

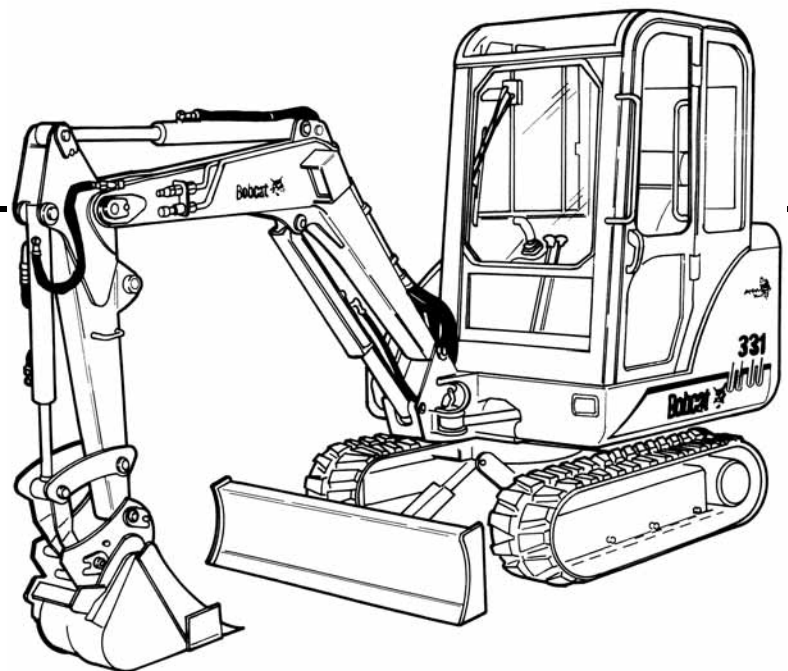


Bobcat®

**331
331E
334**

Service Manual

S/N 232511001 & Above
S/N 232711001 & Above
S/N 232611001 & Above
(D Series)



MAINTENANCE SAFETY



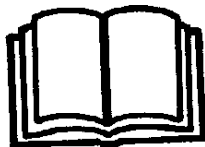
WARNING

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

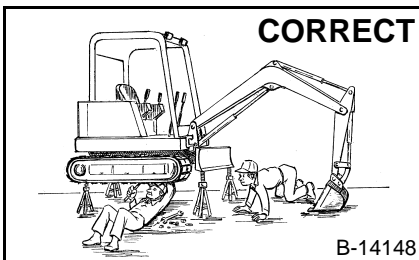


CORRECT



B-10731a

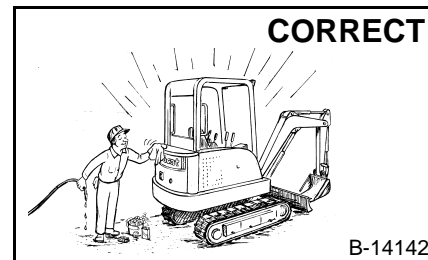
- ⚠ Never service the Bobcat Hydraulic Excavator without instructions.



CORRECT

B-14148

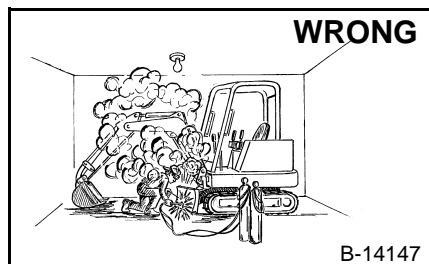
- ⚠ Use the correct procedure to lift and support the excavator.
- ⚠ Always lift the blade fully before installing jackstands.



CORRECT

B-14142

- ⚠ Cleaning and maintenance are required daily.



WRONG

B-14147

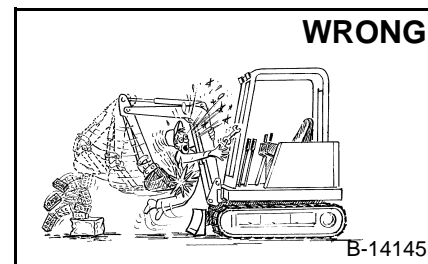
- ⚠ Have good ventilation when welding or grinding painted parts.
- ⚠ Wear dust mask when grinding painted parts. Toxic dust and gas can be produced.



WRONG

B-14141

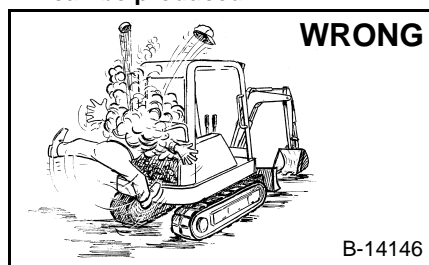
- ⚠ Vent exhaust to outside when engine must be run for service.
- ⚠ Exhaust system must be tightly sealed. Exhaust Fumes can kill without warning.



WRONG

B-14145

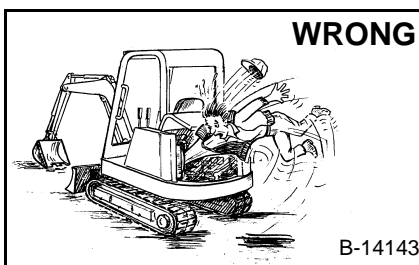
- ⚠ Always lower the bucket and blade to the ground before doing any maintenance.
- ⚠ Never modify equipment or add attachments not approved by Bobcat Company.



WRONG

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.



WRONG

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.



WRONG

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.

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**SAFETY AND
MAINTENANCE**

**HYDRAULIC
SYSTEM**

UNDERCARRIAGE

**UPPERSTRUCTURE
& SWING
SECTION**

**ELECTRICAL
SYSTEM AND
ANALYSIS**

**ENGINE
SERVICE**

**HEATING,
VENTILATION,
AIR CONDITIONING**

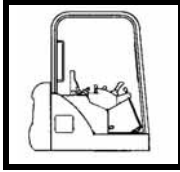
SPECIFICATIONS

FOREWORD

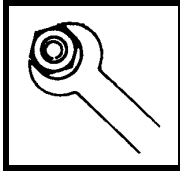
This manual is for the Bobcat Hydraulic excavator mechanic. It provides necessary servicing and adjustment procedures for the hydraulic excavator and its component parts and systems. Refer to the Operation & Maintenance Manual for operating instructions, starting procedure, daily checks, etc.

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

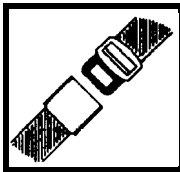
1. Check lift arm support device, replace if damaged. (Stored Position)



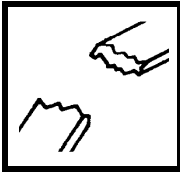
2. Check that ROPS mounting hardware is tightened and is Bobcat approved.



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



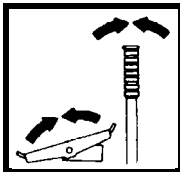
4. Inspect for loose or broken parts or connections.



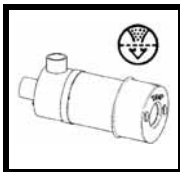
5. Machine signs must be legible and in the correct location.



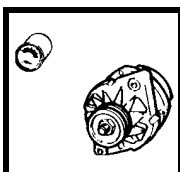
6. Steering levers, control levers and foot pedals must return to neutral. Check that foot pedals lock and control lever locks are in working order.



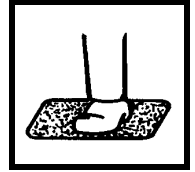
7. Inspect the air cleaner for damage or leaks. Check the condition of the element.



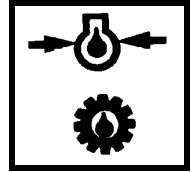
8. Check the electrical charging system.



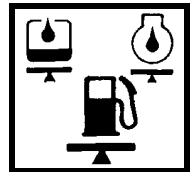
9. Safety treads must be in good condition.



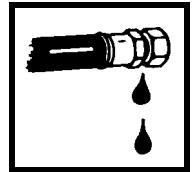
10. Check for correct function of indicator lamps (Optional on some models).



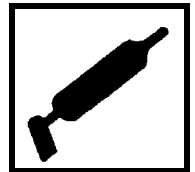
11. Check hydraulic fluid level, engine oil level and fuel supply.



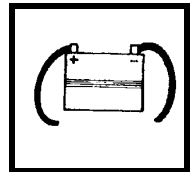
12. Inspect for fuel, oil or hydraulic fluid leaks.



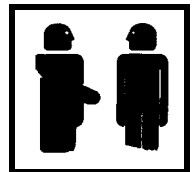
13. Lubricate the excavator.



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)

Fire Prevention

The machine and attachments have components that are at high temperature under normal operating conditions. The primary source of high temperatures is the engine and exhaust system. The electrical system, if damaged or incorrectly maintained, can be a source of arcs or sparks.

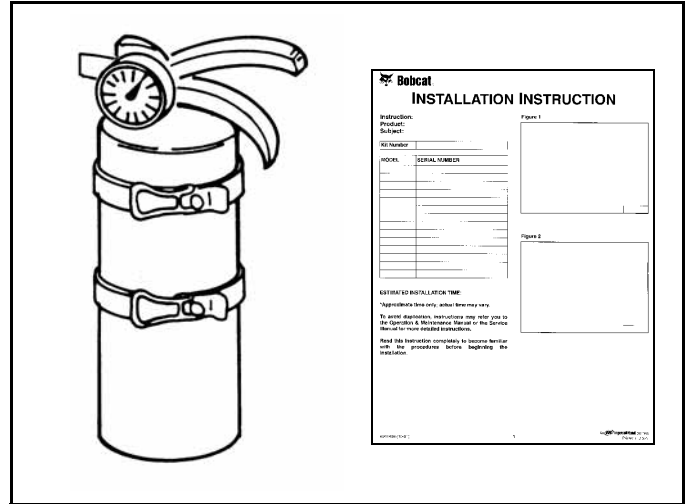
Flammable debris (leaves, straw, etc.) must be removed regularly. If flammable debris is allowed to accumulate, it will increase fire hazard. Clean often to avoid this accumulation. Flammable debris in the engine compartment is a potential hazard.

The spark arrestor muffler is designed to control the emission of hot particles from the engine and exhaust system, but the muffler and the exhaust gases are still hot.

- Do not use the machine where exhaust, arcs, sparks or hot components can contact flammable material, explosive dust or gases.
- The operator cab, engine compartment, and engine cooling system must be inspected every day and cleaned if necessary to prevent 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.
- Do not use ether or starting fluids on any engine which has glow plugs. These starting aids can cause explosion and injure you or bystanders.
- Always clean the machine, disconnect the battery, and disconnect the wiring from the controllers before welding. Cover rubber hoses, battery and all other flammable parts. Keep a fire extinguisher near the machine 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 Manual for connecting the battery and for jump starting.
- Use the procedure in the Operation & Maintenance Manual for cleaning the spark arrestor muffler (if equipped).

Figure 1



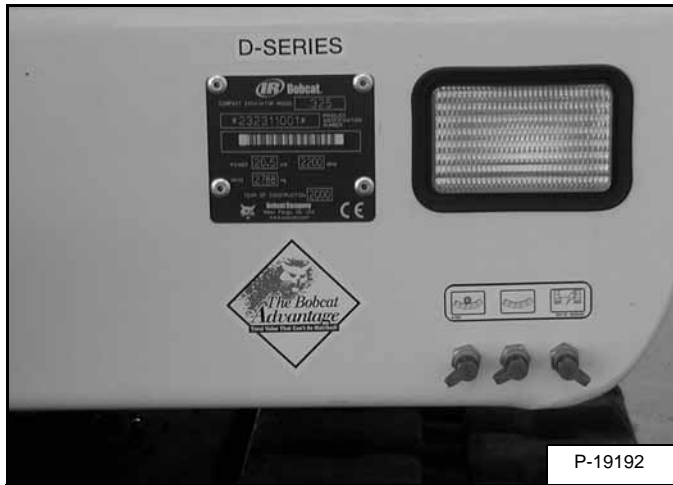
- Know where fire extinguishers and first aid kits are located and how to use them. Fire extinguishers are available from your Bobcat dealer [Figure 1].

SERIAL NUMBER LOCATIONS

Always use the FULL serial number (including the first four digits) when requesting service 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.

Bobcat Excavator Serial Number

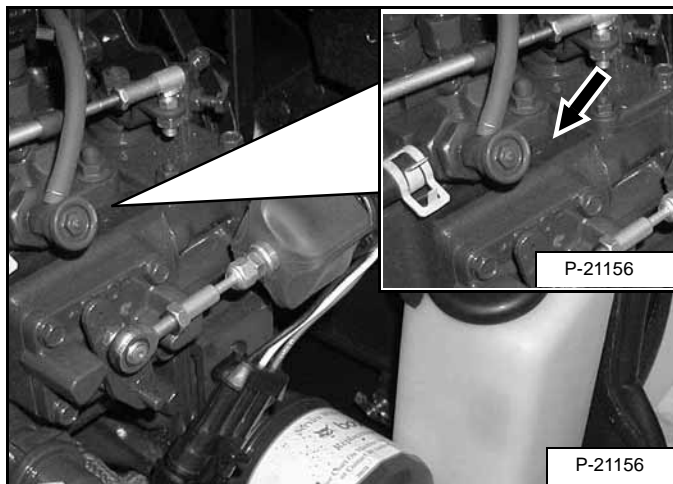
Figure 1



The Bobcat Excavator serial number is on the frame of the machine in the location shown [Figure 1].

Engine Serial Number

Figure 2



The engine serial number is located on the engine in the location shown [Figure 2].

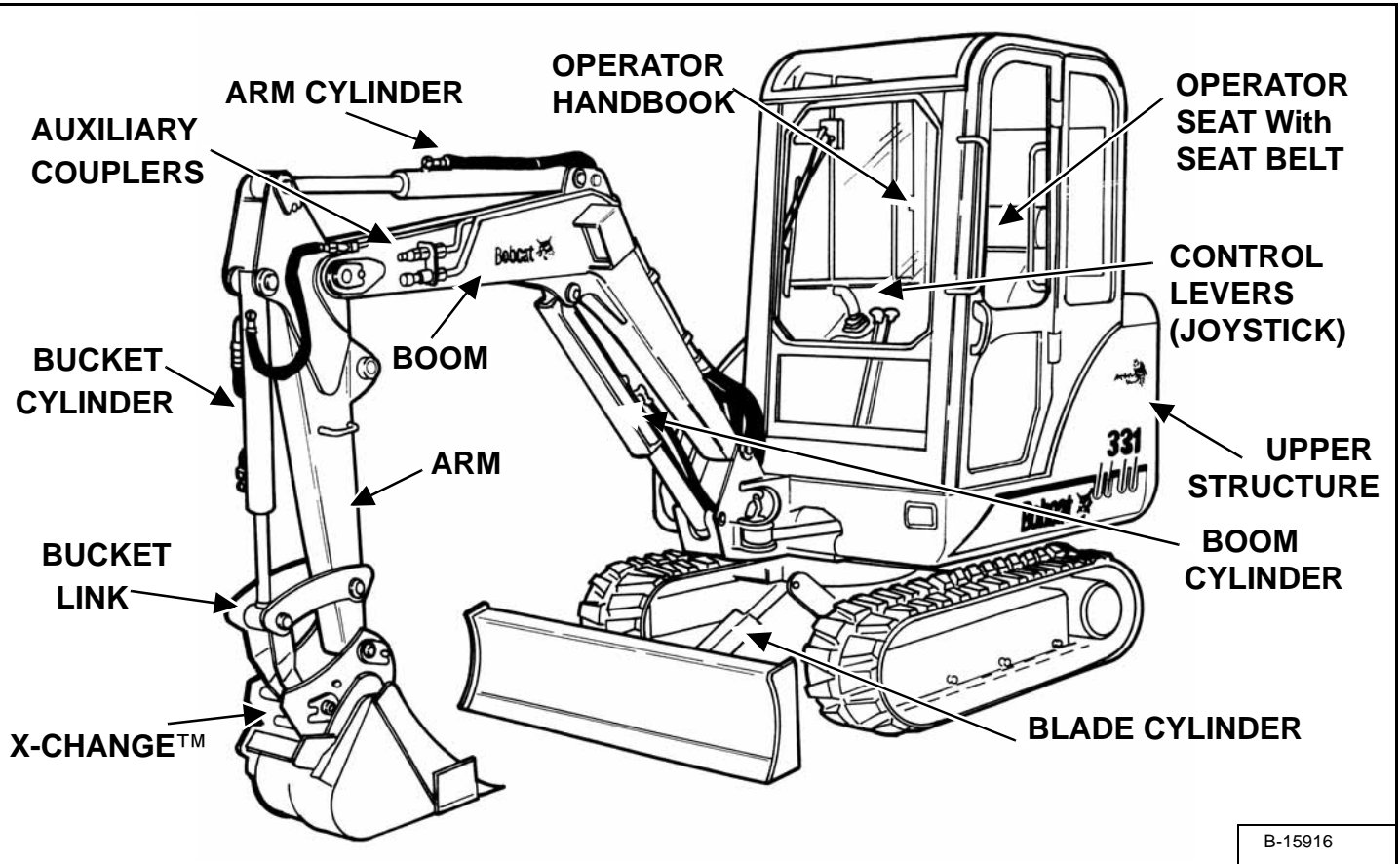
DELIVERY REPORT

Figure 3

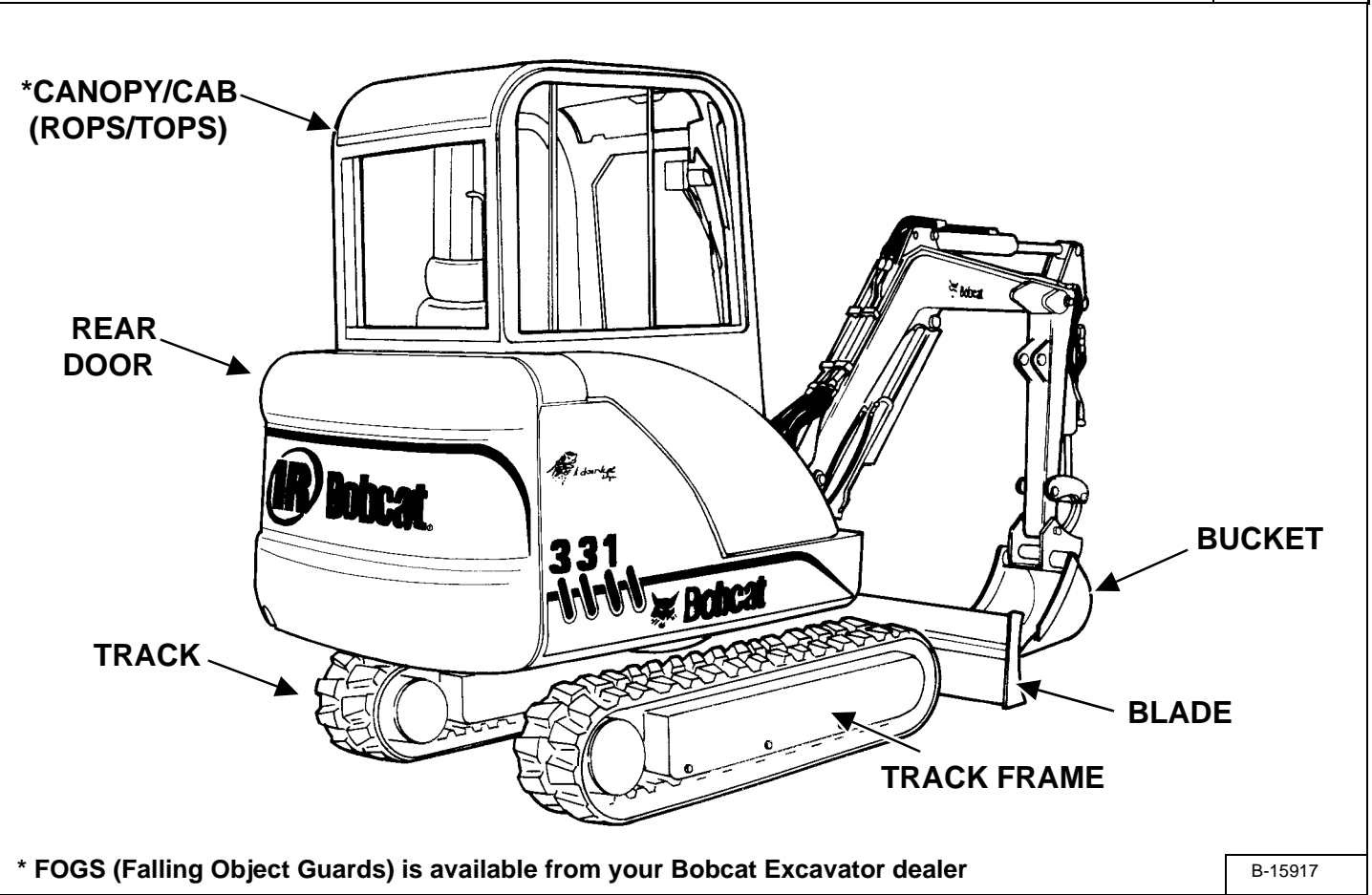
A diagram of a 'DELIVERY REPORT' form. The form is divided into several sections. At the top right is the title 'DELIVERY REPORT'. Below the title are several lines of text for information entry. On the left side, there is a section titled 'WARNING' with a black background and white text. Below this section are several lines of text for information entry. At the bottom right of the form is a small box with the text 'B-16315'.

The Delivery Report items must be explained to the owner/operator by the dealer. The dealer is to fill out the form and the owner/operator signs the form to indicate his understanding [Figure 3].

BOBCAT EXCAVATOR IDENTIFICATION



B-15916



* FOGS (Falling Object Guards) is available from your Bobcat Excavator dealer

B-15917

SAFETY AND MAINTENANCE

SAFETY & MAINTENANCE

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LIFTING AND BLOCKING THE EXCAVATOR

Procedure

WARNING

Instructions are necessary before operating or servicing machine. Read and understand the 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. Untrained operators and failure to follow instructions can cause injury or death.

W-2003-0199

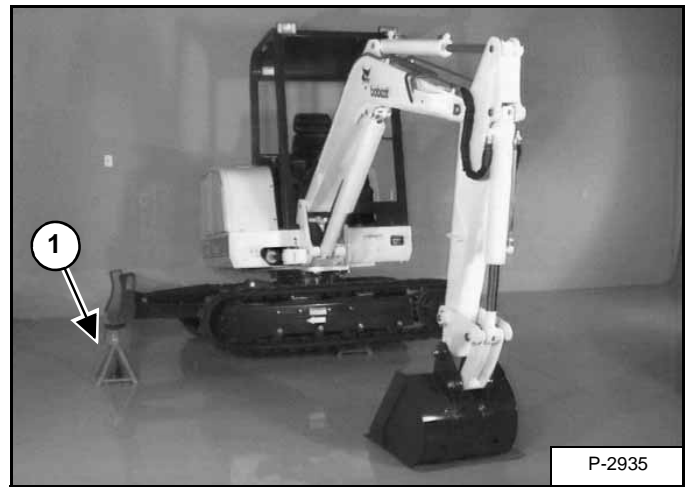
WARNING

Put jack stands under the front axles and rear corners of the frame before running the engine for service. Failure to use jack stands can allow the machine to fall or move and cause injury or death.

W-2017-0286

Always park the machine on a level surface.

Figure 10-10-1



Raise one side of the machine (approximately four inches) using the boom and arm [Figure 10-10-1].

Raise the blade fully and install jack stands under the blade and track frame (Item 1) [Figure 10-10-1]. Lower the boom until all machine weight is on the jack stands.

Repeat the procedure for the other side.

Stop the engine.

SWING LOCK

Operation



AVOID INJURY

The swing lock lever must be engaged when transporting the machine.

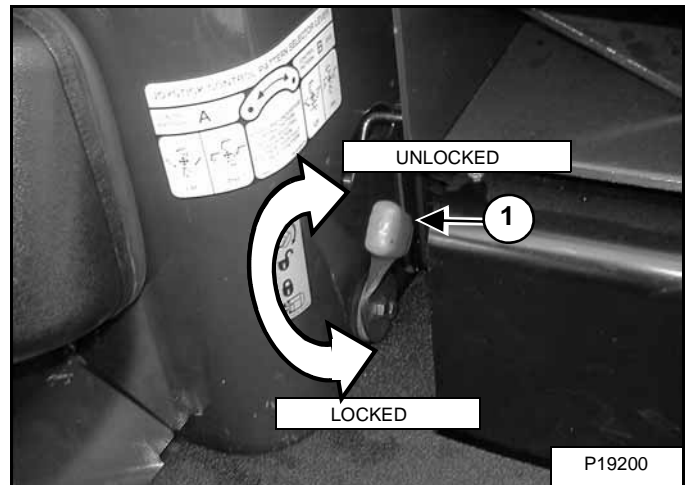
W-2197-0595



Never use attachments or buckets which are not approved by Bobcat Company. Buckets and attachments for safe loads of specified densities are approved for each model. Unapproved attachments can cause injury or death.

W-2052-0500

Figure 10-11-1



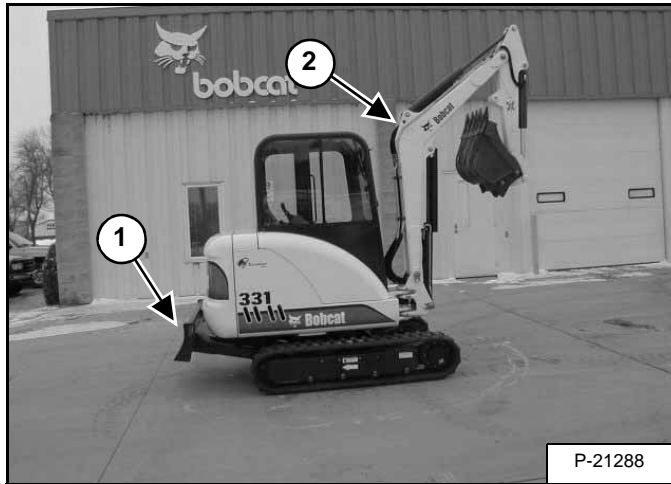
Move the lever (Item 1) **[Figure 10-11-1]** *down* to engage the Swing Lock. When the Swing Lock is engaged (locked), the upperstructure of the excavator is locked to the track frame and will not swing. The upper structure must be parallel to the track frame to engage the Swing Lock.

Move the lever (Item 1) **[Figure 10-11-1]** *up* to disengage the upperstructure from the track frame.

LIFTING THE EXCAVATOR

Procedure

Figure 10-12-1

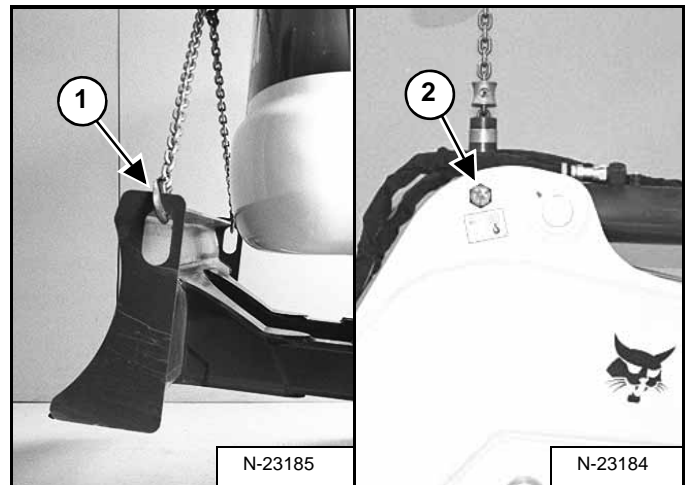


Fully extend the cylinders of the bucket, arm & boom so that the excavator is in the position as shown [Figure 10-12-1].

Raise the blade all the way.

Put the all control levers in neutral and engage the swing lock. (See SWING LOCK on Page 10-11-1.)

Figure 10-12-2



Fasten chains to the ends of the blade (Item 1) [Figure 10-12-1] & [Figure 10-12-2] and up to a lifting fixture above the canopy/cab. The lifting fixture must extend over the sides of the canopy/cab to prevent the chains from hitting the ROPS/TOPS.

Install a 1 inch (25mm) bolt and nut (Grade 5 or 8) through the holes at the top of the boom (Item 2) [Figure 10-12-1] & [Figure 10-12-2]. Fasten a chain from the bolt to the lift fixture.

WARNING

AVOID INJURY OR DEATH

- Use a lifting fixture with sufficient capacity for the weight of the excavator plus any added attachments.
- Maintain center of gravity and balance when lifting.
- Do not swing boom or upperstructure. Engage the swing locking lever.
- Never lift with operator on machine.

W-2202-0595

OPERATOR CAB (ROPS/TOPS) (IF EQUIPPED)

Emergency Exit

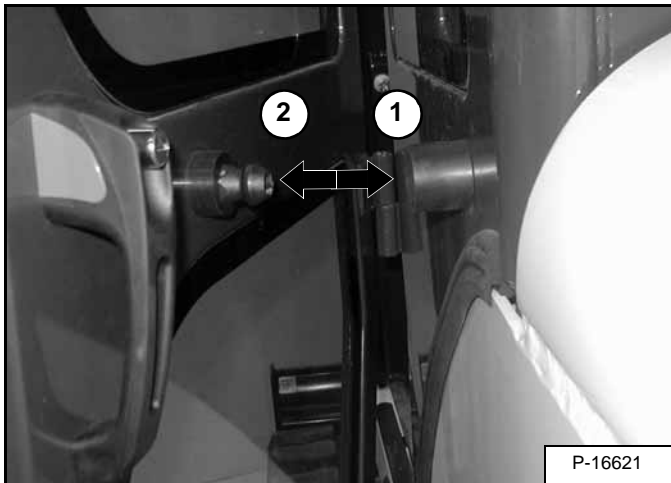
The left door and right rear window provide exits.

Figure 10-20-1



Slide the window to the front of the excavator and exit through the side window [Figure 10-20-1].

Figure 10-20-2



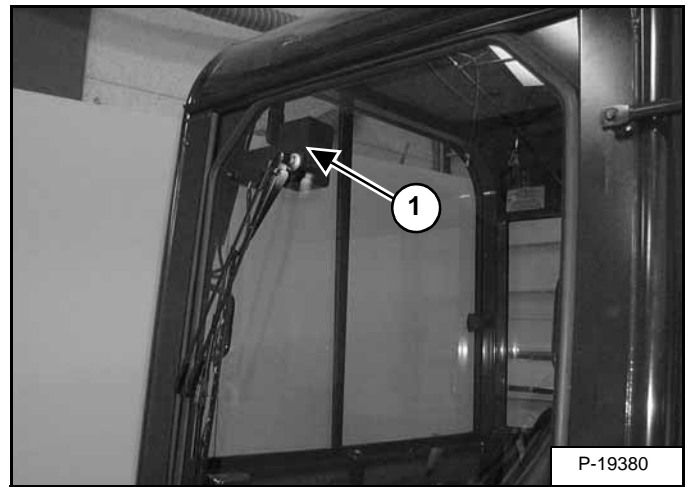
Cab Door

The cab door can be locked with the same key as the starter switch (if equipped).

Push the door all the way open (Item 1) [Figure 10-20-2] until the latch engages to hold the door in the open position.

Firmly pull the door away from the cab (Item 2) [Figure 10-20-2] to disengage the latch and close the door.

Figure 10-20-3



Front Window

The front window is equipped with a wiper (Item 1) [Figure 10-20-3] and washer.

Figure 10-20-4



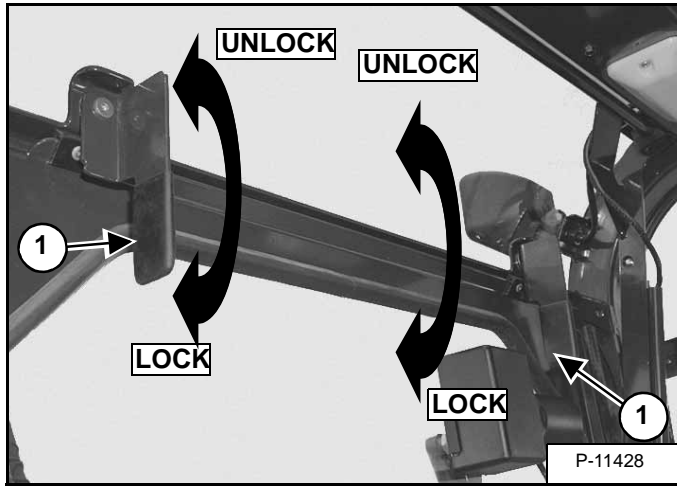
Opening The Front Window

Release the lower window latch pins and turn to the unlocked position [Figure 10-20-4].

OPERATOR CAB (ROPS/TOPS) (CONT'D)

Front Window (Cont'd)

Figure 10-20-5



Turn the two top latches (Item 1) [Figure 10-20-5] to the unlocked position.

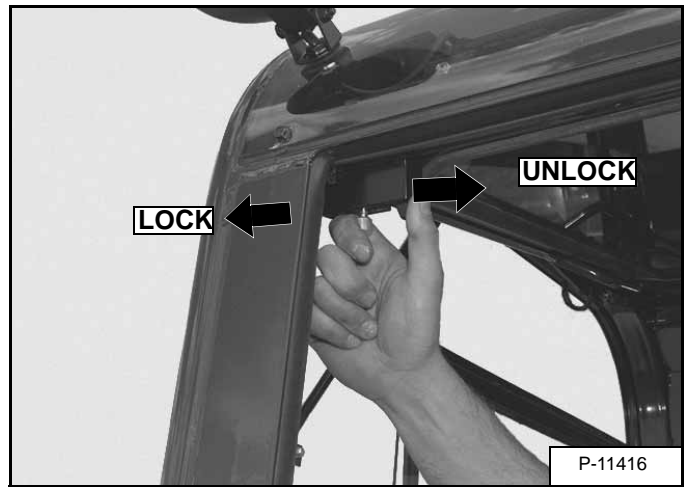
Figure 10-20-6



Use both window grab handles to pull the top of the window in [Figure 10-20-6].

Continue moving the window in and up over the operator's head until the window engages the pocket at the top, rear of the cab.

Figure 10-20-7



Hold the bottom of the window up and lock the two window latch pins. Make sure that the pins are secured to hold the window up [Figure 10-20-7].

Closing The Front Window

Hold the bottom of the window up and release both window latch pins and put them in the unlocked position [Figure 10-20-7].

Use both window grab handles to pull the window down [Figure 10-20-6].

Rotate the top latches (Item 1) [Figure 10-20-5] to the locked position.

Lock the window latch pins [Figure 10-20-4] at the bottom of the window.

TRANSPORTING THE EXCAVATOR

Procedure



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

W-2058-0494

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.

Secure the parking brakes and block the wheels of the transport vehicle.

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 with a slip resistant surface.

Use ramps that 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 to prevent the front of the transport vehicle from raising.

Determine the direction of the track movement before moving the machine (blade forward).

Figure 10-30-1



P-21293

Move the machine forward onto the transport vehicle [Figure 10-30-1].

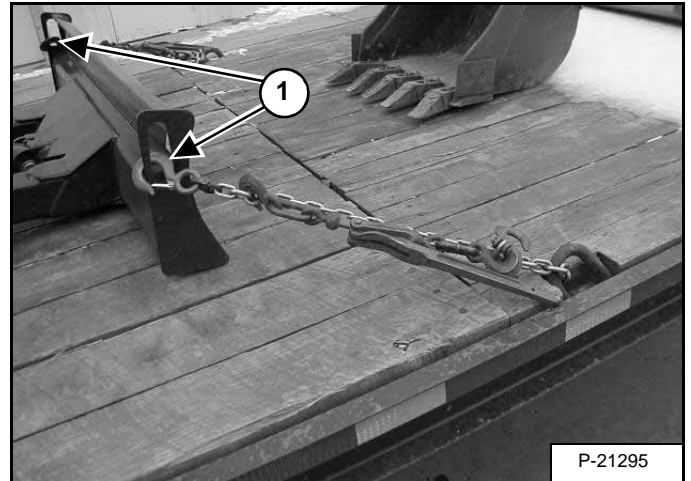
Do not change direction of the machine while it is on the ramps.

Lower the boom, arm, bucket and blade to the transport vehicle.

Stop the engine and remove the key (if equipped).

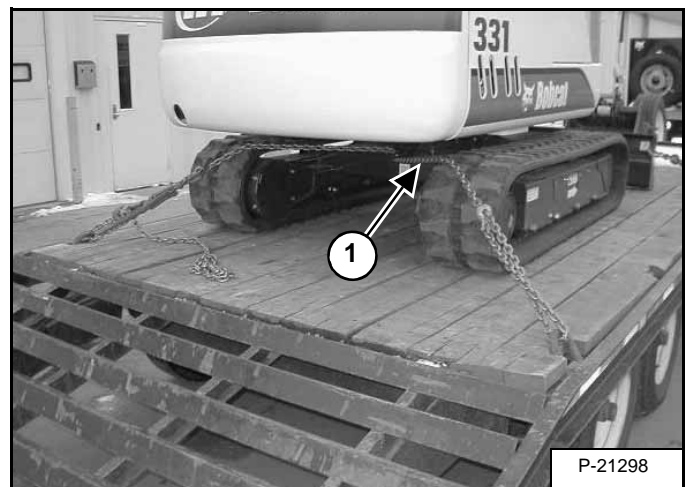
Put blocks at the front and rear of the tracks.

Figure 10-30-2



P-21295

Figure 10-30-3



P-21298

Fasten chains to the front corners of the blade (Item 1) [Figure 10-30-2] and to the tie down loop at the rear (Item 1) [Figure 10-30-3] to prevent it from moving when going up or down slopes, or during sudden stops.

Use chain binders to tighten the chains and then safely tie the chain binder levers to prevent loosening.

TAILGATE

Opening And Closing The Tailgate (Early Models)



AVOID INJURY OR DEATH

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

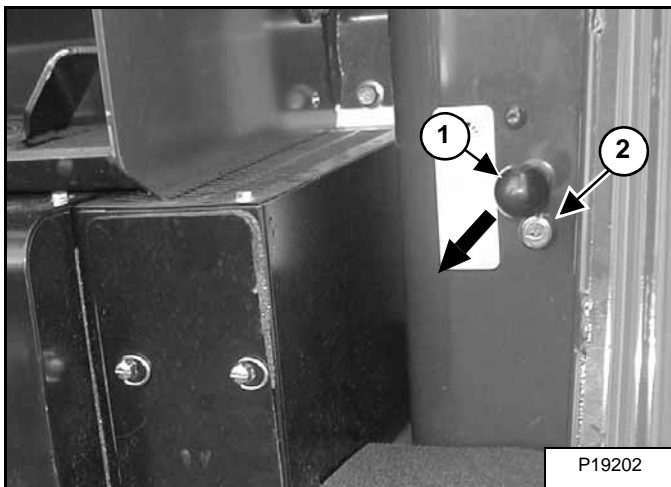
W-2012-0497



Keep the engine cover closed when operating the machine.

W-2141-0189

Figure 10-40-1



Pull the lever (Item 1) [Figure 10-40-1] to release the tailgate latch.

Pull the tailgate open to provide access for service.

Firmly push the tailgate closed to engage the latch.

The tailgate release can be locked (Item 2) [Figure 10-40-1]. Use the start key to lock/unlock the tailgate.

Adjusting The Bumper

Figure 10-40-2

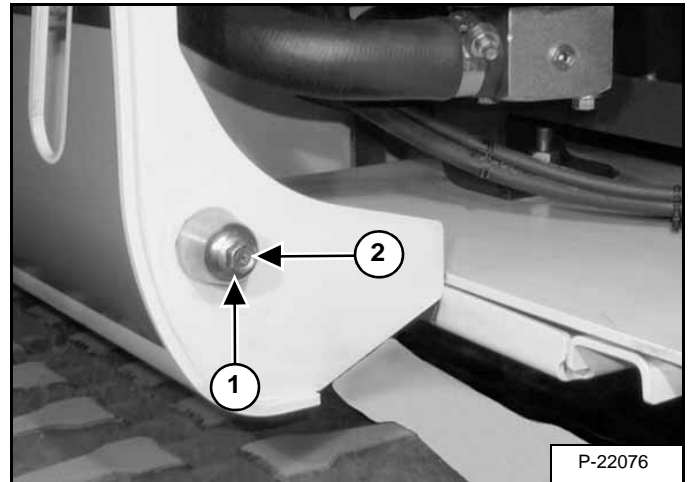
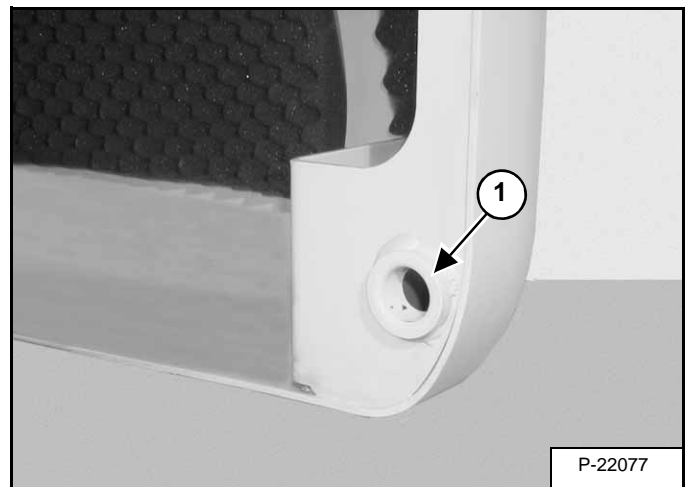


Figure 10-40-3



The door bumper (Item 1) [Figure 10-40-2] can be adjusted for alignment with the door.

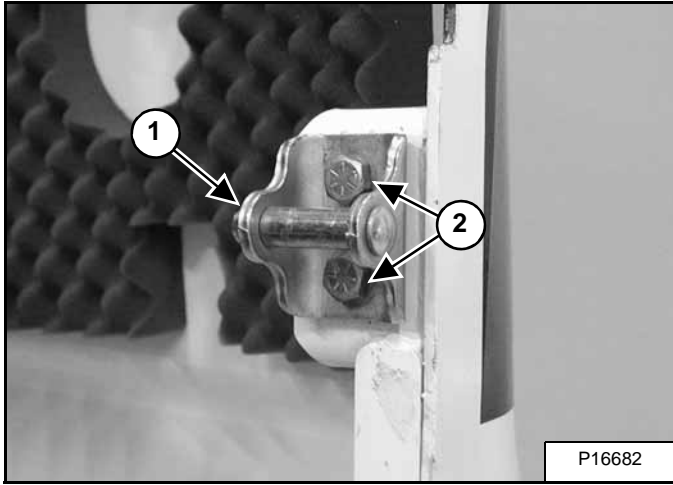
Loosen the bolt (Item 2) [Figure 10-40-2] and nut, and position the bumper so it is centered in the socket (Item 1) [Figure 10-40-3] on the lower corner of the door. Tighten the bolt.

Close the rear door before operating the excavator.

TAILGATE (CONT'D)

Adjusting The Tailgate Latch (Early Models)

Figure 10-40-4



The door catch (Item 1) [Figure 10-40-4] can be adjusted in either direction for alignment with the door latch.

Loosen the bolts (Item 2) [Figure 10-40-4]. Move the door catch as needed and tighten the bolts.

Opening And Closing The Tailgate (Later Models)

! WARNING

AVOID INJURY OR DEATH

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

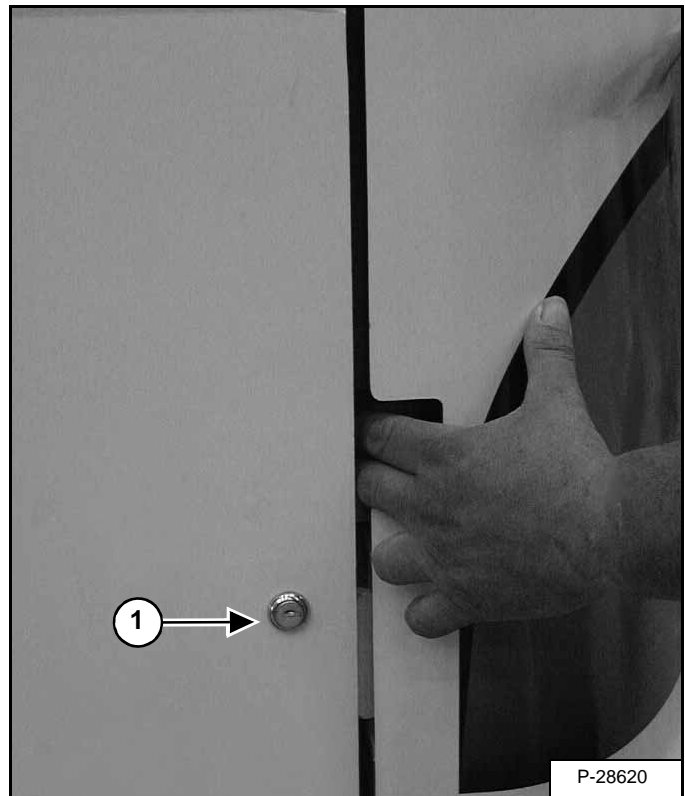
W-2012-0497

! WARNING

Keep the rear door closed when operating the machine. Failure to do so could seriously injure a bystander.

W-2020-1285

Figure 10-40-5



Release the latch [Figure 10-40-5] and pull the tailgate open.

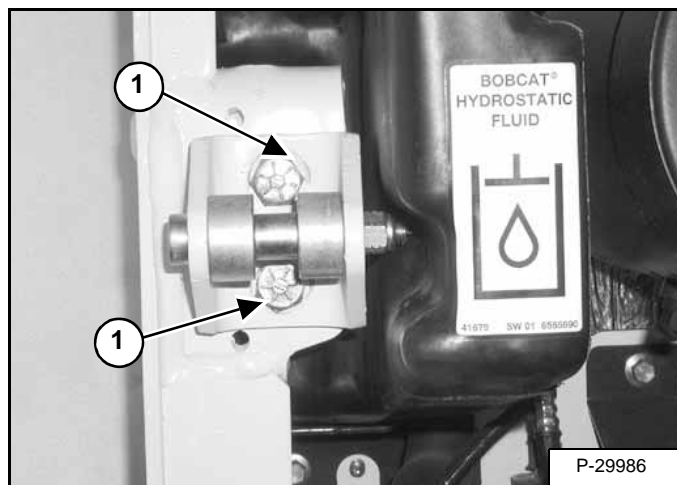
Push firmly to close the tailgate.

The tailgate can be locked (Item 1) [Figure 10-40-5]. Use the start key to lock/unlock the tailgate.

TAILGATE (CONT'D)

Adjusting The Tailgate Latch (Later Models)

Figure 10-40-6



Loosen the two bolts (Item 1) **[Figure 10-40-6]** and move the roller bracket up or down and side to side as needed.

Tighten the bolts.

Close the rear door before operating the excavator.

SERVICE SCHEDULE

Chart

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 Bobcat excavator.



WARNING

Instructions are necessary before operating or servicing machine. Read and understand the Operation & Maintenance Manual 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-2003-1285

SERVICE SCHEDULE		HOURS					
ITEM	SERVICE REQUIRED	8-10	50	100	250	500	■1000
Engine Coolant	Check coolant level. Add premixed coolant as needed.						
Engine Oil	Check the engine oil level and add as needed.						
Hydraulic Fluid, Hoses and Tubelines, Reservoir Breather Cap	Check the hydraulic fluid level and add as needed. Check for damage and leaks. Repair or replace as needed.						
Engine Air Filter and Air System	Check condition indicator and empty dust cup as needed. Check air system for leaks.						
Tracks	Check and adjust track tension as needed.						
Indicators and Lights	Check for correct operation of all indicators and lights.						
Operator Canopy / Cab	Check condition. Check mounting hardware.						
Seat Belt	Check condition. Check mounting hardware.						
Safety Signs and Safety Treads*	Check for damaged signs (decals) and safety treads. Replace any signs or safety treads that are damaged or worn.						
Pivot Points	Grease all machinery pivot points. (21 Places) Apply grease to extendable arm (If Equipped).						
Cab Heater Air Filter	Clean the filter as needed.						
Swing Circle and Pinion	Grease three fittings.						
Fuel Tank & Filter	Drain water and sediment from fuel tank and fuel filter.						
Battery	Check battery, cables, connections and electrolyte level. Add distilled water as needed.						
Alternator / Fan Belt	Check condition of belt and adjust as needed.		●				
Spark Arrestor Muffler	Clean the spark chamber.						
Engine Oil and Filter	Replace oil & filter. Use Cd or better grade oil and Bobcat filter.		●				
Fuel Filter	Replace fuel filter.						
Final Drive Case	Check lubricant level in both final drive cases.			◆			
Radiator, Oil Cooler, *A/C	Clean debris from the radiator fins.						
Hydraulic Filter	Replace the filter element.			◆			
Alternator & Starters	Check the alternator and starter connections.		●				
Engine Valves	Check and adjust the engine valve clearance.						
Case Drain Filter	Replace the filter.						
Final Drive Case	Replace lubricant in both final drive cases.						
Engine Cooling System	Drain and flush the cooling system						
Hydraulic System	Replace the hydraulic fluid and filter. Clean the Reservoir.			◆			

* If Equipped

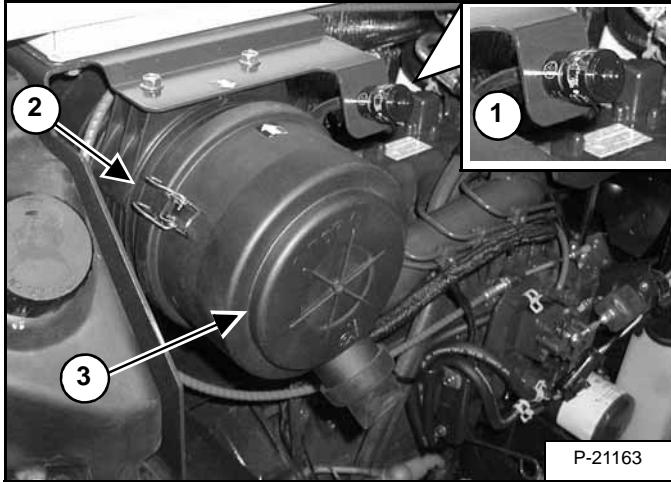
- Also at first 50 Hours
- ◆ Also at first 100 hours
- Or every 6 months.

AIR CLEANER SERVICE

See SERVICE SCHEDULE on Page 10-50-1 for the correct service interval.

Daily Check

Figure 10-60-1



Check the condition indicator (Item 1) [Figure 10-60-1]. If the red ring shows in the condition indicator, the filter element needs to be replaced.

Replace the inner filter every *third* time the outer filter is replaced or as indicated. (See SERVICE SCHEDULE on Page 10-50-1.)

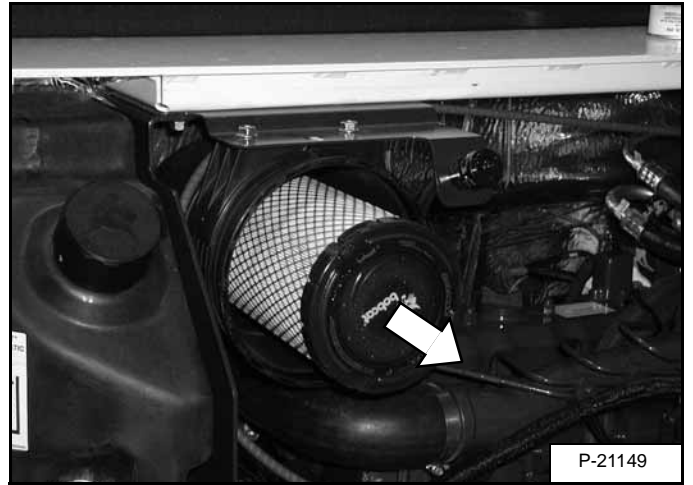
Replacing The Filters

Outer Filter

Release the two fasteners (Item 2) [Figure 10-60-1].

Remove and clean the dust cup (Item 3) [Figure 10-60-1].

Figure 10-60-2



Pull the outer filter from the air cleaner housing [Figure 10-60-2].

Check the housing for damage.

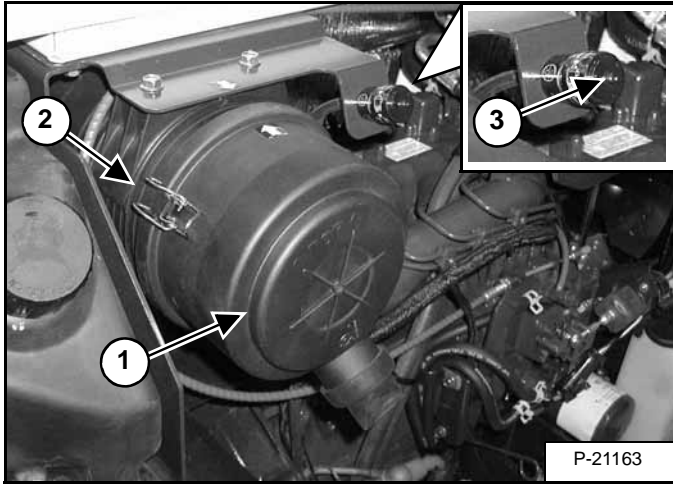
Clean the housing and the seal surface. Do Not use compressed air.

Install a new element.

AIR CLEANER SERVICE (CONT'D)

Replacing The Filters (Cont'd)

Figure 10-60-3



Install the dust cup (Item 1) [Figure 10-60-3] and engage the fasteners (Item 2) [Figure 10-60-3].

Check the air intake hose and the air cleaner housing for damage. Make sure all connections are tight.

Inner Filter

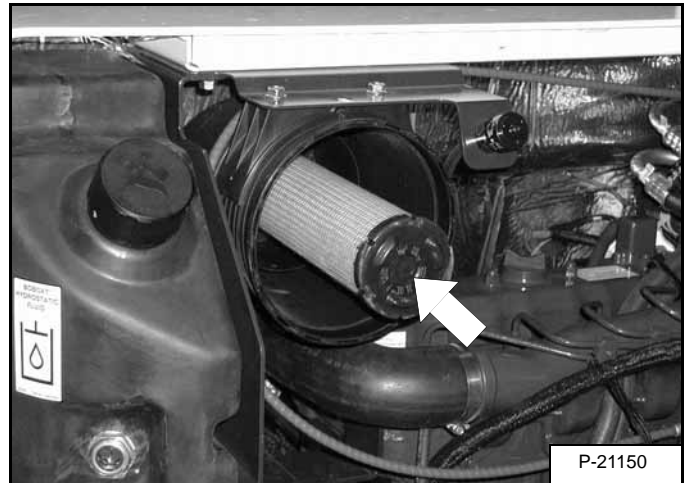
Only replace the inner filter element under the following conditions:

- Replace the inner filter element every *third* time the outer filter is replaced.
- After the outer element has been replaced, press the button (Item 3) [Figure 10-60-3] on the top of the condition indicator and start the engine. Run at full RPM, then reduce engine speed and stop the engine. If the red ring shows in the condition indicator, replace the inner filter element.

Remove the dust cup, outer filter and inner filter.

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

Figure 10-60-4



Install the new inner element [Figure 10-60-4].

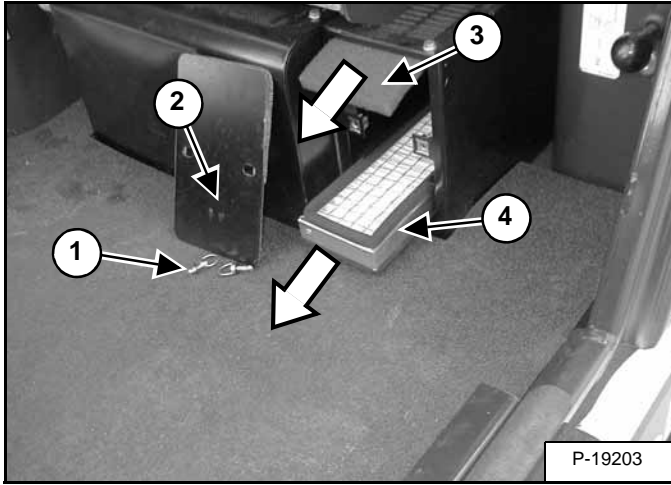
Install the outer element and the dust cup [Figure 10-60-3].

Press the button on the condition indicator (Item 3) [Figure 10-60-3] to remove the red ring.

HEATER AIR FILTERS (WITH CAB OPTION ONLY)

Recirculation Filter

Figure 10-61-1



The heater filters must be cleaned regularly. The filters are located at the left of the operator seat [Figure 10-61-1].

Remove the screws and cover (Items 1 & 2) [Figure 10-61-1]. Remove the filter (Item 3) [Figure 10-61-1] and wash the filter with a mild detergent and water. Dry the filter before installing.

Fresh Air Filter

Remove the filter (Item 4) [Figure 10-61-1]. Use low air pressure to clean the filter; or replace when very dirty.

Install the filter, cover and screws.

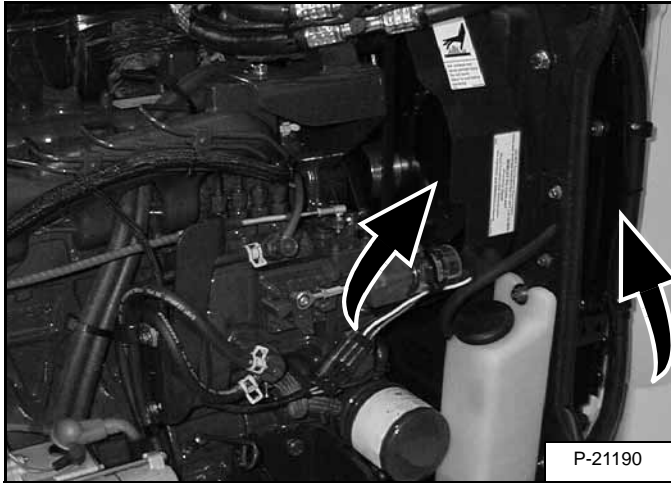
ENGINE COOLING SYSTEM

Check the cooling system every day to prevent overheating, loss of performance or engine damage.

Cleaning The Cooling System

Open the tailgate.

Figure 10-70-1



Use low air pressure or water pressure to clean the radiator and oil cooler [Figure 10-70-1]. Be careful not to damage fins when cleaning.

Checking The Coolant Level

! WARNING

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

W-2070-1285

Open the tailgate.

Figure 10-70-2

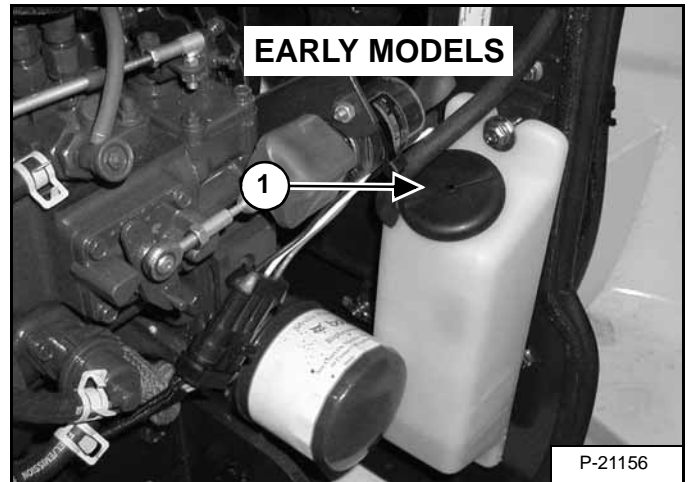
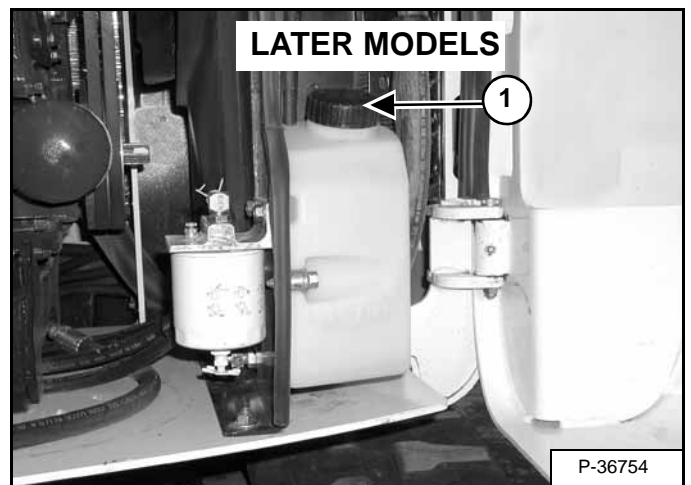


Figure 10-70-3



Check the coolant level in the coolant recovery tank (Item 1)[Figure 10-70-2] & [Figure 10-70-3].

The coolant level must be between the MIN and MAX marks on the coolant recovery tank when the engine is cold.

NOTE: The cooling system is factory filled with propylene glycol (purple color). DO NOT mix propylene glycol with ethylene glycol.

COOLING SYSTEM (CONT'D)

Checking Coolant Level (Cont'd)

! WARNING

Wear safety glasses to prevent eye injury when any of the following conditions exist:

- When fluids are under pressure.
- Flying debris or loose material is present.
- Engine is running.
- Tools are being used.

W-2019-1285

IMPORTANT

AVOID ENGINE DAMAGE

Always use the correct ratio of water to antifreeze.

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

Replacing The Coolant

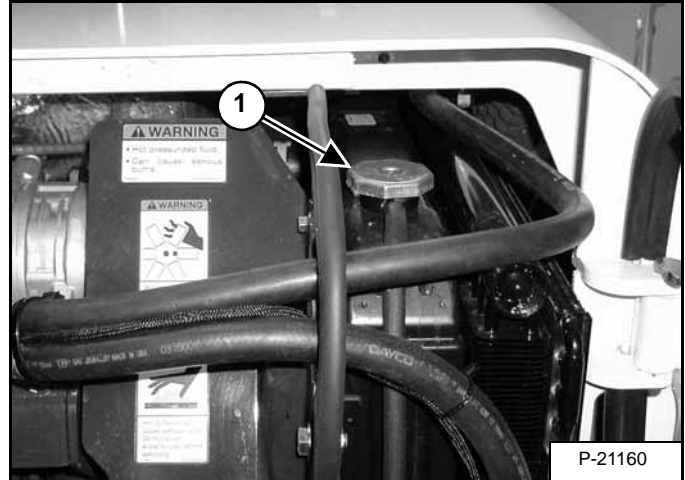
See SERVICE SCHEDULE on Page 10-50-1

! WARNING

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

W-2070-1285

Figure 10-70-4



When the engine is cool, loosen and remove the radiator cap (Item 1) [Figure 10-70-4].

COOLING SYSTEM (CONT'D)

Replacing The Coolant (Cont'd)

Figure 10-70-5

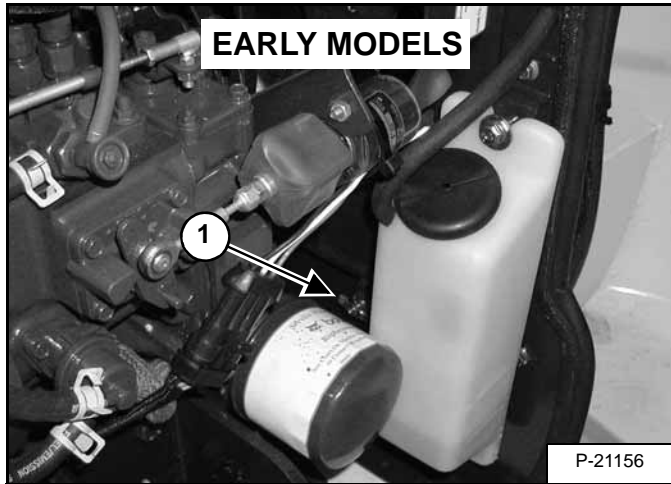
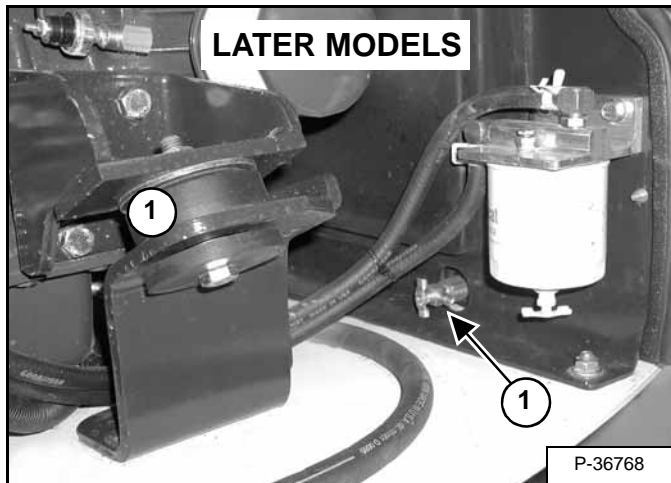
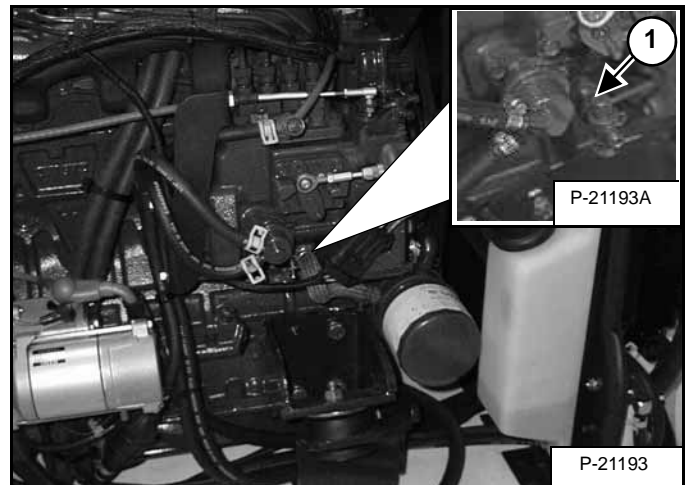


Figure 10-70-6



Put a hose on the drain valve at the bottom of the radiator. Open the drain valve (Item 1) [Figure 10-70-5] & [Figure 10-70-6] and drain the coolant into a container.

Figure 10-70-7



Put a hose on the drain valve on the engine block. Open the drain valve (Item 1) [Figure 10-70-7] drain the coolant into a container.

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

Recycle or dispose of the used coolant in an environmentally safe manner.

Mix the coolant in a separate container. (See FUEL, COOLANT AND LUBRICANTS on Page SPEC-60-1)

NOTE: The cooling system is factory filled with propylene glycol (purple color). 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. (See IMPORTANT on Page 10-70-2.)

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

Add premixed coolant until the level is correct.

Run the engine until it is at operating temperature. Stop the engine. Check the coolant level and add as needed. Be sure the radiator cap is tight.

Add coolant to the recovery tank as needed.

Close the tailgate.

FUEL SYSTEM

Fuel Specification

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

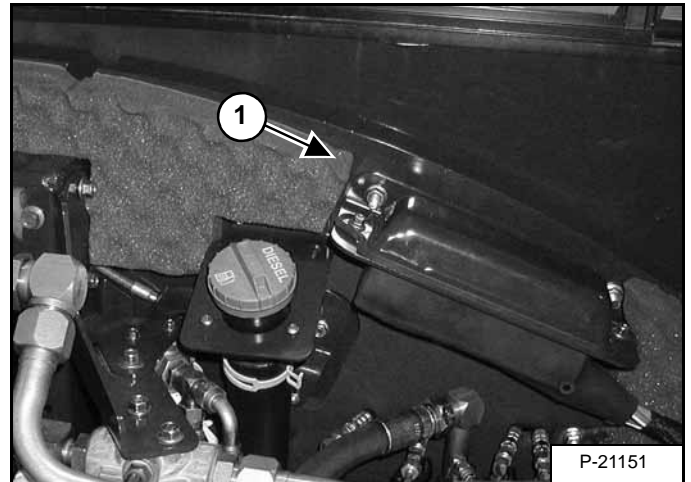
The following is a suggested blending guideline which should prevent fuel gelling problems during cold weather use.

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 his fuel supplier.

Filling The Fuel Tank

Figure 10-80-1



Open the side cover and remove the fuel fill cap (Item 1) [Figure 10-80-1].

Use a clean, approved safety container to add fuel. Add fuel only in an area that has a free movement of air and no flames or sparks. **NO SMOKING!**

Install and tighten the fuel fill cap. Close the side door.(

(See SERVICE SCHEDULE on Page 10-50-1.) for the service interval when to remove water from or replace the fuel filter.

WARNING

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

W-2063-0887

FUEL SYSTEM (CONT'D)

Removing Water From The Fuel Filter

(See SERVICE SCHEDULE on Page 10-50-1.) for the service interval when to remove the water from the fuel filter.

Open the tailgate.

Figure 10-80-2

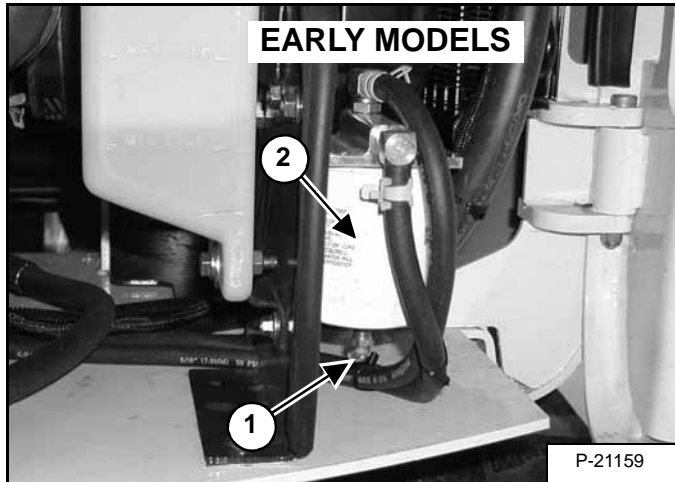
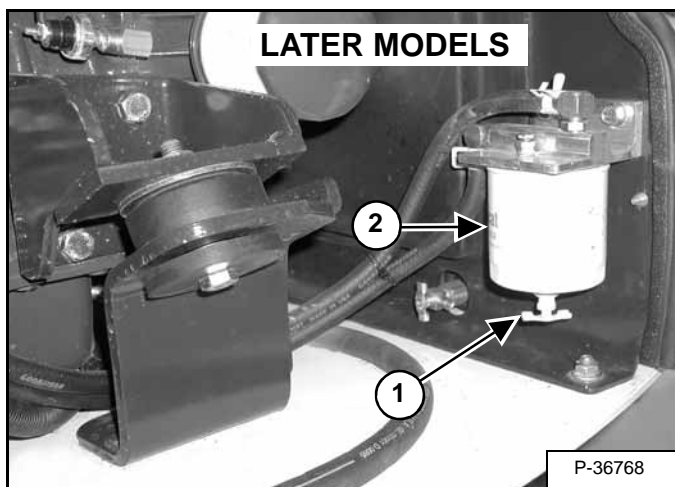


Figure 10-80-3



Loosen the drain (Item 1) [Figure 10-80-2] & [Figure 10-80-3] at the bottom of the filter element to drain water from the filter.

Replacing The Fuel Filter

(See SERVICE SCHEDULE on Page 10-50-1.) for the service interval when to replace the fuel filter.

Remove the filter element (Item 2) [Figure 10-80-2] & [Figure 10-80-3].

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 system. (See Removing Air From The Fuel System on Page 10-80-3.)

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.

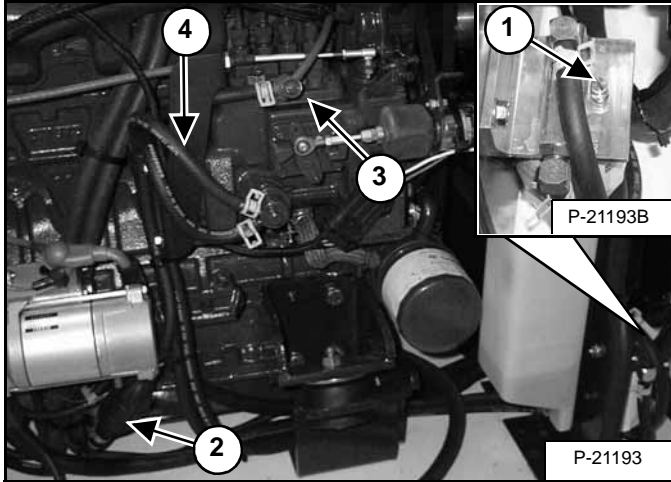
W-2103-1285

FUEL SYSTEM (CONT'D)

Removing Air From The Fuel System

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

Figure 10-80-4



Open the fuel filter vent (Item 1) [Figure 10-80-4].

Operate the hand pump (priming bulb) (Item 2) [Figure 10-80-4] until the fuel flows from the vent with no air bubbles.

Close the vent (Item 1) [Figure 10-80-4].

Start the engine. It may be necessary to open the vent (Item 3) [Figure 10-80-4] (at the fuel injection pump) briefly until the engine runs smoothly.

Draining The Fuel Tank

(See SERVICE SCHEDULE on Page 10-50-1.) for the correct service interval.

Remove the hose (Item 4) [Figure 10-80-4] from the fuel injection pump. Route the hose to the bottom of the engine compartment and out the tailgate.

Drain the fuel into a container.

Reuse, recycle or dispose of fuel in an environmentally safe manner.

WARNING

Diesel fuel or hydraulic fluid under pressure can penetrate skin or eyes, causing serious injury or death. Fluid leaks under pressure may not be visible. Use a piece of cardboard or wood to find leaks. Do not use your bare hand. Wear safety goggles. If fluid enters skin or eyes, get immediate medical attention from a physician familiar with this injury.

W-2072-0496



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