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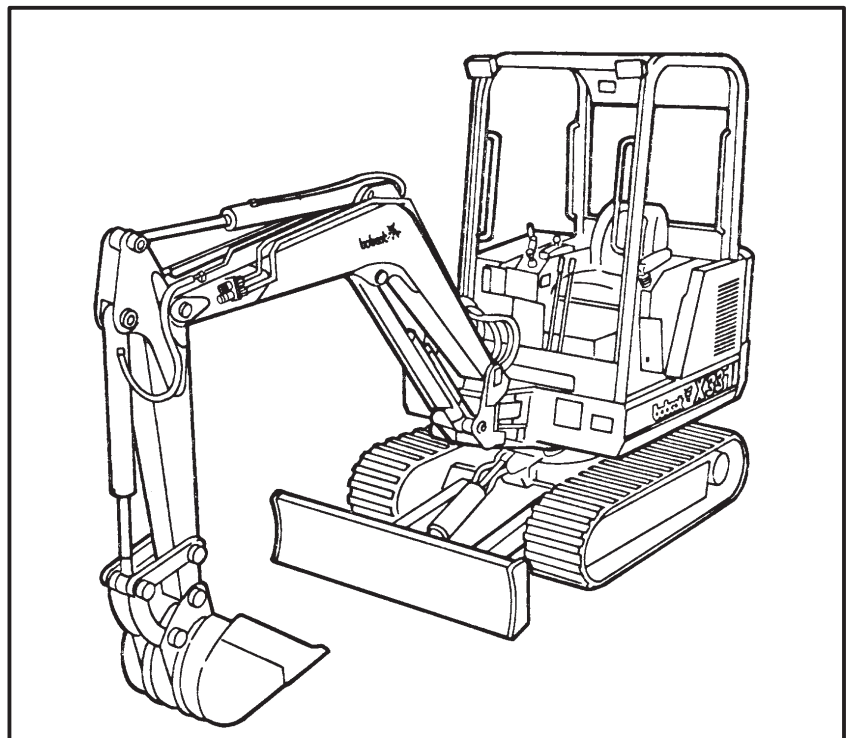
X 331E

X 334

Excavator

Service Manual

331 (S/N 512913001 & Above)
331E (S/N 517711001 & Above)
334 (S/N 516711001 & Above)



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MAINTENANCE SAFETY



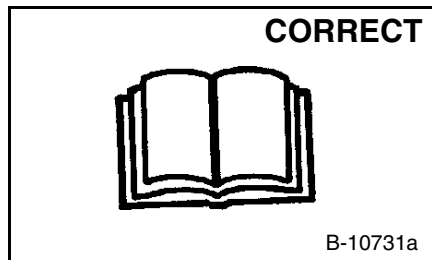
WARNING

Instructions are necessary before operating or servicing machine. Read and understand the Operation & Maintenance Manual, Operator's 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. Untrained operators and failure to follow instructions can cause injury or death.

W-2003-0903

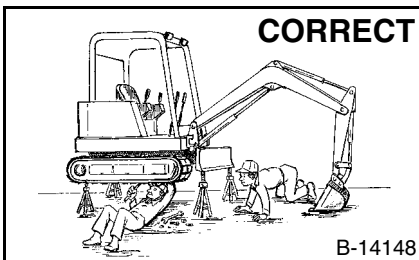


Safety Alert Symbol: This symbol with a warning statement, means: "Warning, be alert! Your safety is involved!" Carefully read the message that follows.



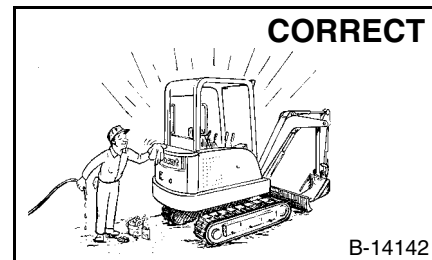
B-10731a

⚠ Never service the Bobcat Hydraulic Excavator without instructions.



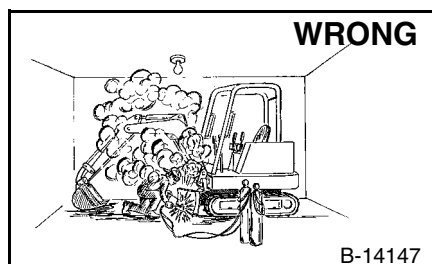
B-14148

⚠ Use the correct procedure to lift and support the excavator.
⚠ Always lift the blade fully before installing jackstands.



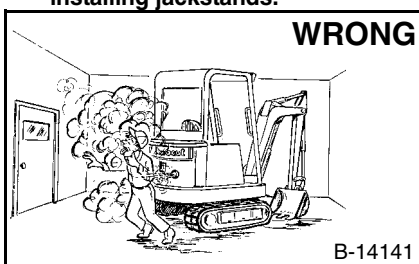
B-14142

⚠ Cleaning and maintenance are required daily.



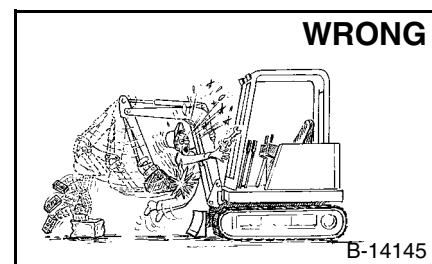
B-14147

⚠ Have good ventilation when welding or grinding painted parts.
⚠ Wear dust mask when grinding painted parts. Toxic dust and gas can be produced.



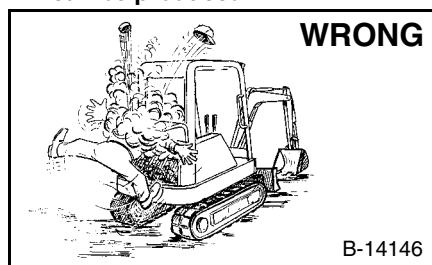
B-14141

⚠ Vent exhaust to outside when engine must be run for service.
⚠ Exhaust system must be tightly sealed. Exhaust Fumes can kill without warning.



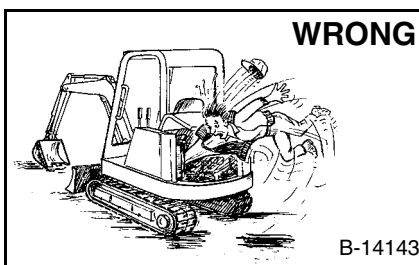
B-14145

⚠ Always lower the bucket and blade to the ground before doing any maintenance.
⚠ Never modify equipment or add attachments not approved by Bobcat Company.



B-14146

⚠ Stop, cool and clean engine of flammable materials before checking fluids.
⚠ Never service or adjust machine with the engine running unless instructed to do so in the manual.
⚠ Avoid contact with leaking hydraulic fluid or diesel fuel under pressure. It can penetrate the skin or eyes.
⚠ Never fill fuel tank with engine running, while smoking or when near open flame.



B-14143

⚠ Keep body, jewelry and clothing away from moving parts, electrical contact, hot parts and exhaust.
⚠ Wear eye protection to guard from battery acid, compressed springs, fluids under pressure and flying debris when engines are running or tools are used. Use eye protection approved for type of welding.
⚠ Keep rear door closed except for service. Close and latch door before operating the excavator.



B-6589

⚠ Lead-acid batteries produce flammable and explosive gases.
⚠ Keep arcs, sparks, flames and lighted tobacco away from batteries.
⚠ Batteries contain acid which burns eyes or skin on contact. Wear protective clothing. If acid contacts body, flush well with water. For eye contact flush well and get immediate medical attention.

Maintenance procedures which are given in the Operation & Maintenance Manual can be performed by the owner/operator without any specific technical training. Maintenance procedures which are **not** in the Operation & Maintenance Manual must be performed **ONLY BY QUALIFIED BOBCAT SERVICE PERSONNEL**. Always use genuine Bobcat replacement parts. The Service Safety Training Course is available from your Bobcat dealer.



Bobcat®

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**PREVENTIVE
MAINTENANCE**

**HYDRAULIC
SYSTEM**

**DRIVE
SECTION**

**UPPER WORKS
& SWING
SECTION**

**MAIN FRAME
& TRACKS**

**ELECTRICAL
SYSTEM**

**ENGINE
SERVICE**

SPECIFICATIONS

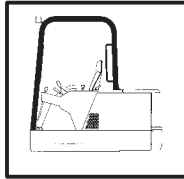


FOREWORD

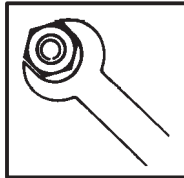
This manual is for the Bobcat hydraulic excavator mechanic. It provides necessary servicing and adjustment procedures for the hydraulic excavator and its component parts and systems. Refer to the Operation & Maintenance Manual for operating instructions, starting procedure, daily checks, etc.

A general inspection of the following items must be made after the hydraulic excavator has had service or repair:

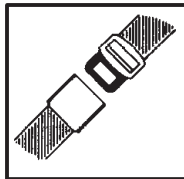
1. Check that the ROPS/TOPS/FOGS is in good condition and is not modified.



2. Check that ROPS/TOPS mounting hardware is tightened and is Melroe approved.



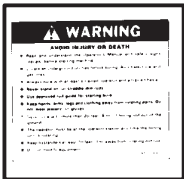
3. The seat belt must be correctly installed, functional and in good condition.



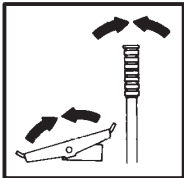
4. Inspect for loose or broken parts or connections.



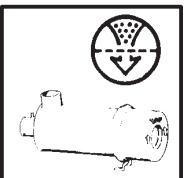
5. Machine signs must be legible and in the correct location.



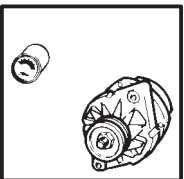
6. Steering levers, control levers and foot pedals must return to neutral. Check that foot pedals lock and control lever locks are in working condition.



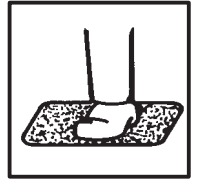
7. Inspect the air cleaner for damage or leaks. Check the condition of the element.



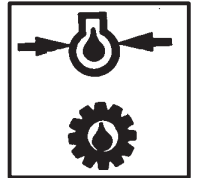
8. Check the electrical charging system.



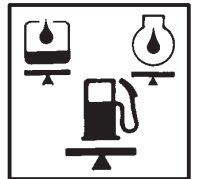
9. Safety treads must be in good condition.



10. Check for correct function of indicator lamps (Optional on some models).



11. Check hydraulic fluid level, engine oil level and fuel supply.



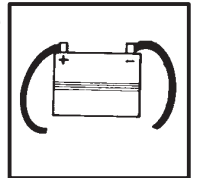
12. Inspect for fuel, oil or hydraulic fluid leaks.



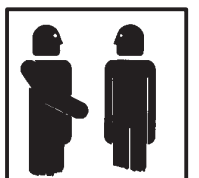
13. Lubricate the excavator.



14. Check the condition of the battery and cables.



Recommend to the owner that all necessary corrections be made before the machine is returned to service.





SAFETY INSTRUCTIONS (Cont'd)

- Wear tight fitting clothing and any other required safety apparel when operating or servicing the excavator.
- Wear safety glasses when maintaining or servicing the excavator.
- Exhaust gases can kill, vent engine exhaust outdoors.
- Do not run the excavator where exhaust, arcs, sparks or hot components can contact flammable material, explosive dust or gases.
- 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.
- Do not use ether or starting fluids on an engine that has glow plugs. These starting aids can explode and injure you.
- Clean the excavator before doing any welding. Remove both battery cables (negative (-) cable first). Cover rubber hoses, battery and all other flammable parts. Keep a fire extinguisher near the excavator when welding.
- Have good ventilation when welding or grinding 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 procedures in this manual for installing, connecting and jump starting batteries.
- Know where fire extinguisher and first aid kits are located and how to use them. A fire extinguisher is available from your Bobcat dealer.



Call Before You Dig 1-888-258-0808

When you call, you will be directed to a location in your state/city for information about buried lines (telephone, cable TV, water, sewer, gas, etc.).

SERIAL NUMBER LOCATIONS

Always use the complete serial number (including the first four digits) of the loader when requesting service information or when ordering parts. Early or later models (identification made by serial number) may use different parts, or it may be necessary to use a different procedure in doing a specific service operation.

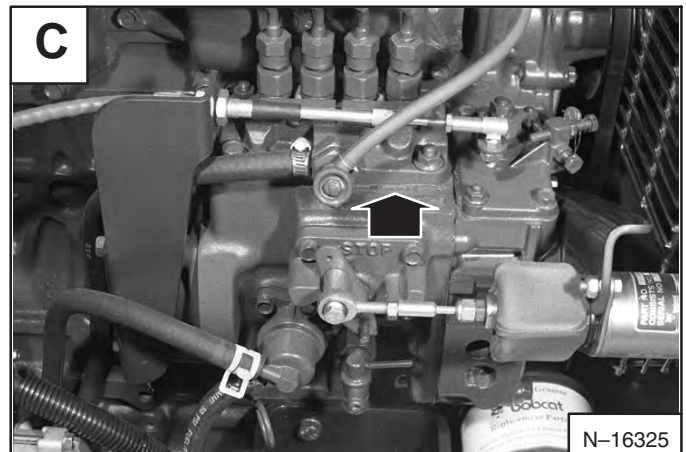
HYDRAULIC EXCAVATOR SERIAL NUMBER

The excavator serial number is on the front of the machine frame, to the left of the boom [A] & [B].



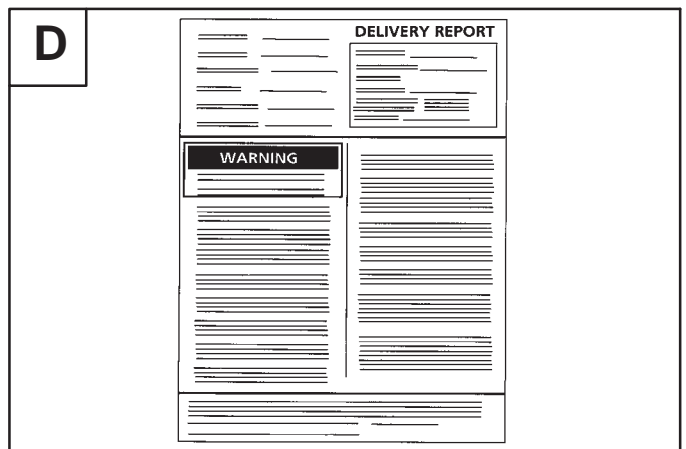
ENGINE SERIAL NUMBER

The engine serial number is located on the engine block, near the fuel injection pump [C].

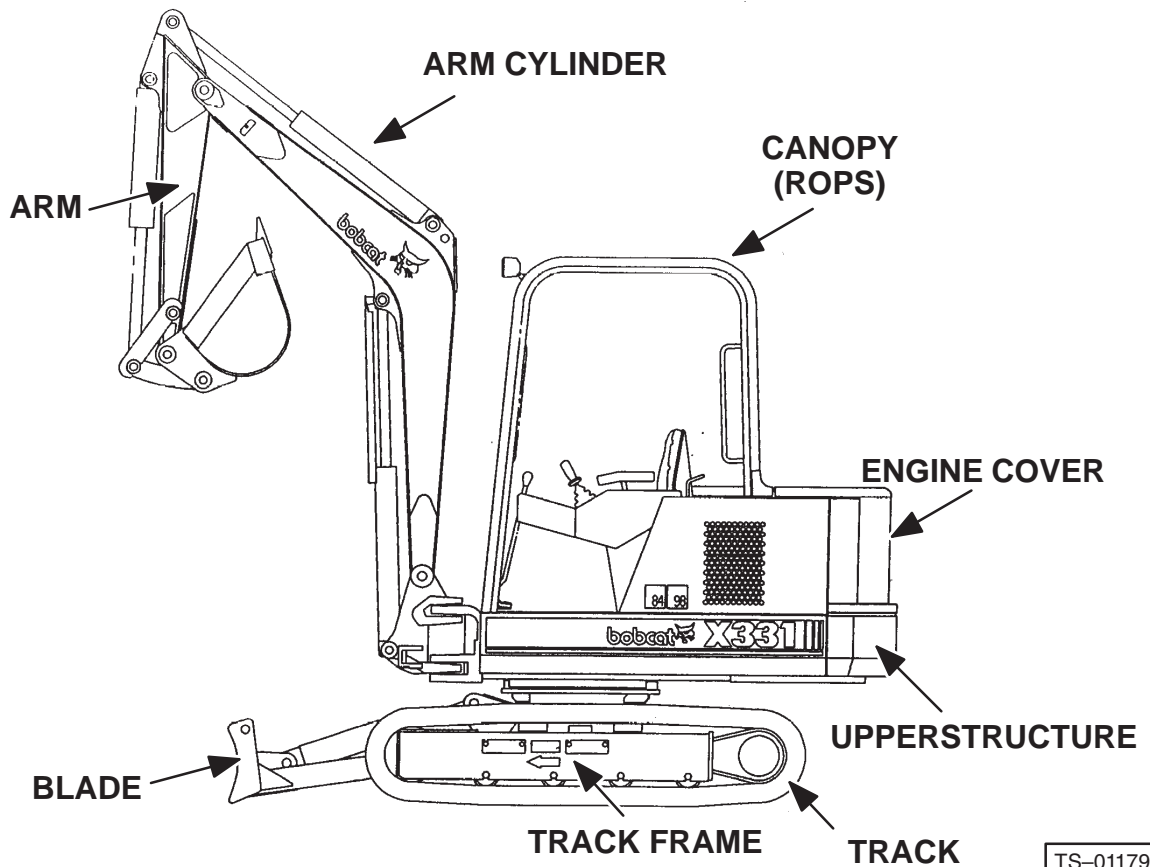
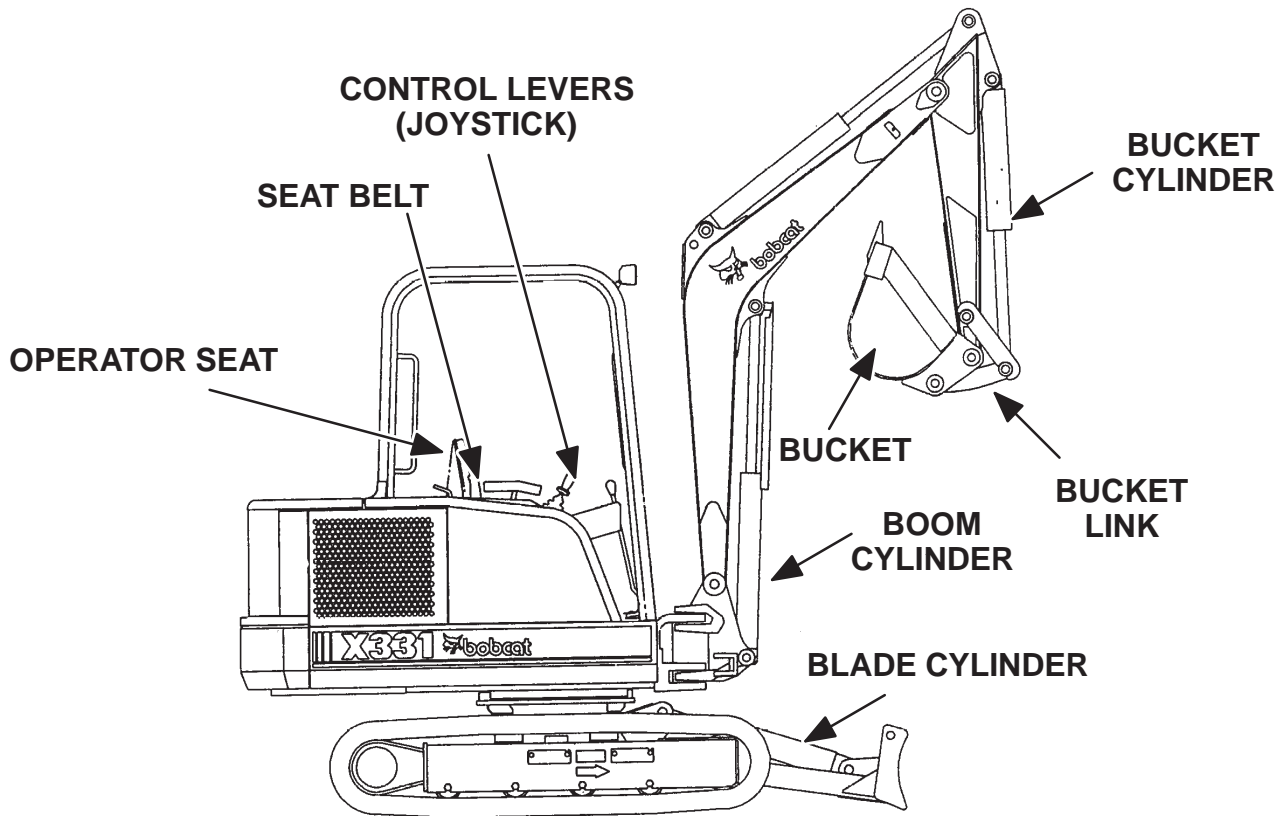


DELIVERY REPORT

The Delivery Report must be filled out by the dealer and signed by the owner or operator when the Bobcat excavator is delivered. The form contents must be explained to the owner. Make sure it is filled out completely [D].



HYDRAULIC EXCAVATOR IDENTIFICATION



TS-01179

PREVENTIVE MAINTENANCE

PREVENTIVE MAINTENANCE

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SERVICE SCHEDULE (331 S/N 512913001–512915199)

Maintenance work must be done at regular intervals. Failure to do so will result in excessive wear and early failures. The service schedule is a guide for correct maintenance of the Hydraulic Excavator.

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-2003-0797

SERVICE SCHEDULE		HOURS					
ITEM	SERVICE REQUIRED	8-10	50	100	250	500	1000
Engine Air Cleaner	Replace the filter element only when the red ring shows in the indicator window. Check for leaks and damaged components.						
Engine Oil	Check the oil level and add oil as needed.						
Engine Coolant System	Check coolant level in recovery tank.						
Indicator Lights	Check for correct operation.						
Operator Cab	Check the fastening bolts, nuts, and condition of cab.						
Seat Belt	Check the condition and that fasteners are tight.						
Safety Signs (Decals)	Check for damaged signs (decals) replace as needed.						
Tracks	Check and adjust tension.						
All Machinery Pivot Points	Lubricate 25 grease fittings.						
Hyd. Fluid, Hoses and Tubelines	Check fluid level and add as needed. Check for damage and leaks. Repair and replace as needed.						
Fuel Tank/Fuel Filter	Drain water and sediment from fuel tank/fuel filter.						
Swing Circle	Lubricate two grease fittings.						
Swing Pinion	Lubricate one grease fitting.						
Spark Arrestor Muffler	Clean spark chamber.						
Alternator Belt	Check and adjust tension.		*				
Engine Oil and Filter	Replace oil and filter element.		*				
Travel Motor	Check fluid level and add oil as needed.						
Hydraulic Filter	Replace filter element.			**			
Fuel Filter	Replace filter element.						
Battery	Check and clean cable ends and check electrolyte level.						
Air Cleaner	Replace the filter element.						
Cooling System	Clean the radiator fins.						
Alternator and Starter	Check the condition.						
Cooling System	Drain, flush and add new coolant to the cooling system.						
Hydraulic Tank	Change the fluid, clean fill neck strainer.						
Travel Motor	Change the oil.			**			

***After the first 50 hours of machine operation do the following:**

- Replace the hydraulic fluid filter.
- Check the condition of fan belt.
- Replace the engine oil and filter.

****After the first 100 hours of machine operation do the following procedures:**

- Change oil in the travel motor.
- Replace hydraulic filter.

■ Or Every 12 Months.

**SERVICE SCHEDULE (331 S/N 512915200 & Above),
(331E 517711001 & Above) & (334 S/N 516711001 &
Above)**

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SERVICE SCHEDULE		HOURS					
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Engine Air Cleaner	Replace the filter element only when the red ring shows in the indicator window. Check for leaks and damaged components.						
Engine Oil	Check the oil level and add oil as needed.						
Engine Coolant System	Check coolant level in recovery tank.						
Indicator Lights	Check for correct operation.						
Operator Cab	Check the fastening bolts, nuts, and condition of cab/canopy.						
Seat Belt	Check the condition and that fasteners are tight.						
Safety Signs (Decals)	Check for damaged signs (decals) replace as needed.						
Tracks	Check and adjust tension.						
All Machinery Pivot Points	Lubricate 25 grease fittings.						
Hyd. Fluid, Hoses and Tubelines	Check fluid level and add as needed. Check for damage and leaks. Repair and replace as needed.						
Extendible Arm (If Equipped)	Lubricate slide on extendible arm						
Fuel Tank/Fuel Filter	Drain water and sediment from fuel tank/fuel filter						
Swing Circle	Lubricate two grease fittings.						
Swing Pinion	Lubricate one grease fitting.						
Battery	Check cables, connections and electrolyte level. Add distilled water as needed.						
Spark Arrestor Muffler	Clean spark chamber.						
Alternator/Fan Belt	Check and adjust tension.		*				
Engine Oil and Filter	Replace oil and filter element.		*				
Travel Motor	Check fluid level and add oil as needed.						
Fuel Filter	Replace filter element.						
Cooling System	Clean the radiator fins.						
Alternator and Starter	Check the condition.						
Hydraulic Filter	Replace filter element.			**			
Drain Return Line Filter	Clean filter with solvent, dry with air pressure.			**			
Engine Valve Clearance	Check and adjust as needed						
Cooling System	Drain, flush and add new coolant to the cooling system.						
Hydraulic Tank	Change the fluid, clean fill neck strainer.						
Travel Motor	Change the oil.			**			
Cab Heater Air Filter	Clean the filter.						

***After the first 50 hours of machine operation do the following:**

- Replace the engine oil and filter.
- Check the condition of the alternator/fan belt.

****After the first 100 hours of machine operation do the following procedures:**

- Change oil in the travel motor.
- Clean drain return line filter.
- Replace hydraulic filter.

■ Or Every 12 Months.

LIFTING AND BLOCKING THE EXCAVATOR

Procedure

Always park the machine on a level surface.



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-2003-0797



WARNING

Put jackstands under the blade and track frame before running the engine for service. Failure to use jackstands can allow the machine to fall or move and cause injury or death.

W-2017-0286



Raise the machine using the boom and arm [A].

Fully raise the blade and install jackstands under the blade [A] and track frame [B].

Lower the boom until all the machine weight is on the jackstands.

Repeat the procedure for the other side.

Stop the engine.

TRANSPORTING THE EXCAVATOR

Procedure

Make sure the parking brakes on the transport vehicle are engaged and wheels are blocked.

Align the ramps with the center of the transport vehicle. Secure the ramps to the truck bed and be sure ramp angle does not exceed 15 degrees.

Use metal loading ramps and slip resistant surface.

Make sure the ramps are the correct length and width, and can support the weight of the machine.

The rear of the trailer must be blocked or supported when loading or unloading the excavator.

Determine the direction of the track movement before moving the machine (blade forward). Engage the swing lock pin to lock the upperstructure.

Move the machine forward onto the transport vehicle[A].

Do not change direction of the machine while it is on the ramps.

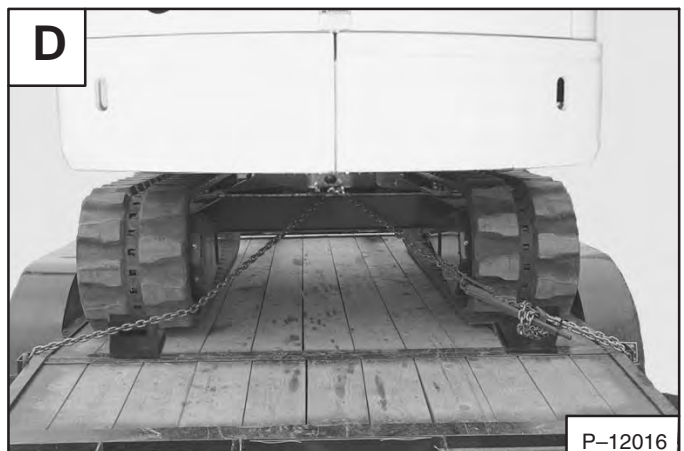
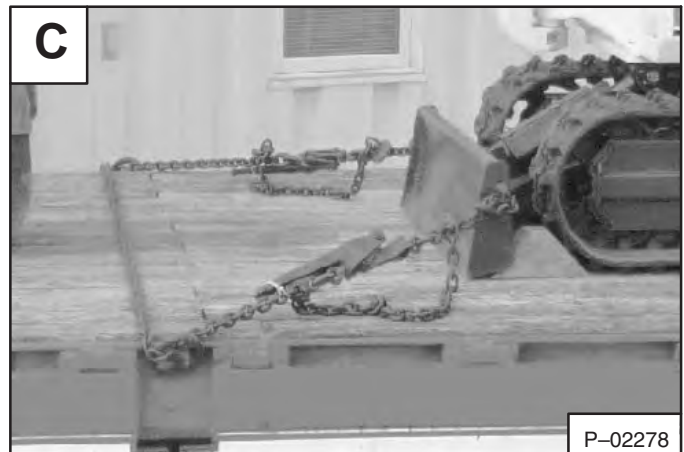
After loading the machine, position the arm and bucket as shown [B].

Lower the boom.

Stop the engine and remove the key.

Use the following procedure to fasten the Excavator to the transport vehicle:

1. Put blocks under the front and rear of the track shoes.
 2. Fasten holddown chains to the front corners of the blade and to the tie down loop at the rear track frame to prevent it from moving when going up or down slopes, or during sudden stops [C] & [D].
 3. Use chain binders to tighten the chains and then tie the chain binder levers to prevent loosening.
- When transporting the machine, observe the rules, motor vehicle laws and vehicle limit ordinances. Use a transport and towing vehicle of adequate length and capacity.



WARNING

Steel loading ramps are needed to support the weight of the machine when loading onto a transport vehicle. Wood ramps can break and cause personal injury.

W-2058-0887

ENGINE COVER

Opening The Engine Cover



WARNING

AVOID INJURY

Never service or adjust the machine when the engine is running unless instructed to do so in this manual.

W-2012-0290

Keep the engine cover closed when operating the machine.

W-2141-0189

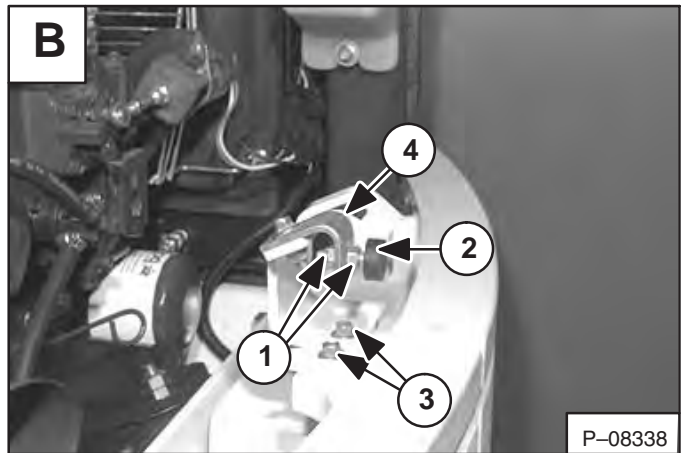
Open the engine cover to service the engine. Pull on the latch and lift the engine cover up until it is fully raised [A].

Adjustment Of The Engine Cover Latch

Open the engine cover.

Loosen the nuts (Item 1) [B] and adjust the stop (Item 2) [B]. Tighten the nuts (Item 1) [B] when the stop (Item 2) [B] is in the correct position.

Loosen the two bolts (Item 3) [B] and adjust the striker plate (Item 4) [B] until it is in the correct position. Tighten the two bolts (Item 3) [B].



AIR CLEANER

Air Cleaner Service

NOTE: 331 (S/N 512915200 & Above) is shown. The procedure is the same for all serial number excavators.

See the *SERVICE SCHEDULE*, Page 1–3 or 1–4 for the correct service interval.

Check the air intake hose for damage. Check the air cleaner housing for damage. Check to make sure all connections are tight.

Replace the large (outer) filter element only when the red ring shows in the window of the connection indicator (Item 1) [A].

NOTE: Push the button on the condition indicator (Item 1) [A] and start the engine. If the red ring does not show, do not replace the filter element.

Service the air cleaner as follows:

Remove the dust cover clamps (Item 2) [A].

Remove the dust cover (Item 3) [A].

Remove the large air filter element (Item 1) [B].

Install the new filter element. Install the dust cover and latch the two clamps.

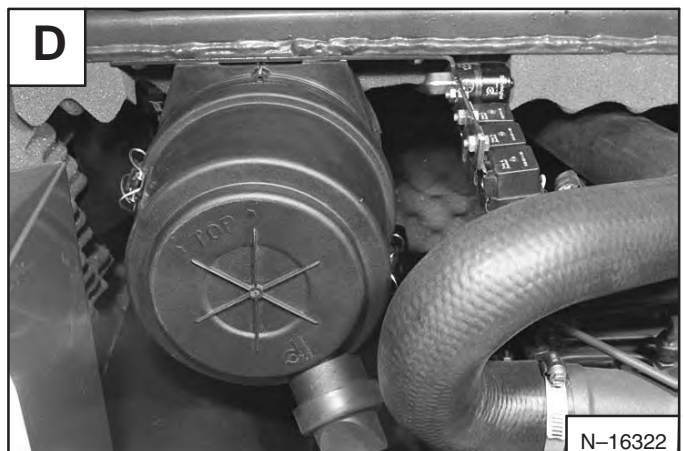
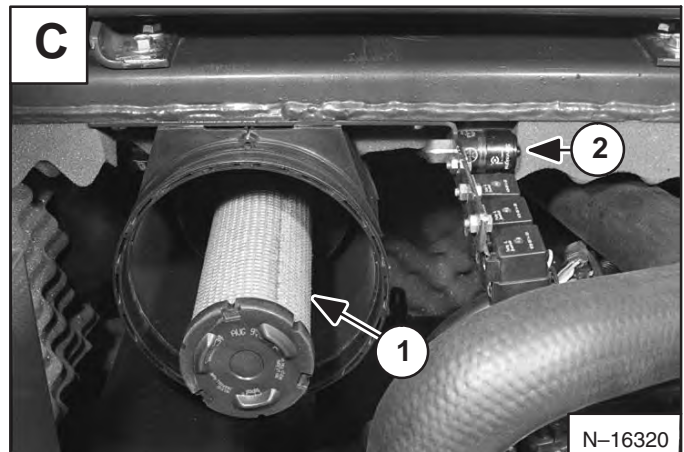
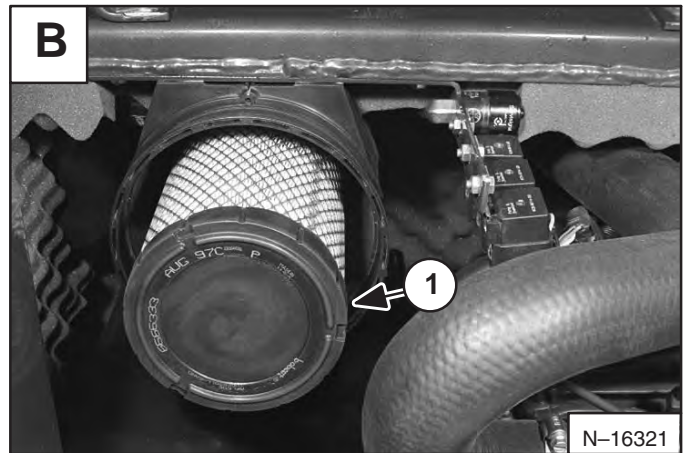
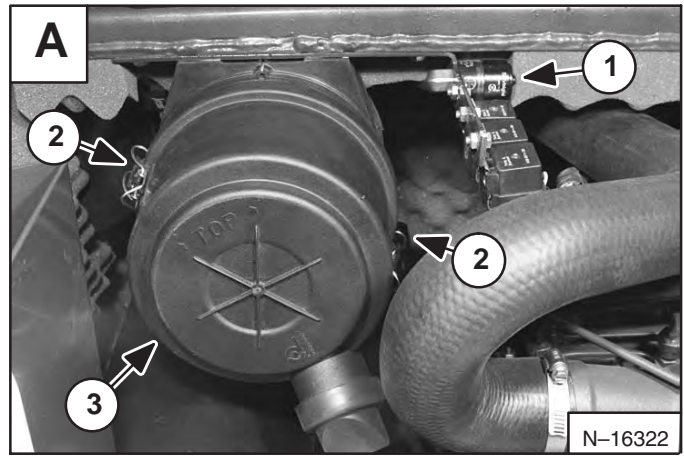
NOTE: Make sure all sealing surfaces are free of dirt and debris.

Only replace the inner filter element (Item 1[C]) under the following conditions.

- Replace the inner filter element every third time the outer filter element is replaced.
- Replace the inner filter element when the red ring still shows in the condition indicator window after the outer filter element is replaced.

NOTE: After replacing the primary (large) filter element, recheck the condition of the inner filter element by pushing the button on the condition indicator (Item 2) [C] and start the engine. Run the engine at full throttle. If the red ring on the condition indicator shows, replace the inner filter element.

Install the dust cover as shown [D].



FUEL SYSTEM

Fuel Specification

Use only clean, high quality diesel fuel, Grade No. 2 or Grade No. 1.

The following is a suggested blending guideline which should prevent fuel gelling problems during cold weather use.

Temp. F° (C°)	No. 2	No.1
+15°(9°)	100%	0%
Down to -20° (-29°)	50%	50%
Below -20° (29°)	0%	100%

For local recommendations, the operator can contact this fuel supplier.

Filling The Fuel Tank

! **WARNING**

Stop and cool the engine before adding fuel, NO SMOKING! Failure to obey warnings can cause an explosion or fire.

W-2063-0887

The fuel level in the tank is indicated by the fuel gauge (Item 1) [A] & [B] when the ignition switch is ON.

NOTE: When the fuel level reaches approximately the 2.5 gals. (9,3 L.) fuel level, the low fuel light (Item 2) [A] & [B] will come ON to alert the operator of this condition.

Use the key to unlock the fuel fill door [C].

Turn the fuel cap to remove it [D].

Use a clean, approved safety container to add fuel to the tank.

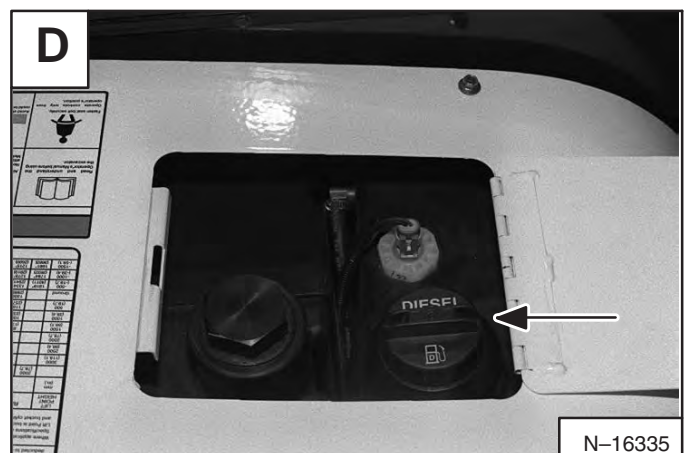
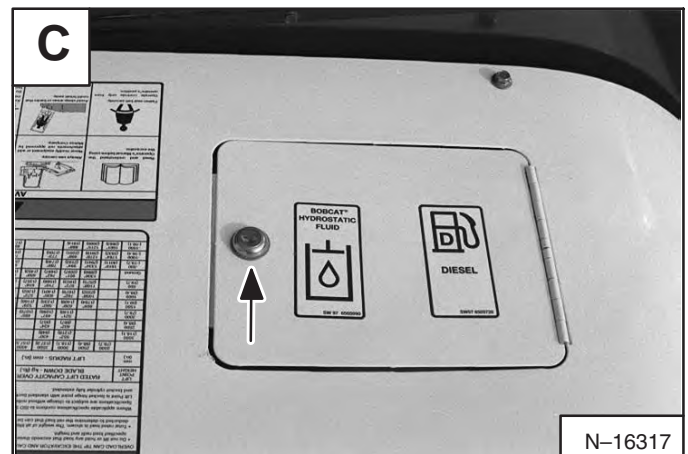
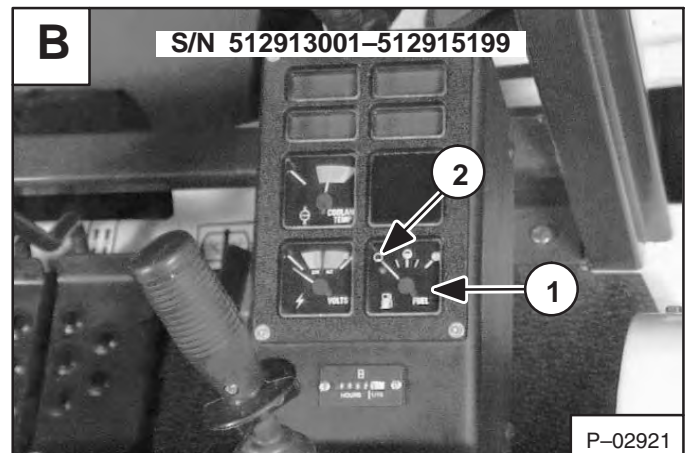
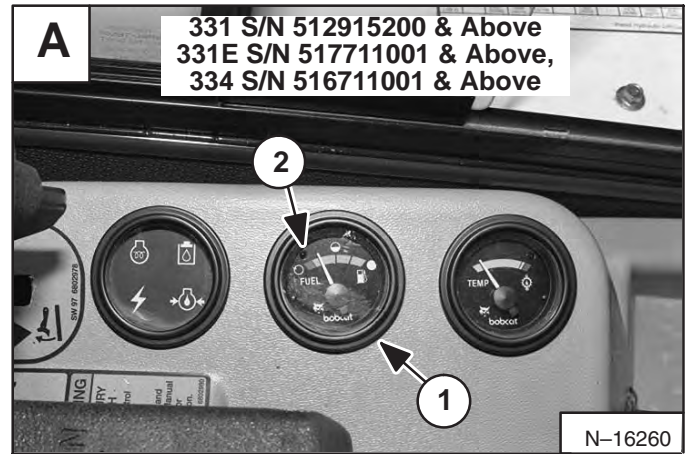
Add fuel only in an area that has a free movement of air and no flames or sparks. NO SMOKING!

After the tank is full, install and tighten the fuel cap. Close and lock the fuel door.

! **WARNING**

Always clean up spilled fuel or oil. Keep heat, flames, sparks or lighted tobacco away from fuel and oil. Failure to use care around combustibles can cause explosion or fire which can result in injury or death.

W-2103-1285



FUEL SYSTEM (Cont'd)

Fuel System Maintenance (331 S/N 512913001–512915199)

See the *SERVICE SCHEDULE*, Page 1–3 for the correct service interval. To remove water and sediment from the fuel tank, turn the upperstructure until the fuel tank is centered between the rear tracks.

Open the drain valve (Item 1)[A] at the bottom of the fuel tank.

Drain all water and sediment into a container.

See the *SERVICE SCHEDULE*, Page 1–3 for the service interval when to remove the water from the fuel filter.

Loosen the drain (Item 1) [B] at the bottom of the filter element to drain any water from the fuel filter.

Tighten the drain when all the water has been removed from the fuel filter.

Fuel Filter (331 S/N 512913001–512915199)

See the *SERVICE SCHEDULE*, Page 1–3 for the service interval when to replace the fuel filter.

Remove the filter element (Item 2) [B].

Clean the area around the filter housing. Put oil on the seal of the new filter element. Install the fuel filter and hand tighten.

Remove the air from the fuel filter.

Removing Air From The Fuel System (331 S/N 512913001–512915199)

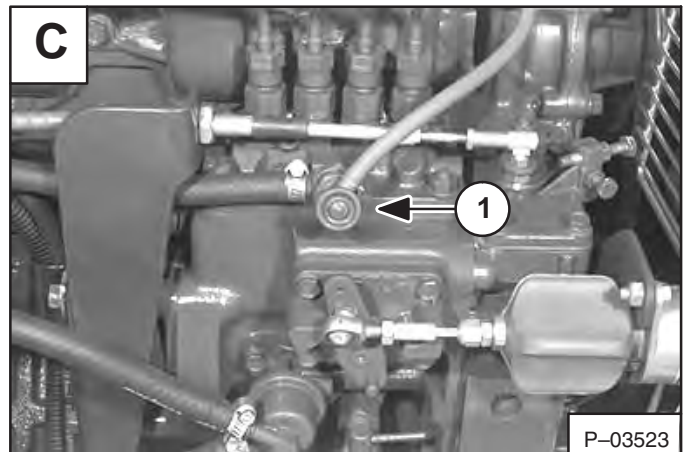
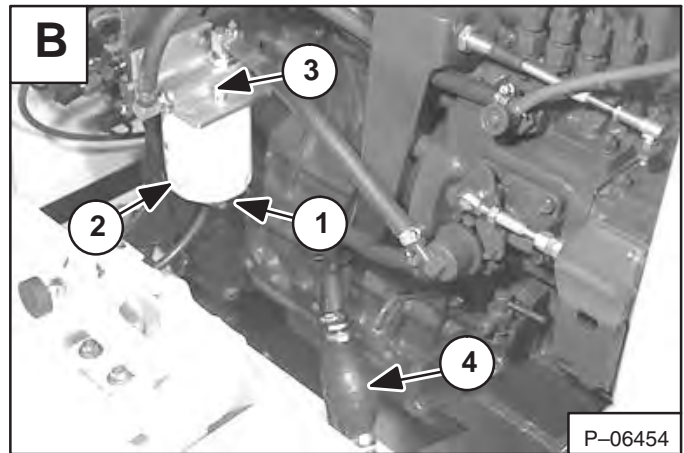
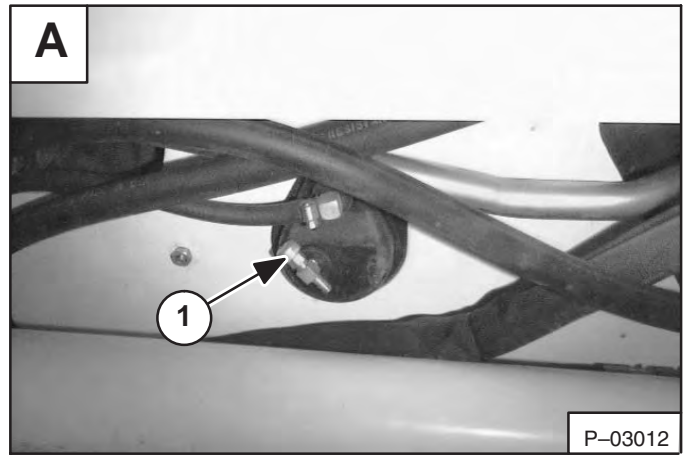
After replacing the fuel filter or when the fuel tank has run out of fuel, the air must be removed from the fuel system prior to starting the engine.

Open the vent (Item 3) [B] on the fuel filter housing.

Operate the hand pump (priming bulb) (Item 4) [B] until the fuel flows from the vent with no air bubbles.

Tighten the vent plug.

Start the engine. It may be necessary to open the vent (Item 1) [C] at the fuel injection pump briefly until the engine runs smooth.



WARNING

Always clean up spilled fuel or oil. Keep heat, flames, sparks or lighted tobacco away from fuel and oil. Failure to use care around combustibles can cause explosion or fire which can result in injury or death.

W-2103-1285

FUEL SYSTEM (Cont'd)

Fuel System Maintenance (331 S/N 512915200 & Above), (331E S/N 517711001 & Above) & (334 S/N 516711001 & Above)

See the *SERVICE SCHEDULE*, Page 1–4 for the correct service intervals.

To remove water and sediment from the fuel tank, turn the upperstructure until the fuel tank is centered between the rear tracks.

Open the drain valve (Item 1) [A] at the bottom of the fuel tank.

Drain contaminated fuel into a container.

Loosen the drain (Item 1) [B] at the bottom of the filler element to drain any water from the fuel filter.

Tighten the drain when all the water has been removed from the fuel filter.

Fuel Filter (331 S/N 512915200 & Above), (331E S/N 517711001 & Above) & (334 S/N 516711001 & Above)

See the *SERVICE SCHEDULE*, Page 1–4 for the correct service intervals.

Remove the filter element (Item 2) [B].

Clean the area around the filter housing. Put oil on the seal of the new filter element. Install the fuel filter and hand tighten.

Remove the air from the fuel filter.

Removing Air From The Fuel System (331 S/N 512915200 & Above), (331E S/N 517711001 & Above) & (334 S/N 516711001 & Above)

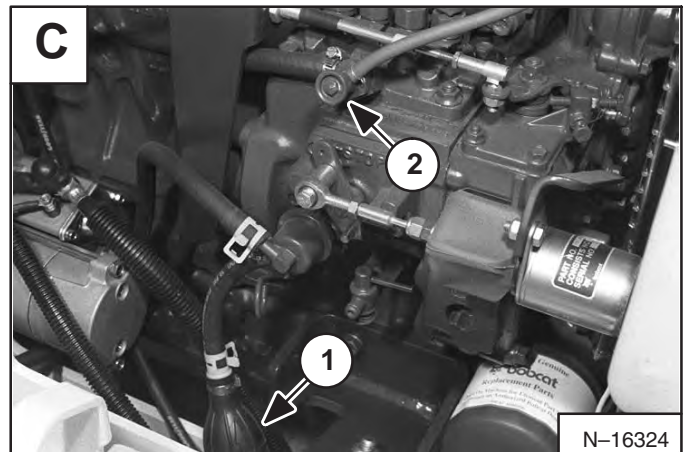
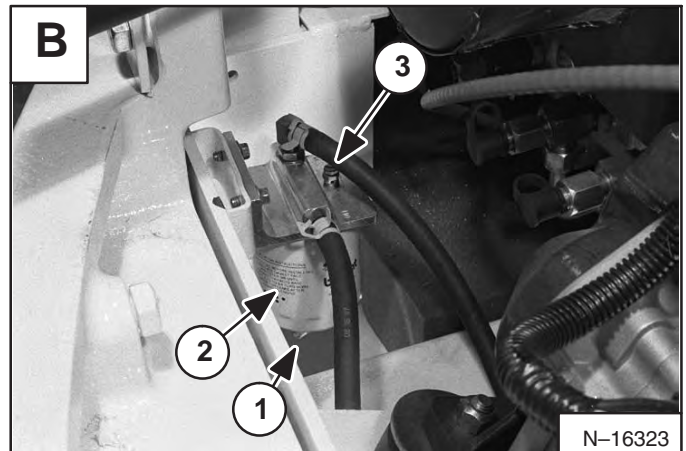
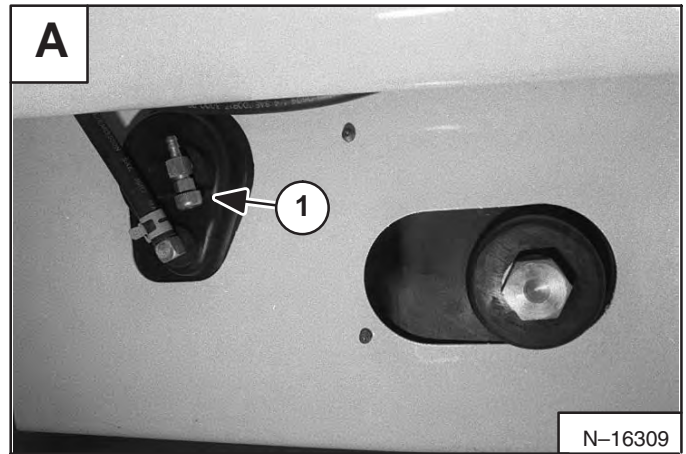
After replacing the fuel filter or when the fuel tank has run out of fuel, the air must be removed from the fuel system before starting the engine.

Open the vent (Item 3) [B] on the fuel filter housing.

Operate the hand pump (priming bulb) (Item 1) [C] until the fuel flows from the vent with no air bubbles.

Tighten the vent (Item 3) [B].

Start the engine. It may be necessary to open the vent (Item 2) [C] at the fuel injection pump briefly until the engine runs smoothly.



WARNING

Always clean up spilled fuel or oil. Keep heat, flames, sparks or lighted tobacco away from fuel and oil. Failure to use care around combustibles can cause explosion or fire which can result in injury or death.

W-2103-1285

ENGINE LUBRICATION SYSTEM

Checking Engine Oil

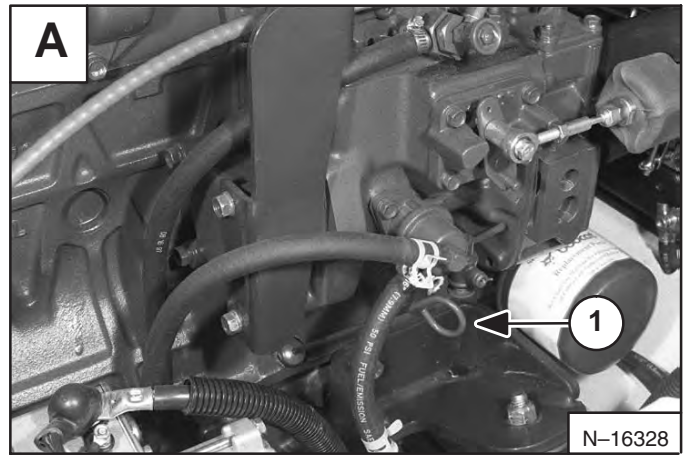
Check the engine oil every day.

Stop the engine. Open the engine cover.

Remove the dipstick (Item 1) [A].

Keep the oil level between the marks on the dipstick.

Use a good quality motor oil that meets the correct API Service Classification. (See *FUEL, COOLANT AND LUBRICATION Chart*, Page 8-1.)



Replacement Of Oil And Filter

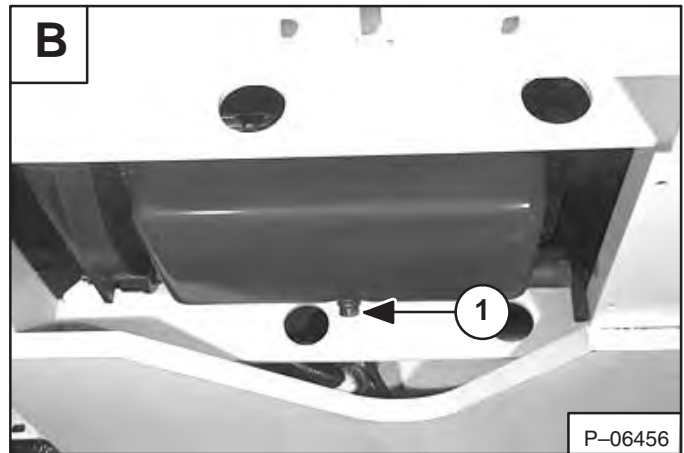
See the *SERVICE SCHEDULE*, Page 1-3 or 1-4 for the correct service interval.

NOTE: 331 S/N 512915200 & Above is shown. The procedure is the same for all serial number machines.

Run the engine until it is at operating temperature. Stop the engine.

Open the engine cover.

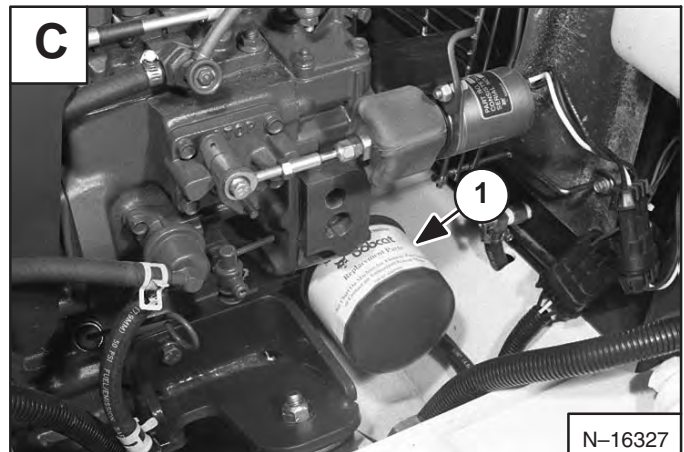
Remove the drain plug (Item 1) [B] from the oil pan. Drain the oil into a container.



Remove the oil filter (Item 1) [C], using a filter wrench.

Clean the filter housing surface. Put clean oil on the filter gasket. Install the new filter and hand tighten only.

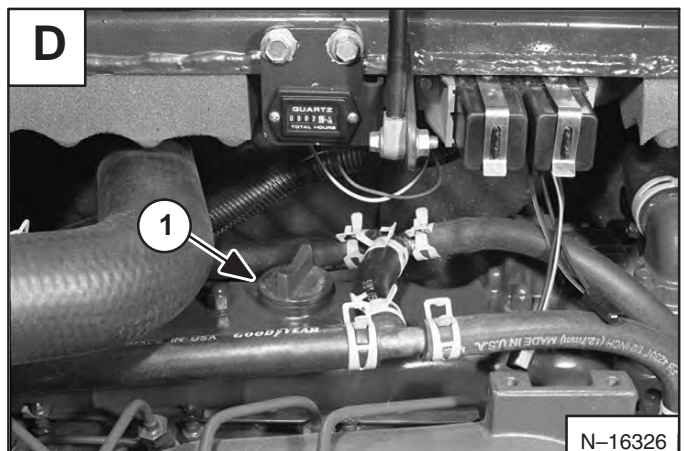
Install and tighten the oil drain plug.



Remove the oil fill cap (Item 1) [D]. Put in 7.5 qts. (7,1 L) of oil into the engine. (SEE *FUEL, COOLANT AND LUBRICANTS Chart*, Page 8-1.)

Start the engine and let it run for several minutes. Stop the engine. Check for leaks at the oil filter and the oil drain plug.

Check the oil level and add oil as needed if it is not at the top mark on the dipstick.



COOLING SYSTEM

Coolant Level



WARNING

Do not remove radiator cap when the engine is hot. You can be seriously burned.

W-2070-1285

When the engine is cool, the coolant level in the recovery tank (Item 1) [A] must be half full.

If the coolant level is low, add premixed coolant to the recovery tank (See type of coolant information below).

Coolant Replacement

See the *SERVICE SCHEDULE*, Page 1-3 or 1-4 for the correct service intervals.

Turn the upperstructure so there is access to the engine and radiator from between the tracks. Stop the engine.

When the engine is cool, loosen and remove the radiator cap (Item 2) [A].

Open the radiator drain valve (Item 1) [B] at bottom of radiator. Drain the coolant into a container.

Open the engine block drain valve (Item 2) [B] and drain the coolant into a container.

After all the coolant is removed, close both drain valves.

Remove all coolant from the coolant recovery tank (Item 1) [A] also.

Mix the coolant in a separate container. (See *SPECIFICATIONS* Page 8-1, for correct capacity).

NOTE: The excavator is factory filled with propylene glycol. DO NOT mix propylene glycol with ethylene glycol.

Add premixed coolant; 47% water and 53% propylene glycol to the recovery tank if the coolant level is low.

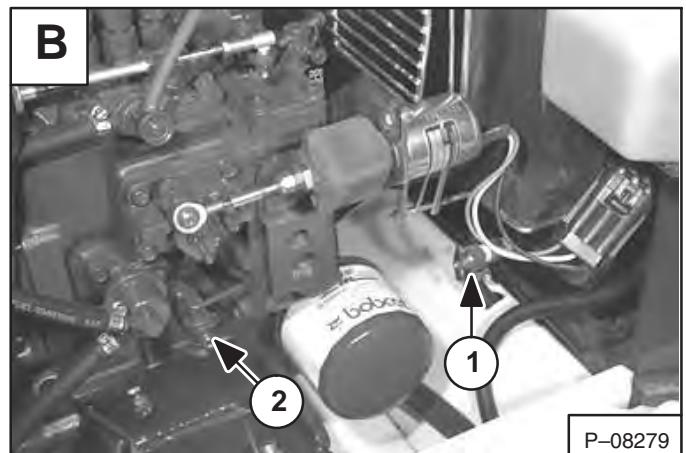
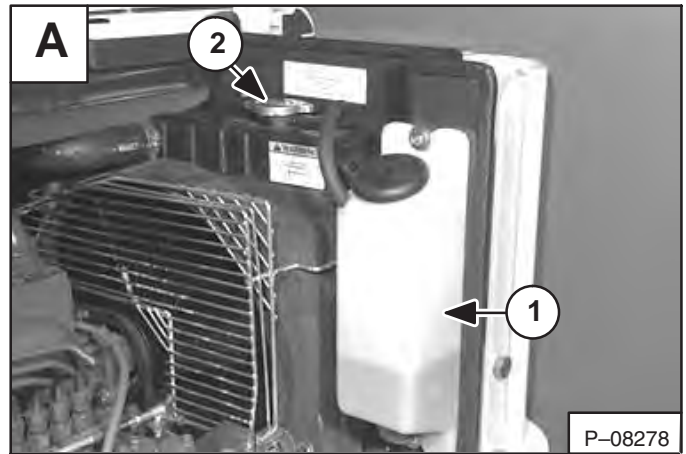
One gallon and one pint of propylene glycol mixed with one gallon of water is the correct mixture of coolant to provide a -34°F (-37°C) freeze protection.

Use a refractometer to check the condition of propylene glycol in your cooling system.

Fill the radiator with the premixed coolant until it is full. Add coolant to the recovery tank until it is half full.

Run the engine at idle speed for about 5 – 10 minutes to remove the air from the cooling system (leave the radiator cap off during this operation).

Stop the engine. Check the coolant level and add as needed to bring it up to the radiator filler neck. Install the radiator cap and tighten.



IMPORTANT

AVOID ENGINE DAMAGE

Always use the correct ratio of water to anti-freeze.

Too much antifreeze reduces cooling system efficiency and may cause serious premature engine damage.

Too little antifreeze reduces the additives which protect the internal engine components; reduces the boiling point and freeze protection of the system.

Always add a premixed solution. Adding full strength concentrated coolant can cause serious premature engine damage.

I-2124-0497

ALTERNATOR BELT

Adjustment

To adjust the belt tension, use the following procedure:

Stop the engine. Open the engine cover.

The belt should deflect about 0.500 inch (13 mm) when pressed between the water pump pulley and crankshaft pulley with approximately 13 lbs. (58 Nm) pressure **[A]**.

If the tension is not correct, remove the seat and seat mount. (See Page 4-1.)

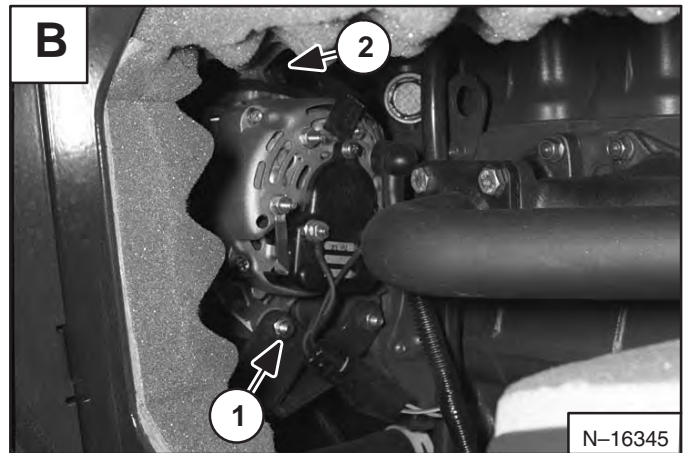
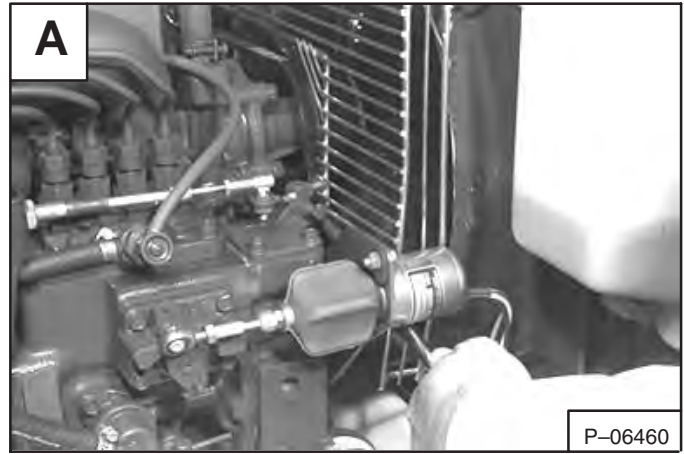
Loosen the alternator mounting bolt (Item 1) **[B]**.

Loosen the alternator adjustment bolt (Item 2) **[B]**.

Move the alternator until the belt tension is correct.

Tighten the adjustment bolt and mounting bolt.

Replace the belt if it has stretched or there are cracks in the belt. Check the pulley grooves, make sure the belt is not in contact with the bottom of the grooves in the pulleys.



ELECTRICAL SYSTEM

Using A Booster Battery (Jump Starting)

If it is necessary to use a booster battery to start the engine. **BE CAREFUL!**

Make sure the swing lock is in the engaged position.

The key switch must be in the OFF position.

The booster battery must be 12 volt.

Using the start key, unlock the two side cover locks.

Tilt the top of the side cover out and lift up on the side cover to remove **[A]**.

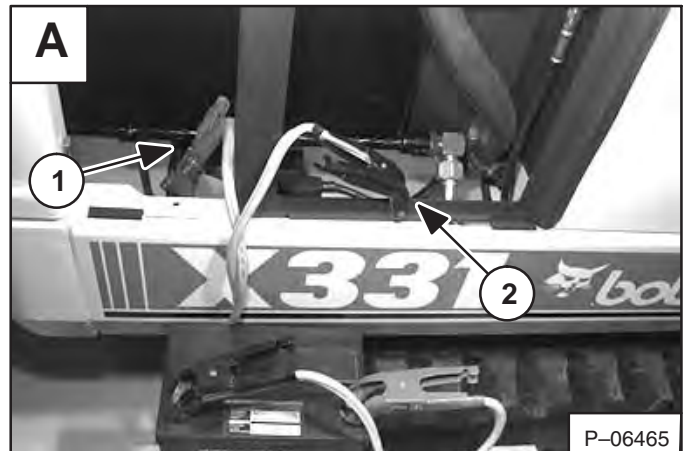


IMPORTANT

If jump starting the excavator from a second machine:

When jump starting the excavator from a battery installed in a second machine. Make sure that the second machine is **NOT** running while using the glow plugs. High voltage spikes from a running machine can burn out the glow plugs.

I-2060-0195



Connect the end of the first cable to the positive (+) terminal of the booster battery. Connect the other end of the same cable to the positive (+) terminal (Item 1) **[B]** of the machine battery.

Connect the end of the second cable to the negative (-) terminal of the booster battery. Connect the other end of the same cable to the frame (Item 2) **[B]**.

NOTE: See *Cold Temperature Starting Procedure*, in the correct *Operation and Maintenance Manual*.

Start the engine. After the engine is running, remove the cable (Item 2) **[B]** connected to the frame first. Disconnect the cable from the machine battery (Item 1) **[B]**.

IMPORTANT

Damage to the alternator can occur if:

- Engine is operated with battery cables disconnected.
- Battery cables are connected when using a fast charger or when welding on the loader (Remove both cables from the battery).
- Extra battery cables (booster cables) are connected wrong.

I-2023-1285

⚠ WARNING

Keep arcs, sparks, flames and lighted tobacco away from batteries. When *jumping* from booster battery make final connection (negative) at engine frame.

Do not jump start or charge a frozen or damaged battery. Warm battery to 60°F. (16°C.) before connecting to a charger. Unplug charger before connecting or disconnecting cables to battery. Never lean over battery while boosting, testing or charging.

Battery gas can explode and cause serious injury.

W-2066-1296

HYDRAULIC SYSTEM

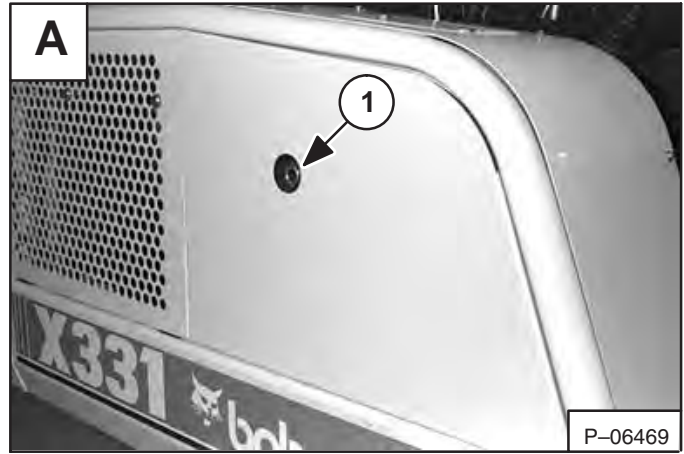
Checking And Adding Fluid

To check and add hydraulic fluid to the reservoir, use the following procedure:

Put the machine on a flat level surface.

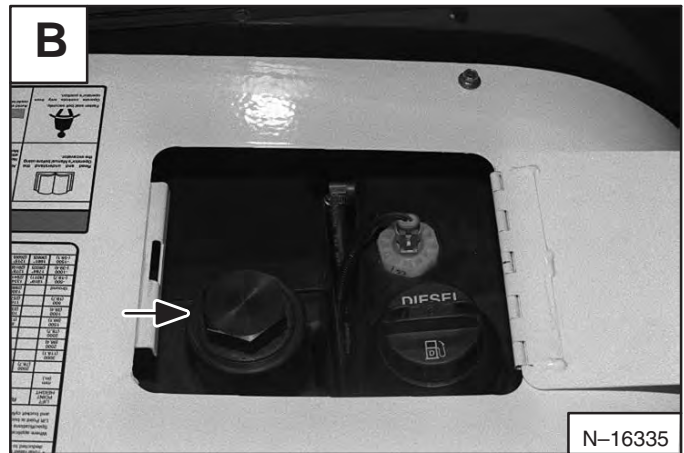
Retract the arm and bucket cylinders, put the bucket on the ground and raise the blade. Stop the engine.

Check the hydraulic fluid level, it must be visible in the sight gauge (Item 1) [A] located on the side of the hydraulic reservoir.



If the fluid level is not correct, open the hydraulic tank access door.

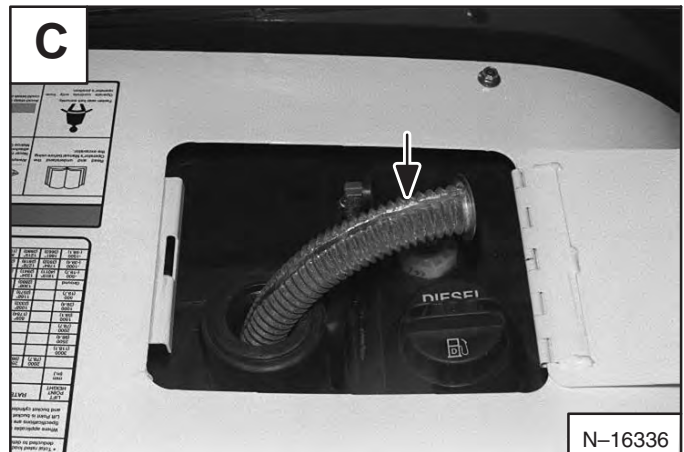
Remove oil fill cap [B].



Check the condition of the fill strainer [C]. The screen must be installed in fill neck when adding oil.

Add the correct fluid to the reservoir until it is visible in the sight gauge. (See *FUEL, COOLANT AND LUBRICANTS Chart*, Page 8-1.)

Install the reservoir cap. Close and lock the access door



HYDRAULIC SYSTEM (Cont'd)

Replacing The Hydraulic Oil

See the *SERVICE SCHEDULE*, Page 1-3 or 1-4 for the correct service interval.

Move the upperstructure so there is clearance for the reservoir drain between the tracks.

Retract the arm and bucket cylinders, lower the bucket to the ground. Stop the engine.

Remove and replace the hydraulic filter.

Remove the drain plug (Item 1) **[A]** & **[B]** from the bottom of the reservoir.

Drain the fluid into a container.

Install the drain plug.

Add approximately 10.5 gals. (40 L) of fluid to the reservoir. (See *FUEL, COOLANT AND LUBRICANTS Chart*, Page 8-1.)

Run the machine through the hydraulic functions. Stop the engine. Check the fluid level and add as needed.

Replacing The Hydraulic Filter

See the *SERVICE SCHEDULE*, Page 1-3 or 1-4 for the correct service interval.

Open the right hand side cover. (See Page 1-15.)

Use a filter wrench and remove the filter element (Item 1) **[B]**.

Clean the housing where the filter gasket makes contact.

Put clean hydraulic fluid on the gasket. Install the new filter element and hand tighten only.

Start the engine. Run the machine through the hydraulic functions. Stop the engine. Check the fluid level at the reservoir and add as needed. Check around the filter for leaks.

Replacing The Drain Line Filter

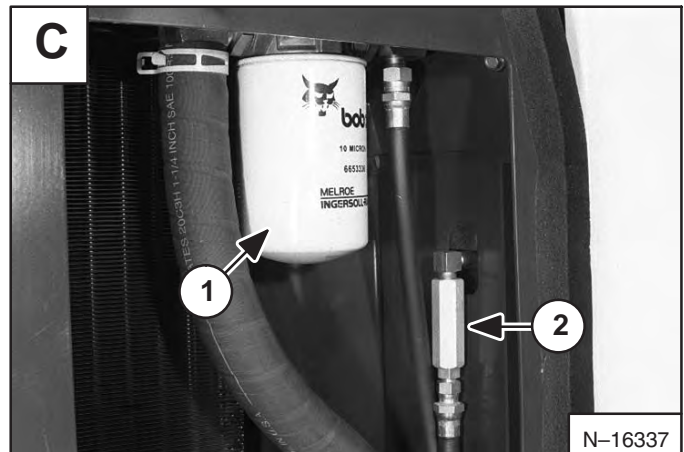
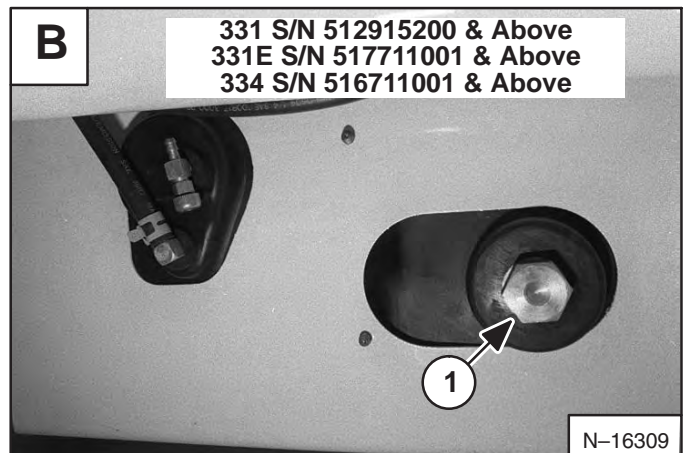
See the *SERVICE SCHEDULE*, Page 1-3 or 1-4 for the correct service interval.

Open the right hand side cover. (See Page 1-15.)

Remove the filter cartridge (Item 2) **[B]**.

Disassemble the cartridge and clean thoroughly.

Install the filter cartridge.



WARNING

Always clean up spilled fuel or oil. Keep heat, flames, sparks or lighted tobacco away from fuel and oil. Failure to use care around combustibles can cause explosion or fire which can result in injury or death.

W-2103-1285

SPARK ARRESTOR MUFFLER

Cleaning The Spark Arrestor Muffler (331 S/N 512913001-512915199)

See the *SERVICE SCHEDULE*, Page 1-3 for the correct service interval.

Do not operate the excavator with a defective exhaust system

IMPORTANT

This excavator is factory equipped with a U.S.D.A. Forestry Service approved spark arrestor muffler. It is necessary to do maintenance on this spark arrestor muffler to keep it in working condition. The spark arrestor muffler must be serviced by dumping the spark chamber every 100 hours of operation.

If this machine is operated on flammable forest, brush or grass covered land, it must be equipped with a spark arrestor attached to the exhaust system and maintained in working order. Failure to do so will be in violation of California State Law, Section 4442 PRC.

Make reference to local laws and regulations for spark arrestor requirements.

I-2061-0195

Stop the engine. Open the engine cover.

Remove the six bolts (Item 1)[A] from the left side cover

Remove the left side cover.

Remove the plug (Item 1) [B] from the bottom of the muffler.

! WARNING

When the engine is running during service, the steering levers must be in neutral.

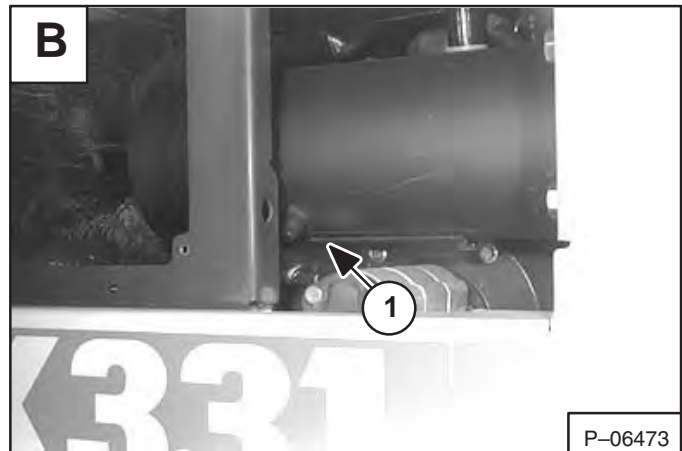
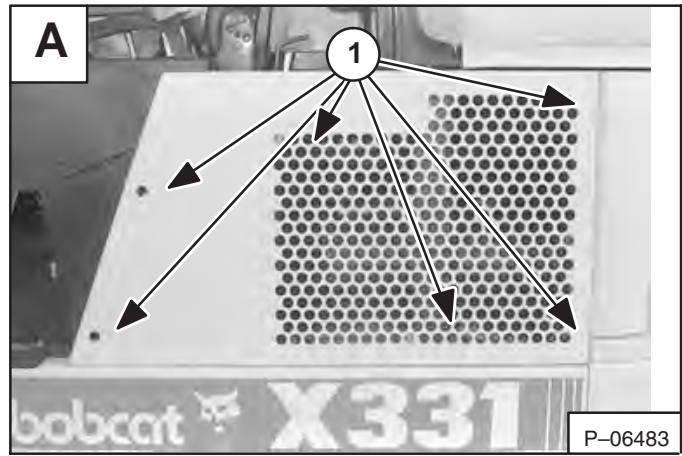
Failure to do so can cause injury or death.

W-2203-0595

Start the engine and run for about ten seconds while a second person, wearing safety glasses, holds a piece of wood over the outlet of the muffler. (The carbon deposits will be forced out of the muffler plug hole.)

Stop the engine. Install and tighten the plug.

Close the engine cover.



! WARNING

When an engine is running in an enclosed area, fresh air must be added to avoid concentration of exhaust outside. If the engine is stationary, vent the exhaust outside. Exhaust fumes contain odorless, invisible gases which can kill without warning.

W-2050-1285

Stop engine and allow the muffler to cool before cleaning the spark chamber. Wear safety glasses or goggles. Failure to obey can cause serious injury.

W-2011-1285

Never use machine in atmosphere with explosive dust or gases or where exhaust can contact flammable material. Failure to obey warnings can cause injury or death.

W-2068-1285

SPARK ARRESTOR MUFFLER (Cont'd)

Cleaning The Spark Arrestor Muffler (331 S/N 512915200 & Above), (331E S/N 517711001 & Above) & (334 S/N 516711001 & Above)

See the *SERVICE SCHEDULE*, Page 1–4 for the correct service interval.

Do not operate the excavator with a defective exhaust system.

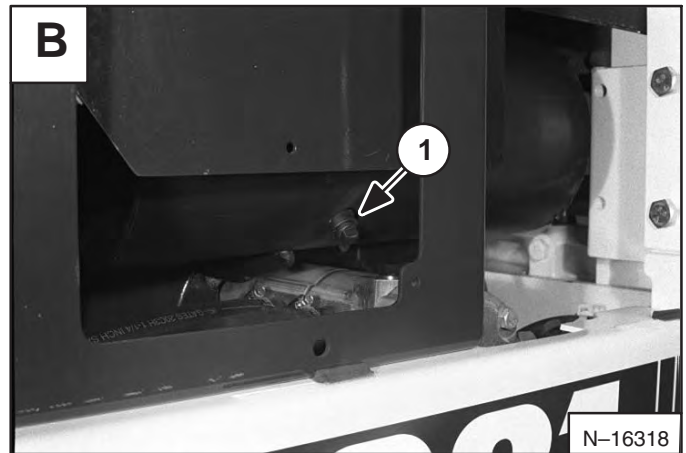
IMPORTANT

This excavator is factory equipped with a U.S.D.A. Forestry Service approved spark arrestor muffler. It is necessary to do maintenance on this spark arrestor muffler to keep it in working condition. The spark arrestor muffler must be serviced by dumping the spark chamber every 100 hours of operation.

If this machine is operated on flammable forest, brush or grass covered land, it must be equipped with a spark arrestor attached to the exhaust system and maintained in working order. Failure to do so will be in violation of California State Law, Section 4442 PRC.

Make reference to local laws and regulations for spark arrestor requirements.

I-2061-0195



Stop the engine. Open the engine cover.

Using the start key, unlock and remove the left side cover [A].

Remove the plug (Item 1) [B] from the bottom of the muffler.

! WARNING

When the engine is running during service, the steering levers must be in neutral.

Failure to do so can cause injury or death.

W-2203-0595

! WARNING

When an engine is running in an enclosed area, fresh air must be added to avoid concentration of exhaust fumes. If the engine is stationary, vent the exhaust outside. Exhaust fumes contain odorless, invisible gases which can kill without warning.

W-2050-1285

Stop engine and allow the muffler to cool before cleaning the spark chamber. Wear safety glasses or goggles. Failure to obey can cause serious injury.

W-2011-1285

Never use machine in atmosphere with explosive dust or gases or where exhaust can contact flammable material. Failure to obey warnings can cause injury or death.

W-2068-1285

Start the engine and run for about ten seconds while a second person, wearing safety glasses, holds a piece of wood over the outlet of the muffler. (The carbon deposits will be forced out of the muffler plug hole.)

Stop the engine. Install and tighten the plug.

Close the engine cover.

Revised May 99

TRAVEL MOTOR

Checking The Oil Level (331 S/N 512913001–512913404)

Put the machine on a level surface with the plugs positioned as shown in figure [A].

Remove the plug (Item 1) [A]. The oil level should be at the bottom edge of the plug hole.

Add gear lube 90W through the hole if the oil level is below the hole. (See *FUEL, COOLANT AND LUBRICANTS Chart*, Page 8–1.)

Install and tighten the plug.

Repeat the procedure for the other side.

Draining And Refilling (331 S/N 512913001–512913404)

See the *SERVICE SCHEDULE*, Page 1–3 for the correct service interval.

Put the machine on a level surface with the plugs positioned as shown in figure [A].

Remove the bottom plug (Item 2) [A] and top plug (Item 1) [A].

After all the gear lube is removed, install and tighten the bottom plug (Item 2) [A].

Add 0.55 quarts (0,5 L) of gear lube to the top plug hole (or until the gear lube level is at the bottom edge of the plug hole). Install and tighten the plug.

Repeat the procedure for the other side.

Checking The Oil Level (331 S/N 512913405 & Above), (331E S/N 517711001 & Above) & (334 S/N 516711001 & Above)

Put the machine on a level surface with the plugs positioned as shown in figure [B].

Remove the plug (Item 1) [B]. The oil level should be at the bottom edge of the plug hole.

Add gear lube 90W through the hole (Item 2)[B] if the oil level is below the hole. (See *FUEL, COOLANT AND LUBRICANTS Chart*, Page 8–1.)

Install and tighten both plugs.

Repeat the procedure for the other side.

Draining And Refilling (331 S/N 512913405 & Above), (331E S/N 517711001 & Above) & (334 S/N 516711001 & Above)

See the *SERVICE SCHEDULE*, Page 1–4 for the correct service interval.

Put the machine on a level surface with the plugs positioned as shown in figure [C].

Remove the bottom plug (Item 1) [C] and top plug (Item 2) [C].

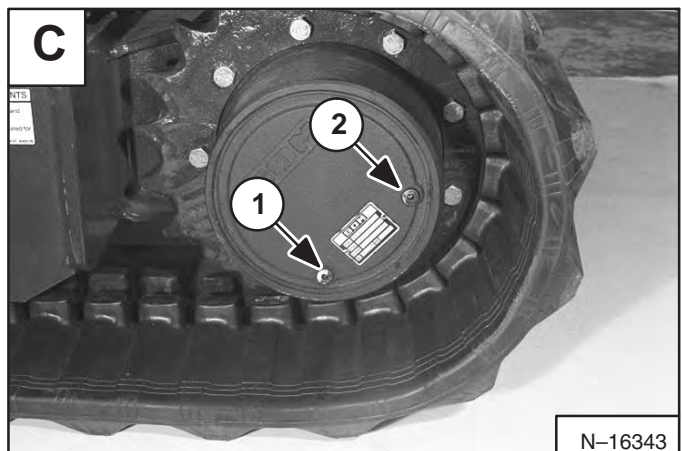
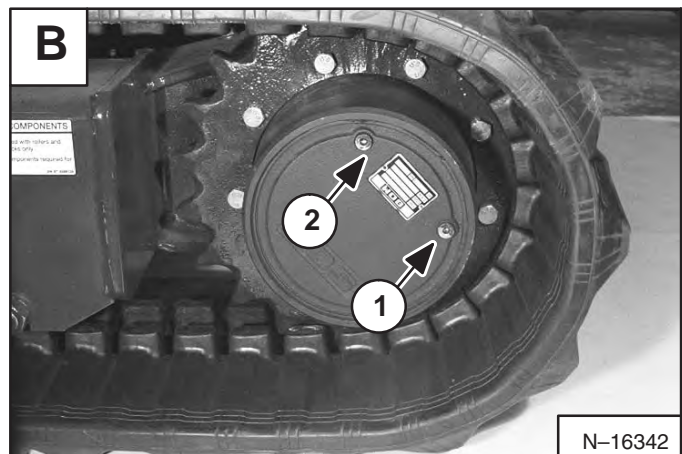
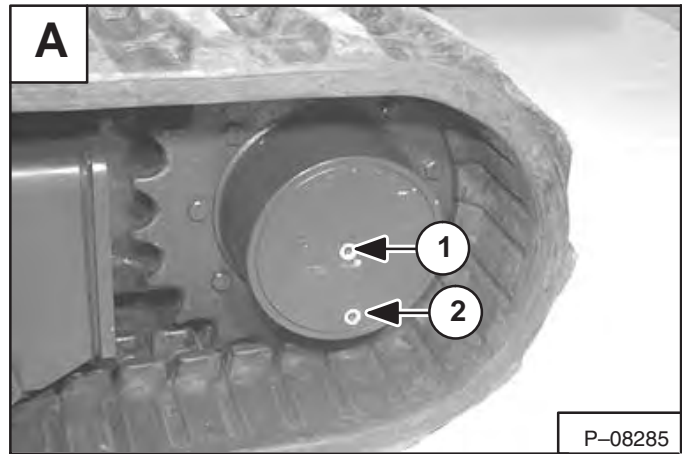
After all the gear lube is removed, rotate the drive motor as shown in figure [B].

Add 1.06 quarts (1,0 L) of gear lube 90W to the top plug hole (Item 2) [B] (or until the gear lube level is at the bottom edge of the plug hole (Item 1) [B].)

Install and tighten the plugs.

Repeat the procedure for the other side.

Revised May 99



LUBRICATION OF THE HYDRAULIC EXCAVATOR

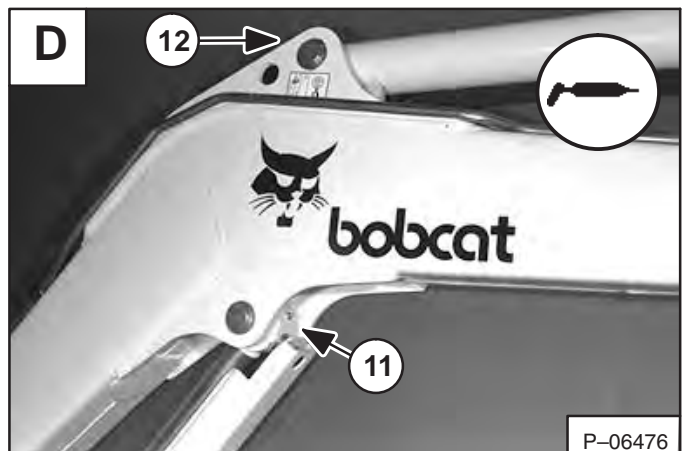
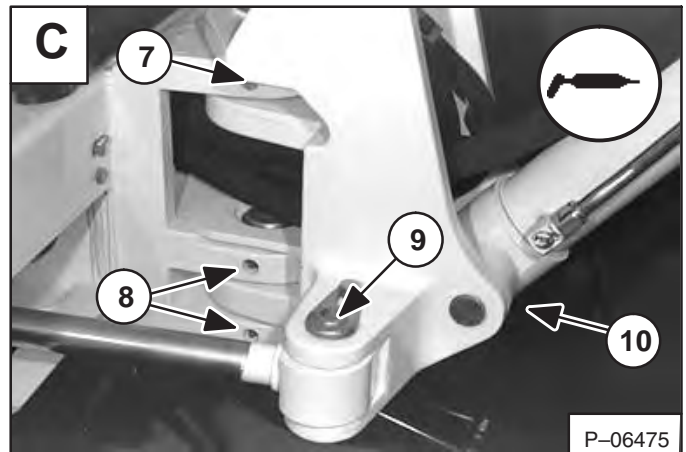
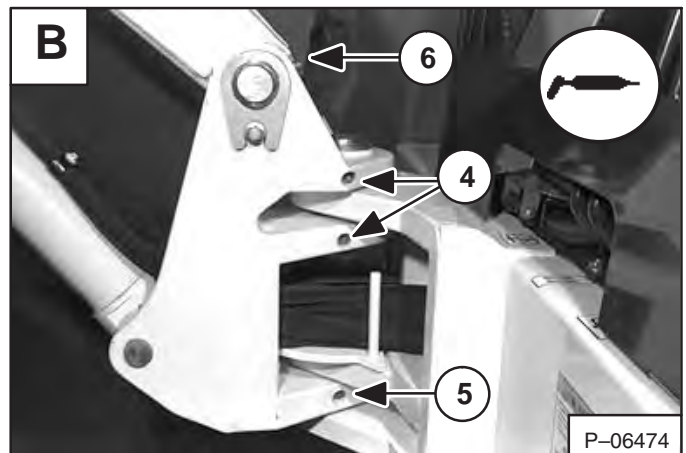
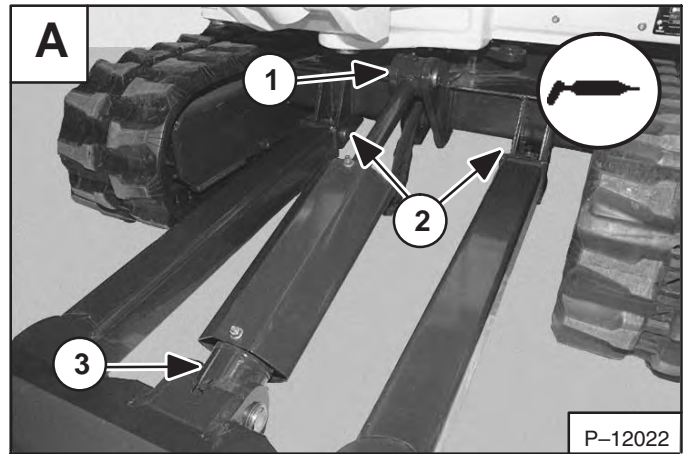
Procedure

Lubricate the Hydraulic Excavator as specified in the *SERVICE SCHEDULE*, Page 1–3 or 1–4 for the best performance of the machine.

Always use a good quality lithium based multipurpose grease when lubricating the machine. Apply the lubricant until extra grease shows.

Lubricate the following locations on the Hydraulic Excavator **EVERY 8–10 HOURS**: 

Ref.	Description (# of Fittings)
1.	Blade Cylinder Rod End (1) [A].
2.	Blade Pivots (2) [A].
3.	Blade Cylinder Base End (1) [A].
4.	Boom Swing Bracket Pivot (2) [B].
5.	Boom Swing Bracket (1) [B].
6.	Boom Base Pivot (1) [B].
7.	Boom Swing Bracket Top Pivot (1) [C].
8.	Boom Swing Bracket Pivot (2) [C].
9.	Boom Swing Cylinder Rod End (1) [C].
10.	Boom Cylinder Base End (1) [C].
11.	Boom Cylinder Rod End (1) [D].
12.	Arm Cylinder Base End (1) [D].

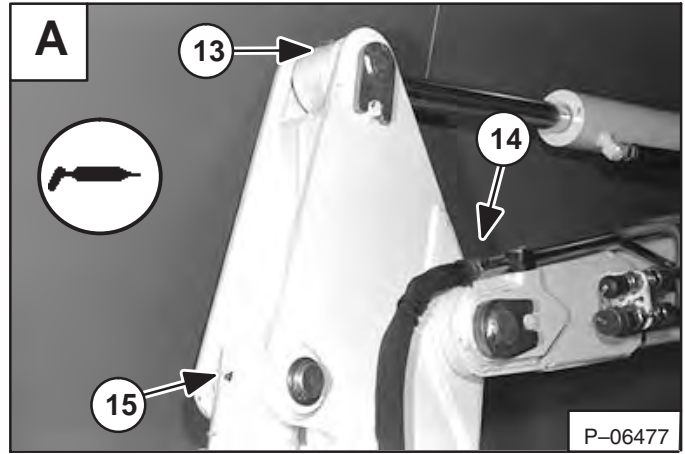


**LUBRICATION OF THE HYDRAULIC EXCAVATOR
(Cont'd)**

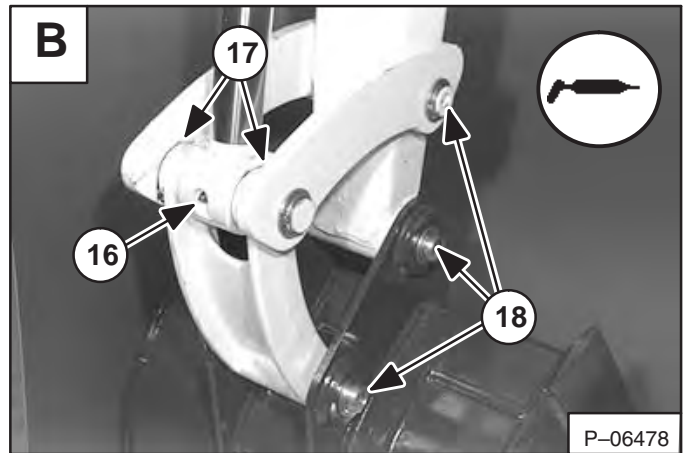
Procedure (Cont'd)

Ref.	Description (# of Fittings)
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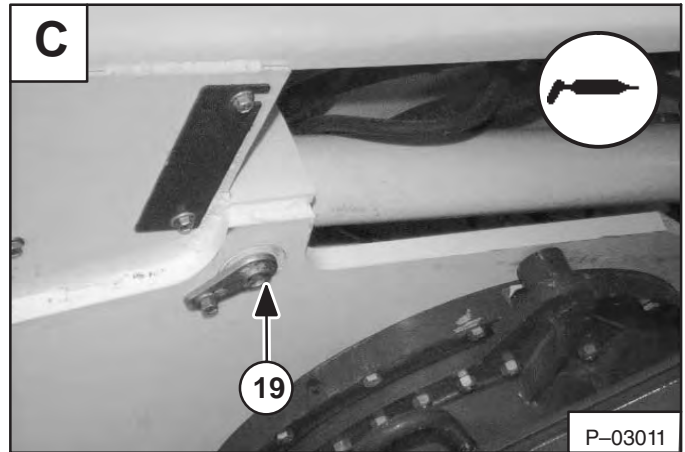
- | | |
|-----|-----------------------------------|
| 13. | Arm Cylinder Rod End (1) [A]. |
| 14. | Arm Base Pivot (1) [A]. |
| 15. | Bucket Cylinder Base End (1) [A]. |




- | | |
|-----|----------------------------------|
| 16. | Bucket Cylinder Rod End (1) [B]. |
| 17. | Bucket Link Pivots (2) [B]. |
| 18. | Bucket Pivots (3) [B]. |



- | | |
|-----|---------------------------------------|
| 19. | Boom Swing Cylinder Base End (1) [C]. |
|-----|---------------------------------------|

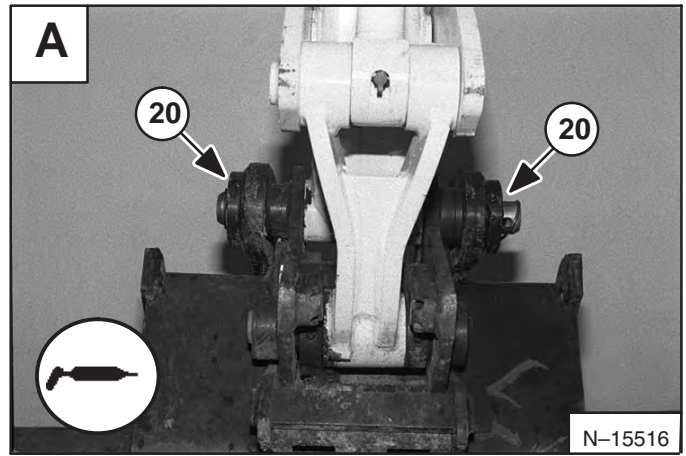


LUBRICATION OF THE HYDRAULIC EXCAVATOR (Cont'd)

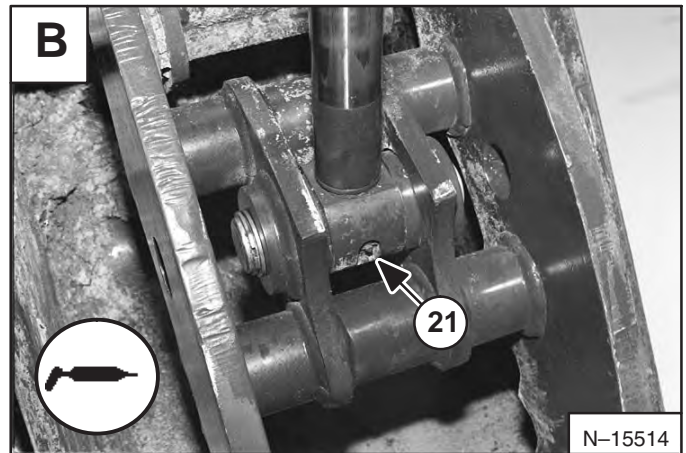
If the excavator is equipped with the optional lifting clamp, lubricate the following locations on the hydraulic excavator **EVERY 8-10 HOURS**: 

Ref.	Description (# of Fittings)
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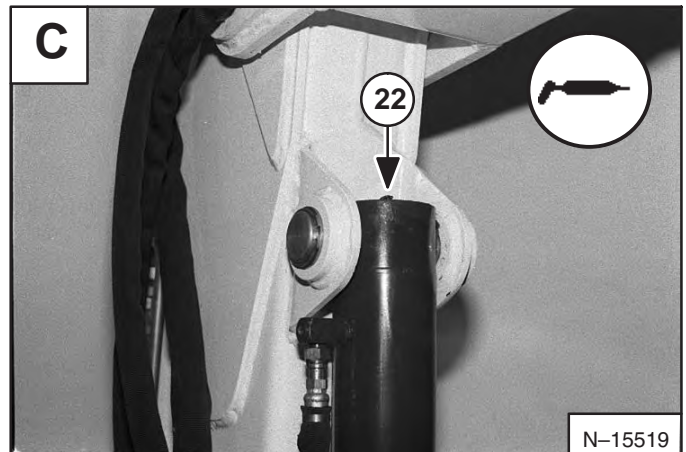
20.	Clamp Pivot Pin (2) [A].
-----	--------------------------



21.	Cylinder Rod End (1) [B].
-----	---------------------------



22.	Cylinder Base End (1) [C].
-----	----------------------------



LUBRICATION OF THE HYDRAULIC EXCAVATOR (Cont'd)

Lubricate the following locations on the Hydraulic Excavator **EVERY 50 HOURS:** 

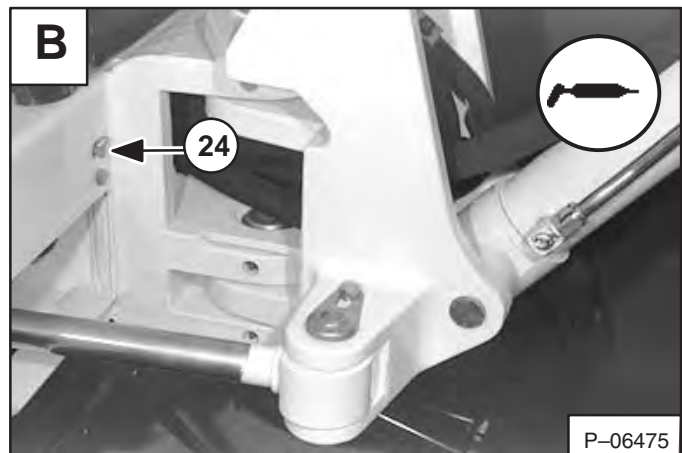
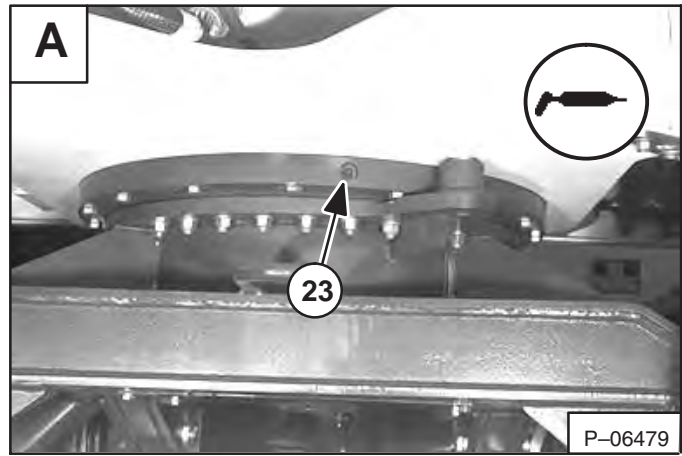
Ref.	Description (# of fittings)
------	-----------------------------

23.	Swing Circle Ball Bearings (2) [A].
-----	-------------------------------------

NOTE: Do not over grease the swing circle or damage to the seals could result. Install four to five pumps of grease from a grease gun into each of the two grease fittings. Rotate the upperstructure 90° and install four to five pumps of grease into each of the two grease fittings.

24.	Swing Circle Pinion (1) [B].
-----	------------------------------

NOTE: Install four pumps of grease from a grease gun into the grease fitting. Rotate the upperstructure 180° and install four more pumps of grease into the grease fitting.



HEATER AIR FILTER (With Cab Option Only) (331 S/N 512913001–512915199)

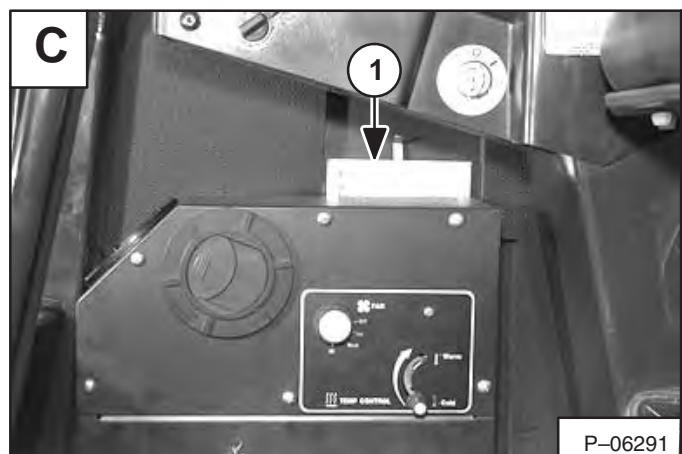
Service

See the *SERVICE SCHEDULE*, Page 1–3 for the correct service interval.

Remove the filter (Item 1) [C] from the back of the heater

Clean the filter element with compressed air.

Install the filter element into the back of the heater.



HEATER AIR FILTER (With Cab Option Only) (331 S/N 512915200 & Above), (331E S/N 517711001 & Above) & (334 S/N 516711001 & Above)

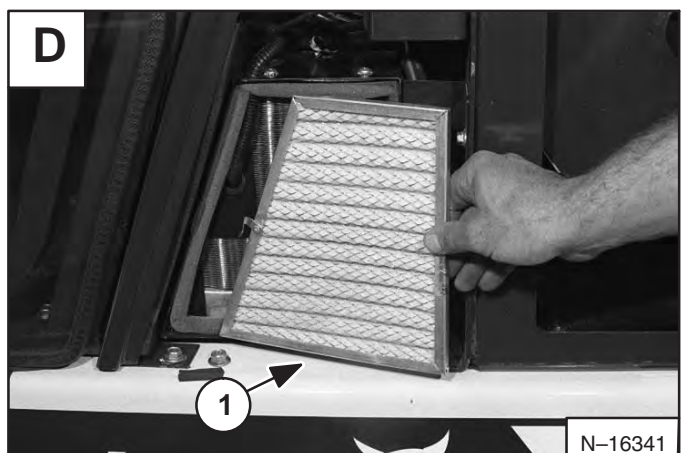
Service

See the *SERVICE SCHEDULE*, Page 1–4 for the correct service interval.

Using the start key, unlock and remove the left side panel.

Remove the air filter (Item 1) [C].

Clean the filter with compressed air only.



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SYSTEM**

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