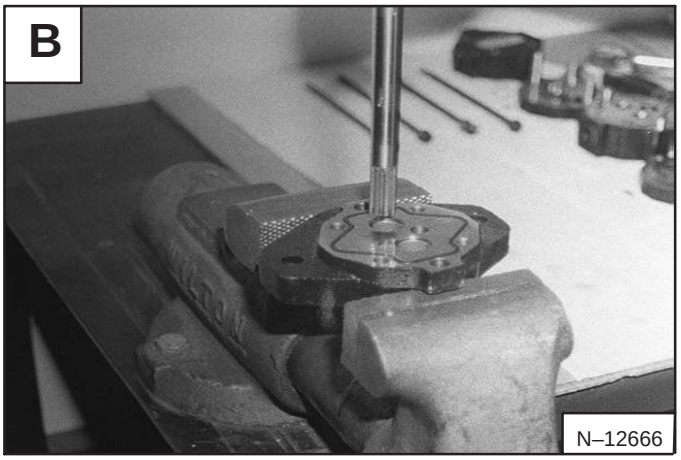
Remove the second bushing plate.

NOTE: Bushings are not serviceable. If the bushings need replacing, order a new bushing section from Melroe Parts.

Remove the third gear plate and dowel pins.

Remove the third drive gear, idler gear and the woodruff key.

Remove the drive shaft from the pump **[B]**.



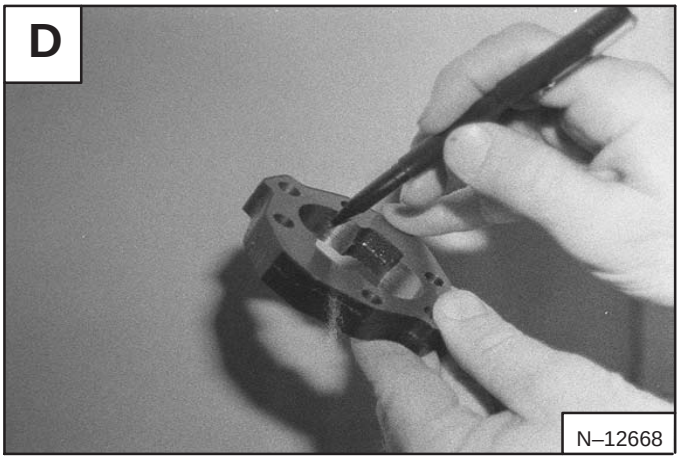
Remove the shaft seal from the pump mounting plate **[C]**.

Clean and inspect all parts **[D]**.

Any gears that need replacing should be replaced in sets.

Inspect the bushing plates in the area that the gears contact the bushing plate side faces for grooves or scratches. Replace if damaged.

Inspect the gear plates in the area around the outer diameter of the gear for grooves or pits. Replace if damages.



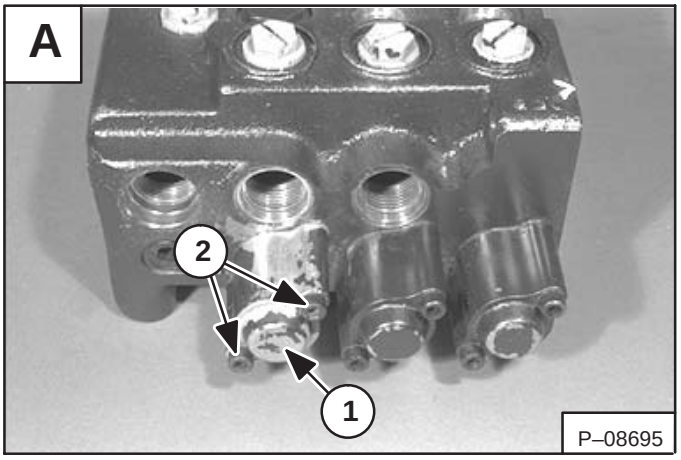
DUKES HYDRAULIC CONTROL VALVE (Cont'd)

Assembly (Cont'd)

Install the end cap (Item 1) **[A]** and the two screws (Item 2) **[A]** on the valve assembly and tighten.

Tighten the screws to 2–3 ft.–lbs. (2.7–4.1 Nm) torque.

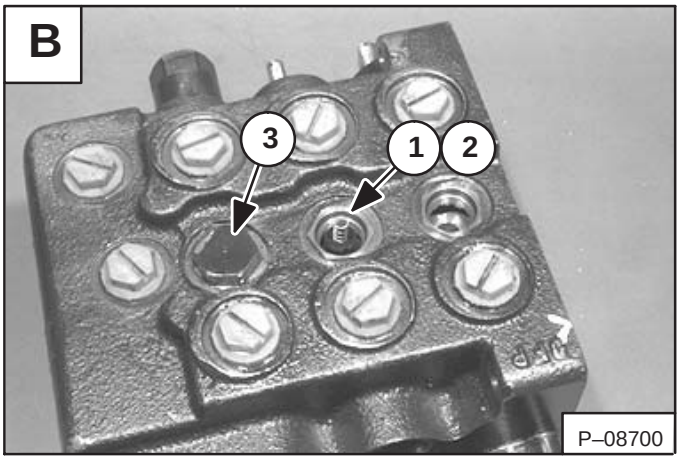
Repeat this procedure for the remaining end caps.



Install the spring (Item 1) **[B]** and poppet (Item 2) **[B]** into the valve assembly.

NOTE: The poppet (Item 2) [B] installs in the control valve port with the spring seat hole pointing up.

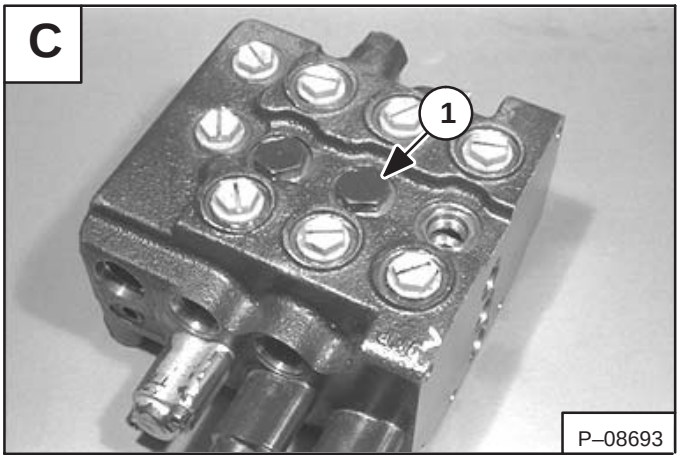
Repeat this procedure for the remaining plugs (Item 3) **[B]**.



Install a new O–ring onto the plug (Item 1) **[C]** and install in the valve assembly.

Tighten the plug to 15–20 ft.–lbs. (20.3–27.1 Nm) torque.

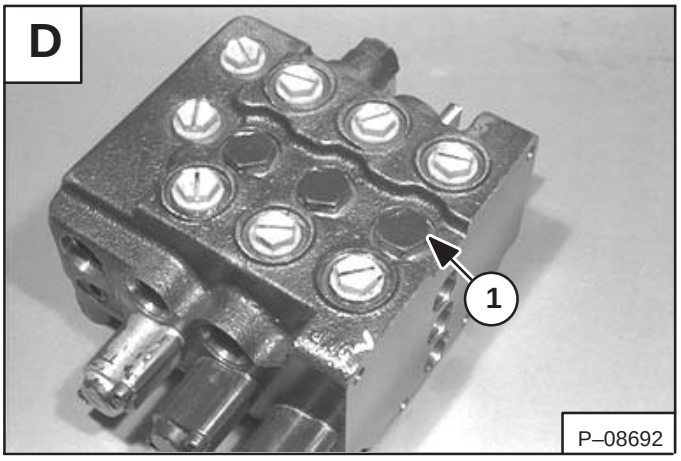
Repeat this procedure for the remaining plugs.



Install a new O–ring on the plug (Item 1) **[D]** and install in the valve assembly.

Tighten the plug to 15–20 ft.–lbs. (20.3–27.1 Nm) torque.

Repeat this procedure for the remaining plugs.

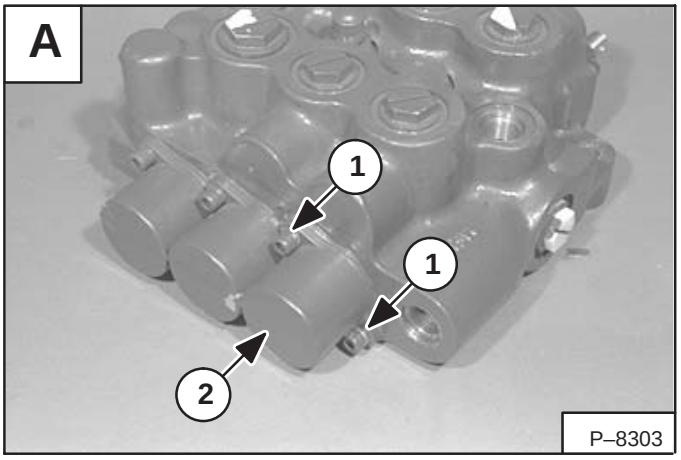


MELROE HYDRAULIC CONTROL VALVE (Cont'd)

Disassembly (Cont'd)

Boom Swing And Blade Sections

Remove the two screws (Item 1) **[A]** and bonnet (Item 2) **[A]** from the control valve.

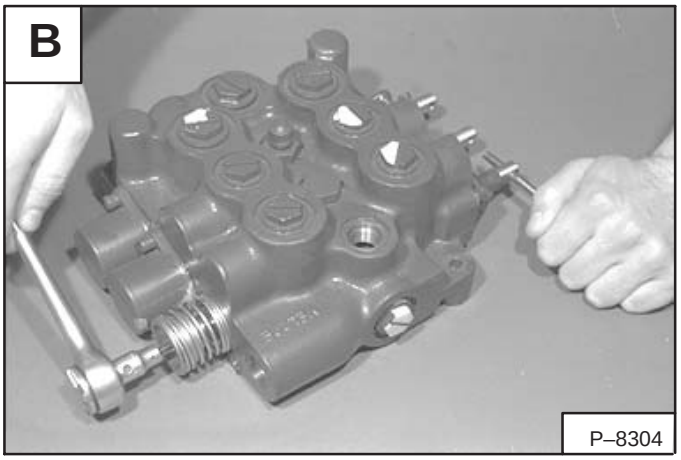


Insert a hardened pin in the hole in the actuating end of the spool to keep the spool from turning.

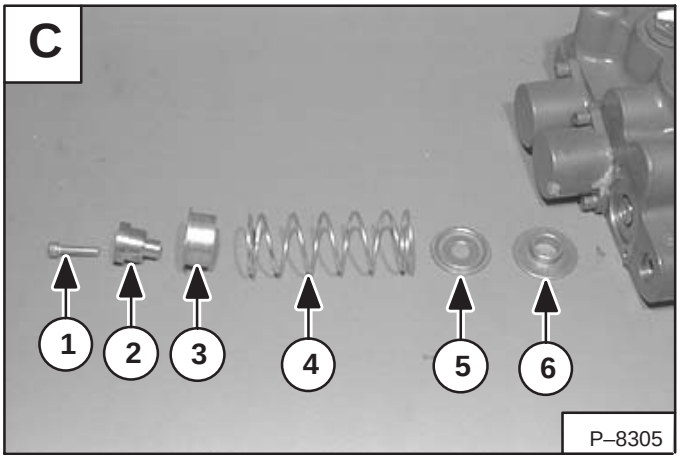
Do not use any type of tool to grip the finished surface of the spool or the spool will be damaged.

Loosen the spring retaining bolt from the end of the spool **[B]**.

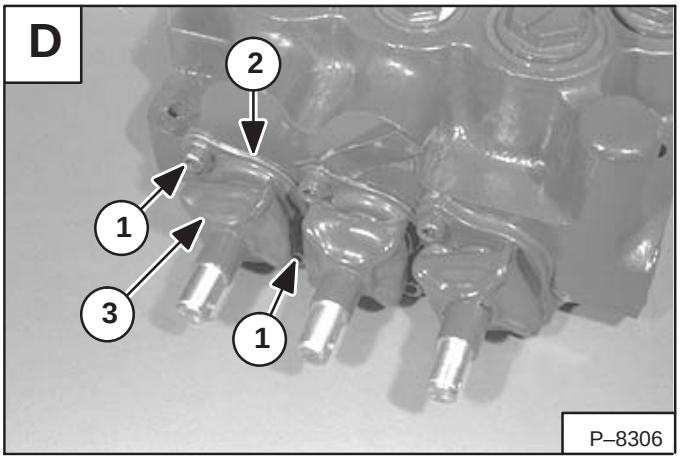
NOTE: The spring is under pressure. Use care when removing the spring retainer bolt.



Remove the bolt (Item 1) **[C]**, adapter (Item 2) **[C]**, collar (Item 3) **[C]**, spring (Item 4) **[C]**, washer (Item 5) **[C]** and bushing (Item 6) **[C]**.



Remove the two screws (Item 1) **[D]**, retainer (Item 2) **[D]** and dust boot (Item 3) **[D]** from the actuating end of the spool.



HOLDING VALVES

Removal And Installation

Remove the floor panels. (See Page 3–1.)

IMPORTANT

When repairing hydrostatic and hydraulic systems, clean the work area before disassembly and keep all parts clean. Always use caps and plugs on hoses, tubelines and ports to keep dirt out. Dirt can quickly damage the system.

I–2003–0888

Mark the hoses and tubelines for the correct installation.

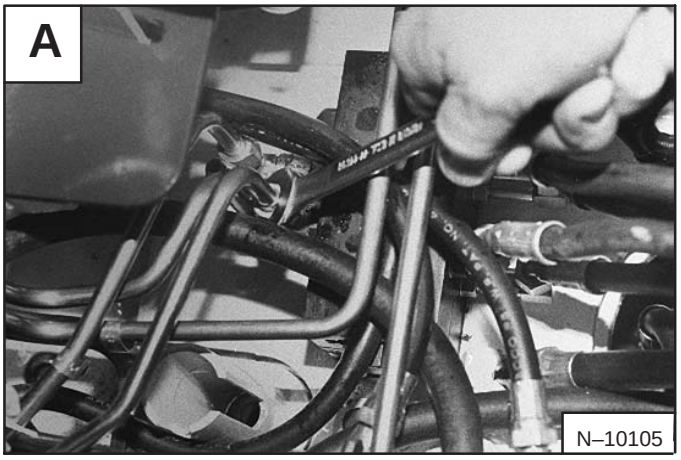
Remove the tubelines from the front of the holding valves **[A]**.

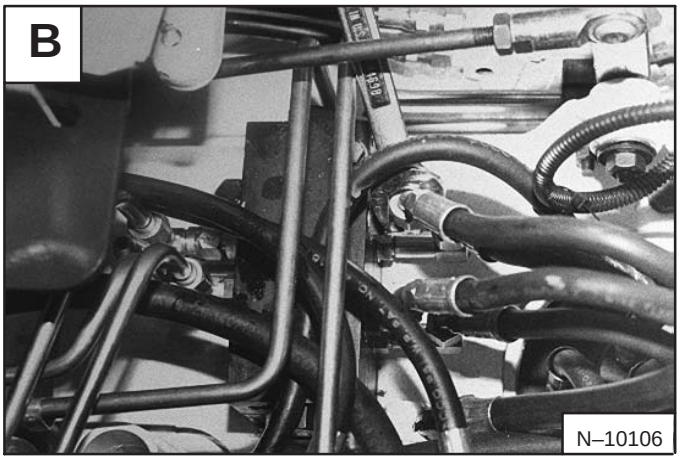
Remove the hoses from the rear of the holding valves **[B]**.

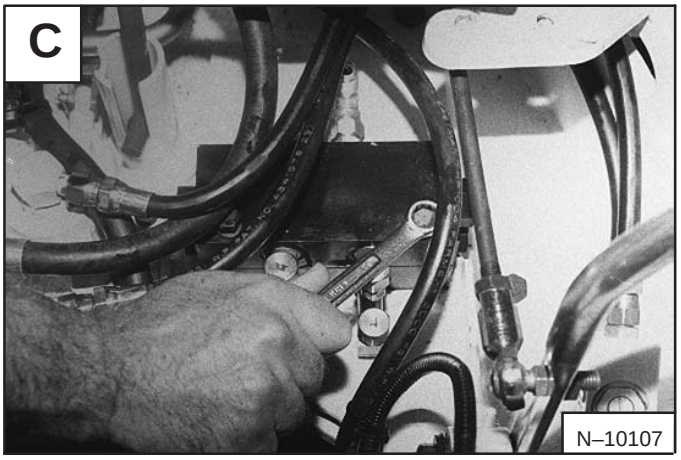
Remove the two mounting bolts **[C]**.

Installation: Tighten the bolts to 65–70 ft.–lbs. (88–95 Nm) Torque.

Remove the holding valve.



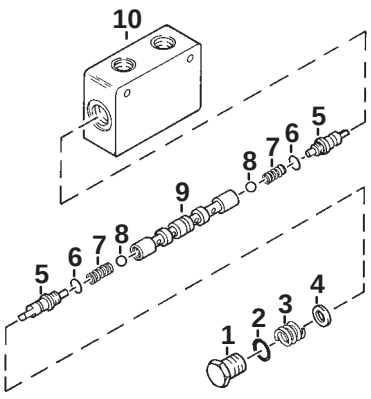




Parts Identification

1. Plug
2. O–ring
3. Spring
4. Washer
5. Plug
6. O–ring
7. Spring
8. Ball
9. Spool
10. Valve Body

NOTE: Check Parts Fiche for serviceable parts.



DIPPERARM CYLINDER

Removal And Installation

NOTE: Refer to the Pages 2–51 – 2–59 for servicing the Cylinder.

Lower the bucket to the floor. Stop the engine.

Support the boom using a chain hoist.

Move the hydraulic controls to release the hydraulic pressure.

IMPORTANT

When repairing hydrostatic and hydraulic systems, clean the work area before disassembly and keep all parts clean. Always use caps and plugs on hoses, tubelines and ports to keep dirt out. Dirt can quickly damage the system.

I–2003–0888

Disconnect the two hoses from the dipperarm cylinder.

Remove the retainer bolt (Item 1) **[A]** and nut from the cylinder base end pin.

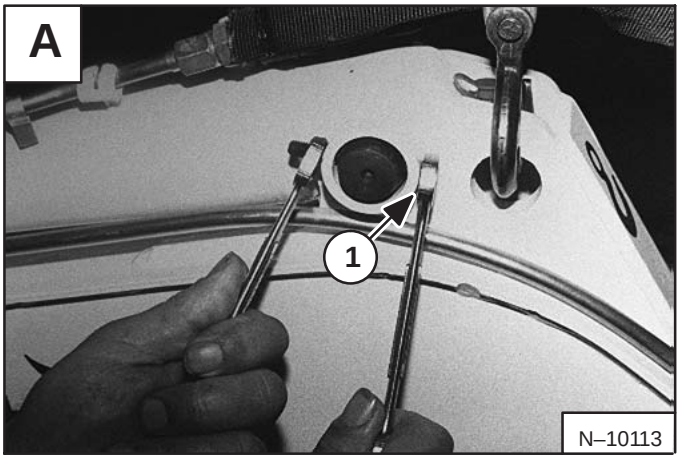
Remove the cylinder base end pin.

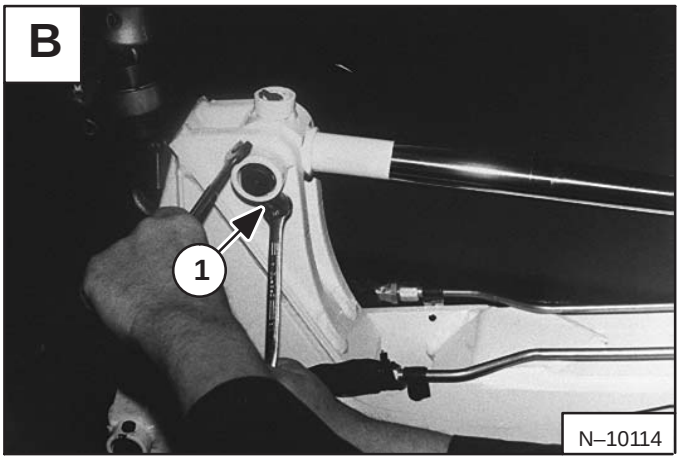
Remove the retainer bolt (Item 1) **[B]** and nut from the cylinder rod end pin.

Remove the cylinder rod end pin.

Remove the cylinder from the dipperarm.

Installation: Tighten the bolt to allow NO endplay of the bolt (Item 1) **[A]** &**[B]**.

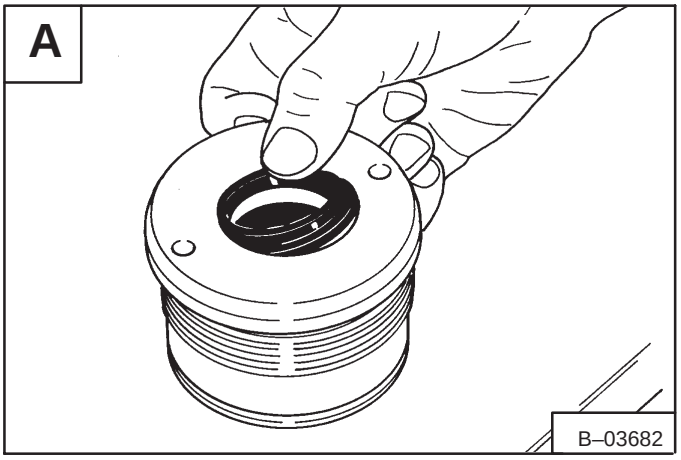




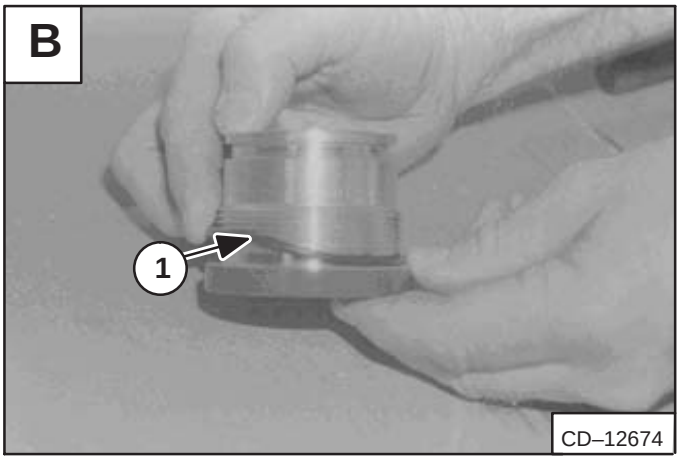
HYDRAULIC CYLINDER (Cont'd)

Assembly (Cont'd)

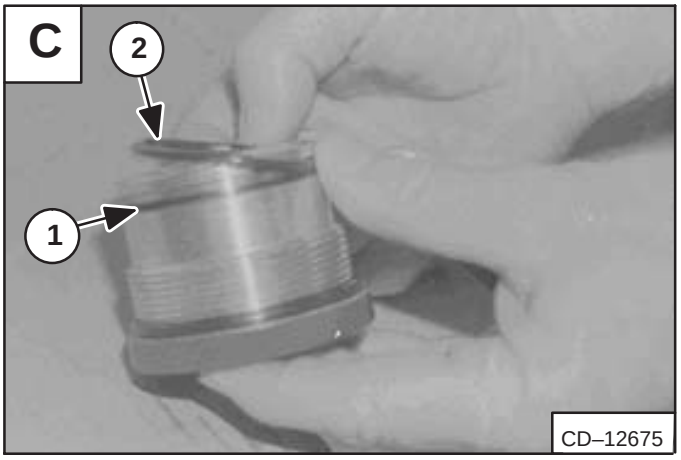
Install the wiper seal with the lip toward the outside of the head **[A]**.



Install the O–ring (Item 1) **[B]** onto the head.



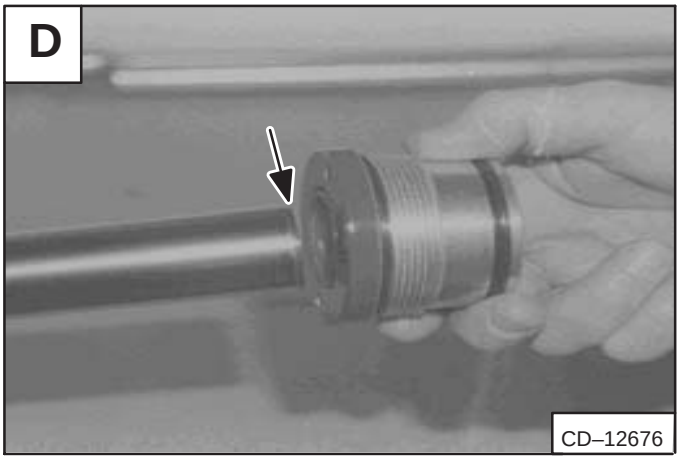
Install the back–up washer (Item 1) **[C]** and O–ring (Item 2) **[C]** onto the head.



Apply grease to the inside of the head and to the lips of the seals.

Inspect the beveled edge of the rod for nicks or sharp edges **[D]**. Remove these with a file prior to installing the gland on the rod or damage to the seals may occur.

Install the head on the rod **[D]**.



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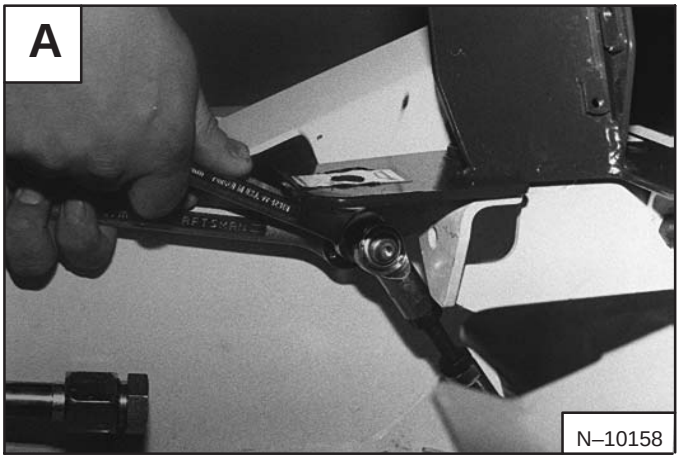
CONSOLE

Removal And Installation

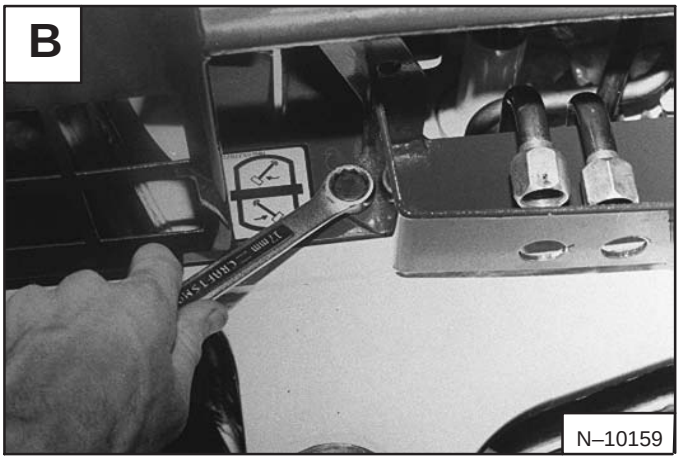
Remove the Dukes control valve. (See Page 2–1.)

Remove the left floor panel. (See Page 3–2.)

Remove the Melroe control valve linkage from the console base (both sides) **[A]**.



Remove the four mounting bolts from the base of the console **[B]**.

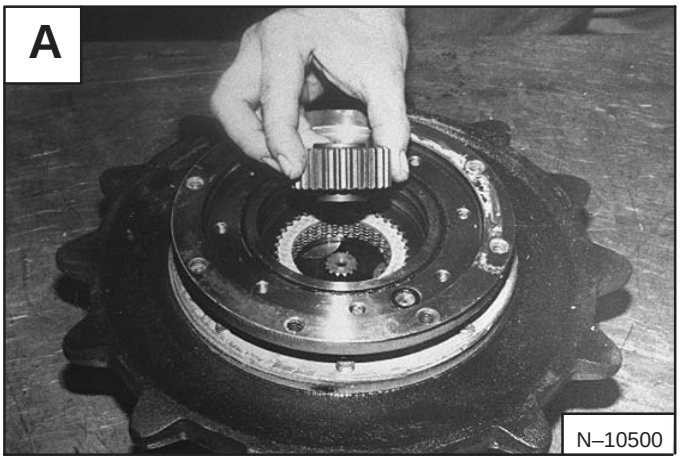


Remove the console **[C]**.

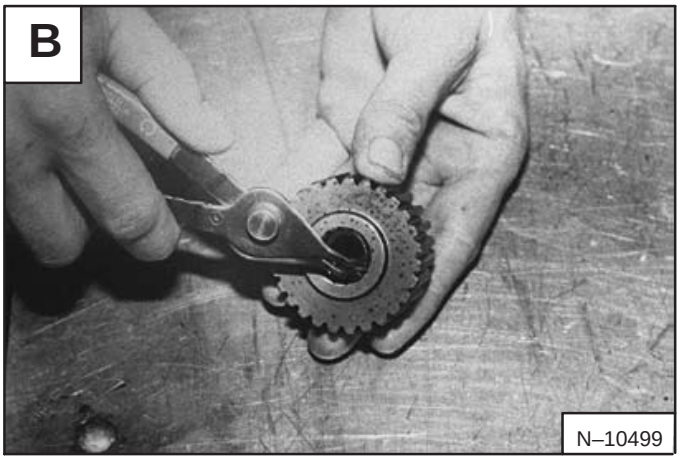
DRIVE MOTOR (Cont'd)

Disassembly (Cont'd)

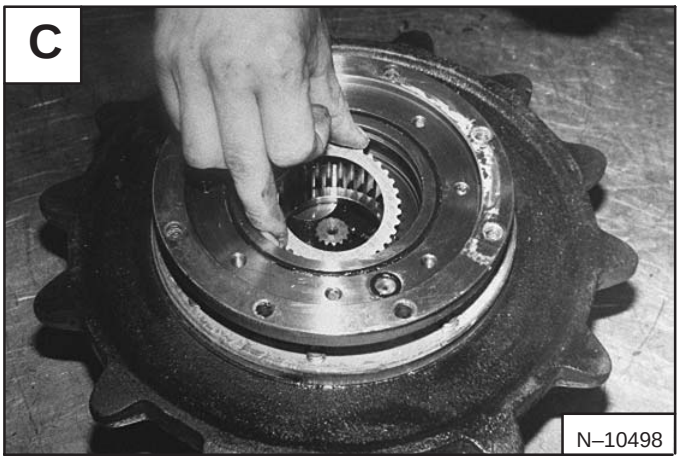
Remove the brake hub from the inside of the brake discs **[A]**.



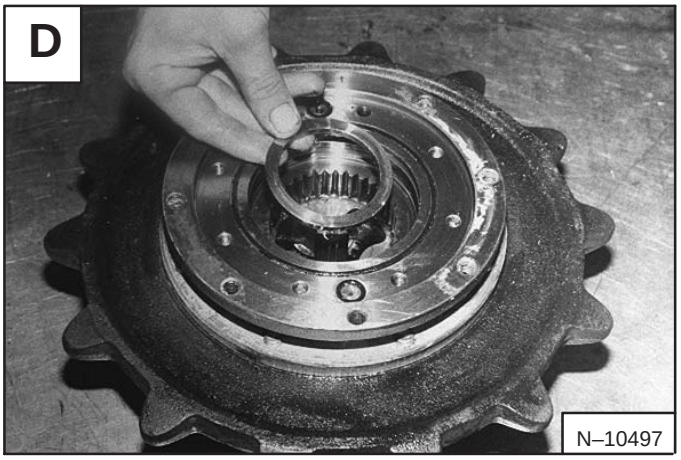
Remove the snap ring from the inside of the gear **[B]**.



Remove the eleven internal and external tooth brake discs **[C]**.



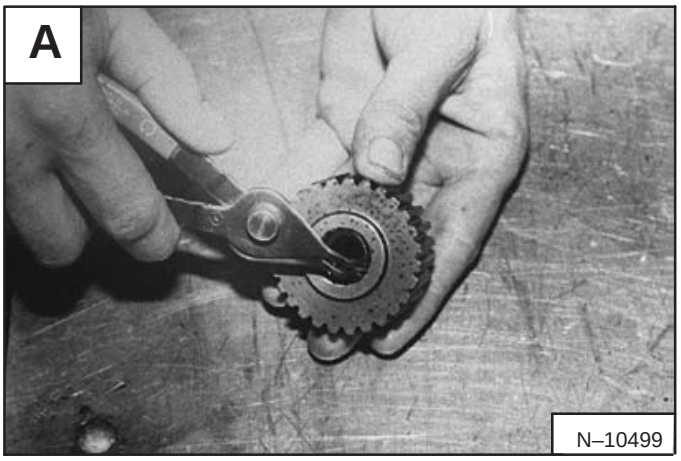
Remove the spacer **[D]**.



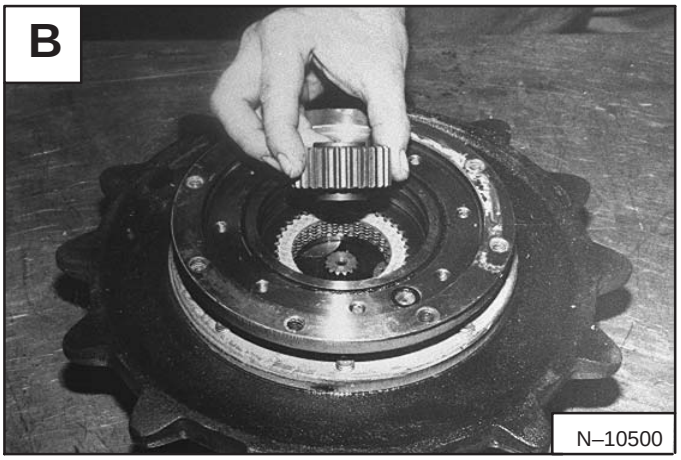
DRIVE MOTOR (Cont'd)

Assembly (Cont'd)

Install the snap ring into the brake gear hub **[A]**.



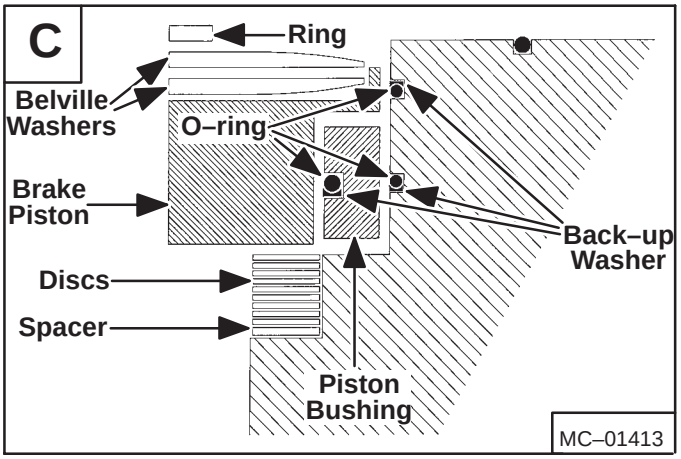
Align the teeth of the steel discs and install the brake gear hub into the brake discs **[B]**.



Install the O–rings and backup washers into the housing **[C]**.

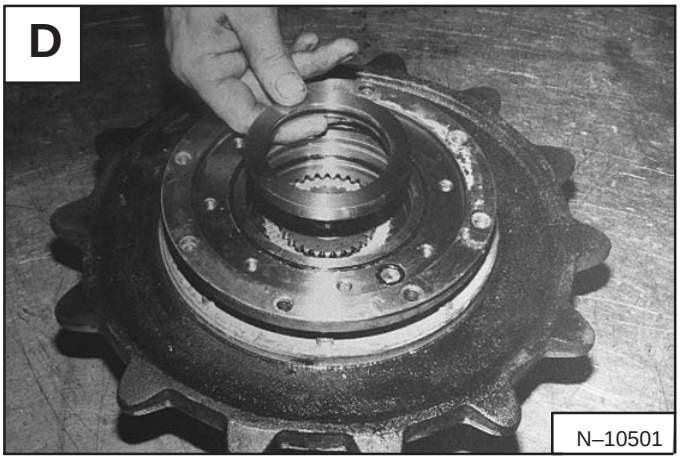
Install the O–ring and backup washer into the piston bushing **[C]**.

NOTE: Make sure the O–rings and backup washers are in the position shown and that the backup washers do not get twisted during the piston bushing installation [C].



Install the piston bushing into the housing **[D]**.

NOTE: Be sure that the O–ring is facing outwards when the bushing is installed [C].



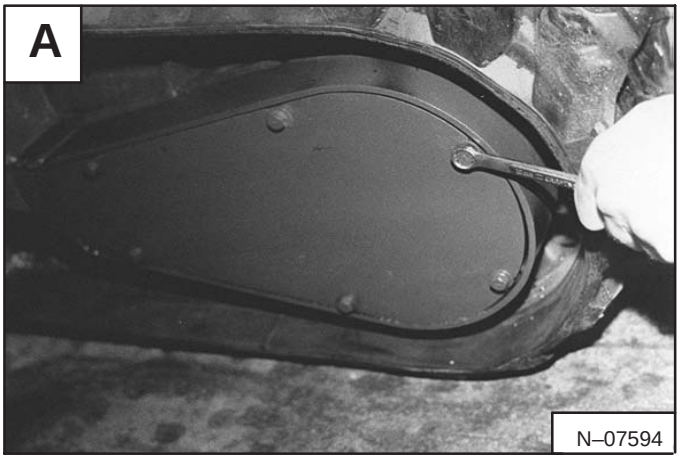
FINAL DRIVE

For S/N 12930 & Above

Removal And Installation

Remove the bolts from the track frame cover **[A]**.

Installation: Tighten the bolts to 15–18 ft.–lbs. (20–25 Nm) torque.



Remove the cover **[B]**.

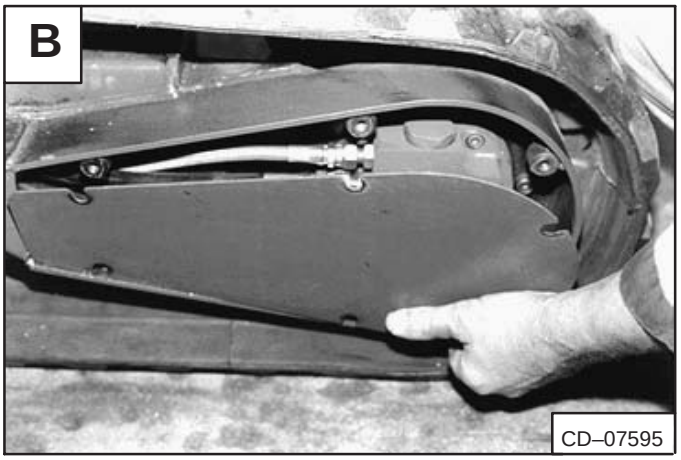
Lift and block the side of the track frame where the final drive will be removed.

Release the track tension and remove the track. (See Page 5–1.)

IMPORTANT

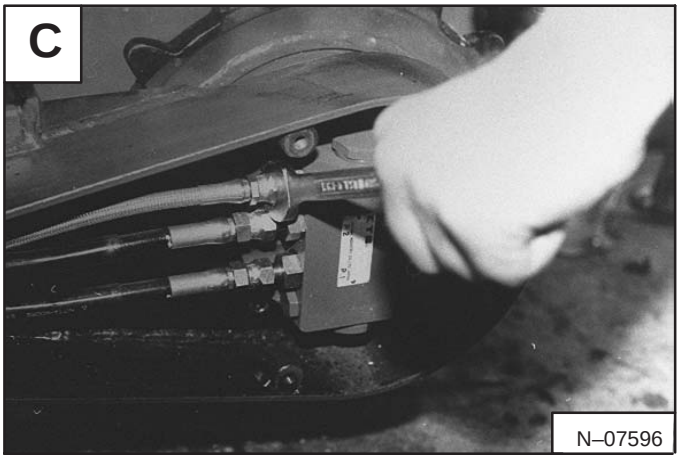
When repairing hydrostatic and hydraulic systems, clean the work area before disassembly and keep all parts clean. Always use caps and plugs on hoses, tubelines and ports to keep dirt out. Dirt can quickly damage the system.

I–2003–0888



Mark the hoses for correct installation.

Disconnect the hoses from the drive motor **[C]**.



Loosen and remove the final drive mounting bolts **[D]**.

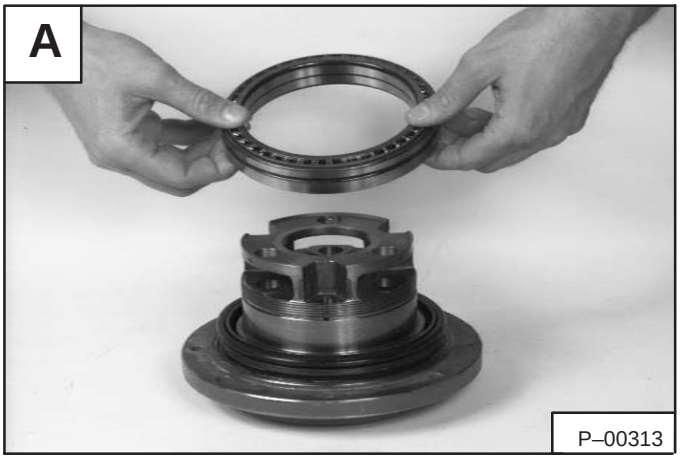
Installation: Put LOCTITE on the bolts and tighten to 48–55 ft.–lbs. (65–75 Nm) torque.

DRIVE MOTOR (Cont'd)

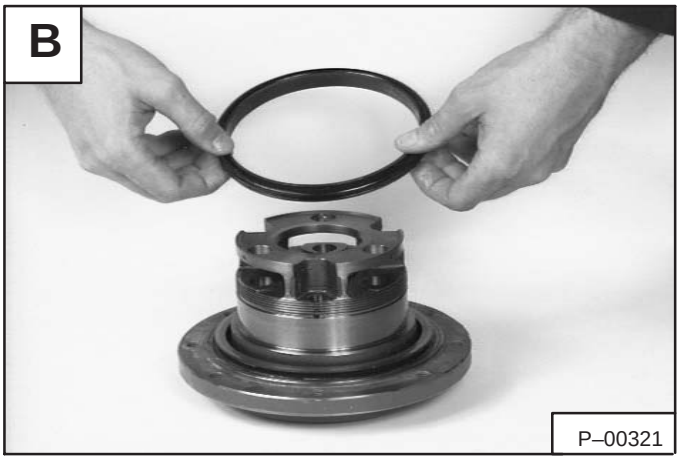
Disassembly (Cont'd)

Carefully remove the double race bearing from the hub **[A]**.

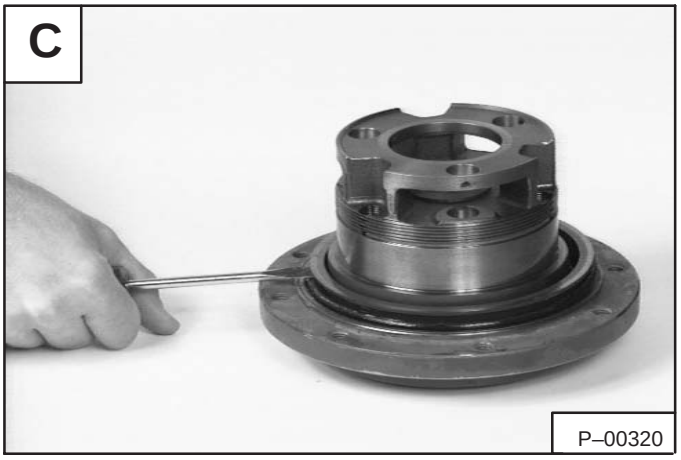
NOTE: The inner and outer races of this bearing are not permanently retained to each other. If not lifted off as an assembly, the races will separate and the steel balls will come loose.



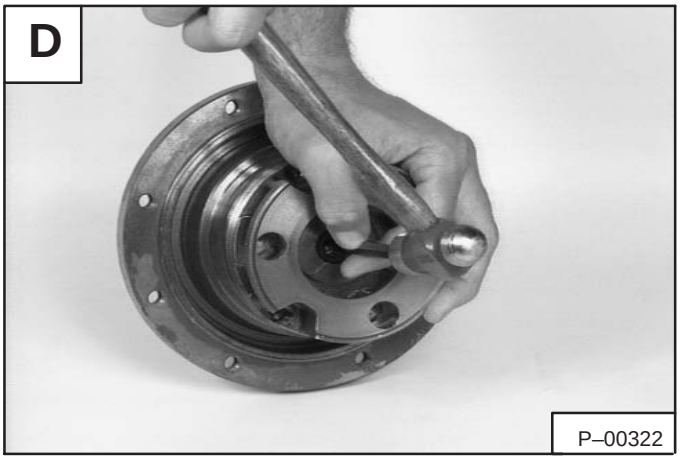
Remove the top half of the floating seal from the hub **[B]**.



Use a screw driver and pry the lower half of the floating seal from the hub and remove **[C]**.



Use a punch and tap the swash plate and drive shaft out of the center of the hub **[D]**.



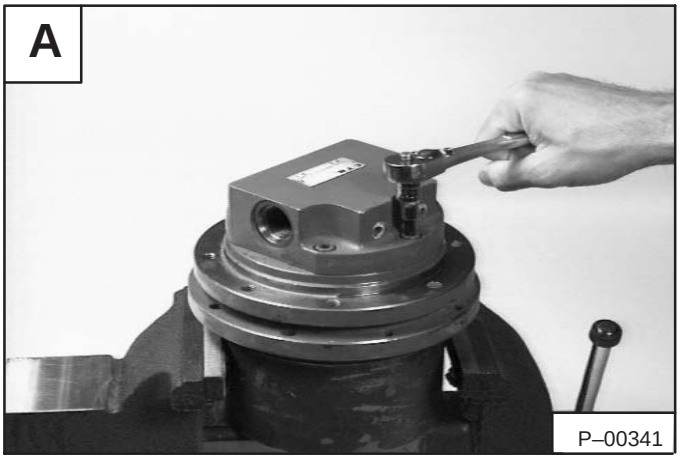
DRIVE MOTOR (Cont'd)

Assembly (Cont'd)

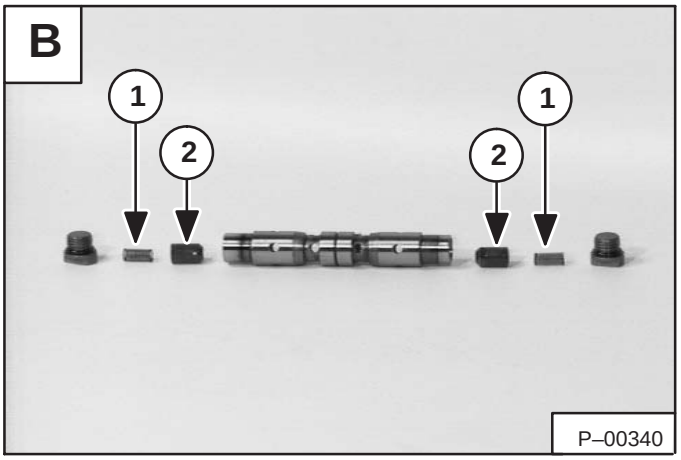
Install the six bolts into the valve end plate **[A]**. Insert a pin thru the holes in the hub and the housing to keep the hub from rotating and tighten the six bolts.

Tighten the bolts to 21–26 ft.–lbs. (29–35 Nm) torque.

Remove the pin that was installed to keep the hub and housing from rotating.

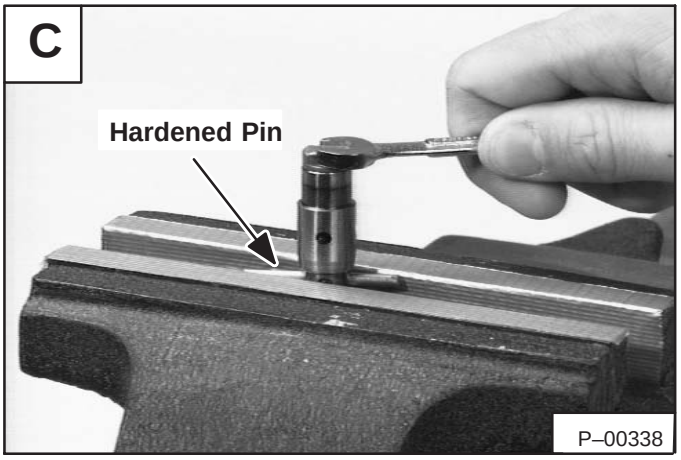


Apply oil to the outer diameter of the poppets and install the poppets (tapered end in first) into the spool **[B]**. Insert the spring into the cavity of the poppets. Install a new O–ring onto the end plugs and install the plugs **[B]**.



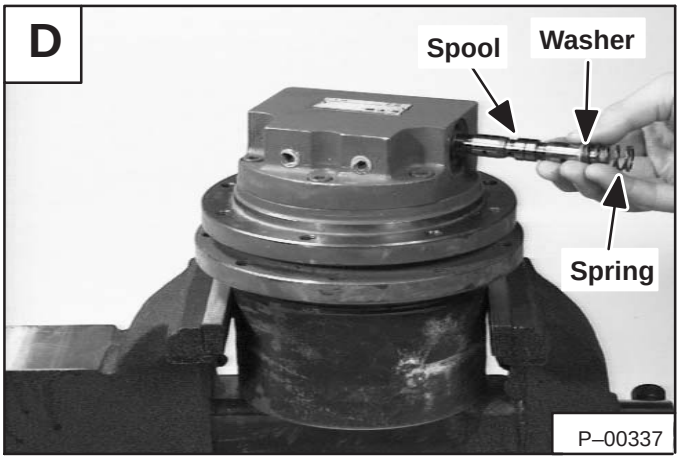
Insert a hardened dowel pin thru the hole in the spool gland and use a vise with protective jaws to hold the spool from turning. Tighten the end plugs **[C]**.

Tighten the plugs to 18–21 ft.–lbs. (24–29 Nm) torque.



Apply oil to the spool and install the spool into the valve end plate **[D]**.

Install the washer over the end of the spool and the spring **[D]**.



UPPER WORKS (Cont'd)

Alignment Screw Procedure

Connect a chain hoist to the frame and lower the frame onto the swing bearing. Maintain a slight amount of frame weight on the chain hoist.

Install the three alignment screws (P/N 6539680), (Item 1) **[A]** thru the frame and into the swing bearing, equally space these screws around the swing bearing.

Lower the frame onto the swing bearing while evenly tightening the three alignment screws until they are tight.

The tapered head of the alignment screws will guide the frame into alignment with the swing bearing.

Apply LOCTITE to the mounting bolts (Item 2) **[A]** and install the bolts thru the frame and into the swing bearing.

Tighten the bolts to 44–47 ft.–lbs. (60–65 Nm) torque.

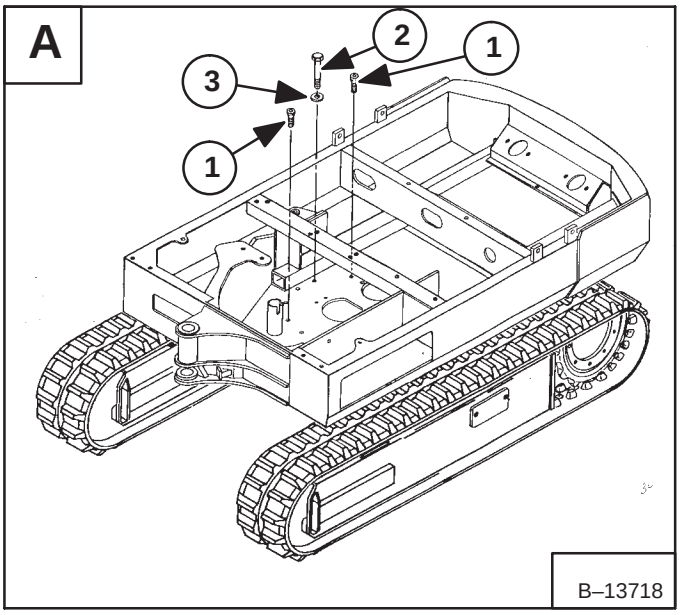
NOTE: If lock washers were used on the original bolts (Item 2) [A], replace the lock washers with hardened flat washers (P/N 27E–6) (Item 3) [A].

Remove the three alignment screws (Item 1) **[A]** from the frame.

Apply LOCTITE to the threads of the remaining bolts and install them into the frame.

Tighten the bolts to 44–47 ft.–lbs. (60–65 Nm) torque.

Remove the chain hoist from the frame.



Installation Of Swing Motor

Do the following for either the alignment pin or the alignment bolt procedure

Install the swing motor (Item 4) **[B]** into the frame.

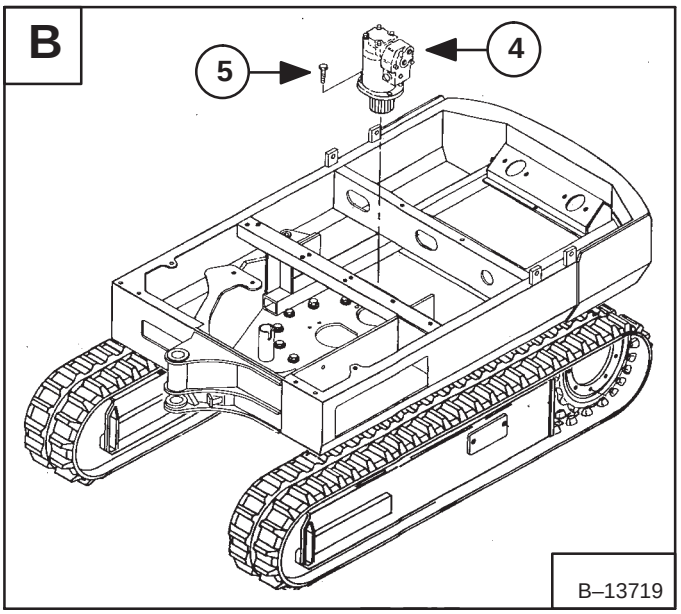
Apply LOCTITE to the threads of the bolts (Item 5) **[B]** and install.

Tighten these bolts to 29–37 ft.–lbs. (40–50 Nm) torque.

Remove the caps and/or plugs from the swing motor but do not install any hoses.

The swing motor gear to the swing bearing gear engagement must be checked to insure that there is back lash between the gears through 360° of frame rotation.

Check for back lash by moving the frame back and forth at several points throughout the frames rotation. There must be some backlash present.



BOOM AND DIPPERSTICK (Cont'd)

Removal And Installation (Cont'd)

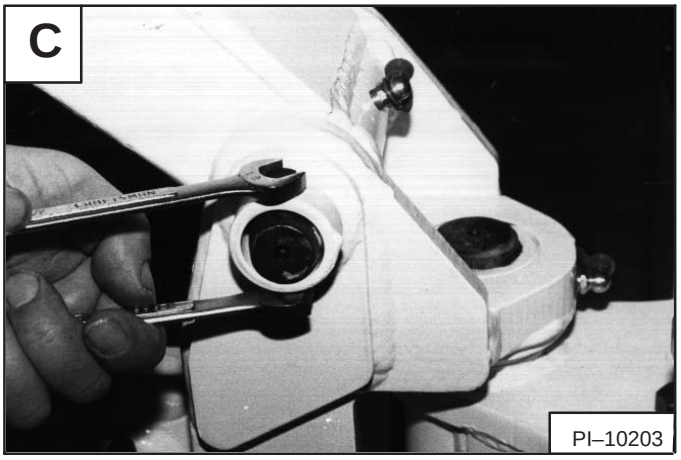
Remove the auxiliary hoses **[A]**.

Remove the bolt from the tubeline clamp **[B]**.

Remove the boom cylinder. (See Page 2–1.)

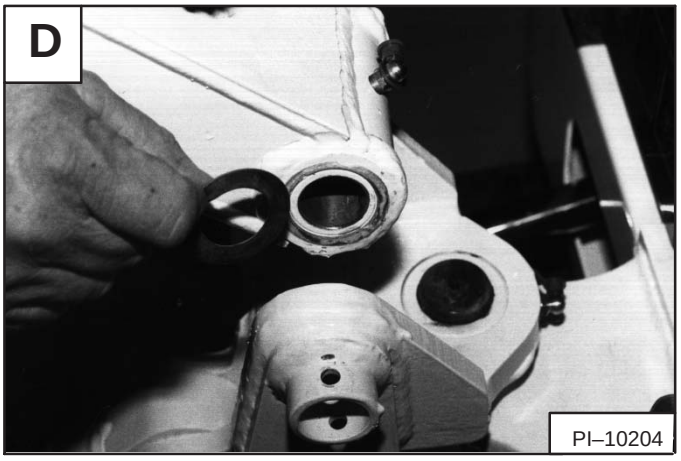
Remove the boom swing cylinder. (See Page 2–1.)

Remove the retainer bolt and nut from the boom pivot pin **[C]**.



Remove the boom pivot pin and washer(s) **[D]**.

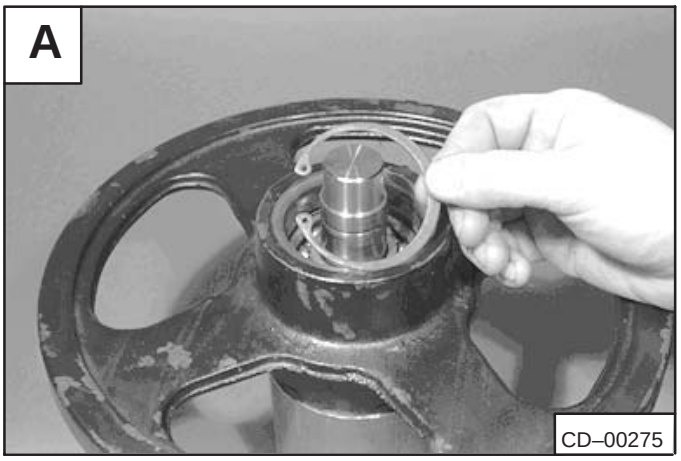
Installation: Make sure to install the washer(s) that were removed when the boom was removed from the swing bracket **[D]**.



TRACK IDLER (Cont'd)

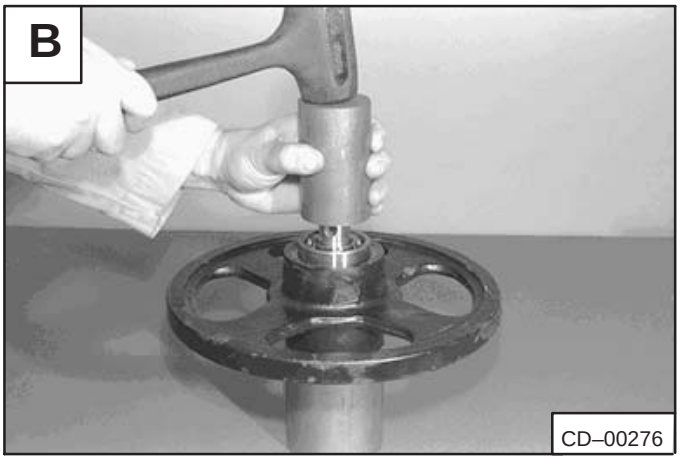
Assembly (Cont'd)

Install the snap ring **[A]**.

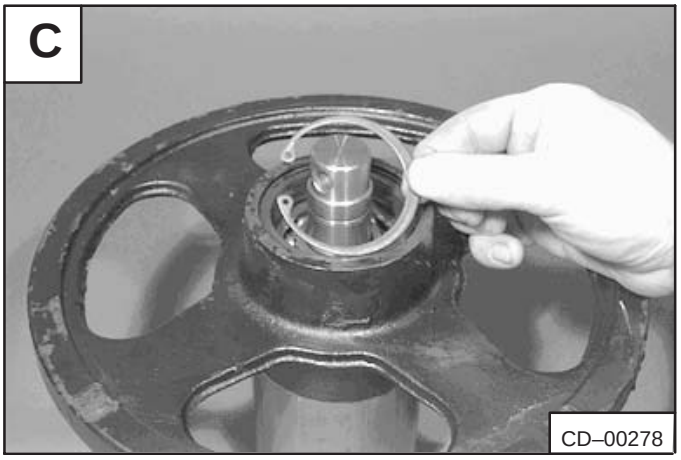


Turn the idler assembly over.

Using the driver tool, install the other bearing, with the numbered side upward, into the idler **[B]**.



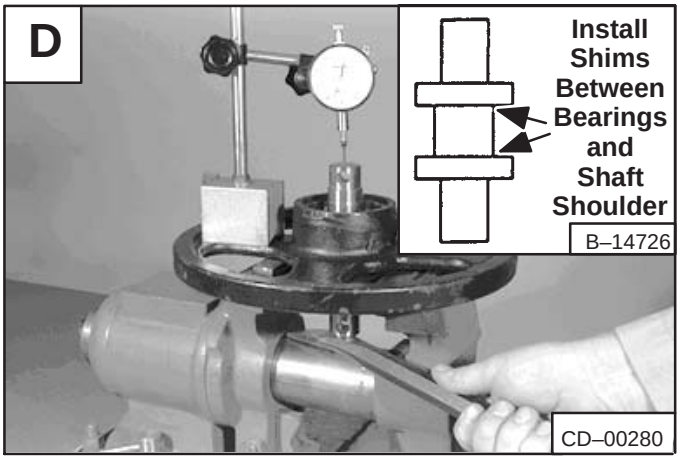
Install the snap ring **[C]**.



Using a dial indicator, check the endplay of the shaft **[D]**.

If the endplay is greater than 0.030 inch (0,76 mm) then the bearing must be shimmed.

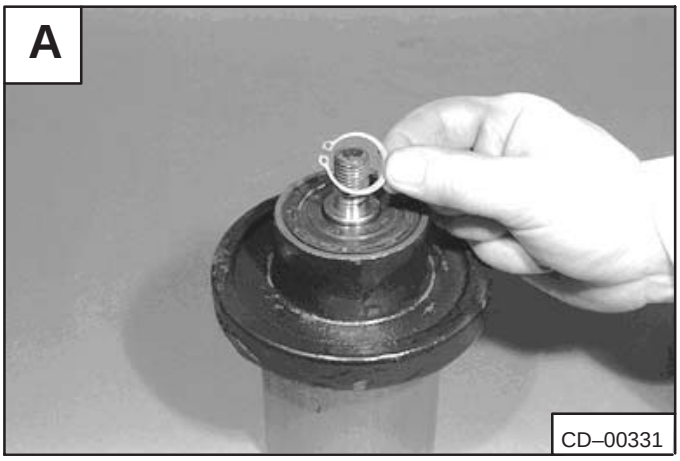
Cut a shim from the necessary thickness shim stock and install the shim between the bearing and the shoulder on the shaft.



TRACK ROLLER (Cont'd)

Assembly (Cont'd)

Install the snap ring on each end of the shaft **[A]**.

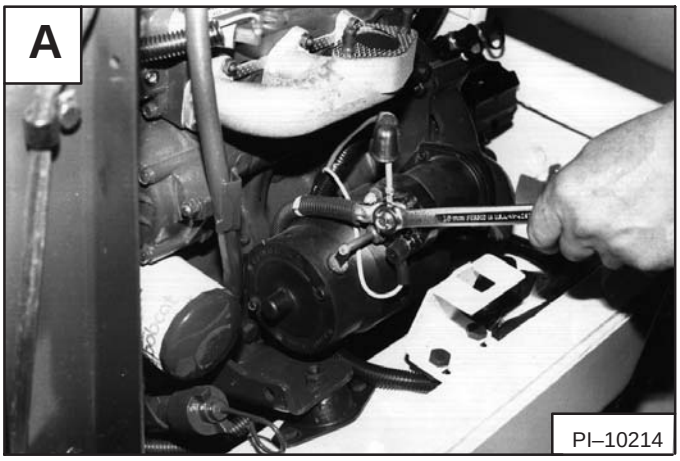


STARTER

Removal And Installation

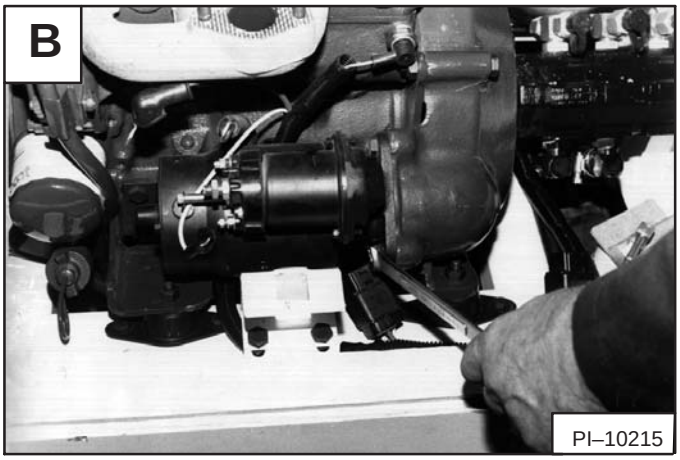
Raise the operator seat. Disconnect the negative (–) cable from the battery.

Disconnect the wires from the starter **[A].**



Remove the mounting bolts from the starter **[B]**.

Remove the starter from the bell housing.



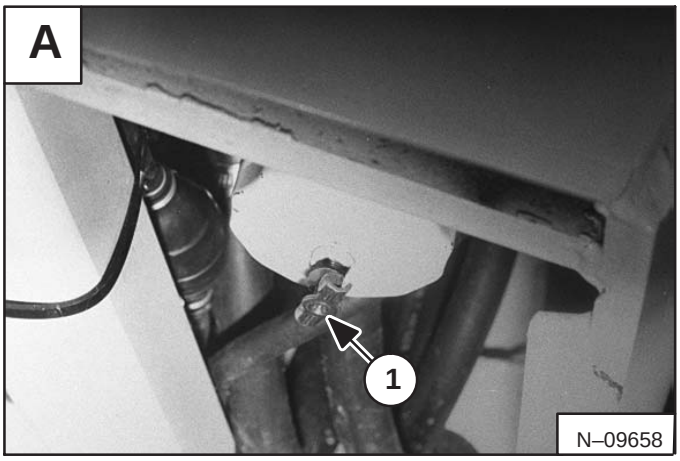
FUEL FILTER

See the *SERVICE SCHEDULE* (See Page 1–1) for the correct service interval for the fuel filters.

Use a filter wrench to remove the fuel filter **[A]**.

Put some oil on the new filter gasket. Install the new filter element and hand tighten only.

To remove water from the filter open the drain valve (Item 1) **[A]**.



Removing Air From The Fuel System

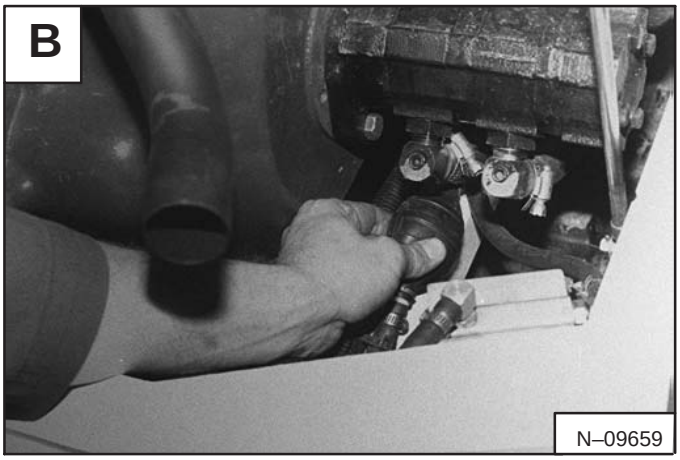
After replacing the fuel filters or after running out of fuel, air must be removed from the fuel system.

Open the vent valve on the injection pump.

Squeeze the priming bulb to fill the filter with fuel **[B]**.

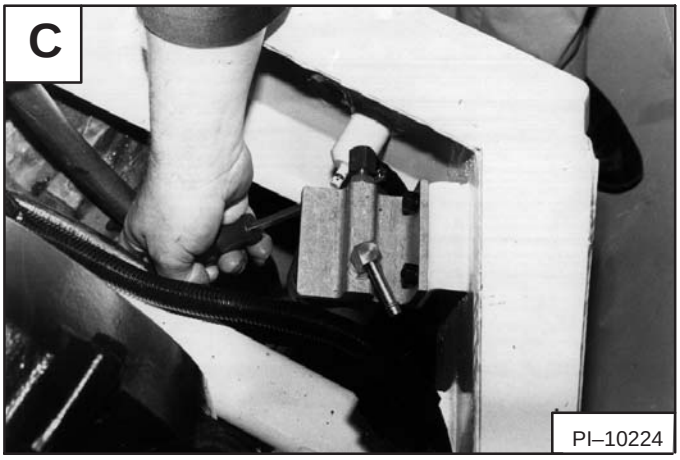
Leave the vent open slightly.

Start the engine. When the engine runs smoothly, close the vent valve.



Fuel Filter Removal And Installation

Remove the fuel lines from the filter head **[C]**.



Remove the bolts from the filter head **[D]**.

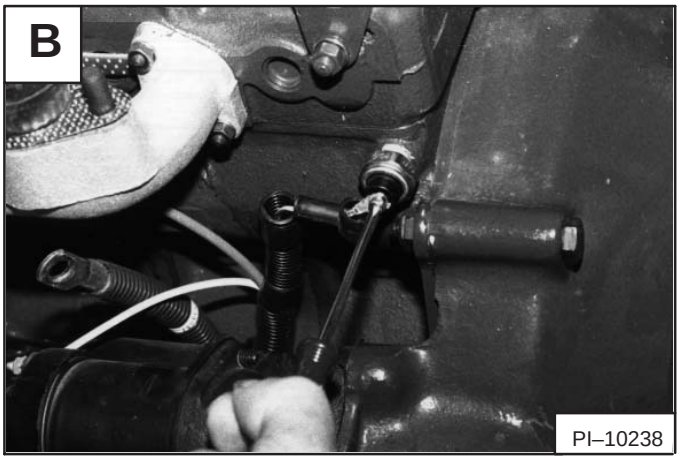
Installation: Tighten the bolts to 15–18 ft.–lbs. (20–25 Nm) torque.

ENGINE (Cont'd)

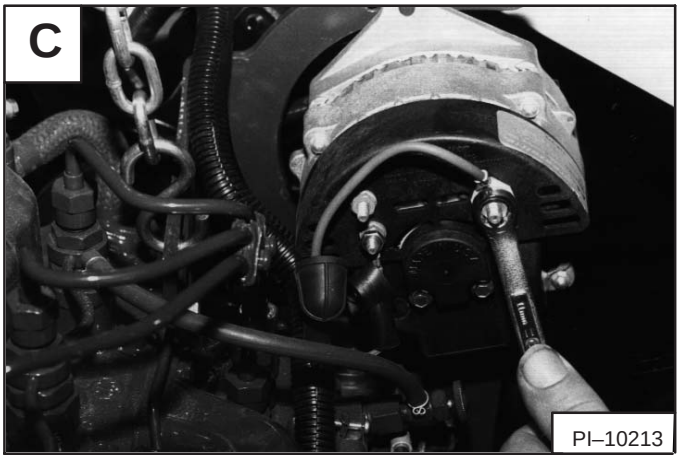
Removal And Installation (Cont'd)

Disconnect the wire from the temperature switch **[A]**.

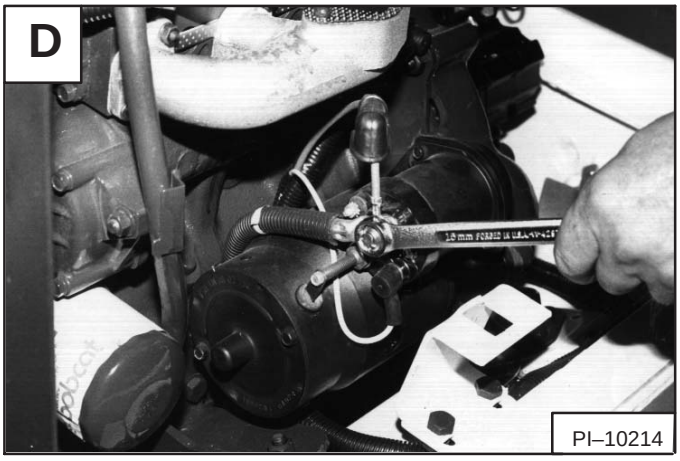
Disconnect the wire from the oil pressure switch **[B]**.



Disconnect the wires from the alternator **[C]**.



Disconnect the wires from the starter **[D]**.



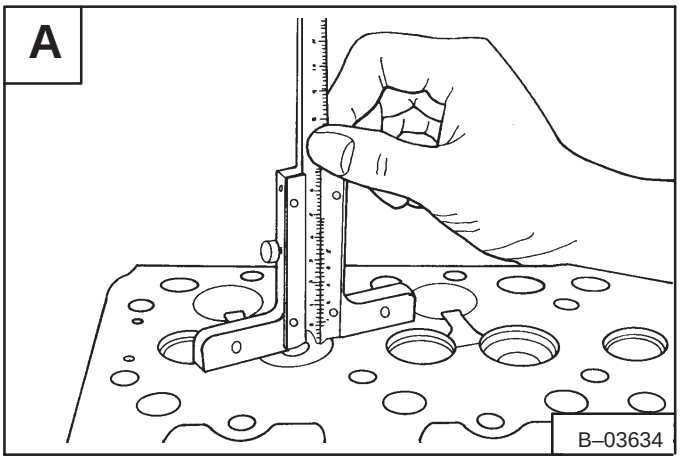
CYLINDER HEAD (Cont'd)

Servicing The Cylinder Head And Valves (Cont'd)

Install the valve in the seat and check the depth **[A]**.

The specifications for the depth of the valves is 0.043–0.051 inches (1,09–1,30 mm).

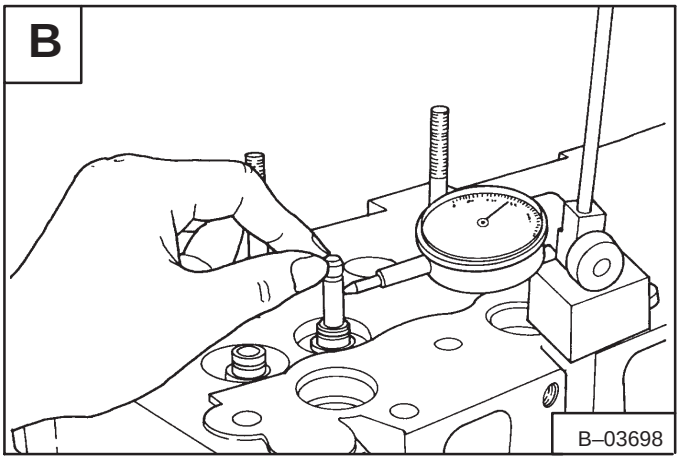
If the measurement is more than specifications, add the correct thickness of washer under the valve spring to keep the correct spring tension.



Clean the valve guide. Install the valve in the cylinder head. Install a dial indicator **[B]**.

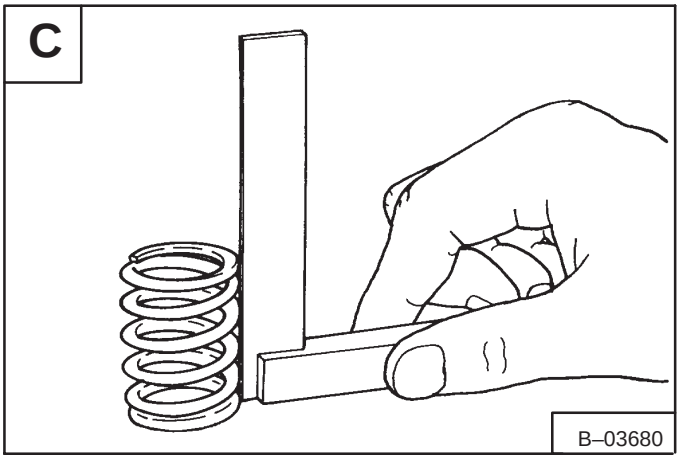
Measure the clearance of the valve guide and the valve. The measurement must be 0.0014–0.0026 inches (0,04–0,07 mm).

Replace the valve guide and valves as needed. Make sure to ream the inside diameter of the new guide to the correct dimension of 0.276–0.277 inches (7,01–7,04 mm).



Checking Valve Springs

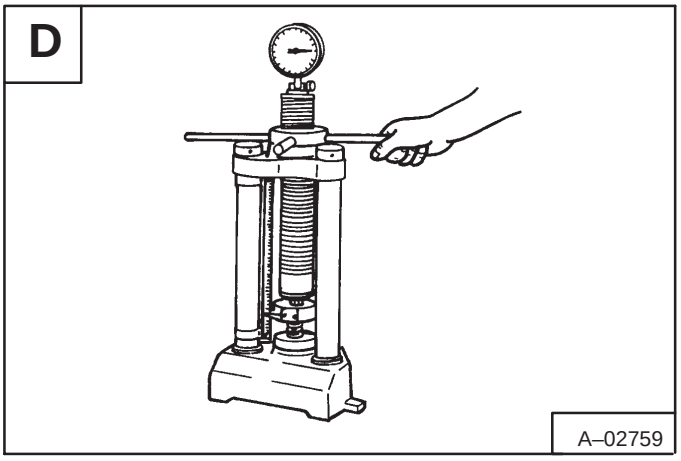
Measure the valve spring. The length of the spring must be 1.382–1.402 inches (35,1–35,6 mm). Check the valve spring with a square to make sure it is straight **[C]**.



Put the valve spring in a tester **[D]**.

Push down on the spring 1.22 inches (31 mm), the compression load must be 16.5 lbs (7,5 kg).

Replace the valve spring if it does not meet these specifications.



CRANKSHAFT AND PISTONS

Removal And Installation

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

MEL1063 – Ring Compressor
MEL1064 – Piston Ring Expander

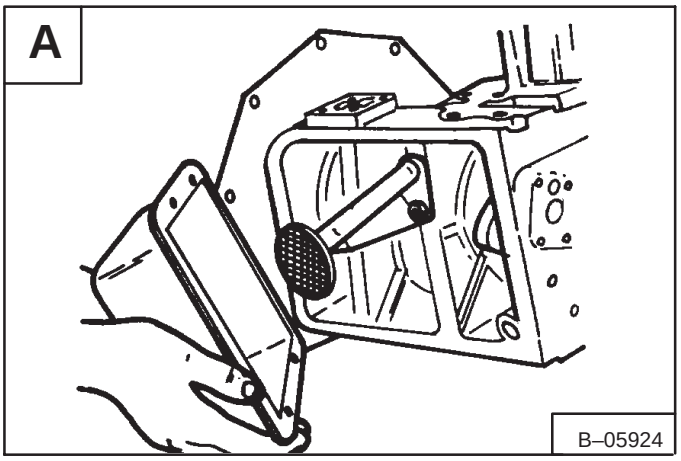
Remove the cylinder head. (See Page 7–21.)

Remove the gear case cover. (See Page 7–27.)

Remove the timing gears. (See Page 7–29.)

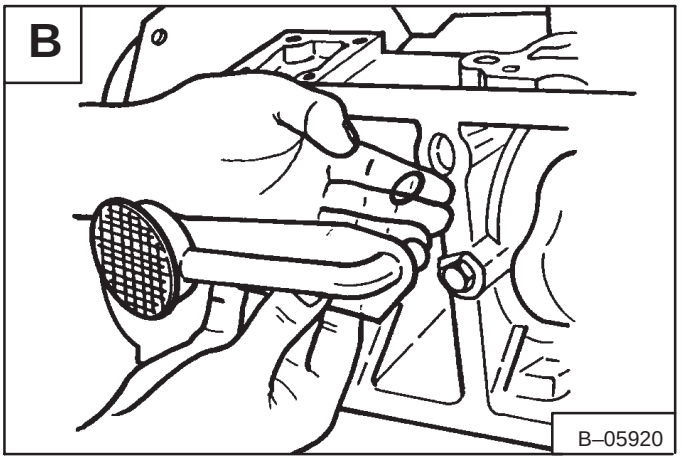
Remove the flywheel.

Remove the oil pan **[A]**.



Remove the oil pump tube and screen **[B]**. Do not damage the O–ring on the tube.

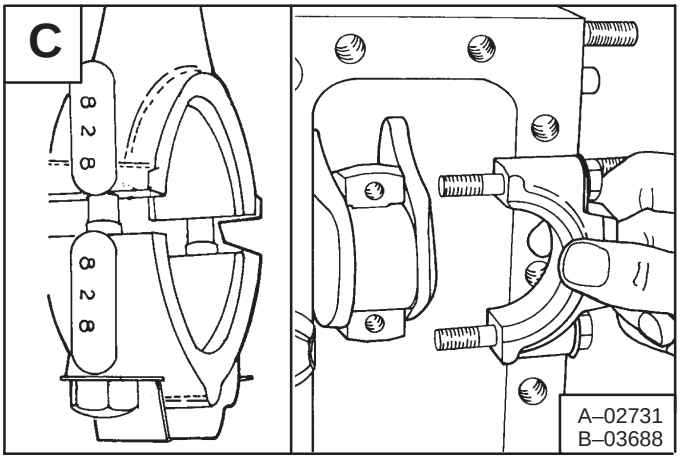
Straighten the washer on the connecting rod bolts. Remove the connecting rod nuts and bolts.



Remove the cap and bearing from the connecting rod **[C]**.

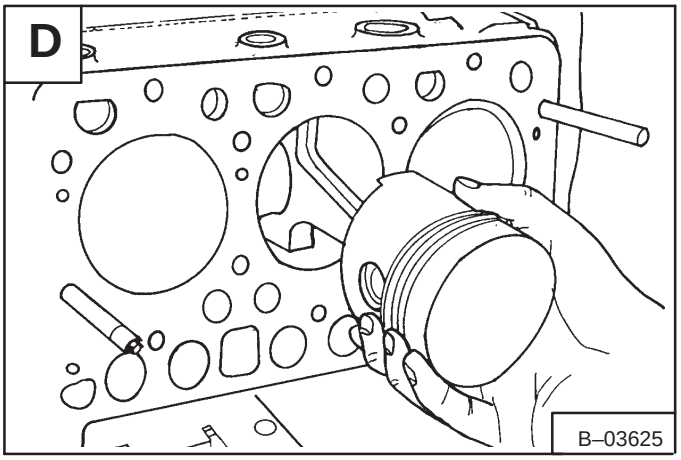
NOTE: Make sure the marks on the connecting rod and bearing cap are in aligned when installing the bearing cap [C].

Installation: Put oil on the bolts and tighten to 26–30 ft.–lbs. (35–41 Nm) torque.



Remove the piston and connecting rod assembly from the engine block **[D]**.

NOTE: Make sure the pistons are marked so they will be returned to the same cylinder bore.



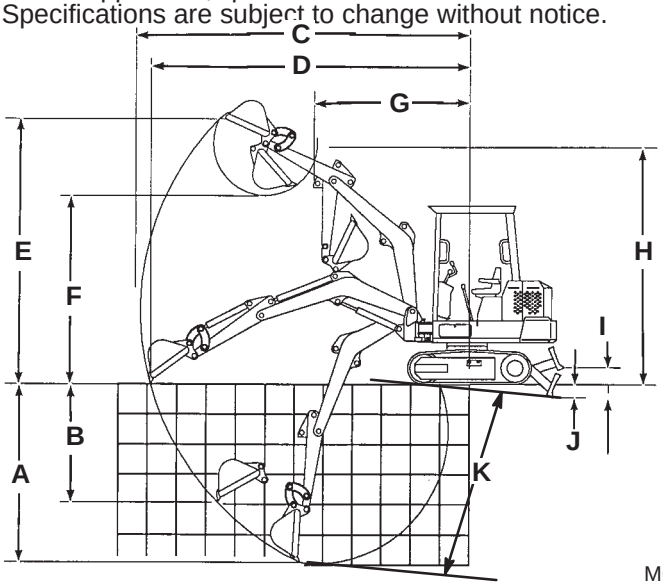
HYDRAULIC EXCAVATOR SPECIFICATIONS (Cont'd)

Machine Dimensions (Cont'd)

All dimensions are shown in inches. Respective metric dimensions are given in millimeters enclosed by parentheses.

Where applicable, specifications conform to SAE standards. Specifications are subject to change without notice.

		With 40.2 (1023) Dipperstick
A	Max. digging depth	80.2 (2041.4)
B	Max. vertical wall depth	48 (1201.3)
C	Max. digging reach	147.3 (3747.4)
D	Max. digging reach at ground level	143.6 (3655.2)
E	Max. digging height	122.4 (3114.4)
F	Max. dumping height	84.4 (2148.6)
G	Min. swing radius (when using boom swing)	52.6 (1337.5)
H	Max. height of Min. swing radius	95.1 (2420)
I	Max. lift above ground (blade)	6.6 (167.4)
J	Max. drop below ground blade	5.6 (141.9)
K	Max. digging depth blade down	86.6 (2205)



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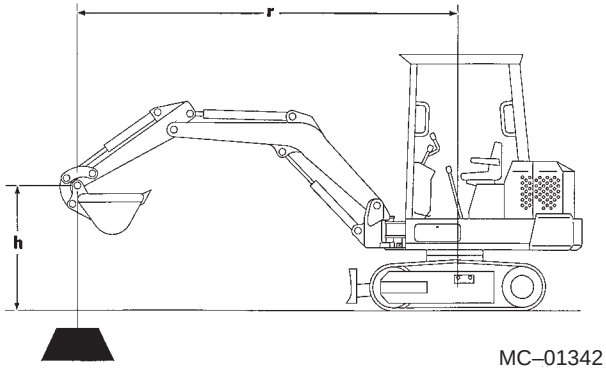
Lifting Capacity With Blade Off Ground



MC–01342

Chart dimensions are shown in millimeters. Inch dimensions are shown in parentheses.

Lift Point Height	(r) Lift Radius – mm (in.)				(r) Lift Radius – mm (in.)				(r) Lift Radius – mm (in.)				
h mm (in)	Rated Lift Capacity Over End Blade Down – kg (lb.)				Rated Lift Capacity Over End Blade Up – kg (lb.)				Rated Lift Capacity Over Side Blade Up – kg (lb.)				
	1500 (59.1)	2000 (78.7)	2500 (98.4)	Max.	1500 (59.1)	2000 (78.7)	2500 (98.4)	Max.	1000 (39.4)	1500 (59.1)	2000 (78.7)	2500 (98.4)	Max.
2000 (78.7)				166 (365)*				166 (365)*					113 (248)*
1500 (59.1)			178 (392)*	178 (392)*			178 (392)*	178 (392)*				178 (392)*	102 (225)
1000 (39.4)		297 (653)*	225 (496)*	190 (418)*		297 (653)*	225 (496)*	190 (418)*		334 (735)	218 (480)	147 (323)	92 (203)
500 (19.7)	625 (1375)*	376 (827)*	285 (626)*	202 (444)*	625 (1375)*	376 (827)*	232 (510)	164 (360)		307 (675)	204 (450)	143 (315)	92 (203)
Ground	751 (1653)*	435 (957)*	306 (674)*	218 (479)*	511 (1125)	324 (713)	239 (525)	170 (375)	392 (863)	273 (600)	188 (413)	140 (308)	94 (206)
–500 (–19.7)	613 (1349)*	376 (827)*	277 (609)*	237 (522)*	524 (1153)*	336 (740)*	222 (488)	188 (413)	443 (975)	256 (563)	188 (413)	145 (319)	102 (225)
–775 (–30.5)	593 (1305)*	376 (827)*	257 (566)*	218 (479)*	443 (975)	298 (656)	257 (566)*	218 (479)*	443 (975)	239 (525)	170 (375)	145 (319)	102 (263)